Test Booklet Code

ENGLISH **70**

Re-NEET (UG)-2026

|| DATE: 21-06-2026 ||

Important Instructions:

1. The test is of **3 hours 15 minutes** duration and the Test Booklet contains **180** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry,** and **Biology (Botany and Zoology)**. All questions are compulsory.
2. Each question carries **4 marks**. For **each correct response**, the candidate will get **4 marks**. For **each incorrect response**, **1 mark will be deducted** from the total scores. The maximum mark is **720**.
3. Use a **Blue/Black** ballpoint Pen only for writing particulars on this page/marking responses on the Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy)** to the **Invigilator** before leaving the room/hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is **70**.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet. The use of white fluid for correction is **NOT** permissible on the Answer Sheet.
8. Each candidate must show on-demand his/her Admit Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of an Electronic/Manual Calculator is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

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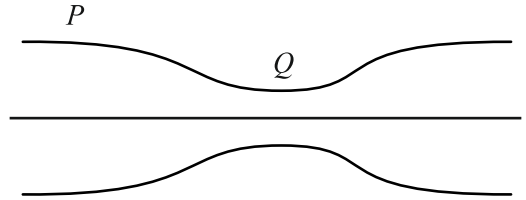
1. A photon and an electron, each of 20 eV energy, move in free space. The ratio of linear momentum of electron p_e to that of photon p_{Ph}, $\frac{p_e}{p_{Ph}}$ is :
(Take speed of light = 3×10^8 ms^{-1}, charge of electron $= -1.6 \times 10^{-19}$ C and mass of electron $\frac{1}{4\pi \in_0} = 9 \times 10^{-31}$ kg)

(1) 275 (2) $\frac{2}{450}$

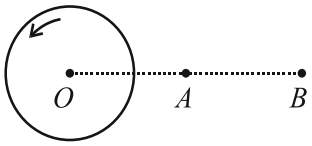
(3) $\frac{1}{250}$ (4) 225

2. Water flows in a streamline motion through a horizontal pipe of circular cross-section as shown in the figure. The pressure difference of water between P and Q is 15 Nm^{-2}. The area of cross-section at P and Q are 40 cm^2 and 20 cm^2, respectively. The rate of flow of water through the pipe, in cm^{3}s^{-1}, is:
[Take density of water $= 1000$ kg m^{-3}]



(1) 400 (2) 100
(3) 200 (4) 300

3. A thin horizontal disc is rotating about a vertical axis passing through its fixed centre O. Its angular momentum is L_A and L_B computed about points A and B, respectively, with $OB = 2 \times OA$. The value of $\frac{L_A}{L_B}$ is :



(1) 2 (2) $\frac{1}{4}$

(3) $\frac{1}{2}$ (4) 1

4. Consider a long solenoid of length l and radius r. If n is the number of turns per unit length and μ_0 is the permeability of free space, the inductance of the solenoid is :

(1) $2\mu_0 \pi n^2 r^2 l$

(2) $\mu_0 \pi n^2 r^2 l$

(3) $\mu_0 n^2 r^2 l$

(4) $(\mu_0 / 2\pi) n^2 r^2 l$

5. The temperature of a metallic sphere of radius R is increased by a small amount ΔT. If the linear coefficient of thermal expansion of the metal is α, the approximate increase in the volume of the sphere is :

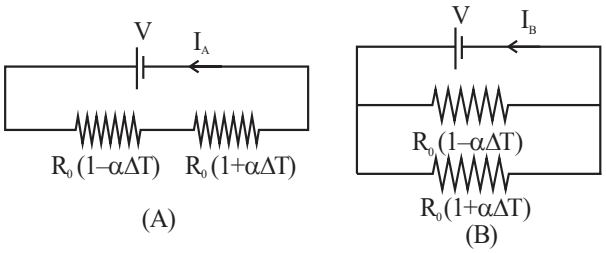
(1) $6\pi R^3 \alpha \Delta T$

(2) $2\pi R^3 \alpha \Delta T$

(3) $3\pi R^3 \alpha \Delta T$

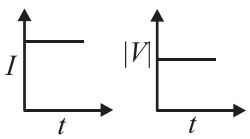
(4) $4\pi R^3 \alpha \Delta T$

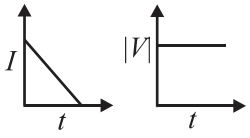
6. Consider two circuits, (A) and (B), each having two resistors. One of them has a positive temperature coefficient of resistance, +α, while the other one has a negative temperature of coefficient, –α, as shown in the figure. The current through these circuits are denoted by I_A and I_B. At initial temperature, the resistance of the two resistors is R_0. As the temperature is increased, the correct option that describes the variation of current in these circuits is :

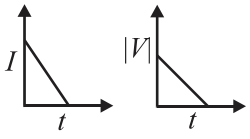


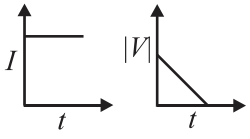
(1) both I_A and I_B remain constant
(2) I_A remains constant while I_B increases
(3) I_A decreases while I_B increases
(4) I_A increases while I_B decreases

7. A beam of light falls on a metal surface such that photo-electrons are generated. If power of the light source starts to decrease linearly with time t, then variation of the photocurrent I and magnitude of the stopping potential $|V|$ with time is best represented by :

(1) 

(2) 

(3) 

(4) 

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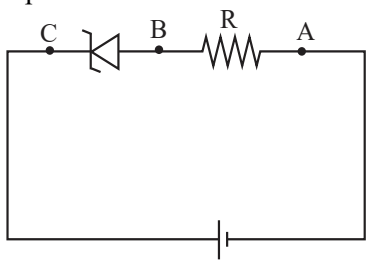
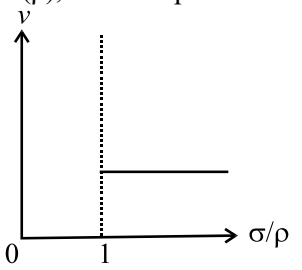
8. An ideal Zener diode with breakdown voltage of -3 V is reverse biased with a negative input voltage V_i = -5 V. The magnitude of voltage difference between points B and A is :



(1) 0 V
(2) 3 V
(3) 2 V
(4) 1 V

9. In the measurement of viscosity of liquids using terminal velocity experiment, spherical balls of same radius but having different densities are used. The variation of the terminal velocity (v) with the ratio of density of spherical ball (σ) to density of the liquid (ρ), is best represented by:

(1)


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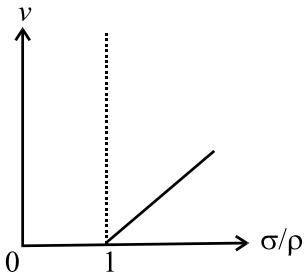

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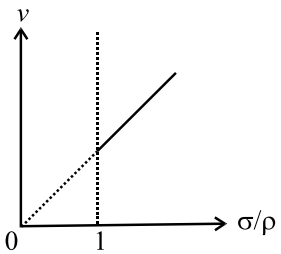

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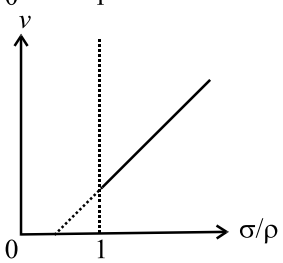
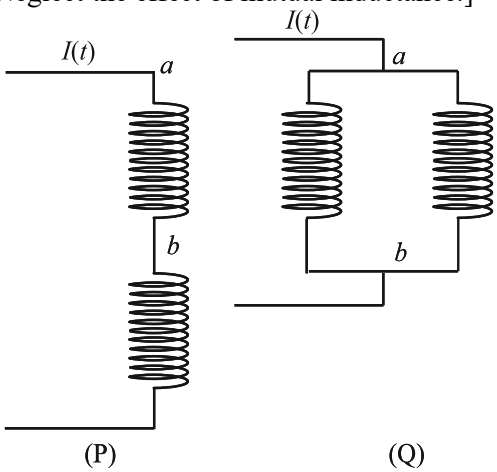


10. Two planets P_1 and P_2 with equal mass have radii R_1 and R_2, respectively, where $R_2=\frac{R_1}{2}$. The escape speeds of P_1 and P_2 are v_1 and v_2, respectively. Then $\frac{v_2}{v_1}$ is :

(1) 2 (2) $\frac{1}{\sqrt{2}}$
(3) 1 (4) $\sqrt{2}$

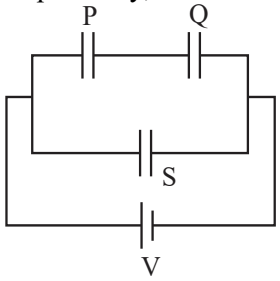
11. An ac voltage V=220 sin(2×10^3t) Volt is applied to a series LCR circuit. Then the current amplitude in this circuit is :
(Given : L=10 mH, C=25μF, R=100 Ω)
(1) 22.0 A (2) 2.2 A
(3) 5.5 A (4) 11.0 A

12. Two identical inductors are connected in two different configurations P and Q, where a time varying current $I(t)$ is flowing, as shown in the figure. The induced emf between points a and b for configuration P is E_P and that for configuration Q is E_Q. The ratio E_P / E_Q is :
[Neglect the effect of mutual inductance.]



(1) 2 (2) 1/4
(3) 1/2 (4) 1

13. Three identical capacitors P, Q and S, each of the capacitance C, are connected to a battery of voltage V, as shown in the figure. If the energy stored in the capacitor P and total energy stored in the system are U_p and U_t, respectively, then the ratio U_p / U_t is :



(1) 1/6 (2) 2/3
(3) 1/3 (4) 1/2

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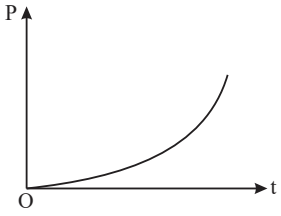
14. A conducting loop of finite resistance lies on the x - y plane. There is a constant magnetic field in the z direction. The area of the loop varies with time t, as $A = A_0(1 + \sin t)$ in appropriate units. The figure that correctly indicates the qualitative behaviour of the power P dissipated in the loop as a function of time is :

(1)


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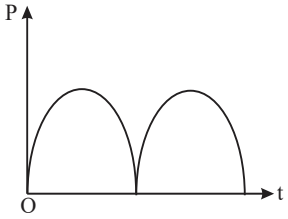

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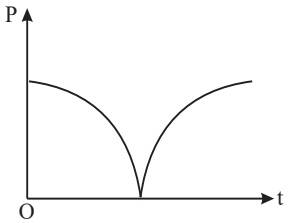

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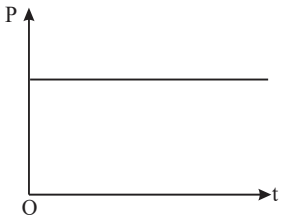


15. In an adiabatic expansion, the temperature of one mole of an ideal monatomic gas ($\gamma = 5/3$) decreases from 60K to 50K. The work done by the gas in the process is :
(Take the universal gas constant as R = 8.3 J mol^{-1} K^{-1})
(1) 166 J
(2) 41.5 J
(3) 83 J
(4) 124.5 J

16. Consider a particle moving along a straight line, whose position as a function of time is given by $s(t) = \alpha t^2 - \beta t + \gamma$, where $\alpha = 1$ ms^{-2}, $\beta = 6$ ms^{-1} and $\gamma = 5$ m. The average speed of the particle, in ms^{-1}, from t = 0 to t = 6 s is:
(1) 0
(2) 12
(3) 6
(4) 3

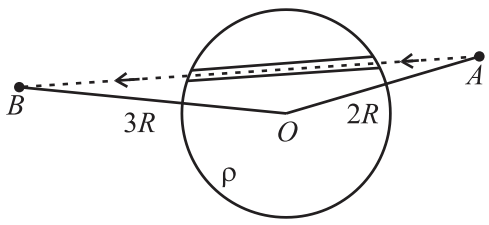
17. The following table presents the part of the electromagnetic spectrum and their corresponding major applications.

Part of the electromagnetic spectrum		Applications	
P	Microwave	I	For purifying the water
Q	UV rays	II	For warming the food
R	Gamma rays	III	For AM and FM communication systems
S	Radio wave	IV	For treating the Cancer cells

The **correct** option is :
(1) P-II, Q-IV, R-III, S-I
(2) P-I, Q-II, R-III, S-IV
(3) P-I, Q-IV, R-II, S-III
(4) P-II, Q-I, R-IV, S-III

18. An ideal gas is made of polyatomic molecules. Each of the molecules has three translational, three rotational and f number of vibrational modes. If the ratio of heat capacities $\frac{C_p}{C_v}$ of the gas is $\frac{8}{7}$, then the value of f is:
(1) 1 (2) 4
(3) 3 (4) 2

19. A unit positive point charge is taken slowly through an infinitesimally thin tube that is inside a charged dielectric sphere of radius R, having uniform positive charge density ρ, as shown in the figure. The initial and final positions of the charge are marked by A and B at distances $2R$ and $3R$ respectively, from the centre of the sphere. In this process, the magnitude of the total work done on the point charge is $\frac{\rho R^2}{n\epsilon_0}$. The value of n is :
(ϵ_0 is the permittivity of vacuum)



(1) 18 (2) 2
(3) 6 (4) 9

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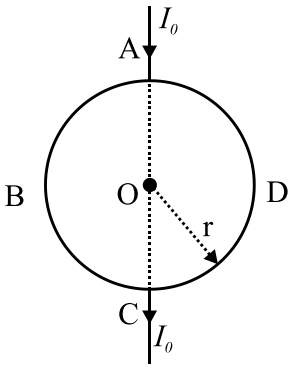
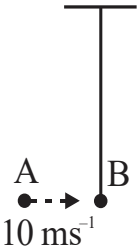
20. A current I_0 flows through a metallic circular loop of radius r as shown in the figure. Resistance of the segment ABC is half of ADC. Magnitude of magnetic field at the center O of the loop is:



(1) $\frac{\mu_0 I_0}{2\pi r}$ (2) $\frac{\mu_0 I_0}{12 r}$

(3) $\frac{\mu_0 I_0}{4 r}$ (4) $\frac{\mu_0 I_0}{2 r}$

21. Bob B of mass m at rest is hanging vertically from the ceiling via a massless string of length 10 m, as shown in the figure. Point mass A of mass m travelling horizontally with speed 10 ms^{-1} hits bob B elastically. The bob B rises h meter after the collision. Taking the acceleration due to gravity g = 10 ms^{-2} and neglecting the size of the bob, the value of h is :



(1) 2.5 (2) 8

(3) 7 (4) 5

22 An electromagnetic wave travelling in a lossless dielectric medium having a dielectric constant, $\varepsilon_r = 9$, has the electric field, $E_x = E_0 \sin(kz - 2\pi \times 10^6 t)$ Vm^{-1} where E_0 is the amplitude and k is the wave vector. Among the following options, the **incorrect** choice is:

(1) The direction of propagation of the electromagnetic wave is along $+z$

(2) The speed of the electromagnetic wave inside the medium is 10^8 ms^{-1}

(3) The wavelength of the electromagnetic wave inside the medium is 300 m

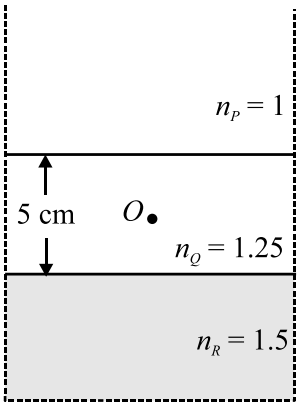
(4) The magnetic field is given by the relation $B_y = \frac{B_0}{v}\sin(kz - 2\pi \times 10^6 t)$ where v is the speed of the electromagnetic wave inside the medium

23. A particle of mass M moves along a horizontal x axis from $x = 0$ to $x = L$. The coefficient of kinetic friction varies as a function of x as $\mu_k(x) = \mu_0 - \alpha x$, where μ_0, α are constants of appropriate dimensions, so that $\mu_k(L) = 0$. The total work done by the frictional force during the motion is $n\mu_0 MgL$, where g is the acceleration due to gravity. The value of n is:

(1) $\frac{1}{2}$ (2) 3

(3) 1 (4) $\frac{1}{3}$

24. Consider three media P, Q and R with refractive indices 1, 1.25, and 1.5, respectively. The medium Q having a thickness of 5 cm is placed between extended media P and R as shown in the figure. An object O is placed at the center of medium Q. If viewed from medium P near the normal direction, the apparent depth of O is h_1 . For similar observation from medium R, the apparent depth is h_2. The value of $|h_1 - h_2|$, in cm, is:



(1) 3 (2) 0

(3) 1 (4) 2

25. Consider a fixed uniformly charged insulating sphere with radius R and total charge $+Q$. A point charge $-q$ ($q << Q$) with mass m is released from rest at a distance of $3R$ from the centre of the charged sphere. When the point charge reaches the surface of the sphere, its speed is :

(ϵ_0 is the permittivity of vacuum, neglect gravitational forces).

(1) $\sqrt{\frac{Qq}{4\pi\epsilon_0 mR}}$ (2) $\sqrt{\frac{3Qq}{4\pi\epsilon_0 mR}}$

(3) $\sqrt{\frac{2Qq}{3\pi\epsilon_0 mR}}$ (4) $\sqrt{\frac{Qq}{3\pi\epsilon_0 mR}}$

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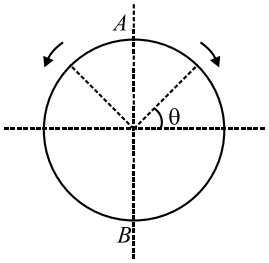
26. A car travels on a circular racetrack of radius 50 m, which is banked at an angle θ. If the car travels at a speed 10 ms^{-1}, then the wear and tear on its tyres is minimum. Taking the acceleration due to gravity to be 10 ms^{-2}, the value of θ is:

(1) $\tan^{-1}\left(2\sqrt{3}\right)$ (2) $\tan^{-1}\left(\frac{1}{5}\right)$

(3) $\tan^{-1}\left(\frac{2}{5}\right)$ (4) $\tan^{-1}\left(\sqrt{3}/2\right)$

27. A frictionless circular wire of unit radius is fixed on the horizontal plane. Two point particles of unit mass start moving simultaneously from point $A\left(\theta=\frac{\pi}{2}\right)$ with identical uniform angular speeds in opposite directions, and meet again at point $B\left(\theta=\frac{-\pi}{2}\right)$. During this time, which of the following figures schematically represent the magnitude of the total linear momentum P of the system, as a function of θ ?



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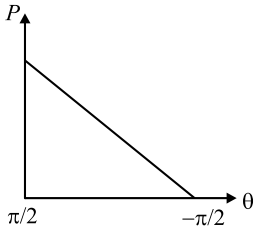

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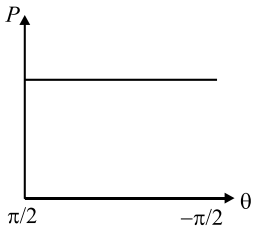

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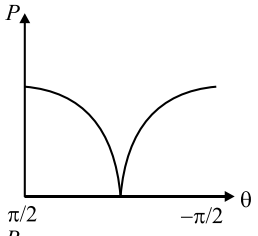

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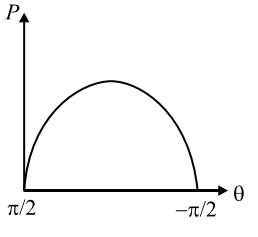
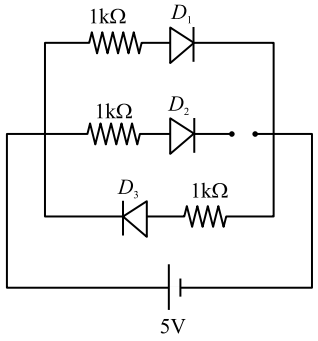


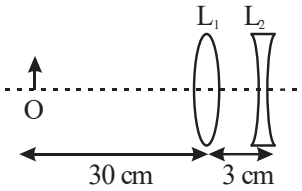
28. Three identical p-n junction diodes D_1, D_2 and D_3 are connected across a battery as shown in the figure. If the width of the depletion regions of D_1, D_2 and D_3 are W_1, W_2 and W_3, respectively, then the **correct** option is:



(1) $W_2 > W_1 = W_3$ (2) $W_1 > W_2 > W_3$

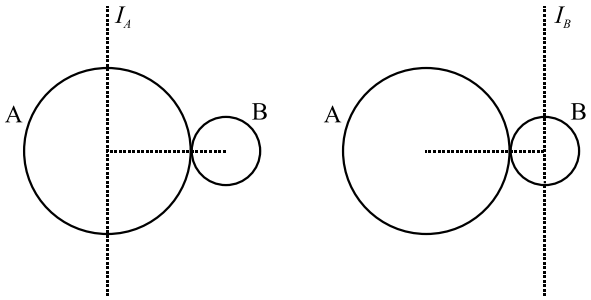
(3) $W_3 = W_1 > W_2$ (4) $W_3 > W_2 > W_1$

29. The lens combination as shown in the figure, consists of two lenses, L_1 and L_2, of the focal lengths + 10 cm and - 10 cm, respectively. The position of the image formed is :



(1) 60 cm to the right of the concave lens
(2) 20 cm to the left of the concave lens
(3) 60 cm to the left of the concave lens
(4) 30 cm to the right of the concave lens

30. A solid sphere A of radius R and mass M is attached at a point to a smaller solid sphere B of radius r < R and mass m < M. Assume that the line joining their centres lies along the horizontal. The moment of inertia of the system calculated about a vertical axis passing through the centre of A is I_A and that calculated about a vertical axis passing through the centre of B is I_B. The difference $I_A - I_B$ is:



(1) 0
(2) $(M - m)(R + r)^2$
(3) $(m - M)(R + r)^2$
(4) $(m - M)(R - r)^2$

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31. Consider that an electron is revolving in an excited state of Hydrogen atom with velocity $\sqrt{25.6}\times10^5$ ms^{-1}. The radius of the orbit is $x\times10^{-9}$ m. The value of x is :
(Take the mass of electron to be 9×10^{-31} kg, charge of electron = -1.6×10^{-19} C and $\frac{1}{4\pi\epsilon_0} = 9\times10^9$ N m^2 C^{-2}]
(1) 1 (2) 4
(3) 3 (4) 2

32. The mean free path of molecules in an ideal gas A is half that of another ideal gas B. The diameter of the spherical molecules of gas A is twice the diameter of the molecules of B. If number densities of the gases A and B are n_A and n_B, respectively, then the correct option is :
(1) $n_A = \frac{1}{2} n_B$ (2) $n_A = n_B$
(3) $n_A = 2n_B$ (4) $n_A = \frac{1}{4} n_B$

33. A cylindrical cork of uniform density floats in a liquid of density ρ_1. If the cork is depressed slightly and released, it oscillates harmonically with time period T. If the same cork floats in another liquid of density ρ_2, then the similar oscillation has time period 2T. The value of ρ_2/ρ_1 is :
(1) $\frac{1}{4}$ (2) 4
(3) 2 (4) $\frac{1}{2}$

34. For sound waves, if the number of nodes for the 5th harmonic of an open-ended pipe is *n* and that for the 9th harmonic of the same pipe with one of its ends closed is *m*, the ratio $\frac{n}{m}$ is :
(1) $\frac{3}{5}$ (2) $\frac{5}{9}$
(3) $\frac{9}{5}$ (4) 1

35. Consider the following nuclear reaction :
$^{238}U \rightarrow {}^{234}Th + {}^{4}He$
Take masses of ^{238}U, ^{234}Th and ^{4}He as 238.050 u, 234.043 u and 4.003 u, respectively. The Q value for the reaction, in keV, is :
[Given : 1 u = 931.5 MeV c^{-2}]
(1) 3740
(2) 3726
(3) 3730
(4) 3736

36. Which of the following measurements require 'index correction' ?
(1) Measurement of speed of sound using resonance tube
(2) Measurement of resistance of a wire using meter bridge
(3) Measurement of gravitational acceleration using simple pendulum
(4) Measurement of focal length of lenses using optical bench

37. In a solar system, the time-period of revolution of a planet tracing a circular orbit of radius R is proportional to:
(1) R^3 (2) $R^{1/2}$
(3) $R^{3/2}$ (4) R^2

38. Consider that σ_s, k_B, b represent Stefan-Boltzmann constant, Boltzmann constant and Wien's displacement law constant, respectively. The dimension of $\sigma_s k_B^{-1} b$ is:
(1) $[L^{-1}T^{-1}K^{-4}]$
(2) $[L^{-1}T^{-1}K^{-2}]$
(3) $[L^{-1}K^{-2}]$
(4) $[L^{-1}T^{-1}K^{-3}]$

39. A ray of light with wavelength λ is incident on three different photo-electric cells namely 1, 2 and 3. The threshold wavelength of these photo-electric cells are λ_1, λ_2 and λ_3, respectively and the magnitude of stopping potentials of these cells are V_1, V_2 and V_3, respectively. The relation between λ and threshold wavelengths are $\lambda_1 < \lambda$, $\lambda_2 > \lambda$ and $\lambda_3 >> \lambda$. The correct option is:
(1) $V_1 < V_2$, $V_3 = 0$
(2) $V_1 = 0$, $V_2 < V_3$
(3) $V_1 = 0$, $V_2 > V_3$
(4) $V_1 > V_2$, $V_3 = 0$

40. One main scale division of a Vernier calliper is equal to 1 mm and the number of divisions on the Vernier scale is 10. When both the jaws touch each other, the Vernier scale shifts to the left of zero of the main scale in such a way that 4th Vernier division coincides with a division of the main scale. If this Vernier caliper measures the length of a wire to be 1 cm, the actual length of the wire is:
(1) 1.04 cm
(2) 0.60 cm
(3) 0.96 cm
(4) 1.00 cm

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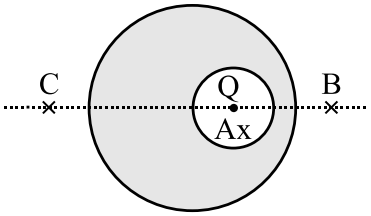
41. A point charge Q is placed inside a cavity within a solid isolated conducting sphere. Consider points A, B and C as shown in the figure, where the magnitudes of the electric fields are E_A, E_B and E_C, respectively. The points B and C are at the same distance from the center of the solid sphere. The correct option is:



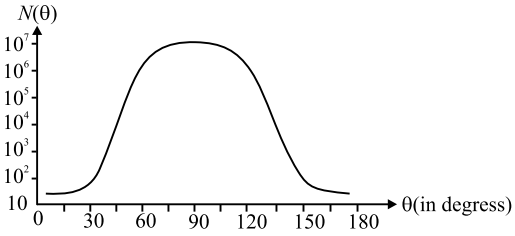
(1) $E_A \neq 0, E_B < E_C$

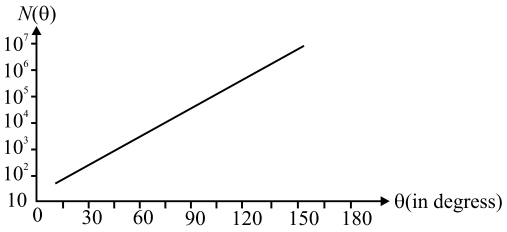
(2) $E_A = 0, E_B = E_C$

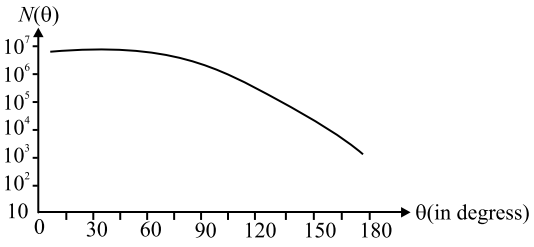
(3) $E_A \neq 0, E_B = E_C$

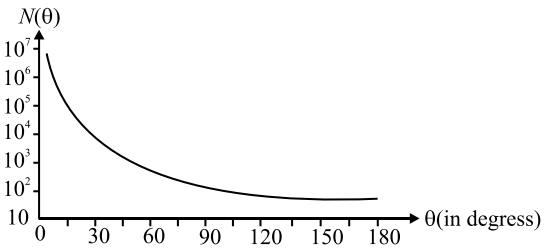
(4) $E_A = 0, E_B > E_C$

42. In Geiger-Marsden experiment, the number of scattered α-particles $N(\theta)$ is plotted as a function of scattering angle θ. Which of the following options represents the **correct** plot?

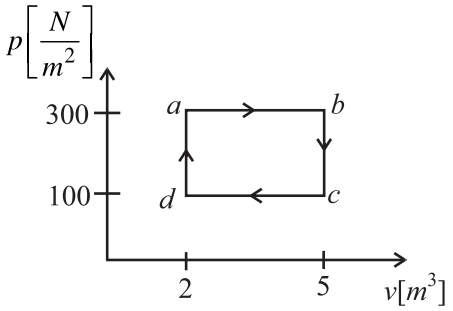
(1)


(2)


(3)


(4)


43. One mole of an ideal monatomic gas undergoes a cyclic process as shown in the figure. The total heat supplied to the gas is :



(1) 800 J

(2) 400 J

(3) 500 J

(4) 600 J

44. Two infinitely long parallel conducting wires *A* and *B* carry currents *I* and 2*I*, respectively, in the same direction. The wire *A* has uniform mass per unit length λ and lies on an insulated floor. The wire *B* is kept fixed at a height *h* above the floor. The minimum magnitude of *h* so that the wire *A* does not rise from the floor is :

[*g* is the acceleration due to gravity and μ_0 is the permeability of free space.]

(1) $\frac{4\mu_0 I^2}{\pi\lambda g}$

(2) $\frac{\mu_0 I^2}{2\pi\lambda g}$

(3) $\frac{\mu_0 I^2}{\pi\lambda g}$

(4) $\frac{2\mu_0 I^2}{\pi\lambda g}$

45. Consider a spring-mass simple harmonic oscillator in one dimension. The mass of the particle is m kg and the spring constant is $k\,\text{Nm}^{-1}$. At a given instant, the extension of the spring is x meter and the speed of the particle is v m s^{-1}. On the $x-v$ plane, if the graph of v as a function of x is a circle, then the correct option is:

(1) $k = \sqrt{m}$

(2) $k = \frac{1}{m}$

(3) $k = m$

(4) $k = m^2$

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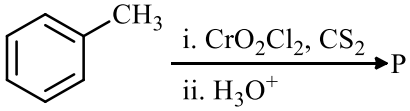
46. Consider the following reaction, and choose the correct option.



(1) Compound **P** is obtained by the hydrogenation of benzoyl chloride with Pd on $BaSO_4$.

(2) On treating compound **P** with saturated $NaHCO_3$ solution, brisk effervescence is observed.

(3) Compound **P** can be prepared by treating benzene with anhydrous $AlCl_3$ and CH_3COCl.

(4) On treatment with bromine water, compound **P** gives a white precipitate.

47. The formula of tetraammineaquachloridocobalt(III) chloride is

(1) $[Co(NH_3)_4(H_2O)Cl]Cl_2$

(2) $[Co(NH_3)_4Cl_2]\times H_2O$

(3) $[Co(NH_3)_4]Cl_3\times H_2O$

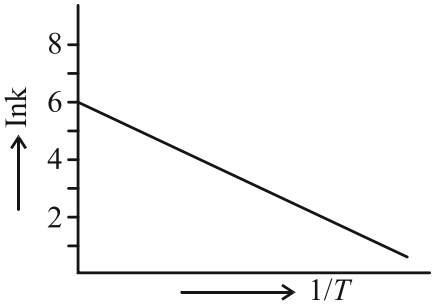
(4) $[Co(NH_3)_4(H_2O)Cl]Cl$

48. The lanthanide ion having four unpaired electrons is (Given: Atomic numbers of Ce = 58, Nd = 60, Tb = 65 and Ho = 67)

(1) Ho^{3+} (2) Nd^{3+}

(3) Ce^{3+} (4) Tb^{3+}

49. For an elementary chemical reaction, the Arrhenius plot is given below.



If the energy of activation is 6.64 kJ mol^{-1} and R = 8.3 J K^{-1} mol^{-1}, the temperature at which the rate constant becomes e^2 min^{-1}, is:

(1) 250 K (2) 125 K

(3) 150 K (4) 200 K

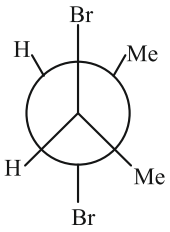
50. The green paramagnetic species formed by heating $KMnO_4$ at 513 K is

(1) KO_2 (2) K_2MnO_4

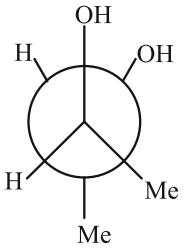
(3) Mn_3O_4 (4) MnO

51. Given below are two statements:

Statement-I: *trans*-But-2-ene upon treatment with Br_2 in CCl_4 gives the following product



Statement-II : *cis*-But-2-ene upon treatment with alkaline $KMnO_4$ gives the following product.



In the light of the above statements, choose the most appropriate answer from the options given below.

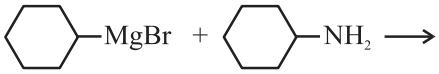
(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are correct

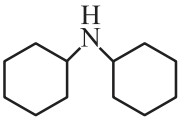
(3) Both Statement I and Statement II are incorrect

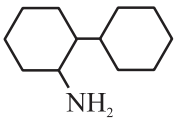
(4) Statement I is correct but Statement II is incorrect

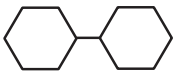
52. One of the products formed in the following reaction is



(1)

(2) 

(3) 

(4) 

53. Given below are two statements:

Statement-I : Heating NaCl with concentrated H_2SO_4 and MnO_2 results in oxidation of Mn.

Statement-II: Heating NaI with concentrated H_2SO_4 and MnO_2 results in reduction of Mn.

In light of the above statements, choose the most appropriate answer from the options given below:

(1) Statement-I is incorrect but Statement-II is correct.

(2) Both Statement-I and Statement-II are correct.

(3) Both Statement-I and Statement-II are incorrect.

(4) Statement-I is correct but Statement-II is incorrect.

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54. Among the following options, the correct trend in the electron gain enthalpy is

(1) I > Br > Cl > F
(2) F > Cl > Br > I
(3) Br > Cl > F > I
(4) Cl > F > Br > I

55. Given below are two statements:

Statement-I: $[Fe(ox)_3]^{3-}$ is chiral.

Statement-II: *trans*-$[Cr(H_2O)_2(ox)_2]^-$ is chiral.

(Given : $oxH_2 = HOOC - COOH$)

In light of the above statements, choose the ***most appropriate*** answer from the options given below:

(1) **Statement-I** is incorrect but **Statement-II** is correct.
(2) Both **Statement-I** and **Statement-II** are correct.
(3) Both **Statement-I** and **Statement-II** are incorrect.
(4) **Statement-I** is correct but **Statement-II** is incorrect.

56. The correct statement about peptides and proteins is

(1) In α-helices, the polypeptide chain is twisted into a left-handed screw (helix) through intramolecular hydrogen bonds.
(2) Tertiary structure of proteins has two or more polypeptide subunits.
(3) Only the proteins having a quaternary structure are biologically active.
(4) In β-pleated sheet structures, peptide chains are held together by intermolecular hydrogen bonds.

57. Given below are two statements:

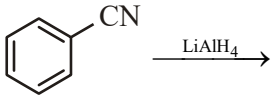
Statement-I: Oxidation of *p*-nitrotoluene with acidic $KMnO_4$ gives an acid that is stronger than benzoic acid.

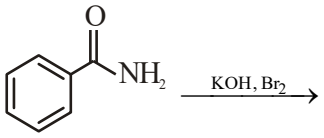
Statement-II: Reduction of *p*-nitrotoluene with Sn/HCl followed by neutralization gives an amine that is more basic than aniline.

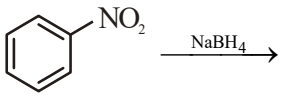
In light of the above statements, choose the ***most appropriate*** answer from the options given below.

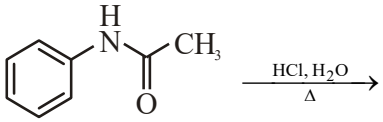
(1) **Statement-I** is incorrect but **Statement-II** is correct.
(2) Both **Statement-I** and **Statement-II** are correct.
(3) Both **Statement-I** and **Statement-II** are incorrect.
(4) **Statement-I** is correct but **Statement-II** is incorrect.

58. Identify the reactions which give aniline as the major product.

A. 

B. 

C. 

D. 

Choose the correct answer form the options given below.

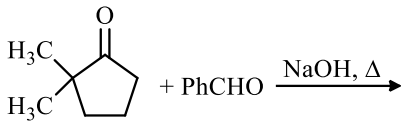
(1) C and D only
(2) A and B only
(3) B and D only
(4) A and C only

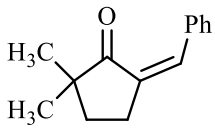
59. Two moles of an ideal gas undergo free expansion from 10 L to 100 L at 300 K. The values of ΔS_{system} and $\Delta S_{surroundings}$ are

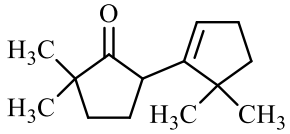
(R is universal gas constant)

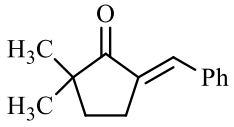
(1) $\Delta S_{system} = 4.606R$; $\Delta S_{surroundings} = 0$
(2) $\Delta S_{system} = 0$; $\Delta S_{surroundings} = 0$
(3) $\Delta S_{system} = 4.606$ R; $\Delta S_{surroundings} = -4.606$ R
(4) $\Delta S_{system} = 0$; $\Delta S_{surroundings} = 4.606R$

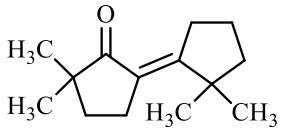
60. The compound that **CANNOT** be obtained from the aldol condensation reaction shown below, is



(1) 

(2) 

(3) 

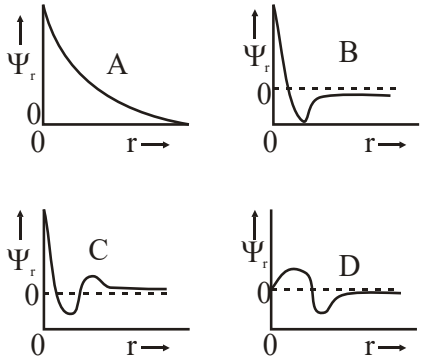
(4) 

61. The complex which has *facial* and *meridional* isomers is
(Given : py = pyridine and en = $H_2N–CH_2–CH_2–NH_2$)
(1) $\left[Ni(en)_2(H_2O)_2\right]^{2+}$
(2) $\left[Cr(py)_3(Cl)_3\right]$
(3) $\left[Cr(H_2O)_6\right]^{3+}$
(4) $\left[Co(NH_3)_4(H_2O)_2\right]^{3+}$

62. The numbers 17.0145 and 21.0235 were rounded to three figures after the decimal point. The resulting numbers, respectively, are
(1) 17.015 and 21.024
(2) 17.014 and 21.023
(3) 17.015 and 21.023
(4) 17.014 and 21.024

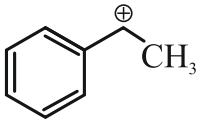
63. The amount of carbon dioxide evolved upon complete combustion of 116 g of *n*-butane is
(Given: atomic mass in amu H=1, C=12 and O = 16)
(1) 362 g (2) 352 g
(3) 322 g (4) 176 g

64. Consider the following schematic plots of orbital wavefunction (Ψ_r) against distance (r) from the nucleus.



The figure representing two radial nodes in the orbital is
(1) D (2) A
(3) B (4) C

65. The following carbocation is stabilized by the interaction of the empty *p* orbital with



(1) empty σ* and empty π* orbitals
(2) filled σ and filled π orbitals
(3) empty σ and empty π* orbitals
(4) empty σ* and filled π orbitals

66. A 1:3 electrolyte in an aqueous solution is
(1) $[Co(NH_3)_3(NO_2)_3]$
(2) $[CoCl_2(NH_3)_4]Cl$
(3) $[CoCl(NH_3)_5]Cl_2$
(4) $[Co(NH_3)_6]Cl_3$

67. The standard electrode potential (E°) for the half-cell reaction $Fe^{3+} + e^- \rightarrow Fe^{2+}$ at 298 K is
(Given: $E^\circ\left(Fe^{3+}/Fe\right) = -0.04$ V and
$E^\circ\left(Fe^{2+}/Fe\right) = -0.44$ V at 298 K)
(1) +0.92 V
(2) +0.40 V
(3) +0.76 V
(4) −0.48 V

68. In potash alum, the ratio of K^+ and SO_4^{2-} ions is
(1) 3:2 (2) 1:2
(3) 2:1 (4) 2:3

69. Consider the following statements about the solutions formed by mixing two liquids.
A. An ideal solution thus formed obeys Raoult's law throughout the composition range.
B. Mixture of chloroform and acetone shows negative deviation from Raoult's law.
C. Mixture of aniline and phenol shows positive deviation from Raoult's law.
(1) A and C only (2) A and B only
(3) B and C only (4) A only

70. For a salt **XY**, which is a strong electrolyte, the plot of Λ_m versus $\sqrt{c}$ has a slope of -90.0 S cm^2 mol$^{-3/2}$ L$^{1/2}$ at 298 K . At 0.01 M concentration of **XY**, the value of Λ_m is 145.0 S cm^2 mol^{-1}. The limiting molar conductivity of Y^- ion ($\lambda^o_{Y^-}$, in S cm^2 mol^{-1}) at 298 K will be
(Given : $\lambda^o_{X^+} = 74.0$ S cm^2 mol^{-1})
(1) 76.0 (2) 80.0
(3) 100.0 (4) 90.0

71. Arrange the following compounds in the increasing order of polarity.
A. $CH_3CH_2OCH_2CH_3$
B. CH_3CH_2OH
C. CH_3COCH_3
D. CH_3COOH
Choose the **correct** options given below. swer from the
(1) A < C < B < D
(2) A < B < C <D
(3) C < A <D < B
(4) C < A < B <D

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72. According to crystal field theory, the correct order of ligands with respect to their decreasing order of field strength is

(1) $Cl^- > NH_3 > H_2O > CO$

(2) $CO > NH_3 > H_2O > Cl^-$

(3) $CO > H_2O > NH_3 > Cl^-$

(4) $Cl^- > H_2O > NH_3 > CO$

73. The amino acid that gives a red-blood colour on treating its sodium fusion extract with sodium nitroprusside is

(1) serine
(2) leucine
(3) threonine
(4) methionine

74. In an acidic medium, 10 mL of 0.25 M oxalic acid is titrated with $KMnO_4$ solution. If the volume of $KMnO_4$ solution required to reach end point is 10 mL, the strength of the $KMnO_4$ solution is

(1) 0.15 M (2) 0.10 M
(3) 0.20 M (4) 0.25 M

75. The correct statement is

(1) Aluminium has five valence orbitals.
(2) Boron has a maximum covalency of four.
(3) Beryllium has three valence orbitals.
(4) Magnesium has a maxium covalency of four.

76. Among the following, the compound having conjugated double bonds is

(1) hepta-1,6-diene (2) hepta-1,3-diene
(3) hepta-1,4-diene (4) hepta-1,5-diene

77. $2A \xrightarrow{k} B$ is a zero-order reaction, where k = 1.0 mol L^{-1} min^{-1}. If the initial concentration of A is 2 M, then the time taken to complete 75% of the reaction will be

(1) 2.0 min (2) 1.5 min
(3) 0.75 min (4) 1.0 min

78. The correct order of solubility of the given salts in water at 298 K is

Salt	K_{sp} at 298 K
AgBr	5.0×10^{-13}
$Zn(OH)_2$	1.0×10^{-15}
Hg_2Cl_2	1.3×10^{-18}

(1) $Zn(OH)_2 > AgBr > Hg_2Cl_2$
(2) $Hg_2Cl_2 > Zn(OH)_2 > AgBr$
(3) $AgBr > Zn(OH)_2 > Hg_2Cl_2$
(4) $Hg_2Cl_2 > AgBr > Zn(OH)_2$

79. The correct decreasing order of oxidation state of the underlined atom in each molecule is

(1) $\underline{P}_4O_6 > \underline{Cl}_2O_7 > \underline{Al}H_3$

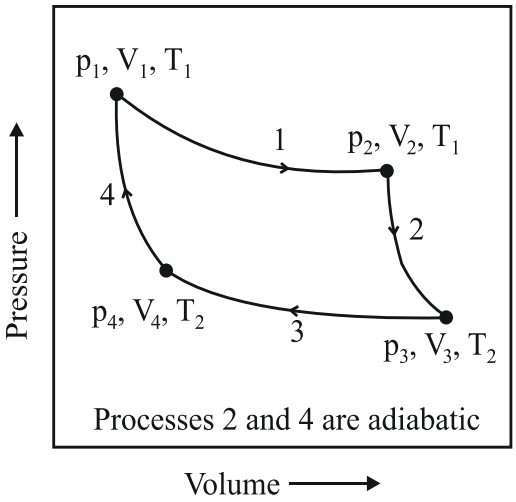
(2) $\underline{P}_4O_{10} > \underline{S}O_3 > H_2\underline{O}$

(3) $\underline{N}_2O_5 > \underline{Al}_2O_3 > H_2\underline{S}$

(4) $\underline{Pb}O_2 > \underline{N}_2O_3 > \underline{S}O_3$

80. Consider the reversible processes for 1.0 mol of an ideal gas as shown in the figure.

Figure



w_1, w_2, w_3 and w_4 represent work done (in calories) in the processes 1, 2, 3 and 4, respectively; ΔU_2 and ΔU_4 are changes in the internal energy for the processes 2 and 4, respectively.

[use R = 2 cal K^{-1} mol^{-1}]

The correct option is

(1) $w_1 + w_2 + w_3 + w_4 = 0$

(2) $w_1 + w_3 = -2T_1 \ln\frac{V_2}{V_1} - 2T_2 \ln\frac{V_4}{V_3}$

(3) $w_2 + w_4 = \Delta U_2 - \Delta U_4$

(4) $w_1 + w_2 = 2T_1 \ln\frac{V_2}{V_1}$

81. **Assertion A:** For an ideal solution formed by mixing liquids **P** and **Q**, $\Delta_{mix}H = 0$ and $\Delta_{mix}V = 0$

Reason R: No interactions occur between **P** and **Q**

In the light of the above statements, choose the ***most appropriate*** answer from the options given below.

(1) **A** is not correct but **R** is correct
(2) Both **A** and **R** are correct and **R** is the correct explanation of **A**
(3) Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**
(4) **A** is correct but **R** is not correct

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82. Among the species given below, the spin-only magnetic moment is highest for (Given : Atomic number of Ti = 22, Mn = 25, Fe = 26 and Co = 27)

(1) $\left[Ti(H_2O)_6\right]^{3+}$ (2) $\left[Mn(CN)_6\right]^{3-}$

(3) $\left[Fe(CN)_6\right]^{3-}$ (4) $\left[Co(NH_3)_6\right]^{3+}$

83. A protein undergoes reversible thermal denaturation from its state N to denatured state D according to $N \rightleftharpoons D$. At 60°C, the concentrations of both N and D are equal at equilibrium, and the standard enthalpy change of denaturation of 666 kJ mol^{-1}. The standard entropy change ($\Delta S°$ in kJ $K^{-1}mol^{-1}$) of the protein upon denaturation at 60° C is closest to:

(1) 11.1 (2) 2.0

(3) 2000.0 (4) 333.0

84. Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : Generally, 3d transition metals have high melting points.

Reason R : Involvement of 3d-electrons in addition to 4s-electrons in the interatomic metallic bonding.

In light of the above statements, choose the ***most appropriate*** answer from the options given below:

(1) **A** is not correct but **R** is correct.

(2) Both **A** and **R** are correct and **R** is the correct explanation of **A**.

(3) Both **A** and **R** are correct and **R** is **NOT** the correct explanation of **A**.

(4) **A** is correct but **R** is not correct.

85. Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : The first ionization enthalpy of O is lower than that of N and F.

Reason R : The loss of an electron from O leads to stable half-filled *p* orbital.

In light of the above statements, choose the ***most appropriate*** answer from the options given below:

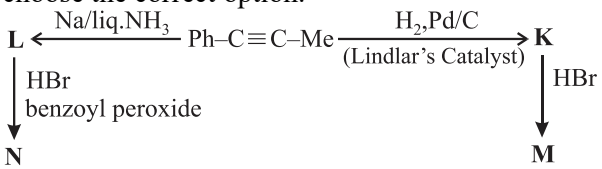
(1) **A** is not correct but **R** is correct.

(2) Both **A** and **R** are correct and **R** is the correct explanation of **A**.

(3) Both **A** and **R** are correct and **R** is **NOT** the correct explanation of **A**.

(4) **A** is correct but **R** is not correct.

86. Consider the following reaction sequences and choose the correct option.



(1) **M** and **N** are stereoisomers

(2) **K** and **L** are geometrical isomers

(3) **K** and **L** are enantiomers

(4) **M** and **N** are geometrical isomers

87. The highest occupied molecular orbital of Ne_2 is:

(1) σ^*_{2p} (2) π_{2p}

(3) σ_{2p} (4) π^*_{2p}

88. Match the species in **List I** with their geometry in **List II**

List I		List II	
A.	PCl_5	I.	Tetrahedral
B.	BrF_5	II.	Square Planar
C.	BF_4^-	III.	Trigonal bipyramidal
D.	$[Ni(CN)_4]^{2-}$	IV.	Square pyramidal

Choose the **correct** answer from the options given below:

(1) A-III, B-II, C-I, D-IV

(2) A-IV, B-III, C-I, D-II

(3) A-III, B-IV, C-I, D-II

(4) A-III, B-I, C-II, D-IV

89. Match the vitamins in **List-I** with their sources in **List-II**

List-I		List-II	
A.	vitamin A	I.	meat
B.	vitamin B_{12}	II.	sunflower oil
C.	vitamin E	III.	green leafy vegetables
D.	vitamin K	IV.	carrots

Choose the correct answer from the options given below.

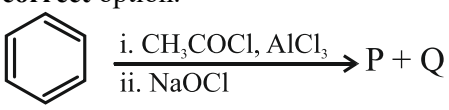
(1) A-III, B-I, C-IV, D-II

(2) A-II, B-III, C-IV, D-I

(3) A-IV, B-I, C-II, D-III

(4) A-IV, B-II, C-I, D-III

90. For the following reaction sequence, choose the **correct** option.



(1) Both P and Q are carbonyl compounds.

(2) If P is the sodium salt of a carboxylic acid, Q is a primary alcohol.

(3) P and Q are aromatic compounds.

(4) If P gives a carboxylic acid on acidification, Q gives a poisonous gas on exposure to air and light.

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91. Given below are two statements:
Statement I: The class name Reptilia refers to creeping or crawling mode of locomotion.
Statement II: All organisms belonging to Reptilia have three chambered heart.
In the light of the above statements, choose the **most appropriate** answer from the options given below:
(1) **Statement I** is incorrect but **Statement II** is correct.
(2) Both **Statement I** and **Statement II** are correct.
(3) Both **Statement I** and **Statement II** are incorrect.
(4) **Statement I** is correct but **Statement II** is incorrect.

92. How many turns of Calvin cycle are required for the formation of three molecules of glucose ?
(1) 18 (2) 6
(3) 3 (4) 1

93. Photorespiration reaction catalyzed by RuBisCo is shown below:
$RuBP + O_2 \rightarrow 3\text{-Phosphoglycerate} + X$
Identify "X" from the given options:
(1) Malate
(2) Phosphoenolpyruvate
(3) 2-phosphoglycolate
(4) Oxaloacetate

94. Given below are two statements:
Statement I: In gymnosperms, the male and female gametophytes remain within the sporangia.
Statement II: In gymnosperms, seeds are not covered.
In the light of the above statements, choose the **most appropriate** answer from the options given below:
(1) **Statement I** is incorrect but **Statement II** is correct.
(2) Both **Statement I** and **Statement II** are correct.
(3) Both **Statement I** and **Statement II** are incorrect.
(4) **Statement I** is correct but **Statement II** is incorrect.

95. How many molecules of pyruvic acid are produced at the end of glycolysis from 206 molecules of glucose?
(1) 412 (2) 206
(3) 309 (4) 103

96. Match **List-I** with **List-II**.

List-I		List-II	
A.	Fusion of protoplasms between gametes	I.	Meiosis
B.	Fusion of two nuclei	II.	Plasmogamy
C.	Generation of haploid spores	III.	Karyogamy

Choose the **correct** answer from the options given below :
(1) A-I, B-III, C-II (2) A-II, B-III, C-I
(3) A-II, B-I, C-III (4) A-III, B-II, C-I

97. Mitochondrial inner membrane encloses _____.
(1) aqueous humor (2) matrix
(3) cytosol (4) mucus

98. Phyllotaxy is the pattern of arrangement of____.
(1) sepals (2) leaves
(3) flowers (4) fruits

99. Mad cow disease is caused by _____.
(1) *Mycoplasma sp*.
(2) prions
(3) viroids
(4) *Aspergillus sp*.

100. Cell theory was formulated by_____ .
(1) Antonie Von Leeuwenhoek
(2) Schleiden and Schwann
(3) Robert Brown
(4) Singer and Nicolson

101. Which of the following plant growth regulators promotes internode elongation prior to flowering in cabbage?
(1) Ethephon (2) Abscisic acid
(3) Gibberellin (4) Indole butyric acid

102. Which pigment has absorption peak at 700 nm in the photosynthetic reaction centre PS I (P700)?
(1) Carotenoids
(2) Chlorophyll b
(3) Chlorophyll a
(4) Xanthophylls

103. Sphenopsida class belongs to _____.
(1) pteridophytes
(2) bryophytes
(3) angiosperms
(4) gymnosperms

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104. Which of the following represents the correct sequence of arrangement of bones in the lower limb of humans?
(1) Femur-tarsal-patella-tibia
(2) Femur-tibia-patella-tarsal
(3) Patella-femur-tibia-tarsal
(4) Femur-patella-tibia-tarsal

105. Which of the following plant growth regulators is used as herbicide ?
(1) Gibberellin (2) 2,4-D
(3) Kinetin (4) Abscisic acid

106. Genus represents _____.
(1) a group of closely related families
(2) an individual plant or animal
(3) a population of plants and animals
(4) a group of closely related species

107. The plastid that stores xanthophyll is known as
(1) amyloplast (2) chloroplast
(3) chromoplast (4) aleuroplast

108. In water, frogs respire using ____.
(1) trachea (2) skin
(3) buccal cavity (4) lungs

109. Which of the following is **not** a characteristic of chordates?
(1) Presence of post anal part (tail)
(2) Presence of notochord
(3) Central nervous system is dorsal
(4) Absence of gills

110. Smooth endoplasmic reticulum____.
(1) is a site for the synthesis of carbohydrates
(2) has ribosomes attached to its surface
(3) is the major site for the synthesis of lipids
(4) is actively involved in protein synthesis

111. Which of the following are characteristics of prokaryotic cells ?
(a) Ribosomes are made of 50S and 30S subunits
(b) They can have plasmids
(c) They contain mesosome
(d) They have peroxisomes
Choose the **correct** answer from the options given below :
(1) (a), (b) and (c) only
(2) (b) and (c) only
(3) (a) and (c) only
(4) (a), (c) and (d) only

112. Match **List-I** with **List-II.**

List-I		List-II	
A.	Cristae	I.	Flat membrane sacs in stroma of chloroplast
B.	Cisternae	II.	Infoldings in mitochondria
C.	Thylakoids	III.	Cell membrane
D.	Phospholipid	IV	Disc shaped sacs in the Golgi apparatus

Choose the **correct** answer from the options given below:
(1) A-IV, B-III, C-I, D-II
(2) A-III, B-IV, C-I, D-II
(3) A-II, B-IV, C-I, D-III
(4) A-II, B-IV, C-III, D-I

113. Which of the following statements related to pituitary gland are **correct**?
(a) It is divided anatomically into adenohypophysis and neurohypophysis
(b) It secretes follicle stimulating hormone
(c) It secretes melanocyte stimulating hormone
(d) It does not secrete prolactin
Choose the **correct** answer from the options given below:
(1) (b) and (c) only
(2) (a) and (b) only
(3) (a), (b) and (c) only
(4) (c) and (d) only

114. Which of the following statements regarding photorespiration are **correct** ?
(a) Do not occur in C3 plants
(b) CO_2 is consumed and O_2 is generated
(c) Phosphoglycolate is formed
(d) No synthesis of ATP and NADPH
Choose the **correct** answer from the options given below :
(1) (c) and (d) only
(2) (b) and (d) only
(3) (a) and (b) only
(4) (a) and (d) only

115. Which of the following statements is **incorrect** ?
(1) Fibrinogen is produced from fibrin
(2) Blood coagulates in response to an injury
(3) Blood clot consists of fibrins
(4) Fibrin is produced from fibrinogen

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116. Arrange the following taxonomic categories in ascending order.

(a) Genus (b) Class
(c) Order (d) Phylum
(e) Family (f) Kingdom
(g) Species

Choose the **correct** answer from the options given below :

(1) (f), (c), (b), (g), (d), (e), (a)
(2) (g), (a), (e), (c), (b), (d), (f)
(3) (a), (c), (d), (g), (f), (b), (e)
(4) (g), (c), (d), (b), (e), (a), (f)

117. Select the correct sequence of experiments that led to a gradual understanding of photosynthesis in green plants.

(1) Production of glucose → role of air → release of oxygen → absorption spectra of chlorophyll a and b
(2) Absorption spectra of chlorophyll a and b → production of glucose → release of oxygen → role of air
(3) Role of air → release of oxygen → production of glucose → absorption spectra of chlorophyll a and b
(4) Release of oxygen → production of glucose → absorption spectra of chlorophyll a and b → role of air

118. Match **List-I** with **List-II.**

List-I		List-II	
A.	Starch	I.	Fights infection
B.	Antibody	II.	Energy storage
C.	Concanavalin A	III.	Glucose transport
D.	Glut-4	IV	Lectin

Choose the **correct** answer from the options given below:

(1) A-I, B-II, C-III, D-IV
(2) A-I, B-II, C-IV, D-III
(3) A-II, B-I, C-IV, D-III
(4) A-II, B-I, C-III, D-IV

119. The number of vertebrae in a human is____.

(1) 206 (2) 7
(3) 12 (4) 26

120. Endomembrane system includes _____ .

(1) Golgi complex, chloroplast, peroxisomes and vacuole
(2) endoplasmic reticulum, Golgi complex, lysosomes and vacuole
(3) endoplasmic reticulum, chloroplast, peroxisomes and vacuole
(4) mitochondria, chloroplast, peroxisomes and vacuole

121. Length of the stem at time 0 is 20 cm. The arithmetic growth rate is 30 cm per day. What is the length of the stem at the end of the 7^{th} day?

(1) 460 cm
(2) 50 cm
(3) 170 cm
(4) 230 cm

122. Match **List-I** with **List-II.**

List-I		List-II	
A.	Spherical	I.	Vibrio
B.	Rod	II.	Cocci
C.	Comma	III.	Spirilla
D.	Spirillum	IV	Bacilli

Choose the **correct** answer from the options given below:

(1) A-II, B-IV, C-I, D-III
(2) A-I, B-III, C-II, D-IV
(3) A-III, B-II, C-I, D-IV
(4) A-II, B-I, C-IV, D-III

123. The number of action potentials generated by sino-arterial node (SAN) in a healthy human is _____ per minute.

(1) 120 - 140
(2) 28 - 30
(3) 70 – 75
(4) 100 - 110

124. Match **List-I** with **List-II**.

List-I		List-II	
A.	Family	I.	Sapindales
B.	Genus	II.	Dicotyledonae
C.	Class	III.	Anacardiaceae
D.	Phylum	IV.	Angiospermae
E.	Order	V.	*Mangifera*

Choose the **correct** answer from the options given below :

(1) A-III, B-V, C-II, D-IV, E-I
(2) A-I, B-V, C-II, D-IV, E-III
(3) A-II, B-I, C-III, D-IV, E-V
(4) A-II, B-III, C-V, D-I, E-IV

125. Which of the following is **not** a part of human central neural system ?

(1) Pericardium
(2) Arachnoid
(3) Dura mater
(4) Pia mater

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126. Given below are two statements :
Statement I : Chromosomes are fully condensed at the end of prophase I.
Statement II : Meiosis I resembles mitosis.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement I is incorrect, but Statement II is true
(2) Both Statement I and Statement II are true
(3) Both Statement I and Statement II are false
(4) Statement I is correct, but Statement II is false

127. Match **List-I** with **List-II**.

List-I		List-II	
A.	Marginal placentation	I.	*Argemone*
B.	Axile placentation	II.	Tomato
C.	Parietal placentation	III.	*Primrose*
D.	Free central placentation	IV.	Pea

Choose the **correct** answer from the options given below :
(1) A-IV, B-II, C-I, D-III
(2) A-II, B-IV, C-I, D-III
(3) A-IV, B-II, C-III, D-I
(4) A-IV, B-III, C-I, D-II

128. Symbiotic association between fungi and algae are called _____.
(1) chrysophytes (2) lichens
(3) sponges (4) mycorrhiza

129. Which of the following is **not** a prokaryote?
(1) Fungi (2) Bacteria
(3) Blue green algae (4) Mycoplasma

130. Arrange the following elements in descending order of their contribution to percentage weight of the human body.
(a) Oxygen
(b) Carbon
(c) Hydrogen
(d) Nitrogen
Choose the **correct** answer from the options given below:
(1) (b), (a), (c), (d)
(2) (a), (b), (c), (d)
(3) (c), (a), (b), (d)
(4) (b), (c), (d), (a)

131. Which one of the following statements is **incorrect**?
(1) β-cells of pancreas secrete insulin
(2) α-cells of pancreas secrete glucagon
(3) α-cells of pancreas secrete insulin
(4) Glucagon stimulates glycogenolysis

132. Which of the following are characteristic features of Solanaceae family?
(a) Flowers are bisexual and actinomorphic
(b) Calyx have five sepals and are united
(c) Androecium have five stamens and are epipetalous
(d) Ovary is inferior
Choose the **correct** answer from the options given below:
(1) (b), (c) and (d) only
(2) (a), (b) and (c) only
(3) (d) only
(4) (a) and (b) only

133. Given below are two statements :
Statement I : When any plane passing through the central axis of the body divides the organism into two identical halves, it is called radial symmetry.
Statement II : In phylum Echinodermata, both adults and larvae are radially symmetrical.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) **Statement I** is incorrect but **Statement II** is correct
(2) Both **Statement I** and **Statement II** are correct
(3) Both **Statement I** and **Statement II** are incorrect
(4) **Statement I** is correct but **Statement II** is incorrect

134. The correct sequence of adult cell cycle phases is _____ .
(1) S-M-G2-G1
(2) G1-G2-S-M
(3) G1-M-G2-S
(4) G1-S-G2-M

135. In frogs, the number of pairs of cranial nerves arising from the brain are _____.
(1) 12
(2) 6
(3) 9
(4) 10

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136. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: In recombinant DNA technology, lysozyme is used for disrupting bacterial cells while cellulase is for plant cells.

Reason R: Isolation of genetic material needs disruption of cells.

In the light of the above statements, choose the ***most appropriate*** answer from the options given below:

(1) A is not correct but R is correct

(2) Both A and R are correct and R is the correct explanation of A

(3) Both A and R are correct but R is not the correct explanation of A

(4) A is correct but R is not correct

137. The method of directly injecting a sperm into ovum in assisted reproductive technology is called:

(1) Embryo transfer (ET)

(2) Gamete intra fallopian transfer (GIFT)

(3) Zygote intra fallopian transfer (ZIFT)

(4) Intra cytoplasmic sperm injection (ICSI)

138. Adaptive radiation in placental mammals and Australian Marsupials leading to similarity between distant species is an example of

(1) genetic drift

(2) divergent evolution

(3) convergent evolution

(4) founder effect

139. Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: In an experiment, Mendel observed that the F1 progeny plants are all tall and none are dwarf.

Reason R: Stem height is a contrasting trait, with tall being dominant and dwarf being recessive.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **A** is not correct but **R** is correct

(2) Both **A** and **R** are correct and **R** is the correct explanation of **A**

(3) Both **A** and **R** are correct but **R** is not the correct explanation of **A**

(4) **A** is correct but **R** is not correct

140. Arrange the following in descending order of number of species in the Amazonian rain forest.

(a) Plants

(b) Birds

(c) Fishes

(d) Invertebrates

(e) Mammals

Choose the **correct** answer from the options given below:

(1) (b) > (a) > (d) > (c) > (e)

(2) (c) > (b) > (d) > (e) > (a)

(3) (d) > (a) > (c) > (b) > (e)

(4) (e) > (b) > (a) > (c) > (d)

141. Sponges exchange O_2 with CO_2 by _____.

(1) gills

(2) simple diffusion over their entire body surfaces

(3) moist cuticle

(4) tracheal tubes

142. For a person with blood group 'O', which of the following is **not** a possible combination of parents' blood group genotypes?

(1) Father : $I^A I^B$ and Mother : $I^A i$

(2) Father : $I^A i$ and Mother : $I^B i$

(3) Father : $I^A i$ and Mother : $I^A i$

(4) Father : $I^B i$ and Mother : $I^B i$

143. Given below are two statements:

Statement I: Modern *Homo sapiens* arose in Australia and moved across continents.

Statement II: *Homo sapiens* arose around 75000 to 10000 years ago.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are correct

(3) Both Statement I and Statement II are incorrect

(4) Statement I is correct but Statement II is incorrect

144. Which of the following is used as an effective sedative and painkiller for treating post-surgery patients?

(1) Anti-retroviral drugs

(2) Interferon

(3) Antibiotics

(4) Morphine

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145. Which of the following plant produces non-albuminous seeds?
(1) Pea (2) Wheat
(3) Maize (4) Barley

146. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Abingdon tortoise in Galapagos islands became extinct within a decade after goats were introduced.
Reason R: Goats were more efficient at browsing than Abingdon tortoise.
In the light of the above statements, choose the **most appropriate** answer from the options given below:
(1) **A** is not correct but **R** is correct
(2) Both **A** and **R** are correct and R is the correct explanation of **A**
(3) Both **A** and **R** are correct but **R** is not the correct explanation of **A**
(4) **A** is correct but **R** is not correct

147. The covering of ovum at ovulation is
(1) chorion
(2) endometrium
(3) zona radiata
(4) zona pellucida

148. Which of the following is used as a clot buster?
(1) Statins (2) Streptokinase
(3) Penicillin (4) Cyclosporin A

149. Which of the following structure is **not** a part of the male reproductive system?
(1) Infundibulum
(2) Rete testis
(3) Epididymis
(4) Vasa efferentia

150. Given below are two statements:
Statement I: Ovulation is caused by LH surge leading to rupture of Graafian follicles.
Statement II: Graafian follicle remaining after ovulation transform into corpus luteum and secretes large amount of estrogen.
In the light of the above statements, choose the *most appropriate* answer from the options given below:
(1) Statement I is incorrect but Statement II is correct
(2) Both Statement I and Statement II are correct
(3) Both Statement I and Statement II are incorrect
(4) Statement I is correct but Statement II is incorrect

151. The opening between the right atrium and the right ventricle is guarded by _____.
(1) sino-atrial node
(2) bicuspid valve
(3) tricuspid valve
(4) semilunar valve

152. Which of the following is **not** evidence for evolution?
(1) Divergent evolution of anatomical structures such as forelimbs
(2) Convergent evolution of traits like wings of birds and butterflies
(3) Paleontological evidence from fossil records
(4) Embryological support for evolution as proposed by Ernst Heckel

153. The inactive form of Bt toxin is converted to the active form in the insect gut_____.
(1) by nucleases
(2) due to alkaline pH
(3) due to acidic pH
(4) by proteases

154. Colostrum, secreted by mother during initial days of lactation, is abundant in
(1) IgD (2) IgG
(3) IgM (4) IgA

155. Which of the following in female gametophyte of an angiosperm helps in guiding the pollen tube for fertilizing the eggs?
(1) Polar nucleus
(2) Antipodals
(3) Synergids
(4) Central cells

156. Which of the following disease is **not** sexually transmitted?
(1) Genital warts
(2) Syphilis
(3) Tuberculosis
(4) Gonorrhoea

157. Which of the following statements about lac-operon is **correct**?
(1) Galactose can act as an inducer of lac operon
(2) Gene *i* is constitutively expressed
(3) Lactose activates repressor to bind to the operator
(4) Genes *i*, *z*, *y* and *a* share single common promoter

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158. Match **List-I** with **List-II**.

List-I		List-II	
A.	Transformation	I.	Restriction enzyme
B.	Cloning site	II.	Transfer DNA to host bacteria
C.	Selection	III.	Replication
D.	Ori	IV.	Antibiotic

Choose the **correct** answer from the options given below:

(1) A-IV, B-I, C-III, D-II
(2) A-II, B-I, C-IV, D-III
(3) A-I, B-II, C-IV, D-III
(4) A-III, B-IV, C-II, D-I

159. A population of diploid organisms is at Hardy-Weinberg equilibrium. If the frequency of allele A is 0.1, the frequency of AA is

(1) 0.99 (2) 0.01
(3) 0.02 (4) 0.10

160. Sperm motility is due to _____.

(1) muscular movement
(2) flagellar movement
(3) ciliary movement
(4) amoeboid movement

161. Consider a population of 10 million cells. Given the per-capita birth rate of 0.002 (per unit time) and the per-capita death rate of 0.002 (per unit time), the expected number of cells after 10 generations is

(1) 100 million (2) 1 million
(3) 5 million (4) 10 million

162. Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: Forelimbs of human and bats are homologous.

Reason R: Forelimbs of humans and bats have similar anatomical structure.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

(1) **A** is false but **R** is true
(2) Both **A** and **R** are correct and **R** is the correct explanation of **A**
(3) Both **A** and **R** are true, but **R** is not the correct explanation of **A**
(4) **A** is true but **R** is false

163. Muscle contraction is initiated by a signal sent by the central nervous system by the release of _____.

(1) cyclic adenine monophosphate
(2) acetyl choline
(3) acetyl coenzyme A
(4) cyclic guanine monophosphate

164. Which of the following hormone is **not** secreted by human placenta?

(1) LH
(2) hCG
(3) Estrogen
(4) Progesterone

165. Which of the following statements is **correct** about *Plasmodium*?

(1) Fertilization takes place in mosquito gut
(2) Reproduces sexually in liver cells
(3) Reproduces sexually in RBCs
(4) Gametocytes develop in mosquito gut

166. Which of the following are primary consumers in a food chain?

(1) Carnivores (2) Parasites
(3) Predators (4) Herbivores

167. Which of the following statements about the reabsorption process in Henle's loop are **correct**?

(a) The descending limb of Henle's loop is permeable to water but almost impermeable to electrolytes.
(b) Urine gets concentrated in Henle's loop.
(c) Reabsorption of Na^+ and water takes place in Henle's loop.
(d) Active or passive transport of electrolytes occurs in the ascending limb of Henle's loop.

Choose the **correct** answer from the options given below:

(1) (a), (b) and (d) only
(2) (a) and (b) only
(3) (b), (c) and (d) only
(4) (a), (b) and (c) only

168. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: The logistic growth model of populations is considered more realistic than the exponential growth model.

Reason R: Resources are finite.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

(1) A is not correct but R is correct
(2) Both A and R are correct and R is the correct explanation of A
(3) Both A and R are correct but R is not the correct explanation of A
(4) A is correct but R is not correct

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169. Which of the following is the **correct** order of arrangement of vertebrate column from the head to toe?

(1) Cervical vertebra, thoracic vertebra, lumbar vertebra, sacrum

(2) Cervical vertebra, thoracic vertebra, sacrum, lumbar vertebra

(3) Sacrum, lumbar vertebra, thoracic vertebra, cervical vertebra

(4) Cervical vertebra, lumbar vertebra, thoracic vertebra, sacrum

170. Match **List-I** with **List-II**.

List-I		List-II	
A.	Both species are harmed	I.	Predation
B.	One species is harmed and the other is benefited	II.	Mutualism
C.	Both species are benefited	III.	Competition
D.	One is benefited while the other has no effect	IV.	Commensalism

Choose the **correct** answer from the options given below:

(1) A-III, B-I, C-II, D-IV

(2) A-III, B-IV, C-II, D-I

(3) A-I, B-II, C-III, D-IV

(4) A-II, B-I, C-IV, D-III

171. If the diploid chromosome number of typical angiosperm is 36, what would be the chromosome number in its endosperm?

(1) 72 (2) 18

(3) 36 (4) 54

172. Which of the following enzymes synthesizes precursor mRNA?

(1) DNA polymerase

(2) RNA polymerase I

(3) RNA polymerase II

(4) RNA polymerase III

173. Given below are two statements:

Statement I: Plasmids are autonomously replicating DNA.

Statement II: Plasmids are extrachromosomal DNA.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

(1) **Statement I** is incorrect but **Statement II** is correct

(2) Both **Statement I** and **Statement II** are correct

(3) Both **Statement I** and **Statement II** are incorrect

(4) **Statement I** is correct but **Statement II** is incorrect

174. How many theca are present in each lobe of a typical bilobed angiosperm anther?

(1) 12 (2) 2

(3) 6 (4) 8

175. Natural selection can lead to

(a) stabilisation

(b) genetic drift

(c) directional change

(d) disruption

Choose the **correct** answer from the options given below:

(1) (a) and (c) only

(2) (a) only

(3) (a), (c) and (d) only

(4) (a), (b), (c) and (d)

176. Which of the following statements are **correct**?

(a) Energy flow from producers to consumers is unidirectional

(b) Energy pyramid can never be inverted

(c) Transfer of energy follows the 1% law

Choose the **correct** answer from the options given below:

(1) (b) and (c) only

(2) (a), (b) and (c)

(3) (a) and (b) only

(4) (a) and (c) only

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177. Match **List-I** with **List-II**.

List-I		List-II	
A.	Excess growth hormone	I.	Reabsorption of water and electrolytes in kidney
B.	Luteinizing hormone	II.	Contraction of uterus during child birth
C.	Vasopressin	III.	Acromegaly
D.	Oxytocin	IV.	Ovulation

Choose the **correct** answer from the options given below:

(1) A-IV, B-III, C-I, D-II
(2) A-III, B-IV, C-II, D-I
(3) A-III, B-IV, C-I, D-II
(4) A-II, B-IV, C-I, D-III

178. Which of the following are secondary lymphoid organs?

(a) Bone marrow
(b) Tonsils
(c) Spleen
(d) Thymus

Choose the **correct** answer from the options given below:

(1) (a) and (d) only (2) (a) and (b) only
(3) (b) and (c) only (4) (b) and (d) only

179. During PCR, primers bind to the DNA strands in the _____ step.

(1) ligation
(2) denaturation
(3) extension
(4) annealing

180. Given below are two statements:

Statement I: Down's syndrome is caused by the absence of one of the X-chromosomes.

Statement II: Turner's syndrome is caused by the presence of an additional copy of the chromosomes.

In the light of the above statements, choose the **correct** answer from the options given below:

(1) Statement I is incorrect but Statement II is correct
(2) Both Statement I and Statement II are correct
(3) Both Statement I and Statement II are incorrect
(4) Statement I is correct but Statement II is incorrect

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Test Booklet Code

ENGLISH **14**

NEET (UG)-2026

|| DATE: 03-05-2026 ||

Important Instructions:

1. The test is of **3 hours** duration and the Test Booklet contains **180** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry,** and **Biology (Botany and Zoology)**. All questions are compulsory.
2. Each question carries **4 marks**. For **each correct response**, the candidate will get **4 marks**. For **each incorrect response**, **1 mark will be deducted** from the total scores. The maximum mark is **720**.
3. Use a **Blue/Black** ballpoint Pen only for writing particulars on this page/marking responses on the Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy)** to the **Invigilator** before leaving the room/hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is **14**.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet. The use of white fluid for correction is **NOT** permissible on the Answer Sheet.
8. Each candidate must show on-demand his/her Admit Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of an Electronic/Manual Calculator is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

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1. A 100-turn closely wound circular coil of radius 5 cm has a magnetic field of 3.14×10^{-3} T at its centre. The current flowing through the coil, and the magnitude of the magnetic moment of this coil are, respectively: (Take $\mu_0 = 4\pi\times10^{-7}$ T m/A)

(1) 2.5 A, 2 A m^2

(2) 2.5 A, 20 A m^2

(3) 2 A, 4 A m^2

(4) 2 A, 10 A m^2

2. Match **List-I** with **List-II**.

List-I		List-II	
(A)	$E = hv$	(I)	de Broglie wavelength
(B)	Diffraction and Interference	(II)	Particle nature of light
(C)	$\lambda = \frac{h}{p}$	(III)	Wave nature of light
(D)	Compton effect	(IV)	Energy of photon

Choose the **correct** answer from the options given below:

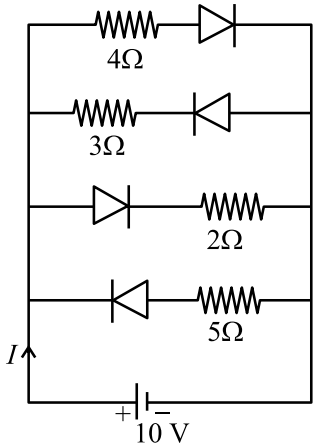
(1) A-IV, B-III, C-I, D-II

(2) A-I, B-IV, C-III, D-II

(3) A-IV, B-I, C-II, D-III

(4) A-IV, B-III, C-II, D-I

3. The current I in the circuit shown below is:
(All diodes are ideal and identical)



(1) $\frac{5}{3}$A

(2) $\frac{15}{2}$A

(3) $\frac{1}{3}$A

(4) $\frac{5}{9}$A

4. The speed of light in vacuum is taken as unity. If light takes 6 min 40 s to reach the Earth from the Sun, the distance between the Sun and the Earth in new unit is:

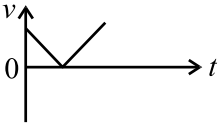
(1) 3×10^8

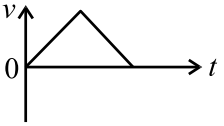
(2) 3×10^{10}

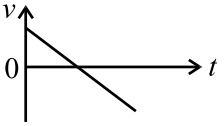
(3) 400

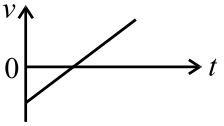
(4) 500

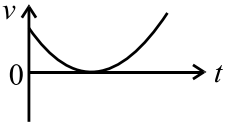
5. The following plots show variation of velocity (v) with time (t), of a ball thrown vertically upward, and falling back. Which of the following plots is/are **correct**?

A. 

B. 

C. 

D. 

E. 

(1) C only

(2) A and E only

(3) D only

(4) B only

6. In a vernier callipers, 20 VSD coincide with 16 MSD (each division of length 1 mm). The least count of the vernier callipers is:

(1) 0.01 cm

(2) 0.1 cm

(3) 0.02 cm

(4) 0.2 cm

7. An ac circuit contains a resistance of 1 kΩ , a capacitor of 0.1 μF and an inductor of 1 mH connected in series. The resonance frequency of the circuit is approximately:

(1) 10.1 kHz

(2) 20.7 kHz

(3) 15.9 kHz

(4) 13.5 kHz

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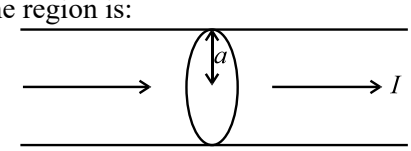
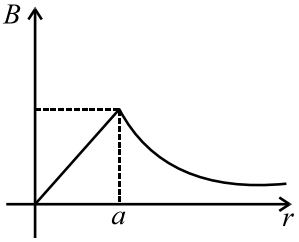
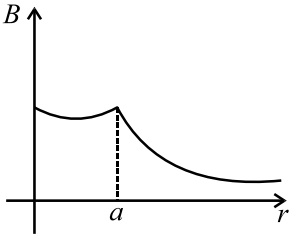
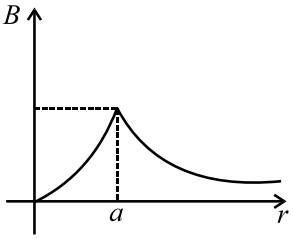
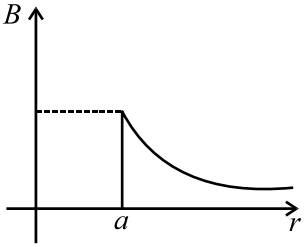
8. The figure given below shows a long straight solid wire of circular cross-section of radius ' a ' carrying steady current I. The current I is uniformly distributed across its cross-section. The plot which correctly represents the variation of magnetic field (B) with distance (r) from the axis of the conductor in the region is:



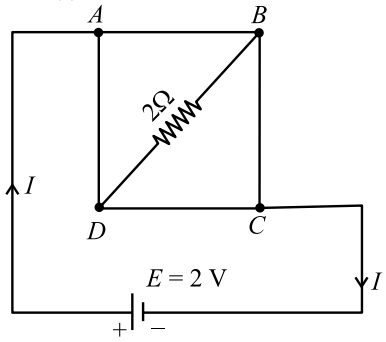
(1)


(2)


(3)


(4)


9. A uniform metallic wire having resistance $4\,\Omega$ is bent to form a square loop ($ABCD$) (see figure). A resistance of $2\,\Omega$ is connected between points B and D and a battery of 2 V is connected across points A and C as shown in the figure. Now the value of current (I) is:



(1) 2 A (2) 4 A
(3) 8 A (4) 4.5 A

10. An unknown nucleus has a nuclear density of 2.29×10^{17} kg/m^3 and mass of 19.926×10^{-27} kg. Its mass number A is approximately :
(Take $R_0 = 1.2 \times 10^{-15}$ m, $4\pi = 12.56$)
(1) 12
(2) 19
(3) 20
(4) 16

11. A rectangular wire loop of sides 8 cm and 3 cm with a small cut, is moving out of a region of uniform magnetic field of magnitude 0.3 T directed normal to the plane of the loop. The emf developed across the cut, if the velocity of the loop is 2 cm s^{-1}, in a direction normal to the shorter side of the loop, will be :
(1) 1.8×10^{-4} volt
(2) 1.2×10^{-4} volt
(3) 1.3×10^{-4} volt
(4) 4.8×10^{-4} volt

12. A galvanometer of resistance 100 Ω gives full scale deflection for a current of 1 mA. It is converted into an ammeter of range 0 – 10 A. The shunt required is:
(1) 0.01 Ω
(2) 0.10 Ω
(3) 0.001 Ω
(4) 1.0 Ω

13. In Young's double slit experiment, using monochromatic light of wavelength λ, the intensity of light at a point on the screen where the path difference is λ is K units. The intensity of light at a point where the path difference is $\frac{\lambda}{3}$ will be :
(1) $\frac{K}{4}$ (2) K
(3) $\frac{K}{2}$ (4) 2 K

14. The magnitude and direction of the acceleration produced in a body of mass 5 kg when two mutually perpendicular forces 8 N and 6 N act on it, are respectively :
(1) 2 m s^{-2} : $\tan^{-1}(3/4)$ with 6 N force
(2) 2 m s^{-2} ; $\tan^{-1}(4/3)$ with 8 N force
(3) 2 m s^{-2} ; $\tan^{-1}(3/4)$ with 8 N force
(4) 20 m s^{-2} $\tan^{-1}(4/3)$ with 8 N force

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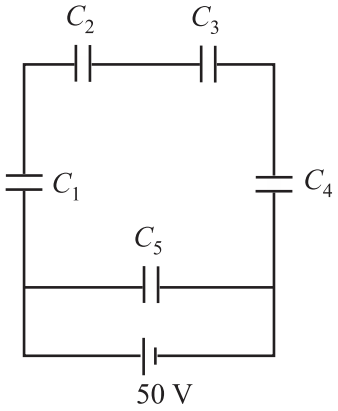
15. Five capacitors of capacitances $C_1 = C_2 = C_3 = C_4 = 10\ \mu F$ and $C_5 = 2.5\ \mu F$ are connected as shown, along with a battery of 50 V.



The equivalent capacitance and the charges on each capacitor respectively are:

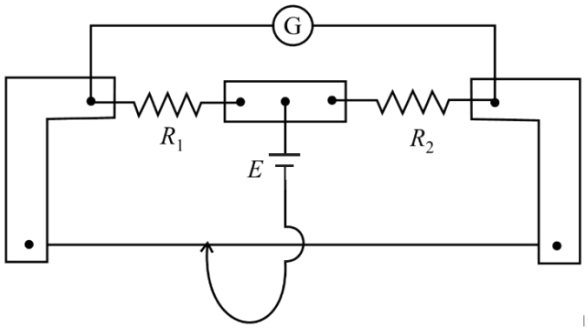
(1) 5 μF, 125 μC on all capacitors

(2) 5 μF, 250 μC on all capacitors

(3) 4 μF, 250 μC on C_1 to C_4 and 125 μC on C_5

(4) 5 μF, 125 μC on C_1 to C_4 and 25 μC on C_5

16. In a metre bridge experiment (see figure), the positions of the cell, E, and galvanometer, G, are interchanged. We shall observe in the galvanometer:



(1) Only the right-sided deflection

(2) Only the left-sided deflection

(3) There will be no deflection irrespective of the position of the jockey

(4) Both right-sided and left-sided deflection and at balance point, no-deflection

17. The power of a crane, which lifts a mass of 1000 kg to a height of 20 m in 10 s is : $\left(g = 9.8\,m/s^2\right)$

(1) 19.6 W

(2) 39.2 W

(3) 39.2 kW

(4) 19.6 kW

18. Match **List-I** with **List-II**.

List-I		List-II	
(A)	Young's Modulus	(I)	$\frac{\Delta d}{\Delta L}\left(\frac{L}{d}\right)$
(B)	Compressibility	(II)	$\frac{FL}{A(\Delta L)}$
(C)	Bulk Modulus	(III)	$-\frac{1}{\Delta P}\left(\frac{\Delta V}{V}\right)$
(D)	Poisson's Ratio	(IV)	$-P\left(\frac{V}{\Delta V}\right)$

Choose the **correct** answer from the options given below:

(1) A-I, B-IV, C-III, D-II

(2) A-IV, B-I, C-II, D-III

(3) A-III, B-II, C-I, D-IV

(4) A-II, B-III, C-IV, D-I

19. In a concave lens, a ray of light emanating from the object parallel to the principal axis of the lens, after refraction:

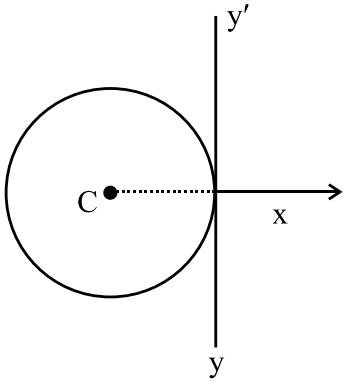
(1) emerges parallel to the principal axis.

(2) appears to diverge from the first principal focus.

(3) passes through 2F, which is the radius of curvature of the lens.

(4) passes through the second principal focus.

20. A thin wire of length 'L' and linear mass density 'm' is bent into a circular ring (in x − y plane) with centre 'C' as shown in figure. The moment of inertia of the ring about an axis yy' will be:



(1) $\frac{3\,mL^3}{8\pi^2}$

(2) $\frac{3\,mL^3}{8\pi}$

(3) $\frac{3\,mL^2}{8\pi^2}$

(4) $\frac{3\,mL^2}{8\pi}$

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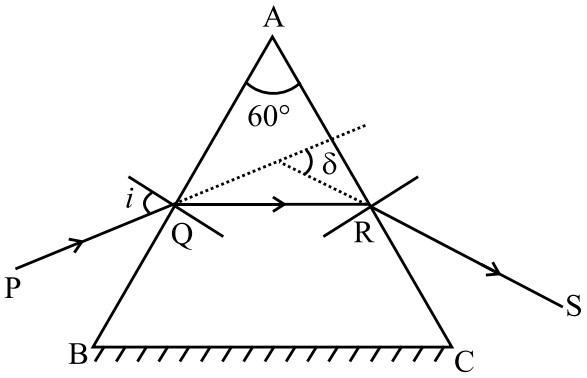
21. Each side of a metallic cube of mass 5.580 kg is measured to be 9.0 cm. Keeping the significant figures in view, the density of the material of the cube can be best expressed as $X \times 10^3$ kg m^{-3}, where the value of X is:

(1) 7.654
(2) 7.7
(3) 7.65
(4) 7.6

22. For a travelling harmonic wave
$y(x, t) = 2.0 \cos 2\pi(10t - 0.0080x + 0.35)$, where x and y are in cm and t in s. The phase difference between oscillatory motion of two points separated by a distance of 0.5 m is:

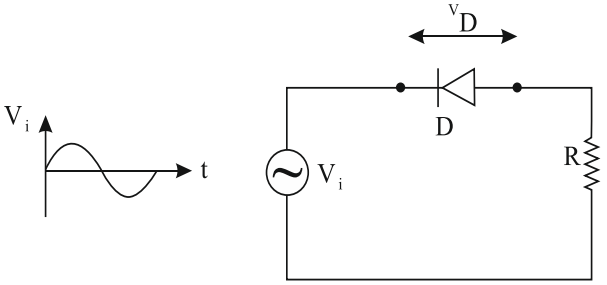
(1) 8 π rad
(2) 0.08 π rad
(3) 0.008 π rad
(4) 0.8 π rad

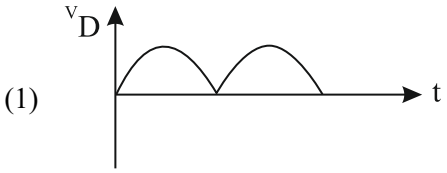
23. A ray of monochromatic light is passing through an equilateral prism (ABC) as shown in the figure. The refracted ray (QR) is parallel to its base (BC) and the angle of incidence (*i*) is 50°. Then the angle of deviation (δ) is:

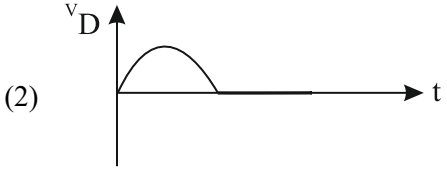


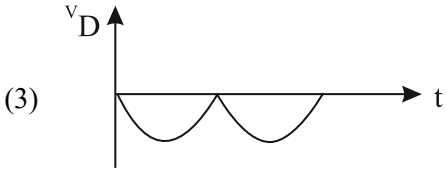
(1) 40°
(2) 45°
(3) 55°
(4) 35°

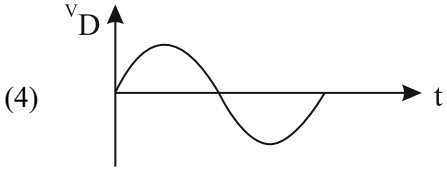
24. In the circuit shown below, the voltage appearing across the diode D will be of the form:



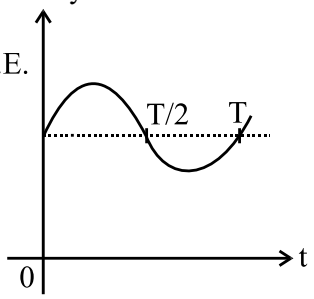
(1) 

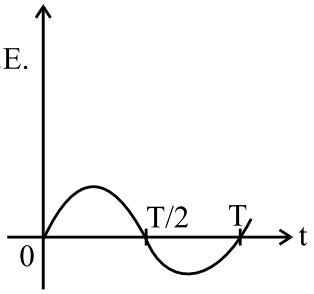
(2) 

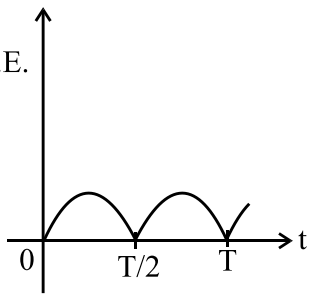
(3) 

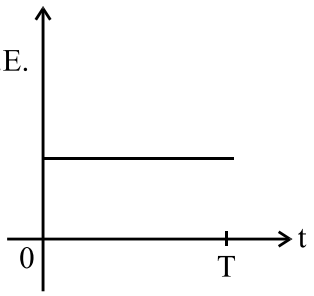
(4) 

25. For a simple pendulum, having time period T, the variation of kinetic energy (K.E.) with time (t) is represented by:

(1) 

(2) 

(3) 

(4) 

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26. A resistor is connected to a battery of 12 V emf and internal resistance 2 Ω. If the current in the circuit is 0.6 A, the terminal voltage of the battery is:
(1) 10 V (2) 10.8 V
(3) 12 V (4) 1.2 V

27. The amount of work done to raise a mass 'm' from the surface of the Earth to a height equal to the radius of the Earth 'R', will be:
(1) 2 mg R (2) mg R
(3) $mg\frac{R}{4}$ (4) $mg\frac{R}{2}$

28. An electric heater supplies heat to a system at a rate of 100 W. If the system performs work at a rate of 75 J/s, then the rate at which internal energy increases will be :
(1) 125 W (2) 100 W
(3) 25 W (4) 75 W

29. A room heater is rated 400 W, 220 V. If the supply voltage drops to 200 V, what will be the power consumed (approximately) ?
(1) 121 W (2) 331 W
(3) 200 W (4) 400 W

30. When a ruler falls vertically, 5 different persons catch it with different reaction times.
($g = 9.8\ ms^{-2}$)
A. Person A has reaction time of 0.20 s.
B. Person B has reaction time of 0.22 s.
C. Person C has reaction time of 0.18 s.
D. Person D has reaction time of 0.19 s.
E. Person E has reaction time of 0.21 s.
What is the **correct** order of the distance travelled by the ruler for each person ?
(1) C > D > A > B > E
(2) C > D > A > E > B
(3) B > E > A > C > D
(4) B > E > A > D > C

31. Consider two uncharged capacitors of equal capacitance 200 pF. One of them is charged by a 100 V supply and disconnected. Now this capacitor is connected to the uncharged capacitor. The amount of electrostatic energy lost in the process is:
(1) 1.0×10^{-6} J(2) 0.5×10^{-6} J
(3) 0.5 J(4) 1.0 J

32. Savitha, a XI standard student, while conducting an experiment to determine the effective length of a simple pendulum L, notes down the data of time taken to complete 30 oscillations as 60 s and hence calculates the length of the simple pendulum as :
(Take $\pi^2 = 9.8$, and $g = 9.8\ m/s^2$)
(1) 2 m (2) 0.75 m
(3) 1.5 m (4) 1 m

33. The peak value of an alternating current is 5 A and frequency is 60 Hz. How long will the current, starting from zero, take to reach the peak value ?
(1) $\frac{1}{240}$ s (2) $\frac{1}{30}$ s
(3) $\frac{1}{120}$ s (4) $\frac{1}{60}$ s

34. In interference and diffraction, the light energy is redistributed. If it reduces in one region, producing a dark fringe, it increases in another region, producing a bright fringe.
A. As there is no gain or loss of energy, these phenomena are consistent with the principle of conservation of energy.
B. Diffraction and interference are characteristics exhibited only by light waves.
Choose the correct answer from the options given below
(1) A is true, but B is false
(2) A is true and B is also true
(3) A is false, but B is true
(4) Both A and B are false

35. A box of mass 15 kg is kept on the floor of a stationary trolley. The coefficient of static friction between the box and the trolley is 0.12. Keeping the box in stationary state over the trolley, the maximum acceleration with which the trolley can be moved horizontally in m s^{-2} is :
($g = 10\ m/s^2$)
(1) 1.5 (2) 1.8
(3) 2.1 (4) 1.2

36. The sum of kinetic energy and potential energy of a simple pendulum bob is 0.02 joule. The speed of the simple pendulum bob at equilibrium position is approximately :
(Consider mass of the bob = 20 g)
(1) 1.41 m/s (2) 14.1 m/s
(3) 0.2 m/s (4) 2.0 m/s

37. Four statements are given (A is mass number) :
A. The volume of a nucleus is proportional to $A^{1/3}$.
B. The volume of a nucleus is proportional to A.
C. The difference in mass of an atom and its nucleus is called the mass defect.
D. The difference in mass of a nucleus and its constituents is called the mass defect.
Choose the **correct** answer from the options given below :
(1) B and D are true, but A and C are false
(2) A and D are true, but B and C are false
(3) A and C are true, but B and D are false
(4) B and C are true, but A and D are false

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38. The angular speed of a flywheel is increased from 600 rpm to 1200 rpm in 10 s. The number of revolutions completed by the flywheel during this time is :

(1) 600 (2) 900
(3) 300 (4) 150

39. A submarine is designed to withstand an absolute pressure of 100 atm. How deep can it go below the water surface ?
(Consider the density of water = 1000 kg m^{-3}, 1 atm = 1×10^5 Pa and gravitational acceleration g = 10 m/s^2)

(1) 9900 m (2) 99 m
(3) 9000 m (4) 990 m

40. Match List I with List II :

List I (Electromagnetic wave)		List II (Production)	
A.	Microwave	I.	Electrons in atoms emit light when they move from a higher energy level to a lower energy level
B.	Visible light	II.	Radioactive decay of nucleus
C.	Gamma rays	III.	Vibration of atoms and molecules
D.	Infra-red rays	IV.	Klystron valve or magnetron valve

Choose the **correct** answer from the options given below :

(1) A-III, B-I, C-II, D-IV
(2) A-III, B-IV, C-I, D-II
(3) A-IV, B-III, C-II, D-I
(4) A-IV, B-I, C-II, D-III

41. Which of the following statements are correct ?

A. Inside a conductor, the electrostatic field is zero.
B. Electric field at the surface of a charged conductor does not depend on its surface charge density.
C. The interior of a charged conductor can have no excess charge in the static situation.
D. At the surface of a charged conductor, the electrostatic field must be normal to the surface at every point.
E. The electrostatic potential is zero everywhere inside a charged conductor.

Choose the **correct** answer from the options given below :

(1) C, D and E only
(2) A, B and D only
(3) A, C and D only
(4) A, C and E only

42. For a metal of work function 6.6 eV, which of the following wavelengths of incident radiation does ***not*** give rise to the photoelectric effect ?
(Take Planck's constant as 6.6×10^{-34} J s)

(1) 200 nm (2) 150 nm
(3) 100 nm (4) 50 nm

43. In the first excited state of hydrogen atom, the energy of its electron is –3.4 eV. The radial distance of the electron from the hydrogen nucleus in this case is approximately :
(Take 1 eV = 1.6×10^{-19} J, e = 1.6×10^{-19} C and $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2/C^2)

(1) 2.1×10^{-8} m (2) 2.1×10^{-11} m
(3) 2.1×10^{-9} m (4) 2.1×10^{-10} m

44. Two statements are given below :

A. When the forward bias voltage across a p-n junction diode increases above a certain threshold voltage, the diode current increases significantly.
B. This current is called reverse saturation current.

Choose the **correct** answer from the options given below :

(1) Both Statements A and B are false
(2) Statement A is true, but Statement B is false
(3) Both Statements A and B are true
(4) Statement A is false, but Statement B is true

45. A flask contains argon and chlorine in the ratio of 2 :1 by mass. The temperature of the mixture is 27°C. The ratio of root mean square speed of the molecules of the two gases $\left(\frac{v_{rms}^{Ar}}{v_{rms}^{Cl}}\right)$ is :

(Atomic mass of argon = 40.0 u and molecular mass of chlorine = 70.0 u)

(1) $\frac{\sqrt{7}}{2}$ (2) $\frac{7}{2}$
(3) $\frac{7}{4}$ (4) $\frac{2}{\sqrt{7}}$

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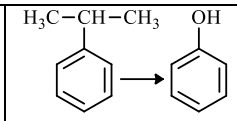
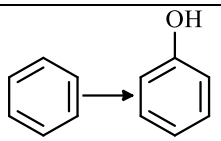
46. Match **List-I** with **List-II**.

List-I		List-II	
(A)		(I)	(i) oleum (ii) NaOH (iii) H^+
(B)	$CH_3COOH \rightarrow CH_3CH_2OH$	(II)	(i) O_2 (ii) H_2O/H^+
(C)	$CH_3CH_2CH_2OH \rightarrow CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$	(III)	(i) CH_3OH/H^+ (ii) H_2, catalyst
(D)		(IV)	(i) conc. H_2SO_4, Δ (ii) H^+/H_2O

Choose the **correct** answer from the options given below:

(1) A-I, B-III, C-IV, D-II

(2) A-II, B-IV, C-III, D-I

(3) A-II, B-III, C-I, D-IV

(4) A-II, B-III, C-IV, D-I

47. The major product Z formed in the following sequence of reaction is:

$$C_2H_6 \xrightarrow[\text{UV light}]{Cl_2} \underset{\text{(monochlorinated product)}}{X} \xrightarrow{NH_3} Y \xrightarrow[\text{(ii) } H_2O]{\text{(i) } NaNO_2,\ HCl} Z$$

(1) $C_2H_5-N=N-OH$

(2) C_2H_5OH

(3) $C_2H_5NO_2$

(4) $C_2H_5NH_2$

48. In a qualitative analysis Bi^{3+} is detected by appearance of precipitate of BiO(OH)(s). Calculate pH when the following equilibrium exists at 298 K:

$BiO(OH)(s) \rightleftharpoons BiO^+(aq) + OH^-(aq)$,

$K = 4 \times 10^{-10}$

(Given: log 2 = 0.3010)

(1) 4.699

(2) 8.714

(3) 9.301

(4) 5.286

49. When 1 dm^3 of CO_2 gas is passed over hot coke, the volume of gaseous mixture after complete reaction at STP becomes 1.4 dm^3. The composition of the gaseous mixture at STP is:

(1) 0.6 dm^3 of CO, 0.8 dm^3 of CO_2

(2) 0.8 dm^3 of CO, 0.8 dm^3 of CO_2

(3) 0.8 dm^3 of CO, 0.6 dm^3 of CO_2

(4) 0.6 dm^3 of CO, 0.4 dm^3 of CO_2

50. Match **List-I** with **List-II**.

List-I (Quantum Numbers)			List-II (Orbital)	
	'n'	'l'		
(A)	2	1	(I)	3d
(B)	4	0	(II)	2p
(C)	5	3	(III)	4s
(D)	3	2	(IV)	5f

Choose the **correct** answer from the options given below:

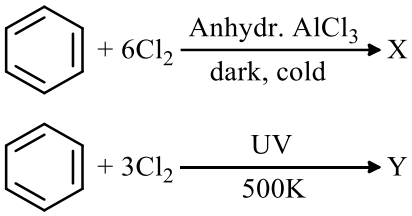
(1) A-II, B-III, C-IV, D-I

(2) A-I, B-II, C-III, D-IV

(3) A-IV, B-II, C-III, D-I

(4) A-II, B-III, C-I, D-IV

51. The number of chlorine atoms present in the organic products X and Y of the following reactions, respectively, are:



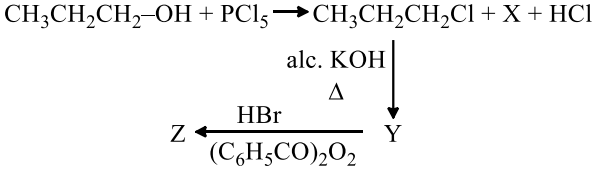
(1) 3 and 6

(2) 6 and 6

(3) 6 and 3

(4) 3 and 3

52. In the following reaction sequence, X and Z, respectively are:



(1) $X = POCl_3$; $Z = CH_3-\underset{\underset{Br}{|}}{CH}-CH_3$

(2) $X = H_3PO_3$; $Z = CH_3CH_2CH_2-Br$

(3) $X = H_3PO_3$; $Z = CH_3-\underset{\underset{Br}{|}}{CH}-CH_3$

(4) $X = POCl_3$; $Z = CH_3CH_2CH_2-Br$

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53. Match **List-I** with **List-II**.

List-I (Transition metal/ compound/complex)		List-II (Catalytic Role)	
(A)	V_2O_5	(I)	Preparation of ammonia from N_2/H_2 mixture
(B)	Fe	(II)	Polymerisation of alkynes
(C)	$PdCl_2$	(III)	Preparation of H_2SO_4 from SO_2
(D)	Ni complex	(IV)	Oxidation of ethyne to ethanal

Choose the **correct** answer from the options given below:

(1) A-III, B-IV, C-I, D-II
(2) A-II, B-I, C-IV, D-III
(3) A-IV, B-I, C-III, D-II
(4) A-III, B-I, C-IV, D-II

54. Identify the **correct** statement about ClF_3 from the following options:

(1) It has a trigonal pyramidal geometry with two lone pairs on Cl atom.
(2) it has T-shaped geometry with two lone pairs on Cl atom.
(3) It has a planar trigonal geometry with two lone pairs on Cl atom.
(4) It has T-shaped geometry with three lone pairs on Cl atom.

55. Calculate emf of the half cell given below:

$Pt(s)\,|\,H_2(g, 2\text{ atm})\,|\,HCl(aq, 0.02\text{ M})$

$E^{\circ}_{H_2/H^+} = 0\text{ V}$

$\left(\text{Given : } \frac{2.303\,RT}{F} = 0.059,\ \log 2 = 0.3010\right)$

(1) 0.109 V (2) 0.035 V
(3) –0.035 V (4) –0.109 V

56. Match the **List-I** with **List-II**.

List-I (Order of reaction)		List-II (Unit of rate constant)	
(A)	Zero order	(I)	$mol^{-1}L\,s^{-1}$
(B)	First order	(II)	$mol^{-2}L^2\,s^{-1}$
(C)	Second order	(III)	s^{-1}
(D)	Third order	(IV)	$mol\,L^{-1}\,s^{-1}$

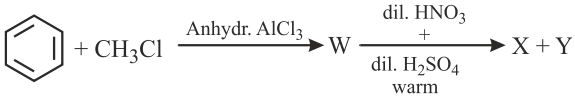
Choose the **correct** answer from the options given below;

(1) A-IV, B-III, C-II, D-I
(2) A-I, B-II, C-III, D-IV
(3) A-IV, B-III, C-I, D-II
(4) A-IV, B-II, C-I, D-III

57. The calculated 'spin-only' magnetic moment of $Ti^{2+}(3d^2)$ is:

(1) 2.84 BM (2) 5.92 BM
(3) 4.90 BM (4) 3.87 BM

58. Two products X and Y are formed in the following reaction sequence.



The suitable method that can be used for the separation of products X and Y is:

(1) Continuous extraction
(2) Differential extraction
(3) Fractional distillation
(4) Sublimation

59. A bulb is rated at 150 watt, converting 8% energy into light. If energy of one photon is 4.42×10^{-19} J, how many photons are emitted by the bulb per second?

(1) 1.35×10^{19} (2) 4.06×10^{19}
(3) 2.71×10^{19} (4) 27.2×10^{19}

60. In a test tube containing a salt, a few drops of dilute H_2SO_4 was added, which gave colourless vapours having the smell of vinegar. The vapours turned the blue litmus paper red.
Identify the **correct** anion from the following:

(1) Acetate, CH_3COO^-
(2) Carbonate, CO_3^{2-}
(3) Sulphate, SO_4^{2-}
(4) Sulphide, S^{2-}

61. Select the reagents that reduce nitriles to primary amines:

A. (i) $LiAlH_4$: (ii) H_2O
B. Sn + HCl
C. H_2/Ni
D. $Na(Hg)/C_2H_5OH$
E. Br_2/aq. NaOH

Choose the **correct** answer from the options given below:

(1) A, B and C only
(2) A, C and D only
(3) A, D and E only
(4) B, D and E only

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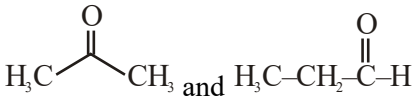
62. Identify the **incorrect** statement from the following:
(1) Carbon has the ability to form $p\pi - p\pi$ multiple bond with itself.
(2) ECl_3 (E = B and Al) is a monomer when E = B and a dimer when E = Al.
(3) Oxygen exhibits only –2 oxidation state.
(4) The order of catenation property of Group 14 elements is C >> Si > Ge ≈ Sn.

63. Although +3 oxidation state is most common in lanthanoids, cerium still shows +4 oxidation state because:
(1) Its nearest gas is Radon.
(2) After losing one more electron, it acquires $4f^{14}$ electronic configuration.
(3) Its atomic number is 61.
(4) After losing one more electron, it acquires $4f^{0}$ electronic configuration.

64. During Lassaigne's test, the elements present in an organic compound are converted from :
(1) covalent form to covalent form
(2) ionic form to ionic form
(3) covalent form to ionic form
(4) ionic form to covalent form

65. The number of hydrogen atoms present in 5.4 g of urea is :
(Given : Molar mass of urea : 60 g mol^{-1},
N_A : 6.022×10^{23} particles mol^{-1})
(1) 2.168×10^{23} (2) 2.168×10^{22}
(3) 1.084×10^{22} (4) 1.084×10^{23}

66. The pair of molecules that are metamers among the following is :
(1) $CH_3CH_2CH_2OH$ and $CH_3 - CH(OH) - CH_3$
(2) $CH_3OCH_2CH_2CH_3$ and $CH_3CH_2OCH_2CH_3$
(3)  and
(4) $CH_3CH_2CH_2CH_2CH_3$ and $(CH_3)_2CHCH_2CH_3$

67. Identify the ***incorrect*** statement from the following :
(1) $P(C_2H_5)_3$ and $As(C_6H_5)_3$ form $d\pi$-$d\pi$ bond with transition metals.
(2) Nitrogen can form $d\pi$-$p\pi$ bond with oxygen.
(3) Nitrogen can form $p\pi$-$p\pi$ multiple bonds with itself.
(4) Phosphorus, arsenic and antimony show catenation property.

68. Phenolphthalein is used as an indicator for the titration of sodium hydroxide solution against a standard solution of oxalic acid. The colour change that is observed at an alkaline pH close to the equivalence point during this titration is :
(1) pinkish red to yellow
(2) yellow to pinkish red
(3) colourless to pink
(4) pink to colourless

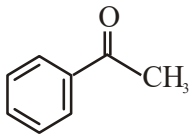
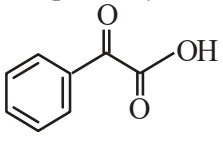
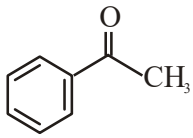
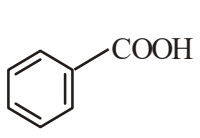
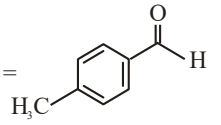
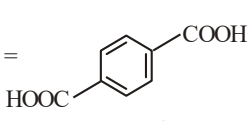
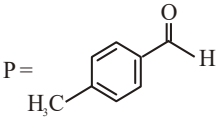
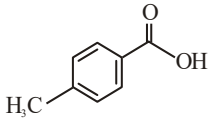
69. Match List I with List II :

List-I		List-I	
A.	C_2H_4	I.	3 σ bonds, 2 π bonds
B.	C_2H_2	II.	3 σ bonds, one lone pair
C.	CH_4	III.	4 σ bonds
D.	NH_3	IV.	5 σ bonds, 1 π bond

Choose the **correct** answer from the options given below :
(1) A-IV, B-I, C-III, D-II
(2) A-III, B-IV, C-II, D-I
(3) A-I, B-II, C-IV, D-III
(4) A-II, B-III, C-I, D-IV

70. At a certain temperature, T (K), during a process, 500 J is absorbed by the system and work of 200 J is done by the system. Then change in internal energy of the system is :
(1) 700 J (2) 300 J
(3) 400 J (4) 500 J

71. Methane reacts with steam at 1273 K in the presence of nickel catalyst to form :
(1) CO and H_2 (2) CO and H_2O
(3) CO_2 and H_2O (4) CO_2 and H_2

72. Compound P (C_8H_8O) gives a red orange precipitate with 2,4-DNP reagent and it does not reduce Fehling's reagent. On drastic oxidation with chromic acid, P gives an aromatic product Q that produces effervescence on treating with aq. $NaHCO_3$. Compounds P and Q, respectively are:
(1) P =  ; Q = 
(2) P =  ; Q = 
(3) P =  ; Q = 
(4) P =  ; Q = 

73. A solution of copper sulphate is electrolysed for 10 minutes with a current of 1.5 amperes. The mass of copper deposited at cathode is :

(Given : Molar mass of Cu = 63 g mol^{-1} ; 1 F = 96487 C mol^{-1})

(1) 2.4036 g
(2) 1.7018 g
(3) 0.5876 g
(4) 0.2938 g

74. The functional group that can be identified through phthalein dye test is :

(1) Phenolic
(2) Alcohol
(3) Aldehyde
(4) Carboxylic acid

75. The **correct** statement with regard to the secondary structure of DNA/RNA is :

(1) DNA possesses a single strand helix structure and contains uracil as one of the four bases.
(2) RNA possesses a single strand helix structure and contains thymine as one of the four bases.
(3) DNA possesses a double strand helix structure and contains thymine as one of the four bases.
(4) RNA possesses a double strand helix structure and contains uracil as one of the four bases.

76. Identify the **correct** statements :

A. The molality of 2.5 g of ethanoic acid (Molar mass : 60 $g\ mol^{-1}$) in 75 g of benzene solution is 0.556 m.
B. The molarity of a solution containing 5 g of NaOH (molar mass : 40 $g\ mol^{-1}$) in 450 mL of solution is 0.278 M at 298 K.
C. Aquatic species are more comfortable in cold water.
D. The solubility of gas increases with decrease in pressure.
E. For a binary mixture of A and B, the number of moles of A and B are n_A and n_B respectively. The mole fraction of B will be $x_B = \frac{n_A}{n_A + n_B}$.

Choose the correct answer from the options given below :

(1) A and C only
(2) A, B and C only
(3) A, D and E only
(4) A and B only

77. Mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law due to :

(1) formation of hydrogen bonding between acetone and chloroform.
(2) increase in escaping tendency of molecules of each component.
(3) stronger intermolecular forces between chloroform molecules than those between chloroform and acetone molecules.
(4) repulsive forces.

78. At 298 K, a certain buffer solution contains equal concentrations of X^- and HX, K_b for X^- is 10^{-10}. What is the pH of this buffer solution ?

(1) 2
(2) 10
(3) 4
(4) 6

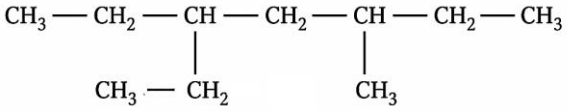
79. Identify the **incorrect** statement from the following:

(1) The IUPAC name of the element with atomic number 107 is Unnilseptium.
(2) The largest and the smallest species among Mg, Mg^{2+}, Al and Al^{3+} are Al and Mg^{2+}, respectively.
(3) The similarity in behaviour of Li with Mg is referred to as 'diagonal relationship'.
(4) The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are 3 and 6 respectively.

80. The correct order of increasing metallic character of Na, Be, P, Mg and Si is :

(1) P < Si < Be < Mg < Na
(2) Be < Si < P < Mg < Na
(3) P < Si < Na < Mg < Be
(4) P < Mg < Be < Si < Na

81. The correct IUPAC name of the following compound is :



(1) 2,4-diethylhexane
(2) 3,5-diethylhexane
(3) 3-ethyl-5-methylheptane
(4) 3-methyl-5-ethylheptane

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82. Match List I with List II:

List-I (Complex/ion)		List-I (Shape/geometry)	
A.	$[Pt(Cl_2)NH_3)_2]$	I.	Octahedral
B.	$[Co(NH_3)_6]Cl_3$	II.	Trigonal bipyramidal
C.	$[NiCl_4]^{2-}$	III.	Square planar
D.	$[Fe(CO)_5]$	IV.	Tetrahedral

Choose the **correct** answer from the options given below:

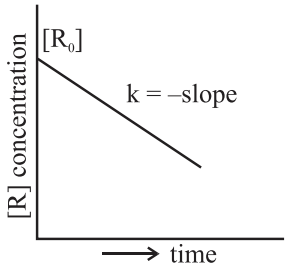
(1) A-I, B-III, C-IV, D-II

(2) A-III, B-IV, C-I, D-II

(3) A-IV, B-I, C-III, D-II

(4) A-III, B-I, C-IV, D-II

83. For a certain reaction R → Product, the plot of concentration [R] vs time has a negative slope as shown. The order of reaction is:



(1) 0

(2) 1

(3) 2

(4) 2.5

84. Which one of the following is an ambidentate ligand?

(1) Ethylenediaminetetraacetate ion

(2) Oxalate

(3) Ethane-1,2-diamine

(4) Thiocyanate

85. Consider the following reaction:

$2A(g) + B(g) \rightarrow 2D(g)$

$\Delta U^{\ominus} = -10$ kJ mol^{-1} and $\Delta S^{\ominus} = -44$ J K^{-1} at 298 K.

Identify the **correct** option with $\Delta G^{\ominus}$ for the reaction and spontaneity of the reaction at 298 K.

(Given: R = 8.31 J mol^{-1} K^{-1})

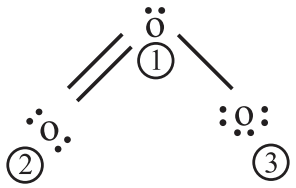
(1) – 1.635 kJ mol^{-1}, spontaneous

(2) + 0.63568 kJ mol^{-1}, non-spontaneous

(3) – 0.63568 kJ mol^{-1}, spontaneous

(4) + 1.635 kJ mol^{-1} non-spontaneous

86.



The correct formal charges on oxygen atoms numbered 2, 1 and 3 respectively are :

(1) – 1, 0, + 1 (2) 0, + 1, – 1

(3) 0, 0, 0 (4) + 1, 0, – 1

87. Given below are certain reactions. Identify the reaction for which $K_p \neq K_c$.

(1) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

(2) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

(3) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

(4) $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$

88. Given below is an expression for the rate constant of a first order reaction occurring at a certain temperature, T (K).

$$ln\, k = 14.34 - \frac{1.25 \times 10^4}{T}$$

The energy of activation in kcal mol^{-1} for the reaction is:

(Given: k in s^{-1}, R = 1.987 cal mol^{-1} K^{-1})

(1) 12.42 (2) 14.34

(3) 18.63 (4) 24.84

89. The following two reactions give the same foul smelling product Z.

$$C_2H_5Cl \xrightarrow{X} Z$$

$$C_2H_5\overset{\overset{O}{\|}}{C}NH_2 \xrightarrow{Br_2, NaOH} Y \xrightarrow[\Delta]{CHCl_3/\text{ethanolic KOH}} Z$$

X and Z, respectively, are :

(1) X = AgCN; Z = C_2H_5CN

(2) X = KCN; Z = C_2H_5CN

(3) X = KCN; Z = C_2H_5NC

(4) X = AgCN; Z = C_2H_5NC

90. Match List I with List II:

List I (Complex)		List II (Type of isomerism)	
A.	$[Pt(NH_3)_2Cl_2]$	I.	Optical
B.	$[Co(en)_3]^{3+}$	II.	Solvate
C.	$[Co(NH_3)_5]NO_2]Cl_2$	III.	Geometrical
D.	$[Cr(H_2O)_6]Cl_3$	IV.	Linkage

Choose the **correct** answer from the options given below:

(1) A-III, B-I, C-II, D-IV

(2) A-I, B-III, C-II, D-IV

(3) A-III, B-I, C-IV, D-II

(4) A-II, B-IV, C-III, D-I

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91. "The Evil Quartet" of biodiversity loss includes which of the following?

(1) Over-exploitation; Alien species invasions; Air pollution; Co-extinctions

(2) Habitat loss and fragmentation; over-exploitation; Alien species invasions; Co-extinctions

(3) Habitat loss and fragmentation; Air pollution; Water pollution; Co-extinctions

(4) Over-exploitation; Alien species invasions; Soil pollution; Co-extinctions

92. Which one of the following is the site for active ribosomal RNA synthesis?

(1) Nucleolus

(2) Chromatin

(3) Centrosome

(4) Kinetochore

93. Match **List-I** with **List-II**:

List-I (Phase of cell cycle)		**List-II (Activity)**	
(A)	G_1 phase	(I)	Actual cell division occurs
(B)	S phase	(II)	Cell is metabolically active and continuously grows but does not replicate its DNA
(C)	G_2 phase	(III)	Synthesis of DNA occurs and the amount of DNA per cell doubles
(D)	M phase	(IV)	Proteins are synthesized while cell growth continues

Choose the **correct** answer from the options given below:

(1) A-II, B-III, C-IV, D-I

(2) A-III, B-IV, C-I, D-II

(3) A-I, B-II, C-III, D-IV

(4) A-IV, B-I, C-II, D-III

94. Match **List-I** with **List-II**:

List-I		**List-II**	
(A)	Productivity	(I)	Gross primary productivity minus respiration losses
(B)	Net primary productivity	(II)	Rate of formation of new organic matter by consumers
(C)	Gross primary productivity	(III)	Rate of biomass production
(D)	Secondary productivity	(IV)	Rate of production of organic matter during photosynthesis

Choose the **correct** answer from the options given below:

(1) A-I, B-II, C-III, D-IV

(2) A-III, B-I, C-IV, D-II

(3) A-III, B-I, C-II, D-IV

(4) A-I, B-III, C-IV, D-II

95. Which of the following statements are **correct**?

A. The Amazon rainforest being cut and cleared for cultivation of soyabeans is an example of habitat loss.

B. Steller's sea cow and passenger pigeon became extinct due to over-exploitation by humans.

C. The Nile perch introduced into Lake Victoria in East Africa helped in population growth of cichlid fish in the lake.

D. Water hyacinth is an invasive species.

E. When a species becomes extinct, the plant and animal species associated with it are not affected.

Choose the **correct** answer from the options given below:

(1) B, C and D only

(2) A, B and D only

(3) A, B and E only

(4) C, D and E only

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96. Identify the correct statements about biomolecules.
A. Lipids are generally water soluble.
B. Proteins are polypeptides.
C. Polysaccharides are long chains of sugars.
D. Adenine and guanine are substituted pyrimidines.
E. Almost all enzymes are proteins.
Choose the **correct** answer from the options given below:
(1) C, D and E only (2) B, C and E only
(3) B, D and E only (4) A, B and C only

97. How many ATP and NADPH molecules are required to make one molecule of glucose through the Calvin pathway?
(1) 18 ATP and 12 NADPH
(2) 6 ATP and 12 NADPH
(3) 24 ATP and 18 NADPH
(4) 12 ATP and 18 NADPH

98. Which of the following statements are **not** true regarding restriction endonucleases?
A. They are called molecular scissors.
B. These are the enzymes responsible for restricting the growth of bacteriophages in *E. coli*.
C. They cut the DNA only at the centre of the palindromic sites.
D. They remove nucleotides only from the ends of DNA fragments.
E. They recognise specific palindromic base-pair sequences.
Choose the answer from the options given below:
(1) A and B only (2) D and E only
(3) C and D only (4) A and E only

99. Match **List-I** with **List-II**:

List-I		**List-II**	
(A)	Decomposition	(I)	Accumulation of dark coloured amorphous colloidal substance
(B)	Detritus	(II)	Release of inorganic nutrients by the activity of microbes in soil
(C)	Mineralisation	(III)	Breaking down of complex organic matter into inorganic substances
(D)	Humification	(IV)	Dead remains of plants and animals including fecal matter

Choose the **correct** answer from the options given below:
(1) A-I, B-II, C-III, D-IV
(2) A-IV, B-III, C-I, D-II
(3) A-III, B-IV, C-II, D-I
(4) A-III, B-II, C-I, D-IV

100. In which one of the following, the ovules are ***not*** enclosed by an ovary wall and remain exposed?
(1) *Selaginella*
(2) *Funaria*
(3) *Pinus*
(4) *Wolffia*

101. Match **List-I** with **List-II**:

List-I (Placentation)		**List-II (Example)**	
(A)	Marginal	(I)	Mustard
(B)	Axile	(II)	Pea
(C)	Parietal	(III)	Marigold
(D)	Basal	(IV)	Lemon

Choose the **correct** answer from the options given below:
(1) A-I, B-III, C-II, D-IV
(2) A-IV, B-II, C-I, D-III
(3) A-II, B-IV, C-I, D-III
(4) A-III, B-I, C-IV, D-II

102. In angiosperms, root hairs arise from which one of the following regions of the root?
(1) The root cap zone
(2) The region of meristematic activity
(3) The region of elongation
(4) The region of maturation

103. Which one of the following is ***not*** a characteristic of plant cells in the phase of elongation?
(1) Increased vacuolation
(2) Large conspicuous nuclei
(3) Cell enlargement
(4) New cell wall deposition

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104. Which of the following statements are **correct** with reference to a transcription unit?

A. A transcription unit in DNA is defined primarily by three regions: promoter, structural gene and terminator.

B. The promoter is said to be located towards the 5'-end of the structural gene.

C. The promoter is a DNA sequence that provides binding site for RNA polymerase.

D. The promoter defines the template and coding strands.

E. The terminator is located towards the 3'-end of the coding strand and it defines the end of the process of transcription.

Choose the **correct** answer from the options given below:

(1) A, B, C, D and E
(2) B, C, D and E only
(3) A, C, D and E only
(4) A, B, C and D only

105. Alpha-helix is found in which level of protein structure?

(1) Quaternary structure
(2) Tertiary structure
(3) Primary structure
(4) Secondary structure

106. Which of the following statements are **correct** regarding amino acids ?

A. They are substituted methanes.
B. Serine is an aromatic amino acid.
C. Valine is a neutral amino acid.
D. Lysine is an acidic amino acid.

Choose the **correct** answer from the options given below:

(1) C and D only
(2) A and B only
(3) A and C only
(4) B and C only

107. The main function of bulliform cells in grasses is :

(1) to make the leaf impermeable to fungal spores.
(2) to perform photosynthesis
(3) to minimize water loss during water stress.
(4) to transport water.

108. Find the **incorrect** statement(s) about photosynthesis from the following:

A. The water splitting complex is associated with PS I.
B. C_4 plants use the C_3 pathway of CO_2 fixation as the main biosynthetic pathway.
C. In C_4 plants, photorespiration does not occur.
D. C_3 plants exhibit 'Kranz' anatomy.
E. ATP synthesis in chloroplast occurs through chemiosmosis.

Choose the answer from the options given below :

(1) B only
(2) A and D only
(3) B and C only
(4) B and E only

109. Match **List I** with **List II**:

List-I		List-II	
A.	Conjunctive tissue	I.	Specialised cells in the vicinity of guard cells
B.	Casparian strips	II.	Endodermal cells rich in starch
C.	Subsidiary cells	III.	Tissue between xylem and phloem
D.	Starch sheath	IV.	Endodermal cells with suberin deposition

Choose the **correct** answer from the options given below:

(1) A-IV, B-III, C-I, D-II
(2) A-III, B-IV, C-II, D-I
(3) A-III, B-IV, C-I, D-II
(4) A-IV, B-III, C-II, D-I

110. Match **List-I** with **List-II**:

List-I		List-II	
A.	Genetically modified organism	I.	*Agrobacterium tumefaciens*
B.	Thermostable DNA polymerase	II.	Bt cotton
C.	Ti plasmid	III.	*Thermus aquaticus*
D.	pBR322	IV.	*Escherichia coli*

Choose the **correct** answer from the options given below:

(1) A-II, B-I, C-IV, D-III
(2) A-I, B-IV, C-III, D-II
(3) A-II, B-III, C-I, D-IV
(4) A-I, B-II, C-IV, D-III

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111. Heterophyllous development in response to environment is an example of which of the following phenomena ?
(1) Dedifferentiation
(2) Elasticity
(3) Redifferentiation
(4) Plasticity

112. In racemose inflorescence,
(1) the main axis terminates in a flower
(2) the growth is limited
(3) flowers are borne in an acropetal succession
(4) flowers are solitary

113. Which one of the following disorders is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of the haemoglobin molecule ?
(1) Haemophilia
(2) Thalassemia
(3) Sickle-cell anaemia
(4) Phenylketonuria

114. Match **List-I** with **List-II**:

List-I		List-II	
A.	Incomplete dominance	I.	Human skin colour
B.	Co-dominance	II.	Inheritance of flower colour in *Antirrhinum* sp.
C.	Pleiotropy	III.	Phenylketonuria disease in humans
D.	Polygenic inheritance	IV.	ABO blood groups

Choose the **correct** answer from the options given below:
(1) A-II, B-IV, C-III, D-I
(2) A-I, B-III, C-II, D-IV
(3) A-II, B-I, C-III, D-IV
(4) A-I, B-IV, C-III, D-II

115. Arrange the following in the correct developmental sequence related to microsporogenesis :
A. Microspore tetrads
B. Sporogenous tissue
C. Pollen grains
D. Pollen mother cells
Choose the **correct** answer from the options given below:
(1) D, A, C, B
(2) B, D, C, A
(3) B, D, A, C
(4) A, D, C, B

116. Arrange the following steps of DNA fingerprinting in a correct sequence.
A. Isolation of DNA and its digestion by restriction endonucleases.
B. Hybridisation using a labelled VNTR probe.
C. Transferring of separated DNA fragments to synthetic membranes.
D. Detection of hybridised DNA fragments by autoradiography.
E. Separation of DNA fragments by electrophoresis.
Choose the **correct** answer from the options given below:
(1) A, E, C, B, D
(2) A, E, B, C, D
(3) A, B, D, C, E
(4) A, D, B, E, C

117. Exploring molecular, genetic and species-level diversity for products of economic importance is called:
(1) Biomagnification
(2) Biofortification
(3) Bioremediation
(4) Bioprospecting

118. Which of the following statements are true with reference to the sex-determination in honeybees ?
A. An offspring formed from the union of a sperm and an egg, develops as a female (queen or worker).
B. An unfertilized egg develops as a male by parthenogenesis.
C. A male has half the number of chromosomes than that of a female.
D. Males produce sperms by meiosis.
E. Honeybees have a haplodiploid sex-determination system.
Choose the **correct** answer from the options given below:
(1) B, C, D and E only
(2) A, B, C and D only
(3) A, B, D and E only
(4) A, B, C and E only

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119. Identify the correct sequence of steps in each cycle of Polymerase Chain Reaction:

(1) Denaturation → Annealing→ Extension
(2) Denaturation → Extension → Annealing
(3) Extension → Annealing → Denaturation
(4) Annealing → Denaturation → Extension

120. Which of the following statements are correct with respect to DNA separation, isolation and visualization?

A. The cutting of DNA is done by molecular scissors.
B. The DNA fragments separate according to their size in an agarose gel, upon electrophoresis.
C. The separated DNA fragments can be seen without staining when exposed to UV light.
D. The separated DNA fragments, when stained with ethidium bromide, can be seen in visible light.

Choose the **correct** answer from the options given below :

(1) A and D only
(2) B and D only
(3) B and C only
(4) A and B only

121. The main criteria used for Five Kingdom Classification proposed by R.H. Whittaker (1969) included:

A. Cell structure
B. Body organization
C. Presence of flagellum
D. Reproduction
E. Phylogenetic relationships

Choose the **correct** answer from the options given below:

(1) A, B, D and E only
(2) A, B, C, D and E
(3) A, B and E only
(4) B, C and D only

122. Which one of the following is a triploid cell?

(1) Central cell
(2) Primary endosperm cell
(3) Zygote
(4) Synergid

123. Which of the following statements are correct with reference to packaging of DNA helix?

A. Histones are organized to form a unit of eight molecules called histone octamer.
B. Histones are negatively charged basic proteins.
C. Histones are rich in the basic amino acid residues - lysine and arginine.
D. The positively charged DNA is wrapped around the histone octamer to form nucleosome.
E. The packaging of chromatin at higher levels requires an additional set of proteins called non-histone chromosomal proteins.

Choose the **correct** answer from the options given below:

(1) A, B and D only
(2) A, C and E only
(3) C, D and E only
(4) B, D and E only

124 Which of the following is an *in situ* conservation method?

(1) Sacred Groves
(2) Wildlife Safari Parks
(3) Botanical Gardens
(4) Seed Banks

125. In the *lac* operon, the *z* gene codes for:

(1) transacetylase
(2) the repressor of *lac* operon
(3) permease
(4) beta-galactosidase

126. Match **List I** with **List II** :

List I (Growth Regulator)		**List II (Function/Effect)**	
A.	2,4-D	I.	Brewing industry
B.	GA_3	II.	Stimulation of stomatal closure
C.	Kinetin	III.	Herbicide
D.	ABA	IV.	Nutrient mobilisation

Choose the **correct** answer from the options given below:

(1) A-IV, B-III, C-II, D-I
(2) A-I, B-II, C-IV, D-III
(3) A-III, B-I, C-IV, D-II
(4) A-I, B-IV, C-III, D-II

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127. Arrange the following steps of somatic hybridisation in a correct sequence.

A. Digestion of cell walls.
B. Isolation of naked protoplasts.
C. Fusion of protoplasts to get hybrid protoplast.
D. Isolation of single cells from two different varieties of plants.
E. Growing of hybrid protoplast to form a new plant.

Choose the **correct** answer from the options given below:

(1) E, A, B, C, D
(2) D, A, B, C, E
(3) E, B, A, D, C
(4) D, B, A, E, C

128. $2(C_{51}H_{98}O_6)+145O_2 \rightarrow 102CO_2+98H_2O+\text{energy}$

The Respiratory Quotient (RQ) of a biomolecule used for respiration, as per the above equation, would be:

(1) Less than 0.5
(2) Between 0.5 and 0.95
(3) Between 1.25 and 2
(4) 1.0

129. Since the origin and diversification of life on Earth, there have been five episodes of mass extinction of species. How is the sixth, which is in progress, different from the previous episodes?

(1) The current species extinction rates are far lower than those in previous episodes.
(2) The present species extinction rates are 100 to 1000 times faster than in the pre-human times.
(3) The present net species extinction rate is zero.
(4) The current species extinction rates are nearly 10 times faster than that in previous episodes.

130. Match **List I** with **List II**:

List-I		List-II	
A.	Trypsin	I.	Intercellular ground substance
B.	Morphine	II.	Lectin
C.	Concanavalin A	III.	Enzyme
D.	Collagen	IV.	Alkaloid

Choose the **correct** answer from the options given below:

(1) A-III, B-IV, C-II, D-I
(2) A-I, B-II, C-III, D-IV
(3) A-III, B-II, C-IV, D-I
(4) A-IV, B-III, C-II, D-I

131. Which one of the following statements is ***not*** true about the universal rules of binomial nomenclature?

(1) Both the words in a biological name, when handwritten, are separately underlined and printed in italics.
(2) The specific epithet in the biological name starts with a small letter.
(3) The first word in the biological name represents the specific epithet, while the second component denotes the genus.
(4) Biological names are generally in Latin.

132. The enzyme required for carboxylation in the Calvin cycle is:

(1) PEP carboxylase
(2) RuBP carboxylase – oxygenase
(3) Carboxypeptidase
(4) Hexokinase

133. Which of the following floral formula is the correct floral formula of Solanaceae family ?

(1) $\oplus \female\!\!\male K_{(5)} \overset{\frown}{C_{(5)}} A_5 \underline{G}_{(2)}$
(2) $\oplus \female\!\!\male K_5 \overset{\frown}{C_{(5)}} A_5 \underline{G}_{(2)}$
(3) $\oplus \female\!\!\male K_{(5)} C_{(5)} A_5 \underline{G}_{(2)}$
(4) $\oplus \female\!\!\male K_5 C_5 A_5 \underline{G}_{(2)}$

134. Which one of the following types of pollination brings genetically different types of pollen grains to the stigma ?

(1) Geitonogamy (2) Autogamy
(3) Xenogamy (4) Cleistogamy

135. Match **List I** with **List II** :

List-I (Process)		List-II (Location)	
A.	Glycolysis	I.	Inner mitochondrial membrane
B.	ETS	II.	Mitochondrial matrix
C.	Accumulation of protons	III.	Cytoplasm
D.	Krebs' cycle	IV.	Intermembrane space

Choose the **correct** answer from the options given below:

(1) A-I, B-IV, C-III, D-II
(2) A-III, B-I, C-IV, D-II
(3) A-IV, B-II, C-I, D-III
(4) A-II, B-III, C-IV, D-I

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136. Insertion of a foreign DNA at BamHI site in an *E. coli* cloning vector pBR322 results in the loss of antibiotic resistance towards:
(1) Gentamycin
(2) Ampicillin and tetracycline
(3) Tetracycline
(4) Ampicillin

137. The sixth mutant codon of beta globin gene causing polymerization of Haemoglobin and change in RBC shape is _____.
(1) CAG (2) GUG
(3) AUG (4) GAG

138. Choose the **correct** statement regarding GIFT to overcome infertility.
(1) Ova collected from a female donor are transferred to the uterus of an infertile female.
(2) It is the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce ovum but can provide suitable environment for fertilization and development.
(3) Early embryos with up to 8 blastomeres are transferred to the uterus of an infertile female.
(4) Early embryos with up to 8 blastomeres are transferred into the fallopian tube of an infertile female.

139. Which one of the following is an appropriate example of 'sexual deceit'?
(1) Female wasp and fig
(2) Cuckoo and crow
(3) *Ophrys* and bumblebee
(4) Sea anemone and clown fish

140. Evolution of human appears parallel to the progressive development of brain and language skills. As such, the evolution of individual species in the sequence of their appearance is:
(1) *Homo habilis* → *Homo erectus* → *Ramapithecus* → *Neanderthal* → *Homo sapiens*
(2) *Ramapithecus* → *Homo habilis* → *Homo erectus* → *Neanderthal* → *Homo sapiens*
(3) *Homo sapiens* → *Ramapithecus* → *Homo habilis* → *Neanderthal* → *Homo erectus*
(4) *Neanderthal* → *Ramapithecus* → *Homo habilis* → *Homo erectus* → *Homo sapiens*

141. Match **List I** with **List II** related to embryonic development at various months of pregnancy:

List I		List II	
A.	The foetus movement starts and hair appears on the head	I.	24 weeks of pregnancy
B.	The foetus develops limbs and digits	II.	20 weeks of pregnancy
C.	The foetus develops external genital organs	III.	8 weeks of pregnancy
D.	The foetus body is covered with fine hair; eyelids separate and eyelashes are formed	IV.	12 weeks of pregnancy

Choose the **correct** answer from the options given below :
(1) A-III, B-II, C-IV, D-I
(2) A-II, B-IV, C-III, D-I
(3) A-IV, B-II, C-III, D-I
(4) A-II, B-III, C-IV, D-I

142. A group of researchers procured some fish-like animals and upon investigation the following characters were observed :
A. Endoskeleton was made of cartilage.
B. Ectoparasitic; as they were found attached on fish skin with their circular sucking mouth.
C. Paired fins and scales were absent, but 7 pairs of gill slits were present.
Which of the following species of animals did they consider to fit best with these characters?
(1) *Exocoetus* sp. (2) *Branchiostoma* sp.
(3) *Petromyzon* sp. (4) *Scoliodon* sp.

143. Spermatogonia undergo a series of cell divisions to produce sperms. Select the correct statements from the following :
A. Spermatogonia always undergo meiotic cell division.
B. Primary spermatocytes divide mitotically to produce secondary spermatocytes.
C. Secondary spermatocytes, through their second meiotic division, produce haploid spermatids.
D. Spermatids produce spermatozoa through mitosis.
E. Spermatids transform into spermatozoa by spermiogenesis.
Choose the **correct** answer from the options given below :
(1) C and E only
(2) A, C and E only
(3) B, C and D only
(4) A and E only

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144. What is the probability of having children with 'O' blood group, where both mother and father are heterozygous for 'A' and 'B' blood group, respectively ?

(1) 50%
(2) 0%
(3) 75%
(4) 25%

145. Arrange the following events occurring in Renin-Angiotensin mechanism in the correct order :

A. Increase in blood pressure and Glomerular filtration rate.
B. Reabsorption of Na^+ and water from distal parts of tubule due to Aldosterone.
C. Fall in Glomerular filtration rate.
D. Vasoconstriction by Angiotensin II and release of Aldosterone.
E. Renin converts Angiotensinogen into Angiotensin I, followed by Angiotensin II.

Choose the **correct** answer from the options given below :

(1) C, A, B, D, E
(2) A, D, B, E, C
(3) A, C, E, B, D
(4) C, E, D, B, A

146. Match **List I** with **List II**.

List I (Respiratory Volume)		**List II (Capacity in mL)**	
A.	ERV (Expiratory Reserve Volume)	I.	2500 – 3000 mL
B.	RV (Residual Volume)	II.	500 mL
C.	IRV (Inspiratory Reserve Volume)	III.	1000 – 1100 mL
D.	TV (Tidal Volume)	IV.	1100 – 1200 mL

Choose the **correct** answer from the options given below :

(1) A-III, B-I, C-IV, D-II
(2) A-I, B-III, C-II, D-IV
(3) A-III, B-IV, C-I, D-II
(4) A-I, B-II, C-III, D-IV

147. Match **List I** with **List II**.

List I		**List II**	
A.	Progestasert	I.	Barrier made of rubber used by females
B.	Multiload 375	II.	Oral contraceptive
C.	Diaphragm	III.	Hormone releasing IUD
D.	Saheli	IV.	Copper releasing IUD

Choose the **correct** answer from the options given below :

(1) A-III, B-IV, C-I, D-II
(2) A-III, B-IV, C-II, D-I
(3) A-IV, B-II, C-I, D-III
(4) A-IV, B-III, C-I, D-II

148. Non-membrane bound cell organelles found in both prokaryotic and eukaryotic cells are _____.

(1) Centrosomes (2) Ribosomes
(3) Lysosomes (4) Mitochondria

149. Ecological pyramids represent the relationship between the organisms at different trophic levels and they are generally inverted for :

(1) Pyramid of energy in pond ecosystem
(2) Pyramid of biomass in sea
(3) Pyramid of number in grassland
(4) Pyramid of biomass in grassland

150. The flightless bird with forelimbs modified as paddle-like structures suited for swimming is known as :

(1) *Struthio* (2) *Psittacula*
(3) *Neophron* (4) *Aptenodytes*

151. Match **List-I** with **List-II**.

List-I (Bioactive molecules)		**List-II (Importance)**	
(A)	Streptokinase	(I)	Immunosuppressive agent
(B)	Statins	(II)	Removal of clots from the blood vessels
(C)	Lipases	(III)	Blood cholesterol-lowering agent
(D)	Cyclosporin A	(IV)	Detergent formulations

Choose the **correct** answer from the options given below:

(1) A-II, B-III, C-IV, D-I
(2) A-IV, B-III, C-II, D-I
(3) A-II, B-III, C-I, D-IV
(4) A-III, B-II, C-IV, D-I

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152. Choose the correct statements regarding cell organelles and their inclusions.

A. The endomembrane system includes Golgi complex, endoplasmic reticulum and mitochondria.

B. Rough endoplasmic reticulum bears ribosomes on its surface.

C. Both mitochondria and plastids have circular DNA.

D. A network of microtubules, microfilaments and intermediate filaments present in the cytoplasm is called cytoskeleton.

E. Mitochondrion is a single membrane-bound structure.

Choose the **correct** answer from the options given below:

(1) C, D and E only
(2) A and B only
(3) A, B and C only
(4) B, C and D only

153. Select the set of fishes which belong to the class Osteichthyes:

(1) Devil fish, Cuttlefish and Hagfish
(2) Starfish, Hagfish and Cuttlefish
(3) Flying fish, Angel fish and Fighting fish
(4) Saw fish, Fighting fish and Dog fish

154. In a population of grasshopper species, chromosome number of some members is 23 and some other members possess 24 chromosomes. The 23 and 24 chromosome-bearing members in this species are _____.

(1) all males
(2) all females
(3) females and males, respectively
(4) males and females, respectively

155. The WBC count of a person's blood sample is 8000/cu.mm. How many eosinophils and lymphocytes would be in the same blood sample approximately?

(1) 160–240/cu.mm and 1600–2000/cu.mm, respectively
(2) 100–120/cu.mm and 160–200/cu.mm, respectively
(3) 300–500/cu.mm and 500–700/cu.mm, respectively
(4) 300–500/cu.mm and 1200–1500/cu.mm, respectively

156. The toxin proteins isolated from *Bacillus thuringiensis*, coded by which of the following genes would control cotton bollworms and corn borer, respectively?

(1) *cryIAc* and *cryIIIAb*
(2) *cryIAc* and *cryIIAb*
(3) *cryIAc* and *cryIAb*
(4) *cryIIAb* and *cryIAc*

157. Match **List-I** with **List-II**.

List-I (Drug)		**List-II (Effect)**	
(A)	Nicotine	(I)	Causes sense of euphoria and increased energy
(B)	Morphine	(II)	Stimulates adrenal gland to release catecholamines into blood circulation
(C)	Heroin	(III)	Effective sedative and painkiller
(D)	Cocaine	(IV)	A depressant; slows down body function

Choose the **correct** answer from the options given below:

(1) A-III, B-II, C-IV, D-I
(2) A-II, B-III, C-IV, D-I
(3) A-II, B-III, C-I, D-IV
(4) A-III, B-II, C-I, D-IV

158. Match **List-I** with **List-II** related to muscular/skeletal system:

List-I		**List-II**	
(A)	Tetany	(I)	Inflammation of joints
(B)	Arthritis	(II)	Autoimmune disorder affecting neuromuscular junction
(C)	Myasthenia gravis	(III)	Wild contraction in muscle due to low Ca^{++} in body fluid
(D)	Muscular dystrophy	(IV)	Progressive degeneration of skeletal muscle

Choose the **correct** answer from the options given below:

(1) A-III, B-I, C-II, D-IV
(2) A-IV, B-III, C-II, D-I
(3) A-I, B-II, C-III, D-IV
(4) A-III, B-II, C-I, D-IV

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159. In which animal do haploid cells divide mitotically to produce gametes?
(1) Male honeybees (2) Male grasshoppers
(3) Male earthworms (4) Male frogs

160. In humans, respiration occurs in the following steps. Arrange these steps in the correct order.
A. Diffusion of O_2 and CO_2 between blood and tissues
B. Diffusion of O_2 and CO_2 across alveolar membrane
C. Pulmonary ventilation by which atmospheric air is drawn in and CO_2 rich alveolar air is released out
D. Cellular respiration
E. Transport of gases by the blood.
Choose the **correct** answer from the options given below:
(1) A, B, C, D, E (2) E, A, C, D, B
(3) C, A, B, E, D (4) C, B, E, A, D

161. Arrange the following cell layers/structure around the female gamete, from outer to inner side:
A. Zona pellucida
B. Perivitelline space
C. Corona radiata
D. Plasma membrane of ovum
Choose the **correct** answer from the options given below:
(1) C, A, D, B (2) C, A, B, D
(3) D, B, A, C (4) A, C, B, D

162. The human protein named α-1 antitrypsin, obtained from transgenic animals, is used for the treatment of_____.
(1) Alzheimer's disease
(2) Emphysema
(3) Rheumatoid arthritis
(4) Cystic fibrosis

163. Select the correct statements regarding cell membrane in eukaryotic cell.
A. Membrane of human RBCs has approximately 52% protein.
B. Major phospholipids are arranged in a bilayer.
C. Extensions of the plasma membrane into the cell form mesosomes.
D. Tails towards the inner part of lipids are hydrophobic and thus protected from aqueous medium.
E. Glycocalyx is present on the outer surface of the plasma membrane.
Choose the **correct** answer from the options given below:
(1) A, C and E only (2) B, C and E only
(3) C, D and E only (4) A, B and D only

164. Male frogs can be distinguished from female frogs due to the presence of:
A. Bulging eyes
B. Vocal sacs
C. Webbed digits in feet
D. Copulatory pad on first digit of fore limbs
E. Olive green-coloured skin with dark irregular spots
Choose the **correct** answer from the options given below:
(1) B and D only (2) B and C only
(3) A and B only (4) C and E only

165. Which of the following equations depicts Verhulst-Pearl logistic population growth?
(1) $dN/dt = rN (K - N / K)$
(2) $dN/dt = rN (K + N / K)$
(3) $dN/dt = rN (K / K - N)$
(4) $dN/dt = rN (K - N / N)$

166. Choose the correct statements regarding frog's anatomy:
A. Hepatic portal system is the special venous connection between liver and intestine.
B. There are twelve pairs of cranial nerves arising from the brain.
C. The ureters and oviducts open separately into the cloaca in female frogs.
D. Hind-brain consists of cerebellum, medulla oblongata and optic lobes.
E. Sinus venosus joins the right atrium of heart.
Choose the **correct** answer from the options given below:
(1) B and D only (2) A, C and E only
(3) A, B and C only (4) B and C only

167. Select the **incorrect** statements with reference to Rh grouping.
A. Erythroblastosis foetalis is a condition observed having foetus with Rh^{-ve} blood and mother with Rh^{+ve} blood.
B. Rh antigen is observed on RBCs in the majority of human beings.
C. Before blood transfusion, Rh group should also be matched.
D. Rh incompatibility is observed when a pregnant mother is Rh^{-ve} and the foetus is Rh^{+ve}.
E. Erythroblastosis foetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery of the second child.
Choose the answer from the options given below:
(1) A and E only (2) A and B only
(3) B and C only (4) C and D only

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168. Which of the following statements are correct with reference to human endoskeleton ?

A. Human skull is monocondylic.
B. The joint between any two adjoining vertebrae is a cartilaginous joint.
C. In human beings, the number of cervical vertebrae is seven.
D. All ribs except the last 2 pairs are bicephalic.
E. The occipital bone of skull is articulated with atlas vertebra.

Choose the **correct** answer from the options given below:

(1) A, B and D only (2) B and E only
(3) B, C and E only (4) C, D and E only

169. Match List I with List II:

List I		List II	
A.	Cortisol	I.	Stimulates the formation of alveoli in mammary glands
B.	Aldosterone	II.	Produces anti-inflammatory reactions
C.	Cholecystokinin	III.	Stimulates reabsorption of Na^+ and water from renal tubule
D.	Progesterone	IV.	Stimulates secretion of pancreatic enzymes and bile juice

Choose the **correct** answer from the options given below:

(1) A-III, B-II, C-IV, D-I
(2) A-II, B-III, C-IV, D-I
(3) A-IV, B-II, C-I, D-III
(4) A-II, B-III, C-I, D-IV

170. The following are the stages of life cycle of *Plasmodium*. Arrange the stages in the proper order.

A. The parasites reproduce asexually in RBCs, bursting the cells.
B. The parasites reproduce asexually in liver cells, bursting the cells and releasing into blood.
C. Gametocytes develop in RBCs.
D. Sporozoites reach the liver through the blood.
E. Female mosquito injects sporozoites into humans during bite.

Choose the **correct** answer from the options given below:

(1) A, B, C, D, E (2) E, D, B, A, C
(3) C, A, B, D, E (4) E, C, D, B, A

171. Select the **incorrect** statements from the following:

A. Digestive system in Platyhelminthes is incomplete.
B. Bilateral symmetry is a characteristic feature of adult Echinoderms.
C. Pseudocoelom is possessed by Aschelminthes.
D. Notochord is persistent throughout life in the class Chondrichthyes.
E. Members of class Reptilia maintain a constant body temperature.

Choose the answer from the options given below:

(1) B and E only
(2) C and D only
(3) A and C only
(4) B and D only

172. The specific receptors for neurotransmitters in a synapse are present on _____.

(1) Post-synaptic membrane
(2) Pre-synaptic membrane
(3) Myelin sheath
(4) Schwann cell

173. Choose the correct statements regarding muscle contraction.

A. A motor neuron carries a signal sent by the Central Nervous System (CNS) to the sarcolemma of the muscle fibre.
B. The neural signal generates an action potential which causes the release of Ca^{++} into sarcoplasm.
C. Increase in Ca^{++} inactivates the actin for breaking cross bridges.
D. Actin binds to the myosin head to form a cross bridge.
E. Shortening of sarcomere takes place, by pulling actin filaments towards the centre of 'A' band.

Choose the **correct** answer from the options given below:

(1) A, B, D and E only
(2) C and D only
(3) C and E only
(4) A and B only

174. Which of the following is ***not*** an example of convergent evolution?

(1) Eyes of octopuses and mammals
(2) Fore limbs of whales and bats
(3) Wings of butterflies and birds
(4) Flippers of penguins and dolphins

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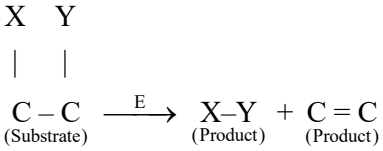
175. The JGA (Juxta Glomerular Apparatus) is a special sensitive region formed by cellular modifications in _____ related to the same nephron.

(1) Distal convoluted tubule and efferent renal arteriole
(2) Proximal convoluted tubule and afferent renal arteriole
(3) Distal convoluted tubule and afferent renal arteriole
(4) Proximal convoluted tubule and efferent renal arteriole

176. The following reaction depicts the activity of a particular class of enzymes:



Identify the enzyme class 'E' from the following options:

(1) Ligases (2) Lyases
(3) Isomerases (4) Transferases

177. Match List I with List II:

List I		List II	
A.	Molluscs	I.	Pulmonary respiration only
B.	Reptiles	II.	Branchial respiration
C.	Adult amphibians	III.	Cellular respiration
D.	*Amoeba*	IV.	Pulmonary and Cutaneous respiration

Choose the **correct** answer from the options given below:

(1) A-III, B-II, C-I, D-IV
(2) A-II, B-I, C-IV, D-III
(3) A-II, B-I, C-III, D-IV
(4) A-I, B-II, C-IV, D-III

178. What is the reason behind production of large holes in 'Swiss Cheese' ?

(1) The production of large amount of CO_2 by *Clostridium butylicum*
(2) The production of large amount of CO_2 and H_2 by *Trichoderma polysporum*
(3) The production of large amount of CO_2 and H_2 by lactic acid bacteria called *Lactobacillus*
(4) The production of large amount of CO_2 by *Propionibacterium sharmanii*

179. Match List I with List II with respect to chronology of evolution of life forms:

List I		List II	
A.	About 65 mya	I.	Jawless fish probably evolved
B.	About 500 mya	II.	The dinosaurs suddenly disappeared from the earth
C.	About 350 mya	III.	Seaweeds and few plants probably existed
D.	About 320 mya	IV.	Invertebrates were formed and became active

Choose the **correct** answer from the options given below:

(1) A-II, B-IV, C-I, D-III
(2) A-II, B-IV, C-III, D-I
(3) A-I, B-II, C-III, D-IV
(4) A-III, B-IV, C-I, D-II

180. Choose the correct statements regarding population interactions between two species.

A. In both parasitism and commensalism, only one species benefits and the other species is harmed.
B. Both species benefit in mutualism.
C. Both species benefit in commensalism.
D. In parasitism, only one species benefits and the other species is harmed.
E. In amensalism, one species is harmed and the other is unaffected.

Choose the **correct** answer from the options given below:

(1) A and D only
(2) A and B only
(3) B and E only
(4) B, D and E only

■■■

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2025

NARMADA

Test Booklet Code

← Test Booklet No.

45

ENGLISH

Do not open this Test Booklet until you are asked to do so.

This Booklet contains 32 pages, including Rough Page.

Important Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on ORIGINAL Copy carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and the Test Booklet contains **180** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology).**
3. Wherever the symbols/constants are not mentioned, they are to be considered as per their standard meaning/ value.
4. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one** mark will be deducted from the total scores. **The maximum marks are 720.**
5. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.
6. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
7. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy) to the Invigilator** before leaving the Room/ Hall. The candidates are allowed to take away this Test Booklet with them.
8. **The CODE for this Booklet is "45". Make sure to enter this code in the OMR answer sheet.**
9. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
10. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
11. Each candidate must show on-demand his/her Admit Card to the Invigilator.
12. No candidate, without special permission of the centre Superintendent or Invigilator, would leave his/her seat.
13. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign (with time) the Attendance Sheet **twice. Cases, where a candidate has not signed the Attendance Sheet second time, will be deemed not to have handed over the Answer Sheet and dealt with as an Unfair Means case.**
14. Use of Electronic/Manual Calculator is prohibited.
15. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per the Rules and Regulations of this examination along with Public Examinations (Prevention of unfair means act 2024).
16. **No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
17. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
18. If a candidate marks more than one answers for a question in the **OMR Sheet**, it will be treated as incorrect and negative marking will be applicable.

Name of the Candidate (in Capitals) : .....

Roll Number : in figures .....

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Candidate's Signature : ..... Invigilator's Signature : .....

Fascimile signature stamp of Centre Superintendent : .....

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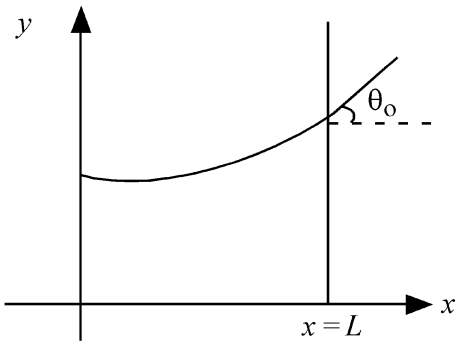
1 Consider a water tank shown in the figure. It has one wall at $x = L$ and can be taken to be very wide in the z direction. When filled with a liquid of surface tension S and density ρ, the liquid surface makes angle $\theta_0 (\theta_0 << 1)$ with the x-axis at $x = L$. If $y(x)$ is the height of the surface then the equation for $y(x)$ is :



(take $\theta(x) = \sin\theta(x) = \tan\theta(x) = \frac{dy}{dx}$, g is the acceleration due to gravity)

(1) $\frac{d^2y}{dx^2} = \frac{\rho g}{S}x$ (2) $\frac{d^2y}{dx^2} = \frac{\rho g}{S}y$

(3) $\frac{d^2y}{dx^2} = \sqrt{\frac{\rho g}{S}}$ (4) $\frac{dy}{dx} = \sqrt{\frac{\rho g}{S}}x$

2 A microscope has an objective of focal length 2 cm, eyepiece of focal length 4 cm and the tube length of 40 cm. If the distance of distinct vision of eye is 25 cm, the magnification in the microscope is

(1) 100 (2) 125

(3) 150 (4) 250

3 An electron (mass 9×10^{-31} kg and charge 1.6×10^{-19}C) moving with speed c/100 (c = speed of light) is injected into a magnetic field $\vec{B}$ of magnitude 9×10^{-4} T perpendicular to its direction of motion. We wish to apply an uniform electric field $\vec{E}$ together with the magnetic field so that the electron does not deflect from its path. Then (speed of light $c = 3\times10^8$ ms^{-1})

(1) $\vec{E}$ is perpendicular to $\vec{B}$ and its magnitude is 27×10^4 V m^{-1}

(2) $\vec{E}$ is perpendicular to $\vec{B}$ and its magnitude is 27×10^2 V m^{-1}

(3) $\vec{E}$ is parallel to $\vec{B}$ and its magnitude is 27×10^2 V m^{-1}

(4) $\vec{E}$ is parallel to $\vec{B}$ and its magnitude is 27×10^4 V m^{-1}

4 There are two inclined surfaces of equal length (L) and same angle of inclination 45° with the horizontal. One of them is rough and the other is perfectly smooth. A given body takes 2 times as much time to slide down on rough surface than on the smooth surface. The coefficient of kinetic friction (μ_k) between the object and the rough surface is close to

(1) 0.25 (2) 0.40

(3) 0.5 (4) 0.75

5 The kinetic energies of two similar cars A and B are 100 J and 225 J respectively. On applying breaks, car A stops after 1000 m and car B stops after 1500 m. If F_A and F_B are the forces applied by the breaks on cars A and B, respectively, then the ratio F_A/F_B is

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$

(3) $\frac{1}{3}$ (4) $\frac{1}{2}$

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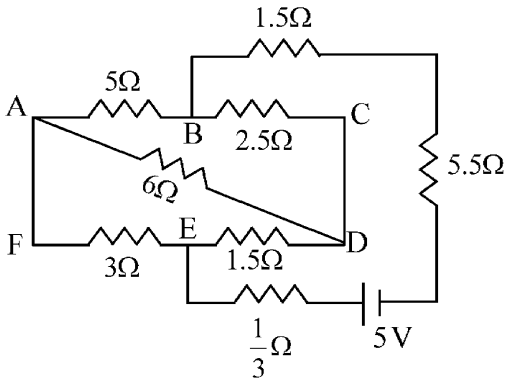
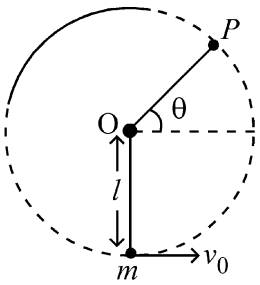
6 The current passing through the battery in the given circuit, is:



(1) 2.0 *A* (2) 0.5 *A*

(3) 2.5 *A* (4) 1.5 *A*

7 A bob of heavy mass *m* is suspended by a light string of length *l*. The bob is given a horizontal velocity v_0 as shown in figure. If the string gets slack at some point *P* making an angle θ from the horizontal, the ratio of the speed *v* of the bob at point *P* to its initial speed v_0 is:



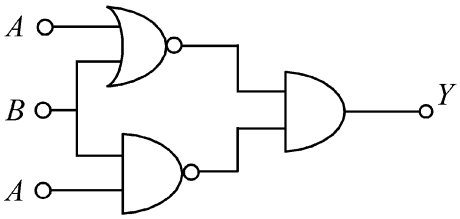
(1) $(\sin\theta)^{1/2}$

(2) $\left(\frac{1}{2+3\sin\theta}\right)^{1/2}$

(3) $\left(\frac{\cos\theta}{2+3\sin\theta}\right)^{1/2}$

(4) $\left(\frac{\sin\theta}{2+3\sin\theta}\right)^{1/2}$

8 The output (Y) of the given logic implementation is similar to the output of an/a _____ gate.



(1) AND (2) NAND

(3) OR (4) NOR

9 The electric field in a plane electromagnetic wave is given by

$E_z = 60\cos(5x + 1.5\times10^9 t)V/m$.

Then expression for the corresponding magnetic field is (here subscripts denote the direction of the field) :

(1) $B_y = 2\times10^{-7}\cos(5x + 1.5\times10^9 t)T$

(2) $B_x = 2\times10^{-7}\cos(5x + 1.5\times10^9 t)T$

(3) $B_z = 60\cos(5x + 1.5\times10^9 t)T$

(4) $B_y = 60\sin(5x + 1.5\times10^9 t)T$

10 A ball of mass 0.5 kg is dropped from a height of 40 m. The ball hits the ground and rises to a height of 10 m. The impulse imparted to the ball during its collision with the ground is (Take g = 9.8 m/s^2)

(1) 21 NS (2) 7 NS

(3) 0 (4) 84 NS

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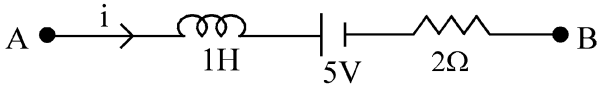
11 AB is a part of an electrical circuit (see figure). The potential difference "$V_A - V_B$", at the instant when current i = 2 A and is increasing at a rate of 1 amp / second is:



(1) 5 volt

(2) 6 volt

(3) 9 volt

(4) 10 volt

12 A 2 amp current is flowing through two different small circular copper coils having radii ratio 1:2. The ratio of their respective magnetic moments will be

(1) 1:4 (2) 1:2

(3) 2:1 (4) 4:1

13 In a certain camera, a combination of four similar thin convex lenses are arranged axially in contact. Then the power of the combination and the total magnification in comparison to the power (p) and magnification (m) for each lens will be, respectively –

(1) $4p$ and $4m$

(2) p^4 and $4m$

(3) $4p$ and m^4

(4) p^4 and m^4

14 An oxygen cylinder of volume 30 litre has 18.20 moles of oxygen. After some oxygen is withdrawn from the cylinder, its gauge pressure drops to 11 atmospheric pressure at temperature 27°C. The mass of the oxygen withdrawn from the cylinder is nearly equal to :

[Given, $R = \frac{100}{12}\ J\ mol^{-1}K^{-1}$, and molecular mass of $O_2 = 32$,

1 atm pressure = $1.01 \times 10^5\ N/m$]

(1) 0.125 kg (2) 0.144 kg

(3) 0.116 kg (4) 0.156 kg

15 In some appropriate units, time (t) and position (x) relation of a moving particle is given by $t = x^2 + x$. The acceleration of the particle is

(1) $-\frac{2}{(x+2)^3}$ (2) $-\frac{2}{(2x+1)^3}$

(3) $+\frac{2}{(x+1)^3}$ (4) $+\frac{2}{2x+1}$

16 To an ac power supply of 220 V at 50 Hz, a resistor of 20 Ω, a capacitor of reactance 25 Ω and an inductor of reactance 45 Ω are connected in series. The corresponding current in the circuit and the phase angle between the current and the voltage is, respectively -

(1) 7.8 A and 30°

(2) 7.8 A and 45°

(3) 15.6 A and 30°

(4) 15.6 A and 45°

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17 The Sun rotates around its centre once in 27 days. What will be the period of revolution if the Sun were to expand to twice its present radius without any external influence? Assume the Sun to be a sphere of uniform density.

(1) 100 days (2) 105 days

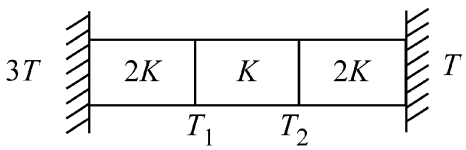
(3) 115 days (4) 108 days

18 A model for quantized motion of an electron in a uniform magnetic field B states that the flux passing through the orbit of the electron is $n(h/e)$ where n is an integer, h is Planck's constant and e is the magnitude of electron's charge. According to the model, the magnetic moment of an electron in its lowest energy state will be (m is the mass of the electron)

(1) $\frac{he}{\pi m}$ (2) $\frac{he}{2\pi m}$

(3) $\frac{heB}{\pi m}$ (4) $\frac{heB}{2\pi m}$

19 Three identical heat conducting rods are connected in series as shown in the figure. The rods on the sides have thermal conductivity $2K$ while that in the middle has thermal conductivity K. The left end of the combination is maintained at temperature $3T$ and the right end at T. The rods are thermally insulated from outside. In steady state, temperature at the left junction is T_1 and that at the right junction is T_2. The ratio T_1/T_2 is



(1) $\frac{3}{2}$ (2) $\frac{4}{3}$

(3) $\frac{5}{3}$ (4) $\frac{5}{4}$

20 The plates of a parallel plate capacitor are separated by d. Two slabs of different dielectric constant K_1 and K_2 with thickness $\frac{3}{8}d$ and $\frac{d}{2}$, respectively are inserted in the capacitor. Due to this, the capacitance becomes two times larger than when there is nothing between the plates.

If $K_1 = 1.25\ K_2$, the value of K_1 is :

(1) 2.66 (2) 2.33

(3) 1.60 (4) 1.33

21 Two cities X and Y are connected by a regular bus service with a bus leaving in either direction every T min. A girl is driving scooty with a speed of 60 km/h in the direction X to Y notices that a bus goes past her every 30 minutes in the direction of her motion, and every 10 minutes in the opposite direction. Choose the correct option for the period T of the bus service and the speed (assumed constant) of the buses.

(1) 9 min, 40 km/h

(2) 25 min, 100 km/h

(3) 10 min, 90 km/h

(4) 15 min, 120 km/h

22 A uniform rod of mass 20 kg and length 5 m leans against a smooth vertical wall making an angle of 60° with it. The other end rests on a rough horizontal floor. The friction force that the floor exerts on the rod is
(take g = 10 m/s^2)

(1) 100 N

(2) $100\sqrt{3}$ N

(3) 200 N

(4) $200\sqrt{3}$ N

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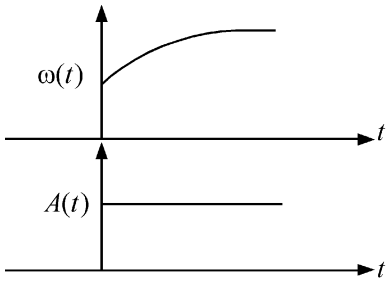
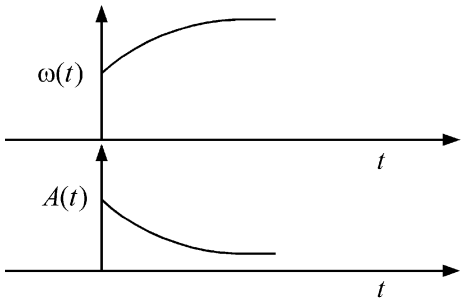
23 In an oscillating spring mass system, a spring is connected to a box filled with sand. As the box oscillates, sand leaks slowly out of the box vertically so that the average frequency $\omega(t)$ and average amplitude $A(t)$ of the system change with time t. Which one of the following options schematically depicts these changes correctly?

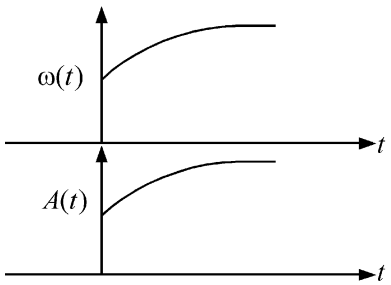
(1)



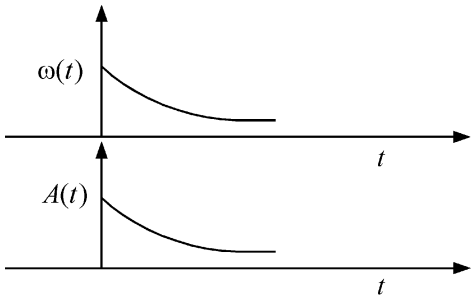
(2)



(3)



(4)



24 A balloon is made of a material of surface tension S and its inflation outlet (from where gas is filled in it) has small area A. It is filled with a gas of density ρ and takes a spherical shape of radius R. When the gas is allowed to flow freely out of it, its radius r changes from R to 0 (zero) in time T. If the speed $v(r)$ of gas coming out of the balloon depends on r as r^a and $T \propto S^{\alpha} A^{\beta} \rho^{\gamma} R^{\delta}$ then

(1) $a = \frac{1}{2}, \alpha = \frac{1}{2}, \beta = -1, \gamma = +1, \delta = \frac{3}{2}$

(2) $a = -\frac{1}{2}, \alpha = -\frac{1}{2}, \beta = -1, \gamma = -\frac{1}{2}, \delta = \frac{5}{2}$

(3) $a = -\frac{1}{2}, \alpha = -\frac{1}{2}, \beta = -1, \gamma = \frac{1}{2}, \delta = \frac{7}{2}$

(4) $a = \frac{1}{2}, \alpha = \frac{1}{2}, \beta = -\frac{1}{2}, \gamma = \frac{1}{2}, \delta = \frac{7}{2}$

25 Consider the diameter of a spherical object being measured with the help of a Vernier callipers. Suppose its 10 Vernier Scale Divisions (V.S.D.) are equal to its 9 Main Scale Divisions (M.S.D.). The least division in the M.S. is 0.1 cm and the zero of V.S. is at $x = 0.1$ cm when the jaws of Vernier callipers are closed.

If the main scale reading for the diameter is M = 5 cm and the number of coinciding vernier division is 8, the measured diameter after zero error correction, is

(1) 5.18 cm (2) 5.08 cm

(3) 4.98 cm (4) 5.00 cm

26 A parallel plate capacitor made of circular plates is being charged such that the surface charge density on its plates is increasing at a constant rate with time. The magnetic field arising due to displacement current is :

(1) zero at all places

(2) constant between the plates and zero outside the plates

(3) non-zero everywhere with maximum at the imaginary cylindrical surface connecting peripheries of the plates

(4) zero between the plates and non-zero outside

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27 An unpolarized light beam travelling in air is incident on a medium of refractive index 1.73 at Brewster's angle. Then-

(1) reflected light is completely polarized and the angle of reflection is close to 60^o

(2) reflected light is partially polarized and the angle of reflection is close to 30^o

(3) both reflected and transmitted light are perfectly polarized with angles of reflection and refraction close to 60^o and 30^o, respectively.

(4) transmitted light is completely polarized with angle of refraction close to 30^o

28 Two identical charged conducting spheres A and B have their centres separated by a certain distance. Charge on each sphere is q and the force of repulsion between them is F. A third identical uncharged conducting sphere is brought in contact with sphere A first and then with B and finally removed from both. New force of repulsion between spheres A and B (Radii of A and B are negligible compared to the distance of separation so that for calculating force between them they can be considered as point charges) is best given as :

(1) $\frac{3F}{5}$ (2) $\frac{2F}{3}$

(3) $\frac{F}{2}$ (4) $\frac{3F}{8}$

29 A container has two chambers of volumes $V_1 = 2$ litres and $V_2 = 3$ litres separated by a partition made of a thermal insulator. The chambers contains $n_1 = 5$ and $n_2 = 4$ moles of ideal gas at pressures $p_1 = 1$ atm and $p_2 = 2$ atm, respectively. When the partition is removed, the mixture attains an equilibrium pressure of :

(1) 1.3 atm (2) 1.6 atm

(3) 1.4 atm (4) 1.8 atm

30 A particle of mass m is moving around the origin with a constant force F pulling it towards the origin. If Bohr model is used to describe its motion, the radius r of the n^{th} orbit and the particle's speed v in the orbit depend on n as

(1) $r \propto n^{1/3}$; $v \propto n^{1/3}$

(2) $r \propto n^{1/3}$; $v \propto n^{2/3}$

(3) $r \propto n^{2/3}$; $v \propto n^{1/3}$

(4) $r \propto n^{4/3}$; $v \propto n^{-1/3}$

31 The radius of Martian orbit around the Sun is about 4 times the radius of the orbit of Mercury. The Martian year is 687 Earth days. Then which of the following is the length of 1 year on Mercury ?

(1) 88 earth days

(2) 225 earth days

(3) 172 earth days

(4) 124 earth days

32 A body weighs 48 N on the surface of the earth. The gravitational force experienced by the body due to the earth at a height equal to one-third the radius of the earth from its surface is :

(1) 16 N (2) 27 N

(3) 32 N (4) 36 N

33 A wire of resistance R is cut into 8 equal pieces. From these pieces two equivalent resistances are made by adding four of these together in parallel. Then these two sets are added in series. The net effective resistance of the combination is :

(1) $\frac{R}{64}$ (2) $\frac{R}{32}$

(3) $\frac{R}{16}$ (4) $\frac{R}{8}$

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34 De-Broglie wavelength of an electron orbiting in the $n = 2$ state of hydrogen atom is close to (Given Bohr radius = 0.052 *nm*)

(1) 0.067 *nm* (2) 0.67 *nm*

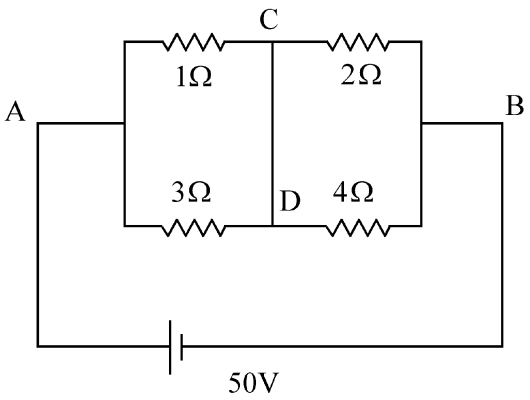
(3) 1.67 *nm* (4) 2.67 *nm*

35 An electric dipole with dipole moment 5×10^{-6} Cm is aligned with the direction of a uniform electric field of magnitude 4×10^{5} N/C. The dipole is then rotated through an angle of 60° with respect to the electric field. The change in the potential energy of the dipole is :

(1) 0.8 J (2) 1.0 J

(3) 1.2 J (4) 1.5 J

36 A constant voltage of 50 V is maintained between the points A and B of the circuit shown in the figure. The current through the branch CD of the circuit is :



(1) 1.5 *A* (2) 2.0 *A*

(3) 2.5 *A* (4) 3.0 *A*

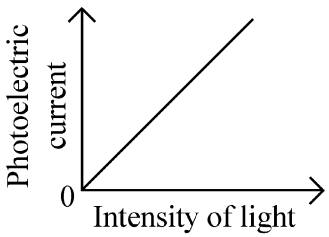
37 A photon and an electron (mass *m*) have the same energy *E*. The ratio $\left(\lambda_{photon}/\lambda_{electron}\right)$ of their de Broglie wavelengths is: (*c* is the speed of light)

(1) $\sqrt{E/2m}$ (2) $c\sqrt{2mE}$

(3) $c\sqrt{\frac{2m}{E}}$ (4) $\frac{1}{c}\sqrt{E/2m}$

38 Which of the following options represent the variation of photoelectric current with property of light shown on the x-axis?

A.



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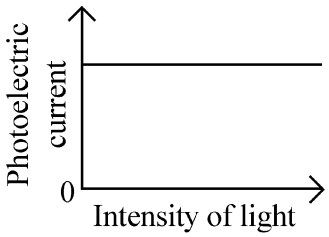

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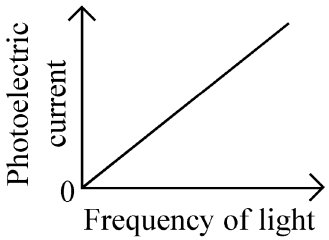

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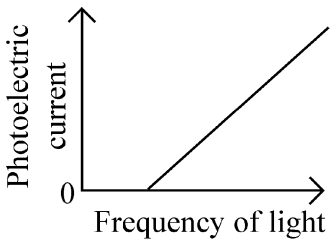

(1) A only

(2) A and C

(3) A and D

(4) B and D

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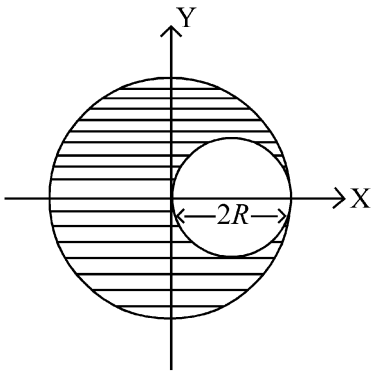
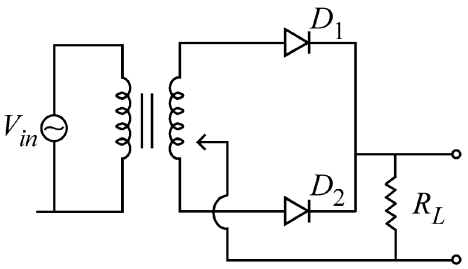
39 A sphere of radius R is cut from a larger solid sphere of radius $2R$ as shown in the figure. The ratio of the moment of inertia of the smaller sphere to that of the rest part of the sphere about the Y-axis is :



(1) $\frac{7}{8}$ (2) $\frac{7}{40}$

(3) $\frac{7}{57}$ (4) $\frac{7}{64}$

40 A full wave rectifier circuit with diodes (D_1) and (D_2) is shown in the figure. If input supply voltage V_{in} = 220sin (100 πt) volt, then at t = 15 *msec*



(1) D_1 is forward biased, D_2 is reverse biased

(2) D_1 is reverse biased, D_2 is forward biased

(3) D_1 and D_2 both are forward biased

(4) D_1 and D_2 both are reverse biased

41 Two gases A and B are filled at the same pressure in separate cylinders with movable pistons of radius r_A and r_B, respectively. On supplying an equal amount of heat to both the systems reversibly under constant pressure, the pistons of gas A and B are displaced by 16 *cm* and 9 *cm,* respectively. If the change in their internal energy is the same, then the ratio r_A/r_B is equal to

(1) $\frac{4}{3}$ (2) $\frac{3}{4}$

(3) $\frac{2}{\sqrt{3}}$ (4) $\frac{\sqrt{3}}{2}$

42 A physical quantity P is related to four observations a, b, c and d as follows:

$$P = a^3b^2 / c\sqrt{d}$$

The percentage errors of measurement in a, b, c and d are 1%, 3%, 2%, and 4% respectively. The percentage error in the quantity P is

(1) 10% (2) 2%

(3) 13% (4) 15%

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43 The intensity of transmitted light when a polaroid sheet, placed between two crossed polaroids at 22.5° from the polarization axis of one of the polaroid, is (I_0 is the intensity of polarised light after passing through the first polaroid):

(1) $\frac{I_0}{2}$ (2) $\frac{I_0}{4}$

(3) $\frac{I_0}{8}$ (4) $\frac{I_0}{16}$

44 Two identical point masses P and Q, suspended from two separate massless springs of spring constants k_1 and k_2, respectively, oscillate vertically. If their maximum speeds are the same, the ratio (A_Q/A_P) of the amplitude A_Q of mass Q to the amplitude A_P of mass P is:

(1) $\frac{k_2}{k_1}$ (2) $\frac{k_1}{k_2}$

(3) $\sqrt{\frac{k_2}{k_1}}$ (4) $\sqrt{\frac{k_1}{k_2}}$

45 A pipe open at both ends has a fundamental frequency f in air. The pipe is now dipped vertically in a water drum to half of its length. The fundamental frequency of the air column is now equal to :

(1) $\frac{f}{2}$ (2) f

(3) $\frac{3f}{2}$ (4) $2f$

46 The ratio of the wavelengths of the light absorbed by a Hydrogen atom when it undergoes $n = 2 \rightarrow n = 3$ and $n = 4 \rightarrow n = 6$ transitions, respectively, is

(1) $\frac{1}{36}$ (2) $\frac{1}{16}$

(3) $\frac{1}{9}$ (4) $\frac{1}{4}$

47 Which of the following statements are true?

A. Unlike Ga that has a very high melting point, Cs has a very low melting point.

B. On Pauling scale, the electronegativity values of N and Cl are not the same.

C. Ar, K^+, Cl^-, Ca^{2+}, and S^{2-} are all isoelectronic species.

D. The correct order of the first ionization enthalpies of Na, Mg, Al, and Si is Si > Al > Mg > Na.

E. The atomic radius of Cs is greater than that of Li and Rb.

Choose the **correct** answer from the options given below :

(1) A, B, and E only

(2) C and E only

(3) C and D only

(4) A, C, and E only

48 Match **List I** with **List II**

	List I (Ion)		**List II (Group Number in Cation Analysis)**
A.	Co^{2+}	I.	Group-I
B.	Mg^{2+}	II.	Group-III
C.	Pb^{2+}	III.	Group-IV
D.	Al^{3+}	IV.	Group-VI

Choose the **correct** answer from the options given below :

(1) A-III, B-IV, C-II, D-I

(2) A-III, B-IV, C-I, D-II

(3) A-III, B-II, C-IV, D-I

(4) A-III, B-II, C-I, D-IV

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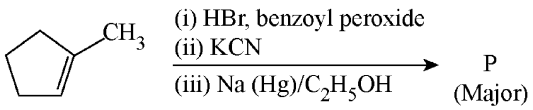
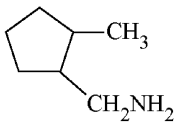
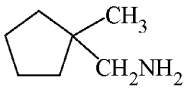
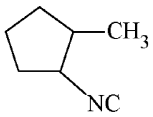
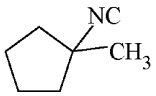
49 Predict the major product 'P' in the following sequence of reactions -



(1) 

(2) 

(3) 

(4) 

50 Energy and radius of first Bohr orbit of He^+ and Li^{2+} are

[Given $R_H = 2.18 \times 10^{-18}$ J, $a_0 = 52.9$ pm]

(1) $E_n(Li^{2+}) = -19.62\times10^{-18}$ J;
$r_n(Li^{2+}) = 17.6$ pm
$E_n(He^+) = -8.72\times10^{-18}$ J;
$r_n(He^+) = 26.4$ pm

(2) $E_n(Li^{2+}) = -8.72\times10^{-18}$ J;
$r_n(Li^{2+}) = 26.4$ pm
$E_n(He^+) = -19.62\times10^{-18}$ J;
$r_n(He^+) = 17.6$ pm

(3) $E_n(Li^{2+}) = -19.62\times10^{-16}$ J;
$r_n(Li^{2+}) = 17.6$ pm
$E_n(He^+) = -8.72\times10^{-16}$ J;
$r_n(He^+) = 26.4$ pm

(4) $E_n(Li^{2+}) = -8.72\times10^{-16}$ J;
$r_n(Li^{2+}) = 17.6$ pm
$E_n(He^+) = -19.62\times10^{-16}$ J;
$r_n(He^+) = 17.6$ pm

51 Which of the following are paramagnetic?

A. $[NiCl_4]^{2-}$ B. $Ni(CO)_4$

C. $[Ni(CN)_4]^{2-}$ D. $[Ni(H_2O)_6]^{2+}$

E. $Ni(PPh_3)_4$

Choose the **correct** answer from the options given below:

(1) A and C only (2) B and E only
(3) A and D only (4) A, D and E only

52 Given below are two statements :

Statement I : Like nitrogen that can form ammonia, arsenic can form arsine.

Statement II : Antimony cannot form antimony pentoxide.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

53 Which among the following electronic configurations belong to main group elements?

A. $[Ne]3s^1$ B. $[Ar]3d^3 4s^2$

C. $[Kr]4d^{10}5s^2 5p^5$ D. $[Ar]3d^{10}4s^1$

E. $[Rn]5f^0 6d^2 7s^2$

Choose the **correct** answer from the option given below :

(1) B and E only (2) A and C only
(3) D and E only (4) A, C and D only

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54 Dalton's Atomic theory could not explain which of the following?

(1) Law of conservation of mass

(2) Law of constant proportion

(3) Law of multiple proportion

(4) Law of gaseous volume

55 Consider the following compounds :

$\underline{K}O_2$, $H_2\underline{O}_2$ and $H_2\underline{S}O_4$.

The oxidation states of the underlined elements in them are, respectively,

(1) +1, –1, and +6

(2) +2, –2, and +6

(3) +1, –2, and +4

(4) +4, –4, and +6

56 If the half-life ($t_{1/2}$) for a first order reaction is 1 minute, then the time required for 99.9% completion of the reaction is closest to :

(1) 2 minutes (2) 4 minutes

(3) 5 minutes (4) 10 minutes

57 The correct order of the wavelength of light absorbed by the following complexes is,

A. $\left[Co(NH_3)_6\right]^{3+}$ B. $\left[Co(CN)_6\right]^{3-}$

C. $\left[Cu(H_2O)_4\right]^{2+}$ D. $\left[Ti(H_2O)_6\right]^{3+}$

Choose the **correct** answer from the options given below:

(1) B < D < A < C (2) B < A < D < C

(3) C < D < A < B (4) C < A < D < B

58 Which one of the following compounds can exist as cis-trans isomers?

(1) Pent-1-ene

(2) 2-Methylhex-2-ene

(3) 1,1-Dimethylcyclopropane

(4) 1,2-Dimethylcyclohexane

59 Phosphoric acid ionizes in three steps with their ionization constant values

K_{a_1}, K_{a_2} and K_{a_3}, respectively,

while K is the overall ionization constant. Which of the following statements are true?

A. $\log K = \log K_{a_1} + \log K_{a_2} + \log K_{a_3}$

B. H_3PO_4 is a stronger acid than $H_2PO_4^-$ and HPO_4^{2-}.

C. $K_{a_1} > K_{a_2} > K_{a_3}$

D. $K_{a_1} = \dfrac{K_{a_3} + K_{a_2}}{2}$

Choose the **correct** answer from the options given below:

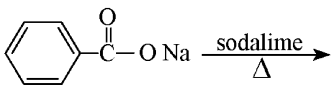
(1) A and B only

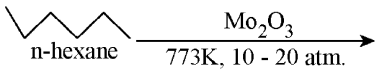
(2) A and C only

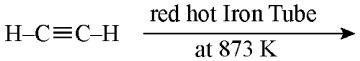
(3) B, C and D only

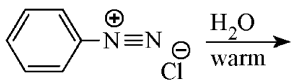
(4) A, B and C only

60 Which one of the following reactions does **NOT** give benzene as the product ?

(1) 

(2) 

(3) 

(4) 

61 If the molar conductivity (Λ_m) of a 0.050 mol L^{-1} solution of a monobasic weak acid is 90 S cm^2 mol^{-1}, its extent (degree) of dissociation will be

[Assume $\Lambda^\circ_+ = 349.6\ S\ cm^2\ mol^{-1}$ and $\Lambda^\circ_- = 50.4\ S\ cm^2\ mol^{-1}$.]

(1) 0.115 (2) 0.125

(3) 0.225 (4) 0.215

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62 Given below are two statements :

Statement I : A hypothetical diatomic molecule with bond order zero is quite stable.

Statement II : As bond order increases, the bond length increases.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both Statement I and Statement II are true

(2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

63 Out of the following complex compounds, which of the compound will be having the minimum conductance in solution?

(1) $\left[Co(NH_3)_3Cl_3\right]$

(2) $\left[Co(NH_3)_4Cl_2\right]$

(3) $\left[Co(NH_3)_6\right]Cl_3$

(4) $\left[Co(NH_3)_5Cl\right]Cl$

64 Match **List - I** with **List - II**

	List-I		**List-II**
A.	XeO_3	I.	sp^3d; linear
B.	XeF_2	II.	sp^3; pyramidal
C.	$XeOF_4$	III.	sp^3d^3; distorted octahedral
D.	XeF_6	IV.	sp^3d^2; square pyramidal

Choose the **correct** answer from the options given below :

(1) A-II, B-I, C-IV, D-III

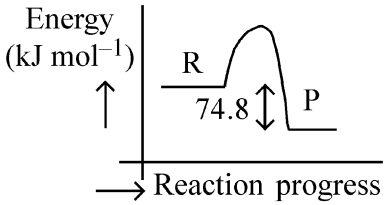
(2) A-II, B-I, C-III, D-IV

(3) A-IV, B-II, C-III, D-I

(4) A-IV, B-II, C-I, D-III

65 $C(s) + 2H_2(g) \rightarrow CH_4(g)$; $\Delta H = -74.8$ kJ mol^{-1}

Which of the following diagrams gives an accurate representation of the above reaction? [R → reactants; P → products]

(1)


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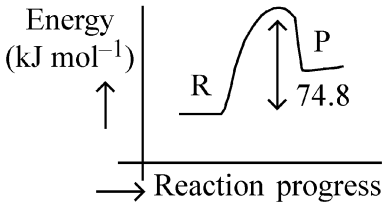

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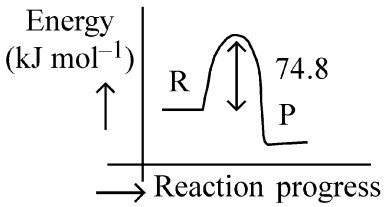
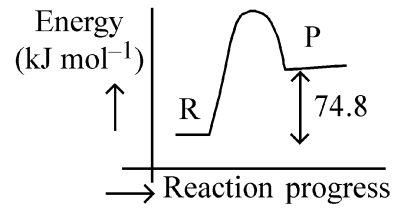


(4)


66 Match **List - I** with **List - II**

	List-I (Example)		**List-II (Type of Solution)**
A.	Humidity	I.	Solid in solid
B.	Alloys	II.	Liquid in gas
C.	Amalgams	III.	Solid in gas
D.	Smoke	IV.	Liquid in solid

Choose the **correct** answer from the options given below :

(1) A-II, B-IV, C-I, D-III

(2) A-II, B-I, C-IV, D-III

(3) A-III, B-I, C-IV, D-II

(4) A-III, B-II, C-I, D-IV

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67 The correct order of decreasing basic strength of the given amines is :

(1) N-methylaniline > benzenamine > ethanamine > N-ethylethanamine

(2) N-ethylethanamine > ethanamine > benzenamine > N-methylaniline

(3) N-ethylethanamine > ethanamine > N-methylaniline > benzenamine

(4) benzenamine > ethanamine > N-methylaniline > N-ethylethanamine

68 Among the following, choose the ones with equal number of atoms.

A. 212 g of Na_2CO_3 (s) [molar mass = 106 g]

B. 248 g of Na_2O (s) [molar mass = 62 g]

C. 240 g of NaOH (s) [molar mass = 40 g]

D. 12 g of H_2 (g) [molar mass = 2 g]

E. 220 g of CO_2(g) [molar mass = 44 g]

Choose the **correct** answer from the options given below :

(1) A, B, and C only

(2) A, B, and D only

(3) B, C, and D only

(4) B, D, and E only

69 Match **List I** with **List II.**

	List I (Name of Vitamin)		**List II (Deficiency disease)**
A.	Vitamin B_{12}	I.	Cheilosis
B.	Vitamin D	II.	Convulsions
C.	Vitamin B_2	III.	Rickets
D.	Vitamin B_6	IV.	Pernicious anaemia

Choose the **correct** answer from the options given below :

(1) A-I, B-III, C-II, D-IV

(2) A-IV, B-III, C-I, D-II

(3) A-II, B-III, C-I, D-IV

(4) A-IV, B-III, C-II, D-I

70 The correct order of decreasing acidity of the following aliphatic acids is :

(1) $(CH_3)_3CCOOH > (CH_3)_2CHCOOH > CH_3COOH > HCOOH$

(2) $CH_3COOH > (CH_3)_2CHCOOH > (CH_3)_3CCOOH > HCOOH$

(3) $HCOOH > CH_3COOH > (CH_3)_2CHCOOH > (CH_3)_3CCOOH$

(4) $HCOOH > (CH_3)_3CCOOH > (CH_3)_2CHCOOH > CH_3COOH$

71 Given below are two statements :

Statement I : Ferromagnetism is considered as an extreme form of paramagnetism.

Statement II : The number of unpaired electrons in a Cr^{2+} ion (Z = 24) is the same as that of a Nd^{3+} ion (Z = 60).

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both Statement I and Statement II are true

(2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

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72 Match **List I** with **List II**

	List I (Mixture)		**List II (Method of Separation)**
A.	$CHCl_3$ + $C_6H_5NH_2$	I.	Distillation under reduced pressure
B.	Crude oil in petroleum industry	II.	Steam distillation
C.	Glycerol from spent-lye	III.	Fractional distillation
D.	Aniline - water	IV.	Simple distillation

Choose the **correct** answer from the options given below :

(1) A-IV, B-III, C-I, D-II
(2) A-IV, B-III, C-II, D-I
(3) A-III, B-IV, C-I, D-II
(4) A-III, B-IV, C-II, D-I

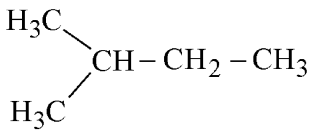
73 For the reaction $A(g) \rightleftharpoons 2B(g)$, the backward reaction rate constant is higher than the forward reaction rate constant by a factor of 2500, at 1000 K.
[Given : R = 0.0831 L atm mol^{-1} K^{-1}]
K_P for the reaction at 1000 K is

(1) 83.1 (2) 2.077×10^5
(3) 0.033 (4) 0.021

74 Given below are two statements :
Statement I : Benzenediazonium salt is prepared by the reaction of aniline with nitrous acid at 273 - 278 K. It decomposes easily in the dry state.
Statement II : Insertion of iodine into the benzene ring is difficult and hence iodobenzene is prepared through the reaction of benzenediazonium salt with KI.
In the light of the above statements, choose the **most appropriate** answer from the options given below :

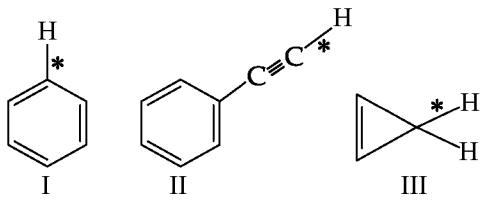
(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

75 How many products (including stereoisomers) are expected from monochlorination of the following compound?



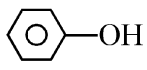
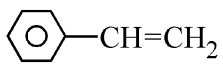
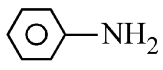
(1) 2 (2) 3
(3) 5 (4) 6

76 Among the given compounds I-III, the correct order of bond dissociation energy of C–H bond marked with * is :



(1) II > I > III (2) I > II > III
(3) III > II > I (4) II > III > I

77 Which one of the following compounds **does not** decolourize bromine water?

(1)
(2) 
(3) 
(4) 

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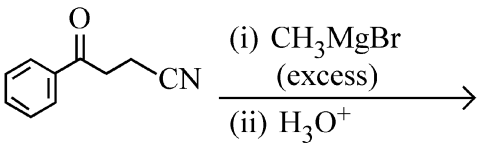
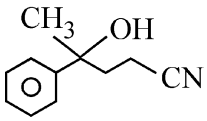
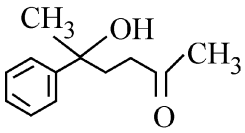
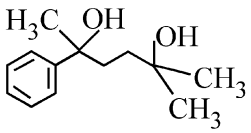
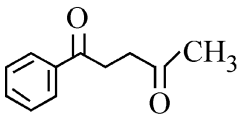
78 The major product of the following reaction is :



(1) 

(2) 

(3) 

(4) 

79 Which of the following aqueous solution will exhibit highest boiling point?

(1) 0.01M Urea
(2) 0.01M KNO_3
(3) 0.01M Na_2SO_4
(4) 0.015M $C_6H_{12}O_6$

80 Match **List - I** with **List - II**

	List-I		**List-II**
A.	Haber process	I.	Fe catalyst
B.	Wacker oxidation	II.	$PdCl_2$
C.	Wilkinson catalyst	III.	$[(PPh_3)_3RhCl]$
D.	Ziegler catalyst	IV.	$TiCl_4$ with $Al(CH_3)_3$

Choose the **correct** answer from the options given below :

(1) A-I, B-II, C-IV, D-III
(2) A-II, B-III, C-I, D-IV
(3) A-I, B-II, C-III, D-IV
(4) A-I, B-IV, C-III, D-II

81 5 moles of liquid X and 10 moles of liquid Y make a solution having a vapour pressure of 70 torr. The vapour pressures of pure X and Y are 63 torr and 78 torr respectively. Which of the following is true regarding the described solution?

(1) The solution shows positive deviation.
(2) The solution shows negative deviation.
(3) The solution is ideal.
(4) The solution has volume greater than the sum of individual volumes.

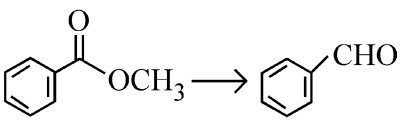
82 Sugar 'X'

A. is found in honey.
B. is a keto sugar.
C. exists in α and β - anomeric forms.
D. is laevorotatory.

'X' is :

(1) D-Glucose (2) D-Fructose
(3) Maltose (4) Sucrose

83 Identify the suitable reagent for the following conversion.



(1) (i) $LiAlH_4$, (ii) H^+/H_2O
(2) (i) $AlH(iBu)_2$ (ii) H_2O
(3) (i) $NaBH_4$, (ii) H^+/H_2O
(4) H_2 / Pd-$BaSO_4$

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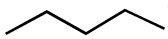
84 Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :  I undergoes S_N2 reaction faster than Cl.

Reason (R) : Iodine is a better leaving group because of its large size.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**

(2) Both **A** and **R** are true but **R** is **not** the correct explanation of **A**

(3) **A** is true but **R** is false

(4) **A** is false but **R** is true

85 The standard heat of formation, in kcal/mol of Ba^{2+} is :

[Given : standard heat of formation of SO_4^{2-} ion (aq) = – 216 kcal/mol, standard heat of crystallisation of $BaSO_4(s)$ = – 4.5 kcal/mol, standard heat of formation of $BaSO_4(s)$ = – 349 kcal/mol]

(1) – 128.5 (2) – 133.0

(3) + 133.0 (4) + 220.5

86 Total number of possible isomers (both structural as well as stereoisomers) of cyclic ethers of molecular formula C_4H_8O is :

(1) 6 (2) 8

(3) 10 (4) 11

87 Identify the correct orders against the property mentioned

A. $H_2O > NH_3 > CHCl_3$ – dipole moment

B. $XeF_4 > XeO_3 > XeF_2$ – number of lone pairs on central atom

C. O–H > C–H > N–O – bond length

D. $N_2 > O_2 > H_2$ – bond enthalpy

Choose the **correct** answer from the options given below :

(1) A, D only (2) B, D only

(3) A, C only (4) B, C only

88 Higher yield of NO in

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ can be obtained at

[ΔH of the reaction = + 180.7 kJ mol^{-1}]

A. higher temperature

B. lower temperature

C. higher concentration of N_2

D. higher concentration of O_2

Choose the **correct** answer from the options given below:

(1) A, D only (2) B, C only

(3) B, C, D only (4) A, C, D only

89 If the rate constant of a reaction is 0.03 s^{-1}, how much time does it take for 7.2 mol L^{-1} concentration of the reactant to get reduced to 0.9 mol L^{-1}?

(Given: log 2 = 0.301)

(1) 69.3 s (2) 23.1 s

(3) 210 s (4) 21.0 s

90 Which one of the following reactions does **NOT** belong to "Lassaigne's test"?

(1) $Na + C + N \xrightarrow[\Delta]{} NaCN$

(2) $2Na + S \xrightarrow[\Delta]{} Na_2S$

(3) $Na + X \xrightarrow[\Delta]{} + NaX$

(4) $2CuO + C \xrightarrow[\Delta]{} 2Cu + CO_2$

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91 The complex II of mitochondrial electron transport chain is also known as
(1) Cytochrome bc_1
(2) Succinate dehydrogenase
(3) Cytochrome c oxidase
(4) NADH dehydrogenase

92 Polymerase chain reaction (PCR) amplifies DNA following the equation.
(1) N^2 (2) 2^n
(3) $2n + 1$ (4) $2N^2$

93 What are the potential drawbacks in adoption of the IVF method?
A. High fatality risk to mother
B. Expensive instruments and reagents
C. Husband/wife necessary for being donors
D. Less adoption of orphans
E. Not available in India
F. Possibility that the early embryo does not survive
Choose the correct answer from the options given below :
(1) B, D, F only
(2) A, C, D, F only
(3) A, B, C, D only
(4) A, B, C, E, F only

94 What is the name of the blood vessel that carries deoxygenated blood from the body to the heart in a frog ?
(1) Aorta
(2) Pulmonary artery
(3) Pulmonary vein
(4) Vena cava

95 Which one of the following statements refers to Reductionist Biology?
(1) Physico-chemical approach to study and understand living organisms.
(2) Physiological approach to study and understand living organisms.
(3) Chemical approach to study and understand living organisms.
(4) Behavioural approach to study and understand living organisms.

96 Given below are two statements :
Statement I : In the RNA world, RNA is considered the first genetic material evolved to carry out essential life processes. RNA acts as a genetic material and also as a catalyst for some important biochemical reactions in living systems. Being reactive, RNA is unstable.
Statement II : DNA evolved from RNA and is a more stable genetic material. Its double helical strands being complementary, resist changes by evolving repairing mechanism.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

97 Epiphytes that are growing on a mango branch is an example of which of the following?
(1) Commensalism
(2) Mutualism
(3) Predation
(4) Amensalism

98 From the statements given below choose the **correct** option :
A. The eukaryotic ribosomes are 80S and prokaryotic ribosomes are 70S.
B. Each ribosome has two sub-units.
C. The two sub-units of 80S ribosome are 60S and 40S while that of 70S are 50S and 30S.
D. The two sub-units of 80S ribosome are 60S and 20S and that of 70S are 50S and 20S.
E. The two sub-units of 80S are 60S and 30S and that of 70S are 50S and 30S.
(1) A, B, C are true
(2) A, B, D are true
(3) A, B, E are true
(4) B, D, E are true

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99 Which one of the following is an example of ex-situ conservation?

(1) National Park
(2) Wildlife Sanctuary
(3) Zoos and botanical gardens
(4) Protected areas

100 Given below are two statements :

Statement I : The primary source of energy in an ecosystem is solar energy.

Statement II : The rate of production of organic matter during photosynthesis in an ecosystem is called net primary productivity (NPP).

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both statement I and statement II are correct
(2) Both statement I and statement II are incorrect
(3) Statement I is correct but statement II is incorrect
(4) Statement I is incorrect but statement II is correct

101 Match **List - I** with **List - II**.

List - I		**List - II**
A. Emphysema	I.	Rapid spasms in muscle due to low Ca^{++} in body fluid
B. Angina Pectoris	II.	Damaged alveolar walls and decreased respiratory surface
C. Glomerulo-nephritis	III.	Acute chest pain when not enough oxygen is reaching to heart muscle
D. Tetany	IV.	Inflammation of glomeruli of kidney

Choose the **correct** answer from the options given below :

(1) A-III, B-I, C-IV, D-II
(2) A-III, B-I, C-II, D-IV
(3) A-II, B-IV, C-III, D-I
(4) A-II, B-III, C-IV, D-I

102 Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : Both wind and water pollinated flowers are not very colourful and do not produce nectar.

Reason (R) : The flowers produce enormous amount of pollen grains in wind and water pollinated flowers.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**
(2) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**
(3) **A** is true but **R** is false
(4) **A** is false but **R** is true

103 Which of the following is an example of non-distilled alcoholic beverage produced by yeast?

(1) Whisky (2) Brandy
(3) Beer (4) Rum

104 Given below are two statements :

Statement I : In a floral formula $\oplus$ stands for zygomorphic nature of the flower, and $\underline{G}$ stands for inferior ovary.

Statement II : In a floral formula $\oplus$ stands for actinomorphic nature of the flower and $\underline{G}$ stands for superior ovary.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

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105 Streptokinase produced by *bacterium Streptococcus* is used for

(1) Curd production

(2) Ethanol production

(3) Liver disease treatment

(4) Removing clots from blood vessels

106 Which chromosome in the human genome has the highest number of genes?

(1) Chromosome X

(2) Chromosome Y

(3) Chromosome 1

(4) Chromosome 10

107 Which of the following statement is **correct** about location of the male frog copulatory pad ?

(1) First and Second digit of fore limb

(2) First digit of hind limb

(3) Second digit of fore limb

(4) First digit of the fore limb

108 Which one of the following phytohormones promotes nutrient mobilization which helps in the delay of leaf senescence in plants?

(1) Ethylene (2) Abscisic acid

(3) Gibberellin (4) Cytokinin

109 While trying to find out the characteristic of a newly found animal, a researcher did the histology of adult animal and observed a cavity with presence of mesodermal tissue towards the body wall but no mesodermal tissue was observed towards the alimentary canal. What could be the possible coelome of that animal ?

(1) Acoelomate

(2) Pseudocoelomate

(3) Schizocoelomate

(4) Spongocoelomate

110 Match **List - I** with **List - II**.

	List - I		**List - II**
A.	Head	I.	Enzymes
B.	Middle piece	II.	Sperm motility
C.	Acrosome	III.	Energy
D.	Tail	IV.	Genetic material

Choose the **correct** answer from the options given below :

(1) A-IV, B-III, C-I, D-II

(2) A-IV, B-III, C-II, D-I

(3) A-III, B-IV, C-II, D-I

(4) A-III, B-II, C-I, D-IV

111 Given below are the stages in the life cycle of pteridophytes. Arrange the following stages in the correct sequence.

A. Prothallus stage

B. Meiosis in spore mother cells

C. Fertilisation

D. Formation of archegonia and antheridia in gametophyte.

E. Transfer of antherozoids to the archegonia in presence of water.

Choose the **correct** answer from the options given below :

(1) B, A, D, E, C

(2) B, A, E, C, D

(3) D, E, C, A, B

(4) E, D, C, B, A

112 Cardiac activities of the heart are regulated by :

A. Nodal tissue

B. A special neural centre in the medulla oblongata

C. Adrenal medullary hormones

D. Adrenal cortical hormones

Choose the **correct** answer from the options given below :

(1) A, B and C Only

(2) A, B, C and D

(3) A, C and D Only

(4) A, B and D Only

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113 Which of following organisms *cannot* fix nitrogen?

A. *Azotobacter* B. *Oscillatoria*
C. *Anabaena* D. *Volvox*
E. *Nostoc*

Choose the ***correct*** answer from the options given below:

(1) A only (2) D only
(3) B only (4) E only

114 Given below are two statements :

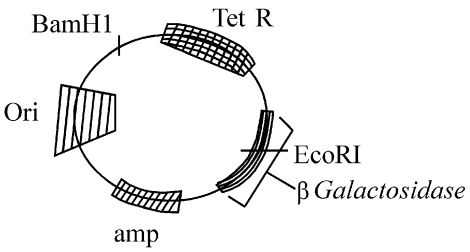
Statement I : Transfer RNAs and ribosomal RNA do not interact with mRNA.

Statement II : RNA interference (RNAi) takes place in all eukaryotic organisms as a method of cellular defence.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

115



In the above represented plasmid an alien piece of DNA is inserted at EcoRI site. Which of the following strategies will be chosen to select the recombinant colonies?

(1) Using ampicillin & tetracyclin containing medium plate.
(2) Blue color colonies will be selected.
(3) White color colonies will be selected.
(4) Blue color colonies grown on ampicillin plates can be selected.

116 Which of the following genetically engineered organisms was used by Eli Lilly to prepare human insulin?

(1) Bacterium (2) Yeast
(3) Virus (4) Phage

117 Name the class of enzyme that usually catalyze the following reaction :

$S - G + S^{\#} \rightarrow S + S^{\#} - G$

Where, G $\rightarrow$ a group other than hydrogen

S $\rightarrow$ a substrate

$S^{\#}$ $\rightarrow$ another substrate

(1) Hydrolase (2) Lyase
(3) Transferase (4) Ligase

118 Find the statement that is **NOT** correct with regard to the structure of monocot stem.

(1) Hypodermis is parenchymatous.
(2) Vascular bundles are scattered.
(3) Vascular bundles are conjoint and closed.
(4) Phloem parenchyma is absent.

119 The correct sequence of events in the life cycle of bryophytes is

A. Fusion of antherozoid with egg.
B. Attachment of gametophyte to substratum.
C. Reduction division to produce haploid spores.
D. Formation of sporophyte.
E. Release of antherozoids into water.

Choose the **correct** answer from the options given below :

(1) D, E, A, C, B
(2) B, E, A, C, D
(3) B, E, A, D, C
(4) D, E, A, B, C

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120 Which are correct:

A. Computed tomography and magnetic resonance imaging detect cancers of internal organs.

B. Chemotherapeutics drugs are used to kill non-cancerous cells.

C. α -interferon activate the cancer patients' immune system and helps in destroying the tumour.

D. Chemotherapeutic drugs are biological response modifiers.

E. In the case of leukaemia blood cell counts are decreased.

Choose the **correct** answer from the options given below:

(1) B and D only (2) D and E only

(3) C and D only (4) A and C only

121 Match **List - I** with **List - II**.

	List - I		**List - II**
A.	Centromere	I.	Mitochondrion
B.	Cilium	II.	Cell division
C.	Cristae	III.	Cell movement
D.	Cell membrane	IV.	Phospholipid Bilayer

Choose the **correct** answer from the options given below :

(1) A-I, B-II, C-III, D-IV

(2) A-II, B-I, C-IV, D-III

(3) A-IV, B-II, C-III, D-I

(4) A-II, B-III, C-I, D-IV

122 Match **List I** with **List II** :

	List I		**List II**
A.	Chlorophyll a	I.	Yellow-green
B.	Chlorophyll b	II.	Yellow
C.	Xanthophylls	III.	Blue-green
D.	Carotenoids	IV.	Yellow to Yellow-orange

Choose the option with all **correct** matches.

(1) A-III, B-IV, C-II, D-I

(2) A-III, B-I, C-II, D-IV

(3) A-I, B-II, C-IV, D-III

(4) A-I, B-IV, C-III, D-II

123 Find the correct statements :

A. In human pregnancy, the major organ systems are formed at the end of 12 weeks.

B. In human pregnancy the major organ systems are formed at the end of 8 weeks.

C. In human pregnancy heart is formed after one month of gestation.

D. In human pregnancy, limbs and digits develop by the end of second month.

E. In human pregnancy the appearance of hair is usually observed in the fifth month.

Choose the **correct** answer from the options given below :

(1) A and E Only

(2) B and C Only

(3) B, C, D and E Only

(4) A, C, D and E Only

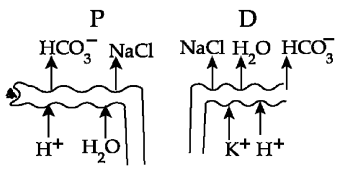
124 In the seeds of cereals, the outer covering of endosperm separates the embryo by a protein-rich layer called :

(1) Coleoptile (2) Coleorhiza

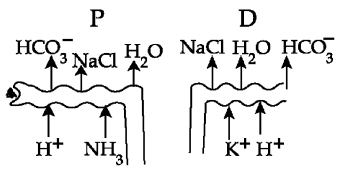
(3) Integument (4) Aleurone layer

125 Which of the following diagrams is correct with regard to the proximal (P) and distal (D) tubule of the Nephron.

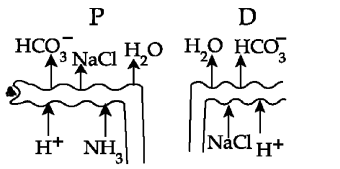
(1)



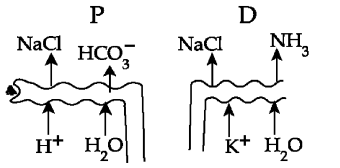
(2)



(3)



(4)



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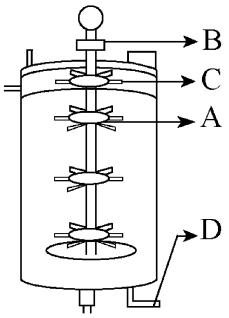
126 Identify the part of a bio-reactor which is used as a foam braker from the given figure.



(1) A (2) B

(3) D (4) C

127 Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : A typical unfertilised, angiosperm embryo sac at maturity is 8 nucleate and 7-celled.

Reason (R) : The egg apparatus has 2 polar nuclei.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**

(2) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**

(3) **A** is true but **R** is false

(4) **A** is false but **R** is true

128 A specialised membranous structure in a prokaryotic cell which helps in cell wall formation, DNA replication and respiration is :

(1) Mesosome

(2) Chromatophores

(3) Cristae

(4) Endoplasmic Reticulum

129 Which of the following are the post-transcriptional events in an eukaryotic cell?

A. Transport of pre-mRNA to cytoplasm prior to splicing.

B. Removal of introns and joining of exons.

C. Addition of methyl group at 5' end of hnRNA.

D. Addition of adenine residues at 3' end of hnRNA.

E. Base pairing of two complementary RNAs.

Choose the **correct** answer from the options given below :

(1) A, B, C only

(2) B, C, D only

(3) B, C, E only

(4) C, D, E only

130 What is the pattern of inheritance for polygenic trait?

(1) Mendelian inheritance pattern

(2) Non-mendelian inheritance pattern

(3) Autosomal dominant pattern

(4) X-linked recessive inheritance pattern

131 Which one of the following enzymes contains 'Haem' as the prosthetic group?

(1) RuBisCo

(2) Carbonic anhydrase

(3) Succinate dehydrogenase

(4) Catalase

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132 Each of the following characteristics represent a Kingdom proposed by Whittaker. Arrange the following in increasing order of complexity of body organization.

A. Multicellular heterotrophs with cell wall made of chitin.

B. Heterotrophs with tissue/organ/organ system level of body organization.

C. Prokaryotes with cell wall made of polysaccharides and amino acids.

D. Eukaryotic autotrophs with tissue/organ level of body organization.

E. Eukaryotes with cellular body organization.

Choose the **correct** answer from the options given below :

(1) A, C, E, B, D (2) C, E, A, D, B

(3) A, C, E, D, B (4) C, E, A, B, D

133 Who is known as the father of Ecology in India?

(1) S. R. Kashyap (2) Ramdeo Misra

(3) Ram Udar (4) Birbal Sahni

134 Match **List I** with **List II** :

	List-I		**List-II**
A.	Alfred Hershey and Martha Chase	I.	Streptococcus pneumoniae
B.	Euchromatin	II.	Densely packed and dark-stained
C.	Frederick Griffith	III.	Loosely packed and light-stained
D.	Heterochromatin	IV.	DNA as genetic material confirmation

Choose the **correct** answer from the options given below :

(1) A-II, B-IV, C-I, D-III

(2) A-IV, B-II, C-I, D-III

(3) A-IV, B-III, C-I, D-II

(4) A-III, B-II, C-IV, D-I

135 Neoplastic characteristics of cells refer to :

A. A mass of proliferating cell

B. Rapid growth of cells

C. Invasion and damage to the surrounding tissue

D. Those confined to original location

Choose the **correct** answer from the options given below:

(1) A, B only (2) A, B, C only

(3) A, B, D only (4) B, C, D only

136 Given below are two statements :

Statement I : The DNA fragments extracted from gel electrophoresis can be used in construction of recombinant DNA.

Statement II : Smaller size DNA fragments are observed near anode while larger fragments are found near the wells in an agarose gel.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both statement I and statement II are correct

(2) Both statement I and statement II are incorrect

(3) Statement I is correct but statement II is incorrect

(4) Statement I is incorrect but statement II is correct

137 Match **List I** with **List II**.

	List I		**List II**
A.	Adenosine	I.	Nitrogen base
B.	Adenylic acid	II.	Nucleotide
C.	Adenine	III.	Nucleoside
D.	Alanine	IV.	Amino acid

Choose the option with all **correct** matches.

(1) A-III, B-IV, C-II, D-I

(2) A-III, B-II, C-IV, D-I

(3) A-III, B-II, C-I, D-IV

(4) A-II, B-III, C-I, D-IV

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138 Consider the following :

A. The reductive division for the human female gametogenesis starts earlier than that of the male gametogenesis.

B. The gap between the first meiotic division and the second meiotic division is much shorter for males compared to females.

C. The first polar body is associated with the formation of the primary oocyte.

D. Luteinizing Hormone (LH) surge leads to disintegration of the endometrium and onset of menstrual bleeding.

Choose the **correct** answer from the options given below :

(1) A and B are true

(2) A and C are true

(3) B and D are true

(4) B and C are true

139 All living members of the class Cyclostomata are:

(1) Free living (2) Endoparasite

(3) Symbiotic (4) Ectoparasite

140 Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The primary function of the Golgi apparatus is to package the materials made by the endoplasmic reticulum and deliver it to intracellular targets and outside the cell.

Reason (R) : Vesicles containing materials made by the endoplasmic reticulum fuse with the cis face of the Golgi apparatus, and they are modified and released from the trans face of the Golgi apparatus.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**

(2) Both **A** and **R** are true but **R** is **not** the correct explanation of **A**

(3) **A** is true but **R** is false

(4) **A** is false but **R** is true

141 Match **List I** with **List II** :

List I	**List II**
A. Scutellum	I. Persistent nucellus
B. Non-albuminous seed	II. Cotyledon of Monocot seed
C. Epiblast	III. Groundnut
D. Perisperm	IV. Rudimentary cotyledon

Choose the option with all **correct** matches.

(1) A-II, B-III, C-IV, D-I

(2) A-IV, B-III, C-II, D-I

(3) A-IV, B-III, C-I, D-II

(4) A-II, B-IV, C-III, D-I

142 Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : All vertebrates are chordates but all chordates are not vertebrate.

Reason (R) : The members of subphylum vertebrata possess notochord during the embryonic period, the notochord is replaced by a cartilaginous or bony vertebral column in adults.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**

(2) Both **A** and **R** are true but **R** is **not** the correct explanation of **A**

(3) **A** is true but **R** is false

(4) **A** is false but **R** is true

143 Identify the statement that is **NOT** correct.

(1) Each antibody has two light and two heavy chains.

(2) The heavy and light chains are held together by disulfide bonds.

(3) Antigen binding site is located at C-terminal region of antibody molecules.

(4) Constant region of heavy and light chains are located at C-terminus of antibody molecules.

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144 Silencing of specific mRNA is possible via RNAi because of -

(1) Complementary dsRNA

(2) Inhibitory ssRNA

(3) Complementary tRNA

(4) Non-complementary ssRNA

145 Genes R and Y follow independent assortment. If RRYY produce round yellow seeds and rryy produce wrinkled green seeds, what will be the phenotypic ratio of the F2 generation?

(1) Phenotypic ratio - 1 : 2 : 1

(2) Phenotypic ratio - 3 : 1

(3) Phenotypic ratio - 9 : 3 : 3 : 1

(4) Phenotypic ratio - 9 : 7

146 Histones are enriched with -

(1) Lysine & Arginine

(2) Leucine & Lysine

(3) Phenylalanine & Leucine

(4) Phenylalanine & Arginine

147 The first menstruation is called :

(1) Menopause (2) Menarche

(3) Diapause (4) Ovulation

148 Match **List - I** with **List - II**.

	List - I		**List - II**
A.	Heart	I.	Erythropoietin
B.	Kidney	II.	Aldosterone
C.	Gastro-intestinal tract	III.	Atrial natriuretic factor
D.	Adrenal Cortex	IV.	Secretin

Choose the **correct** answer from the options given below :

(1) A-II, B-I, C-III, D-IV

(2) A-IV, B-III, C-II, D-I

(3) A-I, B-III, C-IV, D-II

(4) A-III, B-I, C-IV, D-II

149 The protein portion of an enzyme is called :

(1) Cofactor

(2) Coenzyme

(3) Apoenzyme

(4) Prosthetic group

150 Which of the following is the unit of productivity of an Ecosystem?

(1) gm^{-2}

(2) KCal m^{-2}

(3) KCal m^{-3}

(4) (KCal m^{-2})yr^{-1}

151 Sweet potato and potato represent a certain type of evolution. Select the correct combination of terms to explain the evolution.

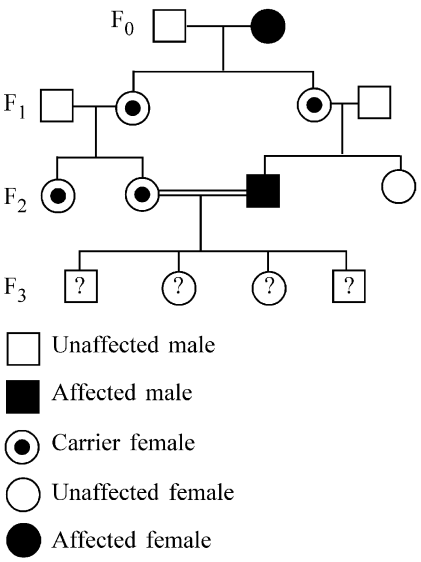
(1) Analogy, convergent

(2) Homology, divergent

(3) Homology, convergent

(4) Analogy, divergent

152 With the help of given pedigree, find out the probability for the birth of a child having no disease and being a carrier (has the disease mutation in one allele of the gene) in F_3 generation.



(1) 1/4 (2) 1/2

(3) 1/8 (4) Zero

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153 Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

Assertion (A) : Cells of the tapetum possess dense cytoplasm and generally have more than one nucleus.

Reason (R) : Presence of more than one nucleus in the tapetum increases the efficiency of nourishing the developing microspore mother cells.

In light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**

(2) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**

(3) **A** is true but **R** is false

(4) **A** is false but **R** is true

154 How many meiotic and mitotic divisions need to occur for the development of a mature female gametophyte from the megaspore mother cell in an angiosperm plant?

(1) 2 Meiosis and 3 Mitosis

(2) 1 Meiosis and 2 Mitosis

(3) 1 Meiosis and 3 Mitosis

(4) No Meiosis and 2 Mitosis

155 Which of the following is an example of a zygomorphic flower?

(1) Petunia (2) Datura

(3) Pea (4) Chilli

156 After maturation, in primary lymphoid organs, the lymphocytes migrate for interaction with antigens to secondary lymphoid organ(s) / tissue(s) like:

A. thymus B. bone marrow

C. spleen D. lymph nodes

E. Peyer's patches

Choose the *correct* answer from the options given below:

(1) B, C, D only (2) A, B, C only

(3) E, A, B only (4) C, D, E only

157 Given below are two statements :

Statement I : Fig fruit is a non-vegetarian fruit as it has enclosed fig wasps in it.

Statement II : Fig wasp and fig tree exhibit mutual relationship as fig wasp completes its life cycle in fig fruit and fig fruit gets pollinated by fig wasp.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both statement I and statement II are correct

(2) Both statement I and statement II are incorrect

(3) Statement I is correct but statement II is incorrect

(4) Statement I is incorrect but statement II is correct

158 What is the main function of the spindle fibers during mitosis ?

(1) To separate the chromosomes

(2) To synthesize new DNA

(3) To repair damaged DNA

(4) To regulate cell growth

159 Which one of the following is the characteristic feature of gymnosperms?

(1) Seeds are enclosed in fruits.

(2) Seeds are naked.

(3) Seeds are absent.

(4) Gymnosperms have flowers for reproduction.

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160 Consider the following statements regarding function of adrenal medullary hormones :

A. It causes pupilary constriction

B. It is a hyperglycemic hormone

C. It causes piloerection

D. It increases strength of heart contraction

Choose the **correct** answer from the options given below :

(1) C and D Only

(2) B, C and D Only

(3) A, C and D Only

(4) D Only

161 Why can't insulin be given orally to diabetic patients?

(1) Human body will elicit strong immune response

(2) It will be digested in Gastro-Intestinal (GI) tract

(3) Because of structural variation

(4) Its bioavailability will be increased

162 Match **List I** with **List II**.

	List I		**List II**
A.	Pteridophyte	I.	*Salvia*
B.	Bryophyte	II.	*Ginkgo*
C.	Angiosperm	III.	*Polytrichum*
D.	Gymnosperm	IV.	*Salvinia*

Choose the option with all **correct** matches.

(1) A-III, B-IV, C-II, D-I

(2) A-IV, B-III, C-I, D-II

(3) A-III, B-IV, C-I, D-II

(4) A-IV, B-III, C-II, D-I

163 Who proposed that the genetic code for amino acids should be made up of three nucleotides?

(1) George Gamow

(2) Francis Crick

(3) Jacque Monod

(4) Franklin Stahl

164 Match **List I** with **List II** :

	List I		**List II**
A.	The Evil Quartet	I.	Cryopreservation
B.	Ex situ conservation	II.	Alien species invasion
C.	*Lantana camara*	III.	Causes of biodiversity losses
D.	Dodo	IV.	Extinction

Choose the option with all correct matches.

(1) A-III, B-II, C-I, D-IV

(2) A-III, B-I, C-II, D-IV

(3) A-III, B-IV, C-II, D-I

(4) A-III, B-II, C-IV, D-I

165 Which of the following hormones released from the pituitary is actually synthesized in the hypothalamus ?

(1) Luteinizing hormone (LH)

(2) Anti-diuretic hormone (ADH)

(3) Follicle-stimulating hormone (FSH)

(4) Adenocorticotrophic hormone (ACTH)

166 Role of the water vascular system in Echinoderms is :

A. Respiration and Locomotion

B. Excretion and Locomotion

C. Capture and transport of food

D. Digestion and Respiration

E. Digestion and Excretion

Choose the **correct** answer from the options given below :

(1) A and B Only

(2) A and C Only

(3) B and C Only

(4) B, D and E Only

167 Which of the following type of immunity is present at the time of birth and is a non-specific type of defence in the human body?

(1) Acquired Immunity

(2) Innate Immunity

(3) Cell-mediated Immunity

(4) Humoral Immunity

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168 In bryophytes, the gemmae help in which one of the following?

(1) Sexual reproduction

(2) Asexual reproduction

(3) Nutrient absorption

(4) Gaseous exchange

169 In frog, the Renal portal system is a special venous connection that acts to link :

(1) Liver and intestine

(2) Liver and kidney

(3) Kidney and intestine

(4) Kidney and lower part of body

170 Given below are two statements :

Statement I : In ecosystem, there is unidirectional flow of energy of sun from producers to consumers.

Statement II : Ecosystems are exempted from 2^{nd} law of thermodynamics.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both statement I and statement II are correct

(2) Both statement I and statement II are incorrect

(3) Statement I is correct but statement II is incorrect

(4) Statement I is incorrect but statement II is correct

171 Which of the following statements about RuBisCO is true?

(1) It is active only in the dark.

(2) It has higher affinity for oxygen than carbon dioxide.

(3) It is an enzyme involved in the photolysis of water.

(4) It catalyzes the carboxylation of RuBP.

172 Which of the following enzyme(s) are **NOT** essential for gene cloning?

A. Restriction enzymes
B. DNA ligase
C. DNA mutase
D. DNA recombinase
E. DNA polymerase

Choose the **correct** answer from the options given below :

(1) C and D only (2) A and B only
(3) D and E only (4) B and C only

173 Read the following statements on plant growth and development.

A. Parthenocarpy can be induced by auxins.
B. Plant growth regulators can be involved in promotion as well as inhibition of growth.
C. Dedifferentiation is a pre-requisite for re-differentiation.
D. Abscisic acid is a plant growth promoter.
E. Apical dominance promotes the growth of lateral buds.

Choose the option with all correct statements.

(1) A, B, C only (2) A, C, E only
(3) A, D, E only (4) B, D, E only

174 Which factor is important for termination of transcription?

(1) α (alpha) (2) σ (sigma)
(3) ρ (rho) (4) γ (gamma)

175 Frogs respire in water by skin and buccal cavity and on land by skin, buccal cavity and lungs.

Choose the **correct** answer from the following :

(1) The statement is true for water but false for land

(2) The statement is true for both the environment

(3) The statement is false for water but true for land

(4) The statement is false for both the environment

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176 Twins are born to a family that lives next door to you. The twins are a boy and a girl. Which of the following must be true?

(1) They are monozygotic twins.

(2) They are fraternal twins.

(3) They were conceived through in vitro fertilization.

(4) They have 75% identical genetic content.

177 Which of the following microbes is **NOT** involved in the preparation of household products?

A. *Aspergillus niger*

B. *Lactobacillus*

C. *Trichoderma polysporum*

D. *Saccharomyces cerevisiae*

E. *Propionibacterium sharmanii*

Choose the **correct** answer from the options given below:

(1) A and B only

(2) A and C only

(3) C and D only

(4) C and E only

178 Match **List - I** with **List - II**.

List - I	**List - II**
A. Progesterone	I. Pars intermedia
B. Relaxin	II. Ovary
C. Melanocyte stimulating hormone	III. Adrenal Medulla
D. Catecholamines	IV. Corpus luteum

Choose the **correct** answer from the options given below :

(1) A-IV, B-II, C-I, D-III

(2) A-IV, B-II, C-III, D-I

(3) A-II, B-IV, C-I, D-III

(4) A-III, B-II, C-IV, D-I

179 The blue and white selectable markers have been developed which differentiate recombinant colonies from non-recombinant colonies on the basis of their ability to produce colour in the presence of a chromogenic substrate.

Given below are two statements about this method:

Statement I : The blue coloured colonies have DNA insert in the plasmid and they are identified as recombinant colonies.

Statement II : The colonies without blue colour have DNA insert in the plasmid and are identified as recombinant colonies.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) Both Statement I and Statement II are correct

(2) Both Statement I and Statement II are incorrect

(3) Statement I is correct but Statement II is incorrect

(4) Statement I is incorrect but Statement II is correct

180 Which one of the following equations represents the Verhulst-Pearl Logistic Growth of population?

(1) $\frac{dN}{dt} = r\left(\frac{K-N}{K}\right)$

(2) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$

(3) $\frac{dN}{dt} = rN\left(\frac{N-K}{N}\right)$

(4) $\frac{dN}{dt} = N\left(\frac{r-K}{K}\right)$

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Test Booklet Code

← Test Booklet No. **ENGLISH** **T1**

DUGRI

This Booklet contains **32** pages, including Rough Page.

Do not open this Test Booklet until you are asked to do so.

Important Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on ORIGINAL Copy carefully with **blue/black** ball point pen only.
2. The test is of **3 hours 20 minutes** duration and the Test Booklet contains **200** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology). 50** questions in each subject are divided into **two Sections (A and B)** as per details given below:
   (a) **Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos – 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.
   (b) **Section B** shall consist of **15 (Fifteen)** questions in each subject (Question Nos – 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.
   Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.**
3. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one** mark will be deducted from the total scores. **The maximum marks are 720.**
4. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.
5. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
6. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy) to the Invigilator** before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.
7. **The CODE for this Booklet is T1. Make sure that the CODE printed on the Original Copy of the Answer Sheet is the same as that on this Test Booklet.** In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
8. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
9. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
10. Each candidate must show on-demand his/her Admit Card to the Invigilator.
11. No candidate, without special permission of the centre Superintendent or Invigilator, would leave his/her seat.
12. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign (with time) the Attendance Sheet **twice. Cases, where a candidate has not signed the Attendance Sheet second time, will be deemed not to have handed over the Answer Sheet and dealt with as an Unfair Means case.**
13. Use of Electronic/Manual Calculator is prohibited.
14. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per the Rules and Regulations of this examination.
15. **No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
16. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
17. Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of Scribe or not.

Name of the Candidate (in Capitals): _____

Roll Number : In figures _____

: In words _____

Centre of Examination (in Capitals): _____

Candidate's Signature: _____ Invigilator's Signature: _____

Facsimile signature stamp of Centre Superintendent

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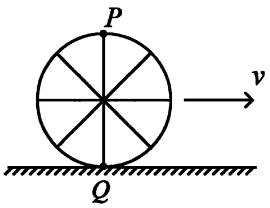
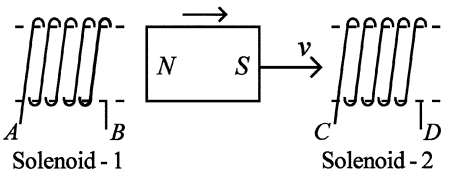
Physics : Section-A (Q. No. 1 to 35)

1 A wheel of a bullock cart is rolling on a level road as shown in the figure below. If its linear speed is v in the direction shown, which one of the following options is correct (P and Q are any highest and lowest points on the wheel, respectively)?



(1) Both the points P and Q move with equal speed.
(2) Point P has zero speed.
(3) Point P moves slower than point Q.
(4) Point P moves faster than point Q.

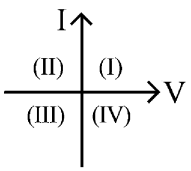
2



In the above diagram, a strong bar magnet is moving towards solenoid-2 from solenoid-1. The direction of induced current in solenoid-1 and that in solenoid-2, respectively, are through the directions:

(1) AB and CD (2) BA and DC
(3) AB and DC (4) BA and CD

3 Consider the following statements A and B and identify the correct answer :



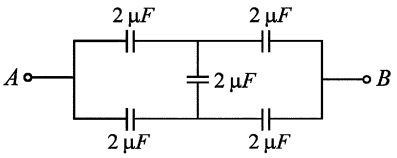
A. For a solar-cell, the I-V characteristics lies in the IV quadrant of the given graph.
B. In a reverse biased pn junction diode, the current measured in (μA), is due to majority charge carriers.

(1) Both A and B are correct.
(2) Both A and B are incorrect.
(3) A is correct but B is incorrect.
(4) A is incorrect but B is correct.

4 A wire of length 'l' and resistance $100\,\Omega$ is divided into 10 equal parts. The first 5 parts are connected in series while the next 5 parts are connected in parallel. The two combinations are again connected in series. The resistance of this final combination is:

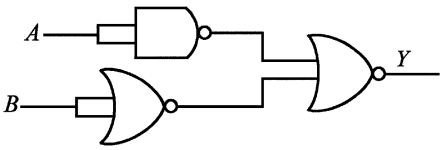
(1) $55\,\Omega$ (2) $60\,\Omega$
(3) $26\,\Omega$ (4) $52\,\Omega$

5 In the following circuit, the equivalent capacitance between terminal A and terminal B is :



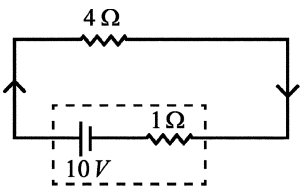
(1) $0.5\,\mu F$ (2) $4\,\mu F$
(3) $2\,\mu F$ (4) $1\,\mu F$

6 The output (Y) of the given logic gate is similar to the output of an/a :



(1) OR gate (2) AND gate
(3) NAND gate (4) NOR gate

7 The terminal voltage of the battery, whose emf is $10\,V$ and internal resistance $1\,\Omega$, when connected through an external resistance of $4\,\Omega$ as shown in the figure is :



(1) $8\,V$ (2) $10\,V$
(3) $4\,V$ (4) $6\,V$

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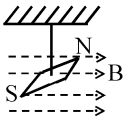
8 The mass of a planet is $\frac{1}{10}^{th}$ that of the earth and its diameter is half that of the earth. The acceleration due to gravity on that planet is :

(1) 4.9 m s^{-2} (2) 3.92 m s^{-2}

(3) 19.6 m s^{-2} (4) 9.8 m s^{-2}

9 In a uniform magnetic field of 0.049 T, a magnetic needle performs 20 complete oscillations in 5 seconds as shown. The moment of inertia of the needle is 9.8×10^{-6} kg m^2. If the magnitude of magnetic moment of the needle is $x \times 10^{-5}$ Am^2; then the value of 'x' is :



(1) $50\,\pi^2$ (2) $1280\,\pi^2$

(3) $5\,\pi^2$ (4) $128\,\pi^2$

10 If c is the velocity of light in free space, the correct statements about photon among the following are :

A. The energy of a photon is $E = hv$.

B. The velocity of a photon is c.

C. The momentum of a photon, $p = \frac{hv}{c}$.

D. In a photon-electron collision, both total energy and total momentum are conserved.

E. Photon possesses positive charge.

Choose the correct answer from the options given below :

(1) A, C and D only

(2) A, B, D and E only

(3) A and B only

(4) A, B, C and D only

11 The maximum elongation of a steel wire of 1 m length if the elastic limit of steel and its Young's modulus, respectively, are 8×10^8 N m^{-2} and 2×10^{11} N m^{-2}, is :

(1) 40 mm (2) 8 mm

(3) 4 mm (4) 0.4 mm

12 A logic circuit provides the output Y as per the following truth table :

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

The expression for the output Y is :

(1) $\overline{B}$ (2) B

(3) $A.B + \overline{A}$ (4) $A.\overline{B} + \overline{A}$

13 The moment of inertia of a thin rod about an axis passing through its mid point and perpendicular to the rod is 2400 g cm^2. The length of the 400 g rod is nearly :

(1) 20.7 cm (2) 72.0 cm

(3) 8.5 cm (4) 17.5 cm

14 In a vernier calipers, $(N + 1)$ divisions of vernier scale coincide with N divisions of main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is :

(1) $100N$ (2) $10\,(N + 1)$

(3) $\frac{1}{10N}$ (4) $\frac{1}{100(N+1)}$

15 Match List I with List II.

List I (Spectral Lines of Hydrogen for transitions from)		**List II (Wavelengths (nm))**	
A.	$n_2 = 3$ to $n_1 = 2$	I.	410.2
B.	$n_2 = 4$ to $n_1 = 2$	II.	434.1
C.	$n_2 = 5$ to $n_1 = 2$	III.	656.3
D.	$n_2 = 6$ to $n_1 = 2$	IV.	486.1

Choose the correct answer from the options given below :

(1) A-IV, B-III, C-I, D-II

(2) A-I, B-II, C-III, D-IV

(3) A-II, B-I, C-IV, D-III

(4) A-III, B-IV, C-II, D-I

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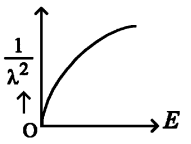
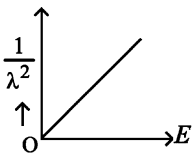
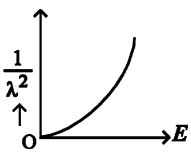
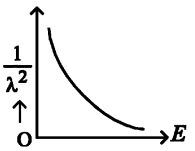
16 If the monochromatic source in Young's double slit experiment is replaced by white light, then
(1) there will be a central bright white fringe surrounded by a few coloured fringes.
(2) all bright fringes will be of equal width.
(3) interference pattern will disappear.
(4) there will be a central dark fringe surrounded by a few coloured fringes.

17 The graph which shows the variation of $\left(\frac{1}{\lambda^2}\right)$ and its kinetic energy, E is (where λ is de Broglie wavelength of a free particle) :

(1) 

(2) 

(3) 

(4) 

18 Match **List-I** with **List-II.**

List-I (Material)		**List-II (Susceptibility (χ))**
A. Diamagnetic	I.	$\chi = 0$
B. Ferromagnetic	II.	$0 > \chi \geq -1$
C. Paramagnetic	III.	$\chi >> 1$
D. Non-magnetic	IV.	$0 < \chi < \varepsilon$ (a small positive number)

Choose the correct answer from the options given below:
(1) A-III, B-II, C-I, D-IV
(2) A-IV, B-III, C-II, D-I
(3) A-II, B-III, C-IV, D-I
(4) A-II, B-I, C-III, D-IV

19 An unpolarised light beam strikes a glass surface at Brewster's angle. Then
(1) both the reflected and refracted light will be completely polarised.
(2) the reflected light will be completely polarised but the refracted light will be partially polarised.
(3) the reflected light will be partially polarised.
(4) the refracted light will be completely polarised.

20 A particle moving with uniform speed in a circular path maintains :
(1) constant velocity but varying acceleration.
(2) varying velocity and varying acceleration.
(3) constant velocity.
(4) constant acceleration.

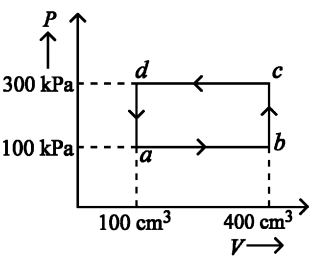
21 The quantities which have the same dimensions as those of solid angle are :
(1) strain and arc
(2) angular speed and stress
(3) strain and angle
(4) stress and angle

22 A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T. If speed becomes 2ω while keeping the same radius, the tension in the string becomes :

(1) $\frac{T}{4}$ (2) $\sqrt{2}T$
(3) T (4) $4T$

23 If $x = 5\sin\left(\pi t + \frac{\pi}{3}\right)m$ represents the motion of a particle executing simple harmonic motion, the amplitude and time period of motion, respectively, are :
(1) 5 cm, 1 s (2) 5 m, 1 s
(3) 5 cm, 2 s (4) 5 m, 2 s

24 A thermodynamic system is taken through the cycle *abcda*. The work done by the gas along the path *bc* is :



(1) $-90\,J$ (2) $-60\,J$
(3) zero (4) $30\,J$

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25 Given below are two statements :

Statement I : Atoms are electrically neutral as they contain equal number of positive and negative charges.

Statement II : Atoms of each element are stable and emit their characteristic spectrum.

In the light of the above statements, choose the *most appropriate* answer from the options given below :

(1) Statement I is correct but Statement II is incorrect.

(2) Statement I is incorrect but Statement II is correct.

(3) Both Statement I and Statement II are correct.

(4) Both Statement I and Statement II are incorrect.

26 In an ideal transformer, the turns ratio is $\frac{N_p}{N_s} = \frac{1}{2}$.

The ratio $V_s : V_p$ is equal to (the symbols carry their usual meaning) :

(1) 1 : 1 (2) 1 : 4

(3) 1 : 2 (4) 2 : 1

27 Two bodies A and B of same mass undergo completely inelastic one dimensional collision. The body A moves with velocity v_1 while body B is at rest before collision. The velocity of the system after collision is v_2. The ratio $v_1 : v_2$ is :

(1) 4:1 (2) 1:4

(3) 1:2 (4) 2:1

28 $${}^{290}_{82}X \xrightarrow{\alpha} Y \xrightarrow{e^+} Z \xrightarrow{\beta^-} P \xrightarrow{e^-} Q$$

In the nuclear emission stated above, the mass number and atomic number of the product Q respectively, are :

(1) 288, 82 (2) 286, 81

(3) 280, 81 (4) 286, 80

29 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R.**

Assertion A : The potential (V) at any axial point, at 2 m distance(r) from the centre of the dipole of dipole moment vector $\vec{P}$ of magnitude, 4×10^{-6} C m, is $\pm 9\times10^3\ V$.

(Take $\frac{1}{4\pi\epsilon_0} = 9\times10^9$ SI units)

Reason R : $V = \pm\frac{2P}{4\pi\epsilon_0 r^2}$, where r is the distance of any axial point, situated at 2 m from the centre of the dipole.

In the light of the above statements, choose the *correct* answer from the options given below:

(1) A is true but R is false.

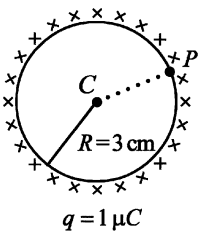
(2) A is false but R is true.

(3) Both A and R are true and R is the correct explanation of A.

(4) Both A and R are true and R is NOT the correct explanation of A.

30 A thin spherical shell is charged by some source. The potential difference between the two points C and P (in V) shown in the figure is:

(Take $\frac{1}{4\pi\epsilon_0} = 9\times10^9$ SI units)



(1) 0.5×10^5 (2) zero

(3) 3×10^5 (4) 1×10^5

31 A thin flat circular disc of radius 4.5 cm is placed gently over the surface of water. If surface tension of water is 0.07 Nm^{-1}, then the excess force required to take it away from the surface is :

(1) 1.98 mN (2) 99 N

(3) 19.8 mN (4) 198 N

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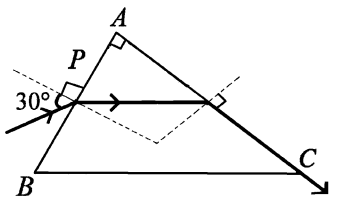
Physics : Section-B (Q. No. 36 to 50)

32 A light ray enters through a right angled prism at point P with the angle of incidence 30° as shown in figure. It travels through the prism parallel to its base BC and emerges along the face AC. The refractive index of the prism is:



(1) $\frac{\sqrt{3}}{4}$ (2) $\frac{\sqrt{3}}{2}$

(3) $\frac{\sqrt{5}}{4}$ (4) $\frac{\sqrt{5}}{2}$

33 At any instant of time t, the displacement of any particle is given by $2t - 1$ (SI unit) under the influence of force of $5N$. The value of instantaneous power is (in SI unit):

(1) 7 (2) 6

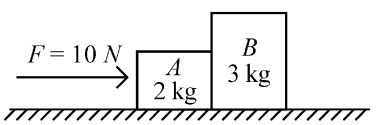
(3) 10 (4) 5

34 A tightly wound 100 turns coil of radius 10 cm carries a current of 7 A. The magnitude of the magnetic field at the centre of the coil is (Take permeability of free space as $4\pi \times 10^{-7}$ SI units):

(1) 4.4 mT (2) 44 T

(3) 44 mT (4) 4.4 T

35 A horizontal force 10 N is applied to a block A as shown in figure. The mass of blocks A and B are 2 kg and 3 kg, respectively. The blocks slide over a frictionless surface. The force exerted by block A on block B is :



(1) 6 N (2) 10 N

(3) zero (4) 4 N

36 A small telescope has an objective of focal length 140 cm and an eye piece of focal length 5.0 cm. The magnifying power of telescope for viewing a distant object is:

(1) 17 (2) 32

(3) 34 (4) 28

37 Two heaters A and B have power rating of 1 kW and 2 kW, respectively. Those two are first connected in series and then in parallel to a fixed power source. The ratio of power outputs for these two cases is:

(1) 1 : 2 (2) 2 : 3

(3) 1 : 1 (4) 2 : 9

38 If the mass of the bob in a simple pendulum is increased to thrice its original mass and its length is made half its original length, then the new time period of oscillation is $\frac{x}{2}$ times its original time period. Then the value of x is:

(1) $2\sqrt{3}$ (2) 4

(3) $\sqrt{3}$ (4) $\sqrt{2}$

39 A parallel plate capacitor is charged by connecting it to a battery through a resistor. If I is the current in the circuit, then in the gap between the plates :

(1) displacement current of magnitude equal to I flows in a direction opposite to that of I.

(2) displacement current of magnitude greater than I flows but can be in any direction.

(3) there is no current.

(4) displacement current of magnitude equal to I flows in the same direction as I.

40 A metallic bar of Young's modulus, 0.5×10^{11} N m^{-2} and coefficient of linear thermal expansion 10^{-5} ^{o}C^{-1}, length 1 m and area of cross-section 10^{-3} m^2 is heated from 0^{o}C to 100^{o}C without expansion or bending. The compressive force developed in it is:

(1) 100×10^3 N (2) 2×10^3 N

(3) 5×10^3 N (4) 50×10^3 N

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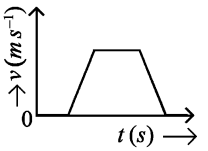
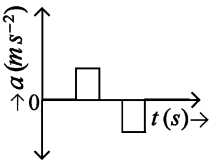
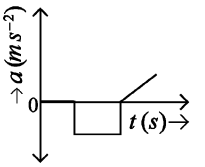
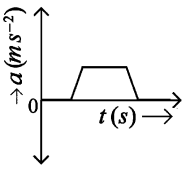
41 The velocity (v) – time (t) plot of the motion of a body is shown below :

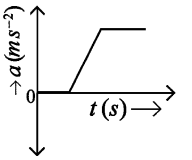


The acceleration (a) – time (t) graph that best suits this motion is :

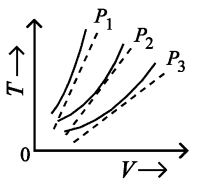
(1) 

(2) 

(3) 

(4) 

42 The following graph represents the T-V curves of an ideal gas (where T is the temperature and V the volume) at three pressures P_1, P_2 and P_3 compared with those of Charles's law represented as dotted lines.

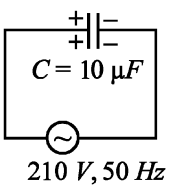


Then the correct relation is:

(1) $P_2 > P_1 > P_3$ (2) $P_1 > P_2 > P_3$

(3) $P_3 > P_2 > P_1$ (4) $P_1 > P_3 > P_2$

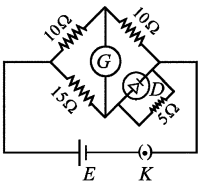
43 A 10 μF capacitor is connected to a 210 V, 50 Hz source as shown in figure. The peak current in the circuit is nearly $(\pi = 3.14)$:

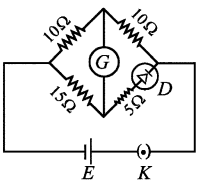


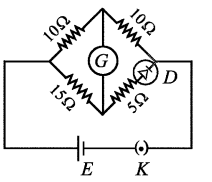
(1) 1.20 A (2) 0.35 A

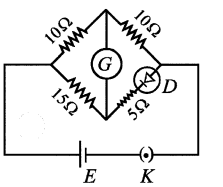
(3) 0.58 A (4) 0.93 A

44 Choose the correct circuit which can achieve the bridge balance.

(1) 

(2) 

(3) 

(4) 

45 The property which is not of an electromagnetic wave travelling in free space is that :

(1) they travel with a speed equal to $\frac{1}{\sqrt{\mu_0 \in_0}}$.

(2) they originate from charges moving with uniform speed.

(3) they are transverse in nature.

(4) the energy density in electric field is equal to energy density in magnetic field.

46 The minimum energy required to launch a satellite of mass m from the surface of earth of mass M and radius R in a circular orbit at an altitude of $2R$ from the surface of the earth is:

(1) $\frac{GmM}{2R}$ (2) $\frac{GmM}{3R}$

(3) $\frac{5GmM}{6R}$ (4) $\frac{2GmM}{3R}$

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Chemistry : Section-A (Q. No. 51 to 85)

47 If the plates of a parallel plate capacitor connected to a battery are moved close to each other, then

A. the charge stored in it, increases.
B. the energy stored in it, decreases.
C. its capacitance increases.
D. the ratio of charge to its potential remains the same.
E. the product of charge and voltage increases.

Choose the most appropriate answer from the options given below:

(1) B, D and E only (2) A, B and C only
(3) A, B and E only (4) A, C and E only

48 A force defined by $F = \alpha t^2 + \beta t$ acts on a particle at a given time t. The factor which is dimensionless, if α and β are constants, is:

(1) $\alpha\beta t$ (2) $\alpha\beta / t$
(3) $\beta t / \alpha$ (4) $\alpha t / \beta$

49 A sheet is placed on a horizontal surface in front of a strong magnetic pole. A force is needed to :

A. hold the sheet there if it is magnetic.
B. hold the sheet there if it is non-magnetic.
C. move the sheet away from the pole with uniform velocity if it is conducting.
D. move the sheet away from the pole with uniform velocity if it is both, non-conducting and non-polar.

Choose the correct statement(s) from the options given below:

(1) A, C and D only
(2) C only
(3) B and D only
(4) A and C only

50 An iron bar of length L has magnetic moment M. It is bent at the middle of its length such that the two arms make an angle 60^o with each other. The magnetic moment of this new magnet is:

(1) 2 M (2) $\frac{M}{\sqrt{3}}$
(3) M (4) $\frac{M}{2}$

51 Match List I with List II.

	List I (Process)		List II (Conditions)
A.	Isothermal process	I.	No heat exchange
B.	Isochoric process	II.	Carried out at constant temperature
C.	Isobaric process	III.	Carried out at constant volume
D.	Adiabatic process	IV.	Carried out at constant pressure

Choose the correct answer from the options given below:

(1) A-I, B-II, C-III, D-IV
(2) A-II, B-III, C-IV, D-I
(3) A-IV, B-III, C-II, D-I
(4) A-IV, B-II, C-III, D-I

52 Given below are two statements:

Statement I : The boiling point of three isomeric pentanes follows the order

n-pentane > isopentane > neopentane

Statement II : When branching increases, the molecule attains a shape of sphere. This results in smaller surface area for contact, due to which the intermolecular forces between the spherical molecules are weak, thereby lowering the boiling point.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

(1) Statement I is correct but Statement II is incorrect.
(2) Statement I is incorrect but Statement II is correct.
(3) Both Statement I and Statement II are correct.
(4) Both Statement I and Statement II are incorrect.

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53 Match List I with List II.

List I (Molecule)	List II (Number and types of bond/s between two carbon atoms)
A. ethane	I. one σ-bond and two π-bonds
B. ethene	II. two π-bonds
C. carbon molecule, C_2	III. one σ-bond
D. ethyne	IV. one σ-bond and one π-bond

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-II, D-I
(2) A-III, B-IV, C-I, D-II
(3) A-I, B-IV, C-II, D-III
(4) A-IV, B-III, C-II, D-I

54 Which one of the following alcohols reacts instantaneously with Lucas reagent?

(1) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2OH$

(2) $CH_3-\overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C}}}}-OH$

(3) $CH_3-CH_2-CH_2-CH_2OH$

(4) $CH_3-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-OH$

55 Match List I with List II.

List I Quantum Number	List II Information provided
A. m_l	I. shape of orbital
B. m_s	II. size of orbital
C. l	III. orientation of orbital
D. n	IV. orientation of spin of electron

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-II, D-I
(2) A-II, B-I, C-IV, D-III
(3) A-I, B-III, C-II, D-IV
(4) A-III, B-IV, C-I, D-II

56 'Spin only' magnetic moment is same for which of the following ions?

A. Ti^{3+} B. Cr^{2+}
C. Mn^{2+} D. Fe^{2+}
E. Sc^{3+}

Choose the most appropriate answer from the options given below:

(1) B and C only
(2) A and D only
(3) B and D only
(4) A and E only

57 On heating, some solid substances change from solid to vapour state without passing through liquid state. The technique used for the purification of such solid substances based on the above principle is known as

(1) Distillation
(2) Chromatography
(3) Crystallization
(4) Sublimation

58 The energy of an electron in the ground state (n = 1) for He^+ ion is –x J, then that for an electron in n = 2 state for Be^{3+} ion in J is :

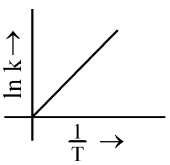
(1) $-4x$ (2) $-\frac{4}{9}x$

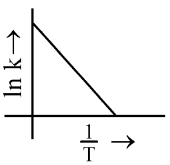
(3) $-x$ (4) $-\frac{x}{9}$

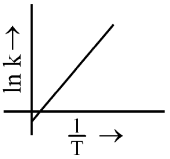
59 Activation energy of any chemical reaction can be calculated if one knows the value of

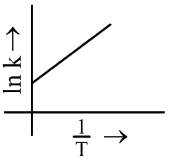
(1) orientation of reactant molecules during collision.
(2) rate constant at two different temperatures.
(3) rate constant at standard temperature.
(4) probability of collision.

60 Which plot of ln k vs $\frac{1}{T}$ is consistent with Arrhenius equation?

(1) 

(2) 

(3) 

(4) 

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61 Given below are two statements:

Statement I : The boiling point of hydrides of Group 16 elements follow the order $H_2O > H_2Te > H_2Se > H_2S$.

Statement II : On the basis of molecular mass, H_2O is expected to have lower boiling point than the other members of the group but due to the presence of extensive H-bonding in H_2O, it has higher boiling point.

In the light of the above statements, choose the *correct* answer from the options given below:

(1) Statement I is true but Statement II is false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Both Statement I and Statement II are false.

62 The reagents with which glucose does **not** react to give the corresponding tests/products are

A. Tollen's reagent
B. Schiff's reagent
C. HCN
D. NH_2OH
E. $NaHSO_3$

Choose the correct options from the given below:

(1) B and E (2) E and D
(3) B and C (4) A and D

63 Arrange the following elements in increasing order of first ionization enthalpy:

Li, Be, B, C, N

Choose the correct answer from the options given below:

(1) Li < Be < C < B < N
(2) Li < Be < N < B < C
(3) Li < Be < B < C < N
(4) Li < B < Be < C < N

64 Arrange the following elements in increasing order of electronegativity:

N, O, F, C, Si

Choose the correct answer from the options given below:

(1) O < F < N < C < Si
(2) F < O < N < C < Si
(3) Si < C < N < O < F
(4) Si < C < O < N < F

65 The E° value for the Mn^{3+}/Mn^{2+} couple is more positive than that of Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+} due to change of

(1) d^4 to d^5 configuration
(2) d^3 to d^5 configuration
(3) d^5 to d^4 configuration
(4) d^5 to d^2 configuration

66 Match List I with List II.

List I (Compound)		**List II (Shape/geometry)**
A.	NH_3	I. Trigonal Pyramidal
B.	BrF_5	II. Square Planar
C.	XeF_4	III. Octahedral
D.	SF_6	IV. Square Pyramidal

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-I, D-II
(2) A-II, B-III, C-IV, D-I
(3) A-I, B-IV, C-II, D-III
(4) A-II, B-IV, C-III, D-I

67 Match List I with List II.

List I (Complex)		**List II (Type of isomerism)**
A.	$\left[Co(NH_3)_5(NO_2)\right]Cl_2$	I. Solvate isomerism
B.	$\left[Co(NH_3)_5(SO_4)\right]Br$	II. Linkage isomerism
C.	$\left[Co(NH_3)_6\right]\left[Cr(CN)_6\right]$	III. Ionization isomerism
D.	$\left[Co(H_2O)_6\right]Cl_3$	IV. Coordination isomerism

Choose the correct answer from the options given below:

(1) A-I, B-IV, C-III, D-II
(2) A-II, B-IV, C-III, D-I
(3) A-II, B-III, C-IV, D-I
(4) A-I, B-III, C-IV, D-II

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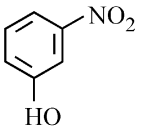
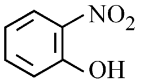
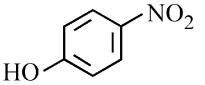
68 Intramolecular hydrogen bonding is present in

(1) 

(2) HF

(3) 

(4) 

69 Given below are two statements:

Statement I : Aniline does not undergo Friedel-Crafts alkylation reaction.

Statement II : Aniline cannot be prepared through Gabriel synthesis.

In the light of the above statements, choose the *correct* answer from the options given below:

(1) Statement I is correct but Statement II is false.

(2) Statement I is incorrect but Statement II is true.

(3) Both Statement I and Statement II are true.

(4) Both Statement I and Statement II are false.

70 The highest number of helium atoms is in

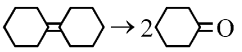
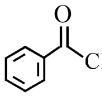
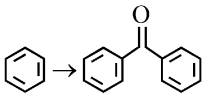
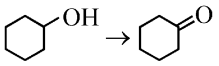
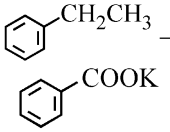
(1) 4 g of helium

(2) 2.271098 L of helium at STP

(3) 4 mol of helium

(4) 4 u of helium

71 Match List I with List II.

List I (Reaction)	**List II (Reagents/ Condition)**
A. 	I.  Anhyd. $AlCl_3$
B. 	II. CrO_3
C. 	III. $KMnO_4$/ KOH, Δ
D. 	IV. (i) O_3 (ii) Zn-H_2O

Choose the correct answer from the options given below:

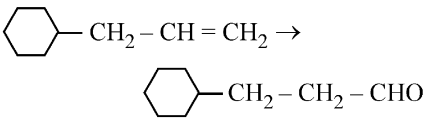
(1) A-IV, B-I, C-II, D-III

(2) A-I, B-IV, C-II, D-III

(3) A-IV, B-I, C-III, D-II

(4) A-III, B-I, C-II, D-IV

72 Identify the correct reagents that would bring about the following transformation.



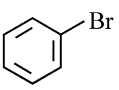
(1) (i) BH_3
(ii) $H_2O_2/\overset{\ominus}{O}H$
(iii) alk. $KMnO_4$
(iv) $H_3O^{\oplus}$

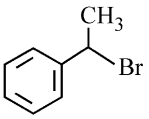
(2) (i) H_2O/H^+
(ii) PCC

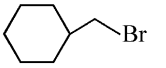
(3) (i) H_2O/H^+
(ii) CrO_3

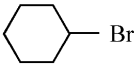
(4) (i) BH_3
(ii) $H_2O_2/\overset{\ominus}{O}H$
(iii) PCC

73 The compound that will undergo S_N1 reaction with the fastest rate is

(1) 

(2) 

(3) 

(4) 

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74 Fehling's solution 'A' is

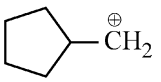
(1) alkaline solution of sodium potassium tartrate (Rochelle's salt)

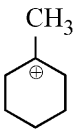
(2) aqueous sodium citrate

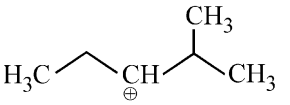
(3) aqueous copper sulphate

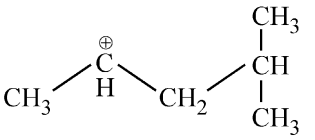
(4) alkaline copper sulphate

75 The most stable carbocation among the following is:

(1) 

(2) 

(3) 

(4) 

76 For the reaction $2A \rightleftharpoons B + C$, $K_c = 4\times10^{-3}$. At a given time, the composition of reaction mixture is : $[A] = [B] = [C] = 2\times10^{-3}M$.

Then, which of the following is correct?

(1) Reaction has a tendency to go in backward direction.

(2) Reaction has gone to completion in forward direction.

(3) Reaction is at equilibrium.

(4) Reaction has a tendency to go in forward direction.

77 The Henry's law constant (K_H) values of three gases (A, B, C) in water are 145, 2×10^{-5} and 35 kbar, respectively. The solubility of these gases in water follow the order:

(1) A > C > B (2) A > B > C

(3) B > A > C (4) B > C > A

78 A compound with a molecular formula of C_6H_{14} has two tertiary carbons. Its IUPAC name is:

(1) 2,3-dimethylbutane

(2) 2,2-dimethylbutane

(3) n-hexane

(4) 2-methylpentane

79 In which of the following equilibria, K_p and K_c are **NOT** equal?

(1) $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$

(2) $2\ BrCl_{(g)} \rightleftharpoons Br_{2(g)} + Cl_{2(g)}$

(3) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$

(4) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2\ HI_{(g)}$

80 Which reaction is **NOT** a redox reaction?

(1) $H_2 + Cl_2 \rightarrow 2\ HCl$

(2) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2\ NaCl$

(3) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

(4) $2\ KClO_3 + I_2 \rightarrow 2\ KIO_3 + Cl_2$

81 Given below are two statements :

Statement I : Both $\left[Co(NH_3)_6\right]^{3+}$ and $\left[CoF_6\right]^{3-}$ complexes are octahedral but differ in their magnetic behaviour.

Statement II : $\left[Co(NH_3)_6\right]^{3+}$ is diamagnetic whereas $\left[CoF_6\right]^{3-}$ is paramagnetic.

In the light of the above statements, choose the *correct* answer from the options given below:

(1) Statement I is true but Statement II is false.

(2) Statement I is false but Statement II is true.

(3) Both Statement I and Statement II are true.

(4) Both Statement I and Statement II are false.

82 1 gram of sodium hydroxide was treated with 25 mL of 0.75 M HCl solution, the mass of sodium hydroxide left unreacted is equal to

(1) Zero mg (2) 200 mg

(3) 750 mg (4) 250 mg

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83 Among Group 16 elements, which one does **NOT** show –2 oxidation state?

(1) Te (2) Po

(3) O (4) Se

84 In which of the following processes entropy increases?

A. A liquid evaporates to vapour.

B. Temperature of a crystalline solid lowered from 130 K to 0 K.

C. $2\,NaHCO_{3(s)} \rightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(g)}$

D. $Cl_{2(g)} \rightarrow 2\,Cl_{(g)}$

Choose the correct answer from the options given below:

(1) A, C and D (2) C and D

(3) A and C (4) A, B and D

85 Match List I with List II.

List I (Conversion)	**List II (Number of Faraday required)**
A. 1 mol of H_2O to O_2	I. 3F
B. 1 mol of MnO_4^- to Mn^{2+}	II. 2F
C. 1.5 mol of Ca from molten $CaCl_2$	III. 1F
D. 1 mol of FeO to Fe_2O_3	IV. 5F

Choose the correct answer from the options given below:

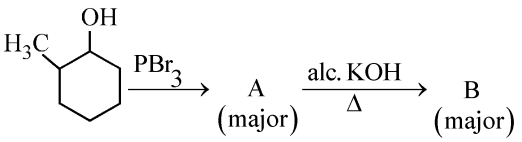
(1) A-II, B-III, C-I, D-IV

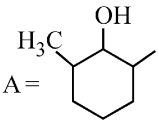
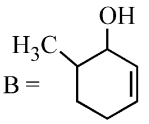
(2) A-III, B-IV, C-II, D-I

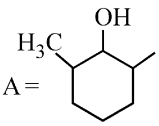
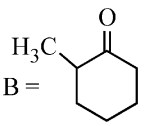
(3) A-II, B-IV, C-I, D-III

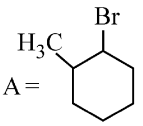
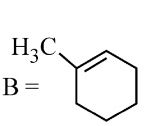
(4) A-III, B-IV, C-I, D-II

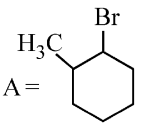
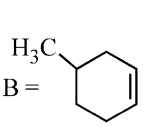
86 Major products A and B formed in the following reaction sequence, are



(1) A =  ; B = 

(2) A =  ; B = 

(3) A =  ; B = 

(4) A =  ; B = 

87 Consider the following reaction in a sealed vessel at equilibrium with concentrations of $N_2 = 3.0 \times 10^{-3}$ M, $O_2 = 4.2 \times 10^{-3}$ M and $NO = 2.8 \times 10^{-3}$ M.

$$2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$$

If 0.1 mol L^{-1} of $NO_{(g)}$ is taken in a closed vessel, what will be degree of dissociation (α) of $NO_{(g)}$ at equilibrium?

(1) 0.8889 (2) 0.717

(3) 0.00889 (4) 0.0889

88 The products A and B obtained in the following reactions, respectively, are

$3ROH + PCl_3 \rightarrow 3RCl + A$

$ROH + PCl_5 \rightarrow RCl + HCl + B$

(1) H_3PO_4 and $POCl_3$

(2) H_3PO_3 and $POCl_3$

(3) $POCl_3$ and H_3PO_3

(4) $POCl_3$ and H_3PO_4

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89 Given below are certain cations. Using inorganic qualitative analysis, arrange them in increasing group number from 0 to VI.

A. Al^{3+} B. Cu^{2+}

C. Ba^{2+} D. Co^{2+}

E. Mg^{2+}

Choose the correct answer from the options given below:

(1) E, C, D, B, A

(2) E, A, B, C, D

(3) B, A, D, C, E

(4) B, C, A, D, E

90 During the preparation of Mohr's salt solution (Ferrous ammonium sulphate), which of the following acid is added to prevent hydrolysis of Fe^{2+} ion?

(1) dilute nitric acid

(2) dilute sulphuric acid

(3) dilute hydrochloric acid

(4) concentrated sulphuric acid

91 The work done during reversible isothermal expansion of one mole of hydrogen gas at 25°C from pressure of 20 atmosphere to 10 atmosphere is:

(Given R = 2.0 cal K^{-1} mol^{-1})

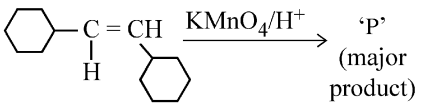
(1) 413.14 calories

(2) 100 calories

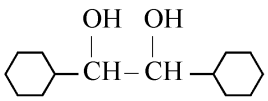
(3) 0 calorie

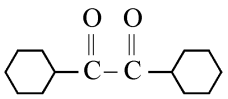
(4) – 413.14 calories

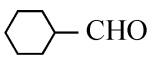
92 For the given reaction:

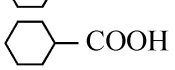


'P' is

(1) 

(2) 

(3) 

(4) 

93 The plot of osmotic pressure (Π) vs concentration (mol L^{-1}) for a solution gives a straight line with slope 25.73 L bar mol^{-1}. The temperature at which the osmotic pressure measurement is done is:

(Use R = 0.083 L bar mol^{-1} K^{-1})

(1) 25.73°C (2) 12.05°C

(3) 37°C (4) 310°C

94 Identify the major product C formed in the following reaction sequence :

$$CH_3-CH_2-CH_2-I \xrightarrow{NaCN} A$$

$$\xrightarrow[\text{Partial hydrolysis}]{OH^-} B \xrightarrow[Br_2]{NaOH} \underset{(\text{major})}{C}$$

(1) butanamide

(2) α – bromobutanoic acid

(3) propylamine

(4) butylamine

95 A compound X contains 32% of A, 20% of B and remaining percentage of C. Then, the empirical formula of X is :

(Given atomic masses of A = 64; B = 40; C = 32 u)

(1) AB_2C_2 (2) ABC_4

(3) A_2BC_2 (4) ABC_3

96 The rate of a reaction quadruples when temperature changes from 27°C to 57°C. Calculate the energy of activation.

Given R = 8.314 J K^{-1} mol^{-1}, log 4 = 0.6021

(1) 3.80 kJ/mol

(2) 3804 kJ/mol

(3) 38.04 kJ/mol

(4) 380.4 kJ/mol

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97 Identify the **correct** answer.

(1) Dipole moment of NF_3 is greater than that of NH_3.

(2) Three canonical forms can be drawn for CO_3^{2-} ion.

(3) Three resonance structures can be drawn for ozone.

(4) BF_3 has non-zero dipole moment.

98 The pair of lanthanoid ions which are diamagnetic is

(1) Gd^{3+} and Eu^{3+}

(2) Pm^{3+} and Sm^{3+}

(3) Ce^{4+} and Yb^{2+}

(4) Ce^{3+} and Eu^{2+}

99 Given below are two statements :

Statement I : $\left[Co(NH_3)_6\right]^{3+}$ is a homoleptic complex whereas $\left[Co(NH_3)_4Cl_2\right]^{+}$ is a heteroleptic complex.

Statement II : Complex $\left[Co(NH_3)_6\right]^{3+}$ has only one kind of ligands but $\left[Co(NH_3)_4Cl_2\right]^{+}$ has more than one kind of ligands.

In the light of the above statements, choose the *correct* answer from the options given below:

(1) Statement I is true but Statement II is false.

(2) Statement I is false but Statement II is true.

(3) Both Statement I and Statement II are true.

(4) Both Statement I and Statement II are false.

100 Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is:

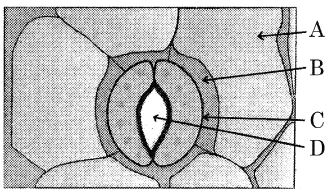
(Given : Molar mass of Cu : 63 g mol^{-1}, 1F = 96487 C)

(1) 31.5 g (2) 0.0315 g

(3) 3.15 g (4) 0.315 g

Botany : Section-A (Q. No. 101 to 135)

101 In the given figure, which component has thin outer walls and highly thickened inner walls?



(1) A (2) B

(3) C (4) D

102 List of endangered species was released by-

(1) FOAM (2) IUCN

(3) GEAC (4) WWF

103 The type of conservation in which the threatened species are taken out from their natural habitat and placed in special setting where they can be protected and given special care is called;

(1) Semi-conservative method

(2) Sustainable development

(3) *in-situ* conservation

(4) Biodiversity conservation

104 Which one of the following can be explained on the basis of Mendel's Law of Dominance?

A. Out of one pair of factors one is dominant and the other is recessive.

B. Alleles do not show any expression and both the characters appear as such in F_2 generation.

C. Factors occur in pairs in normal diploid plants.

D. The discrete unit controlling a particular character is called factor.

E. The expression of only one of the parental characters is found in a monohybrid cross.

Choose the correct answer from the options given below:

(1) B, C and D only

(2) A, B, C, D and E

(3) A, B and C only

(4) A, C, D and E only

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105 The lactose present in the growth medium of bacteria is transported to the cell by the action of:
(1) Permease
(2) Polymerase
(3) Beta-galactosidase
(4) Acetylase

106 Match List I with List II

	List I		List II
A.	*Clostridium butylicum*	I.	Ethanol
B.	*Saccharomyces cerevisiae*	II.	Streptokinase
C.	*Trichoderma polysporum*	III.	Butyric acid
D.	*Streptococcus* sp.	IV.	Cyclosporin-A

Choose the correct answer from the options given below:
(1) A-III, B-I, C-IV, D-II
(2) A-IV, B-I, C-III, D-II
(3) A-III, B-I, C-II, D-IV
(4) A-II, B-IV, C-III, D-I

107 The equation of Verhulst-Pearl logistic growth is

$$\frac{dN}{dt} = rN\left[\frac{K-N}{K}\right].$$

From this equation, K indicates:
(1) Carrying capacity
(2) Population density
(3) Intrinsic rate of natural increase
(4) Biotic potential

108 A transcription unit in DNA is defined primarily by the three regions in DNA and these are with respect to upstream and down stream end;
(1) Inducer, Repressor, Structural gene
(2) Promotor, Structural gene, Terminator
(3) Repressor, Operator gene, Structural gene
(4) Structural gene, Transposons, Operator gene

109 Formation of interfascicular cambium from fully developed parenchyma cells is an example for
(1) Dedifferentiation
(2) Maturation
(3) Differentiation
(4) Redifferentiation

110 Match List I with List II

	List I		List II
A.	*Rhizopus*	I.	Mushroom
B.	*Ustilago*	II.	Smut fungus
C.	*Puccinia*	III.	Bread mould
D.	*Agaricus*	IV.	Rust fungus

Choose the correct answer from the options given below:
(1) A-III, B-II, C-I, D-IV
(2) A-IV, B-III, C-II, D-I
(3) A-III, B-II, C-IV, D-I
(4) A-I, B-III, C-II, D-IV

111 What is the fate of a piece of DNA carrying only gene of interest which is transferred into an alien organism?
A. The piece of DNA would be able to multiply itself independently in the progeny cells of the organism.
B. It may get integrated into the genome of the recipient.
C. It may multiply and be inherited along with the host DNA.
D. The alien piece of DNA is not an integral part of chromosome.
E. It shows ability to replicate.
Choose the correct answer from the options given below:
(1) B and C only
(2) A and E only
(3) A and B only
(4) D and E only

112 Match List I with List II

	List I		List II
A.	Nucleolus	I.	Site of formation of glycolipid
B.	Centriole	II.	Organization like the cartwheel
C.	Leucoplasts	III.	Site for active ribosomal RNA synthesis
D.	Golgi apparatus	IV.	For storing nutrients

Choose the correct answer from the options given below:
(1) A-III, B-IV, C-II, D-I
(2) A-I, B-II, C-III, D-IV
(3) A-III, B-II, C-IV, D-I
(4) A-II, B-III, C-I, D-IV

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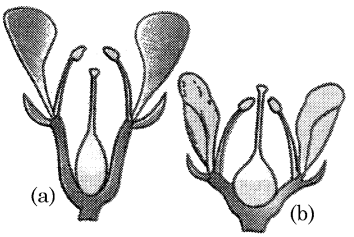
113 Identify the type of flowers based on the position of calyx, corolla and androecium with respect to the ovary from the given figures (a) and (b)



(1) (a) Perigynous; (b) Epigynous
(2) (a) Perigynous; (b) Perigynous
(3) (a) Epigynous; (b) Hypogynous
(4) (a) Hypogynous; (b) Epigynous

114 Spindle fibers attach to kinetochores of chromosomes during
(1) Anaphase (2) Telophase
(3) Prophase (4) Metaphase

115 These are regarded as major causes of biodiversity loss:
A. Over exploitation
B. Co-extinction
C. Mutation
D. Habitat loss and fragmentation
E. Migration
Choose the correct option:
(1) A, B and E only
(2) A, B and D only
(3) A, C and D only
(4) A, B, C and D only

116 Lecithin, a small molecular weight organic compound found in living tissues, is an example of:
(1) Glycerides
(2) Carbohydrates
(3) Amino acids
(4) Phospholipids

117 Identify the set of correct statements:
A. The flowers of *Vallisneria* are colourful and produce nectar.
B. The flowers of waterlily are not pollinated by water.
C. In most of water-pollinated species, the pollen grains are protected from wetting.
D. Pollen grains of some hydrophytes are long and ribbon like.
E. In some hydrophytes, the pollen grains are carried passively inside water.
Choose the correct answer from the options given below:
(1) A, C, D and E only
(2) B, C, D and E only
(3) C, D and E only
(4) A, B, C and D only

118 The cofactor of the enzyme carboxypeptidase is:
(1) Flavin (2) Haem
(3) Zinc (4) Niacin

119 Inhibition of Succinic dehydrogenase enzyme by malonate is a classical example of:
(1) Competitive inhibition
(2) Enzyme activation
(3) Cofactor inhibition
(4) Feedback inhibition

120 Which of the following is an example of actinomorphic flower?
(1) *Pisum* (2) *Sesbania*
(3) *Datura* (4) *Cassia*

121 Given below are two statements:
Statement I : Chromosomes become gradually visible under light microscope during leptotene stage.
Statement II : The begining of diplotene stage is recognized by dissolution of synaptonemal complex.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement I is true but Statement II is false
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are true
(4) Both Statement I and Statement II are false

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122 A pink flowered Snapdragon plant was crossed with a red flowered Snapdragon plant. What type of phenotype/s is/are expected in the progeny?

(1) Only pink flowered plants

(2) Red, Pink as well as white flowered plants

(3) Only red flowered plants

(4) Red flowered as well as pink flowered plants

123 Given below are two statements:

Statement I : Parenchyma is living but collenchyma is dead tissue.

Statement II : Gymnosperms lack xylem vessels but presence of xylem vessels is the characteristic of angiosperms.

In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is true but Statement II is false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

124 Given below are two statements:

Statement I : Bt toxins are insect group specific and coded by a gene *cry* IAc.

Statement II : Bt toxin exists as inactive protoxin in *B. thuringiensis*. However, after ingestion by the insect the inactive protoxin gets converted into active form due to acidic pH of the insect gut.

In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is true but Statement II is false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

125 Which one of the following is not a criterion for classification of fungi?

(1) Mode of spore formation

(2) Fruiting body

(3) Morphology of mycelium

(4) Mode of nutrition

126 The capacity to generate a whole plant from any cell of the plant is called:

(1) Differentiation

(2) Somatic hybridization

(3) Totipotency

(4) Micropropagation

127 Which of the following are required for the dark reaction of photosynthesis?

A. Light

B. Chlorophyll

C. CO_2

D. ATP

E. NADPH

Choose the correct answer from the options given below:

(1) C, D and E only

(2) D and E only

(3) A, B and C only

(4) B, C and D only

128 Tropical regions show greatest level of species richness because

A. Tropical latitudes have remained relatively undisturbed for millions of years, hence more time was available for species diversification.

B. Tropical environments are more seasonal.

C. More solar energy is available in tropics.

D. Constant environments promote niche specialization.

E. Tropical environments are constant and predictable.

Choose the correct answer from the options given below:

(1) A, B and E only

(2) A, B and D only

(3) A, C, D and E only

(4) A and B only

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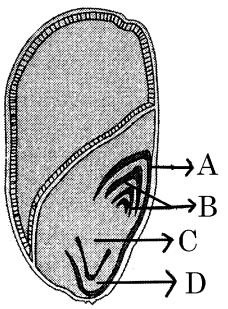
129 Identify the part of the seed from the given figure which is destined to form root when the seed germinates.



(1) C (2) D
(3) A (4) B

130 How many molecules of ATP and NADPH are required for every molecule of CO_2 fixed in the Calvin cycle?

(1) 3 molecules of ATP and 3 molecules of NADPH
(2) 3 molecules of ATP and 2 molecules of NADPH
(3) 2 molecules of ATP and 3 molecules of NADPH
(4) 2 molecules of ATP and 2 molecules of NADPH

131 In a plant, black seed color (BB/Bb) is dominant over white seed color (bb). In order to find out the genotype of the black seed plant, with which of the following genotype will you cross it?

(1) Bb (2) BB/Bb
(3) BB (4) bb

132 Hind II always cuts DNA molecules at a particular point called recognition sequence and it consists of:

(1) 4 bp (2) 10 bp
(3) 8 bp (4) 6 bp

133 Bulliform cells are responsible for

(1) Increased photosynthesis in monocots.
(2) Providing large spaces for storage of sugars.
(3) Inward curling of leaves in monocots.
(4) Protecting the plant from salt stress.

134 Match List I with List II

	List I		**List II**
A.	Two or more alternative forms of a gene	I.	Back cross
B.	Cross of F_1 progeny with homozygous recessive parent	II.	Ploidy
C.	Cross of F_1 progeny with any of the parents	III.	Allele
D.	Number of chromosome sets in plant	IV.	Test cross

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-I, D-II
(2) A-IV, B-III, C-II, D-I
(3) A-I, B-II, C-III, D-IV
(4) A-II, B-I, C-III, D-IV

135 Auxin is used by gardeners to prepare weed-free lawns. But no damage is caused to grass as auxin

(1) does not affect mature monocotyledonous plants.
(2) can help in cell division in grasses, to produce growth.
(3) promotes apical dominance.
(4) promotes abscission of mature leaves only.

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Botany : Section-B (Q. No. 136 to 150)

136 Match List I with List II

	List I		List II
A.	Rose	I.	Twisted aestivation
B.	Pea	II.	Perigynous flower
C.	Cotton	III.	Drupe
D.	Mango	IV.	Marginal placentation

Choose the correct answer from the options given below:

(1) A-IV, B-III, C-II, D-I

(2) A-II, B-III, C-IV, D-I

(3) A-II, B-IV, C-I, D-III

(4) A-I, B-II, C-III, D-IV

137 The DNA present in chloroplast is:

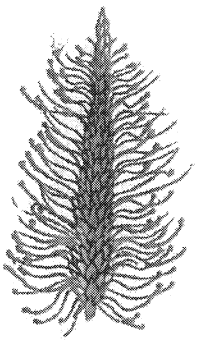
(1) Linear, single stranded

(2) Circular, single stranded

(3) Linear, double stranded

(4) Circular, double stranded

138 Identify the correct description about the given figure:



(1) Cleistogamous flowers showing autogamy.

(2) Compact inflorescence showing complete autogamy.

(3) Wind pollinated plant inflorescence showing flowers with well exposed stamens.

(4) Water pollinated flowers showing stamens with mucilaginous covering.

139 Match List I with List II

	List I		List II
A.	Robert May	I.	Species-Area relationship
B.	Alexander von Humboldt	II.	Long term ecosystem experiment using out door plots
C.	Paul Ehrlich	III.	Global species diversity at about 7 million
D.	David Tilman	IV.	Rivet popper hypothesis

Choose the correct answer from the options given below:

(1) A-I, B-III, C-II, D-IV

(2) A-III, B-IV, C-II, D-I

(3) A-II, B-III, C-I, D-IV

(4) A-III, B-I, C-IV, D-II

140 Given below are two statements:

Statement I : In C_3 plants, some O_2 binds to RuBisCO, hence CO_2 fixation is decreased.

Statement II : In C_4 plants, mesophyll cells show very little photorespiration while bundle sheath cells do not show photorespiration.

In the light of the above statements, choose the *correct* answer from the options given below:

(1) Statement I is true but Statement II is false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

141 Identify the step in tricarboxylic acid cycle, which does not involve oxidation of substrate.

(1) Succinyl-CoA $\rightarrow$ Succinic acid

(2) Isocitrate $\rightarrow$ α-ketoglutaric acid

(3) Malic acid $\rightarrow$ Oxaloacetic acid

(4) Succinic acid $\rightarrow$ Malic acid

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142 Match List I with List II

	List I		List II
A.	Citric acid cycle	I.	Cytoplasm
B.	Glycolysis	II.	Mitochondrial matrix
C.	Electron transport system	III.	Intermembrane space of mitochondria
D.	Proton gradient	IV.	Inner mitochondrial membrane

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-I, D-II
(2) A-IV, B-III, C-II, D-I
(3) A-I, B-II, C-III, D-IV
(4) A-II, B-I, C-IV, D-III

143 Which of the following are fused in somatic hybridization involving two varieties of plants?

(1) Protoplasts
(2) Pollens
(3) Callus
(4) Somatic embryos

144 Match List I with List II

	List I		List II
A.	GLUT-4	I.	Hormone
B.	Insulin	II.	Enzyme
C.	Trypsin	III.	Intercellular ground substance
D.	Collagen	IV.	Enables glucose transport into cells

Choose the correct answer from the options given below:

(1) A-II, B-III, C-IV, D-I
(2) A-III, B-IV, C-I, D-II
(3) A-IV, B-I, C-II, D-III
(4) A-I, B-II, C-III, D-IV

145 Match List I with List II

	List I (Types of Stamens)		List II (Example)
A.	Monoadelphous	I.	Citrus
B.	Diadelphous	II.	Pea
C.	Polyadelphous	III.	Lily
D.	Epiphyllous	IV.	China-rose

Choose the correct answer from the options given below:

(1) A-I, B-II, C-IV, D-III
(2) A-III, B-I, C-IV, D-II
(3) A-IV, B-II, C-I, D-III
(4) A-IV, B-I, C-II, D-III

146 Read the following statements and choose the set of correct statements:

In the members of Phaeophyceae,

A. Asexual reproduction occurs usually by biflagellate zoospores.
B. Sexual reproduction is by oogamous method only.
C. Stored food is in the form of carbohydrates which is either mannitol or laminarin.
D. The major pigments found are chlorophyll a, c and carotenoids and xanthophyll.
E. Vegetative cells have a cellulosic wall, usually covered on the outside by gelatinous coating of algin.

Choose the correct answer from the options given below:

(1) A, C, D and E only
(2) A, B, C and E only
(3) A, B, C and D only
(4) B, C, D and E only

147 Match List I with List II

	List I		List II
A.	Frederick Griffith	I.	Genetic code
B.	Francois Jacob & Jacque Monod	II.	Semi-conservative mode of DNA replication
C.	Har Gobind Khorana	III.	Transformation
D.	Meselson & Stahl	IV.	*Lac* operon

Choose the correct answer from the options given below:

(1) A-II, B-III, C-IV, D-I
(2) A-IV, B-I, C-II, D-III
(3) A-III, B-II, C-I, D-IV
(4) A-III, B-IV, C-I, D-II

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Zoology : Section-A (Q. No. 151 to 185)

148 Which of the following statement is correct regarding the process of replication in *E.coli*?

(1) The DNA dependent DNA polymerase catalyses polymerization in 5' → 3' as well as 3' → 5' direction.

(2) The DNA dependent DNA polymerase catalyses polymerization in 5' → 3' direction.

(3) The DNA dependent DNA polymerase catalyses polymerization in one direction that is 3' → 5'.

(4) The DNA dependent RNA polymerase catalyses polymerization in one direction, that is 5' → 3'.

149 Spraying sugarcane crop with which of the following plant growth regulators, increases the length of stem, thus, increasing the yield?

(1) Cytokinin

(2) Abscisic acid

(3) Auxin

(4) Gibberellin

150 In an ecosystem if the Net Primary Productivity (NPP) of first trophic level is

$100x\,(kcal\,m^{-2})\,yr^{-1}$, what would be the GPP (Gross Primary Productivity) of the third trophic level of the same ecosystem?

(1) $10x\,(kcal\,m^{-2})\,yr^{-1}$

(2) $\frac{100x}{3x}\,(kcal\,m^{-2})\,yr^{-1}$

(3) $\frac{x}{10}\,(kcal\,m^{-2})\,yr^{-1}$

(4) $x\,(kcal\,m^{-2})\,yr^{-1}$

151 Match List I with List II :

	List I		**List II**
A.	Down's syndrome	I.	11^{th} chromosome
B.	α-Thalassemia	II.	'X' chromosome
C.	β-Thalassemia	III.	21^{st} chromosome
D.	Klinefelter's syndrome	IV.	16^{th} chromosome

Choose the correct answer from the options given below :

(1) A-III, B-IV, C-I, D-II

(2) A-IV, B-I, C-II, D-III

(3) A-I, B-II, C-III, D-IV

(4) A-II, B-III, C-IV, D-I

152 Match List I with List II :

	List I (Sub Phases of Prophase I)		**List II (Specific characters)**
A.	Diakinesis	I.	Synaptonemal complex formation
B.	Pachytene	II.	Completion of terminalisation of chiasmata
C.	Zygotene	III.	Chromosomes look like thin threads
D.	Leptotene	IV.	Appearance of recombination nodules

Choose the correct answer from the options given below :

(1) A-II, B-IV, C-I, D-III

(2) A-IV, B-III, C-II, D-I

(3) A-IV, B-II, C-III, D-I

(4) A-I, B-II, C-IV, D-III

153 Which of the following factors are favourable for the formation of oxyhaemoglobin in alveoli?

(1) Low pCO_2 and High H^+ concentration

(2) Low pCO_2 and High temperature

(3) High pO_2 and High pCO_2

(4) High pO_2 and Lesser H^+ concentration

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154 Match List I with List II :

List I		List II
A.	Typhoid	I. Fungus
B.	Leishmaniasis	II. Nematode
C.	Ringworm	III. Protozoa
D.	Filariasis	IV. Bacteria

Choose the correct answer from the options given below :

(1) A-III, B-I, C-IV, D-II
(2) A-II, B-IV, C-III, D-I
(3) A-I, B-III, C-II, D-IV
(4) A-IV, B-III, C-I, D-II

155 Match List I with List II :

List I		List II
A.	Expiratory capacity	I. Expiratory reserve volume + Tidal volume + Inspiratory reserve volume
B.	Functional residual capacity	II. Tidal volume + Expiratory reserve volume
C.	Vital capacity	III. Tidal volume + Inspiratory reserve volume
D.	Inspiratory capacity	IV. Expiratory reserve volume + Residual volume

Choose the correct answer from the options given below :

(1) A-II, B-I, C-IV, D-III
(2) A-I, B-III, C-II, D-IV
(3) A-II, B-IV, C-I, D-III
(4) A-III, B-II, C-IV, D-I

156 Which of the following are Autoimmune disorders?

A. Myasthenia gravis
B. Rheumatoid arthritis
C. Gout
D. Muscular dystrophy
E. Systemic Lupus Erythematosus (SLE)

Choose the most appropriate answer from the options given below :

(1) B, C & E only
(2) C, D & E only
(3) A, B & D only
(4) A, B & E only

157 Given below are two statements :

Statement I : In the nephron, the descending limb of loop of Henle is impermeable to water and permeable to electrolytes.

Statement II : The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are true
(4) Both Statement I and Statement II are false

158 Which of the following is not a steroid hormone?

(1) Progesterone
(2) Glucagon
(3) Cortisol
(4) Testosterone

159 Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : FSH acts upon ovarian follicles in female and Leydig cells in male.

Reason R : Growing ovarian follicles secrete estrogen in female while interstitial cells secrete androgen in male human being.

In the light of the above statements, choose the correct answer from the options given below :

(1) A is true but R is false
(2) A is false but R is true
(3) Both A and R are true and R is the correct explanation of A.
(4) Both A and R are true but R is NOT the correct explanation of A.

160 Given below are some stages of human evolution. Arrange them in correct sequence. (Past to Recent)

A. *Homo habilis*
B. *Homo sapiens*
C. *Homo neanderthalensis*
D. *Homo erectus*

Choose the correct sequence of human evolution from the options given below :

(1) C-B-D-A (2) A-D-C-B
(3) D-A-C-B (4) B-A-D-C

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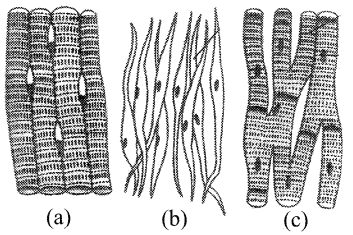
161 Three types of muscles are given as a, b and c. Identify the correct matching pair along with their location in human body :



Name of muscle/location

(1) (a) Skeletal - Biceps
(b) Involuntary - Intestine
(c) Smooth - Heart.

(2) (a) Involuntary - Nose tip
(b) Skeletal - Bone
(c) Cardiac - Heart.

(3) (a) Smooth - Toes
(b) Skeletal - Legs
(c) Cardiac - Heart.

(4) (a) Skeletal - Triceps
(b) Smooth - Stomach
(c) Cardiac - Heart.

162 Match List I with List II :

	List I		**List II**
A.	Cocaine	I.	Effective sedative in surgery
B.	Heroin	II.	*Cannabis sativa*
C.	Morphine	III.	*Erythroxylum*
D.	Marijuana	IV.	*Papaver somniferum*

Choose the correct answer from the options given below :

(1) A-II, B-I, C-III, D-IV
(2) A-III, B-IV, C-I, D-II
(3) A-IV, B-III, C-I, D-II
(4) A-I, B-III, C-II, D-IV

163 The "Ti plasmid" of *Agrobacterium tumefaciens* stands for

(1) Tumor inducing plasmid
(2) Temperature independent plasmid
(3) Tumour inhibiting plasmid
(4) Tumor independent plasmid

164 Which one is the correct product of DNA dependent RNA polymerase to the given template?

3'TACATGGCAAATATCCATTCA5'

(1) 5'AUGUACCGUUUAUAGGGAAGU3'
(2) 5'ATGTACCGTTTATAGGTAAGT3'
(3) 5'AUGUACCGUUUAUAGGUAAGU3'
(4) 5'AUGUAAAGUUUAUAGGUAAGU3'

165 Match List I with List II :

	List I		**List II**
A.	*Pterophyllum*	I.	Hag fish
B.	*Myxine*	II.	Saw fish
C.	*Pristis*	III.	Angel fish
D.	*Exocoetus*	IV.	Flying fish

Choose the correct answer from the options given below :

(1) A-IV, B-I, C-II, D-III
(2) A-III, B-II, C-I, D-IV
(3) A-II, B-I, C-III, D-IV
(4) A-III, B-I, C-II, D-IV

166 Match List I with List II :

	List I		**List II**
A.	Fibrous joints	I.	Adjacent vertebrae, limited movement
B.	Cartilaginous joints	II.	Humerus and Pectoral girdle, rotational movement
C.	Hinge joints	III.	Skull, don't allow any movement
D.	Ball and socket joints	IV.	Knee, help in locomotion

Choose the correct answer from the options given below :

(1) A-II, B-III, C-I, D-IV
(2) A-III, B-I, C-IV, D-II
(3) A-IV, B-II, C-III, D-I
(4) A-I, B-III, C-II, D-IV

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167 The flippers of the Penguins and Dolphins are the example of the

(1) Convergent evolution

(2) Divergent evolution

(3) Adaptive radiation

(4) Natural selection

168 Match List I with List II :

	List I		List II
A.	α-1 antitrypsin	I.	Cotton bollworm
B.	Cry IAb	II.	ADA deficiency
C.	Cry IAc	III.	Emphysema
D.	Enzyme replacement therapy	IV.	Corn borer

Choose the correct answer from the options given below :

(1) A-III, B-IV, C-I, D-II

(2) A-II, B-IV, C-I, D-III

(3) A-II, B-I, C-IV, D-III

(4) A-III, B-I, C-II, D-IV

169 Match List I with List II :

	List I		List II
A.	Axoneme	I.	Centriole
B.	Cartwheel pattern	II.	Cilia and flagella
C.	Crista	III.	Chromosome
D.	Satellite	IV.	Mitochondria

Choose the correct answer from the options given below :

(1) A-II, B-IV, C-I, D-III

(2) A-II, B-I, C-IV, D-III

(3) A-IV, B-III, C-II, D-I

(4) A-IV, B-II, C-III, D-I

170 Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : Breast-feeding during initial period of infant growth is recommended by doctors for bringing a healthy baby.

Reason R : Colostrum contains several antibodies absolutely essential to develop resistance for the new born baby.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) A is correct but R is not correct.

(2) A is not correct but R is correct.

(3) Both A and R are correct and R is the correct explanation of A.

(4) Both A and R are correct but R is NOT the correct explanation of A.

171 Which of the following is not a component of Fallopian tube?

(1) Infundibulum

(2) Ampulla

(3) Uterine fundus

(4) Isthmus

172 Which of the following statements is incorrect?

(1) Bio-reactors are used to produce small scale bacterial cultures.

(2) Bio-reactors have an agitator system, an oxygen delivery system and foam control system.

(3) A bio-reactor provides optimal growth conditions for achieving the desired product.

(4) Most commonly used bio-reactors are of stirring type.

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173 Match List I with List II :

	List I		List II
A.	Pons	I.	Provides additional space for Neurons, regulates posture and balance.
B.	Hypothalamus	II.	Controls respiration and gastric secretions.
C.	Medulla	III.	Connects different regions of the brain.
D.	Cerebellum	IV.	Neuro secretory cells

Choose the correct answer from the options given below :

(1) A-I, B-III, C-II, D-IV
(2) A-II, B-I, C-III, D-IV
(3) A-II, B-III, C-I, D-IV
(4) A-III, B-IV, C-II, D-I

174 Match List I with List II :

	List I		List II
A.	Lipase	I.	Peptide bond
B.	Nuclease	II.	Ester bond
C.	Protease	III.	Glycosidic bond
D.	Amylase	IV.	Phosphodiester bond

Choose the correct answer from the options given below :

(1) A-II, B-IV, C-I, D-III
(2) A-IV, B-I, C-III, D-II
(3) A-IV, B-II, C-III, D-I
(4) A-III, B-II, C-I, D-IV

175 Which of the following is not a natural/traditional contraceptive method?

(1) Lactational amenorrhea
(2) Vaults
(3) Coitus interruptus
(4) Periodic abstinence

176 Following are the stages of pathway for conduction of an action potential through the heart:

A. AV bundle
B. Purkinje fibres
C. AV node
D. Bundle branches
E. SA node

Choose the correct sequence of pathway from the options given below :

(1) B-D-E-C-A (2) E-A-D-B-C
(3) E-C-A-D-B (4) A-E-C-B-D

177 Match List I with List II :

	List I		List II
A.	Pleurobrachia	I.	Mollusca
B.	Radula	II.	Ctenophora
C.	Stomochord	III.	Osteichthyes
D.	Air bladder	IV.	Hemichordata

Choose the correct answer from the options given below :

(1) A-II, B-IV, C-I, D-III
(2) A-IV, B-III, C-II, D-I
(3) A-IV, B-II, C-III, D-I
(4) A-II, B-I, C-IV, D-III

178 Match List I with List II :

	List I		List II
A.	Common cold	I.	*Plasmodium*
B.	Haemozoin	II.	Typhoid
C.	Widal test	III.	Rhinoviruses
D.	Allergy	IV.	Dust mites

Choose the correct answer from the options given below :

(1) A-III, B-I, C-II, D-IV
(2) A-IV, B-II, C-III, D-I
(3) A-II, B-IV, C-III, D-I
(4) A-I, B-III, C-II, D-IV

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179 Consider the following statements :

A. Annelids are true coelomates

B. Poriferans are pseudocoelomates

C. Aschelminthes are acoelomates

D. Platyhelminthes are pseudocoelomates

Choose the correct answer from the options given below :

(1) C only (2) D only

(3) B only (4) A only

180 In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on :

(1) 8^{th} and 9^{th} segment

(2) 11^{th} segment

(3) 5^{th} segment

(4) 10^{th} segment

181 Given below are two statements :

Statement I : The presence or absence of hymen is not a reliable indicator of virginity.

Statement II : The hymen is torn during the first coitus only.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

182 Which one of the following factors will not affect the Hardy-Weinberg equilibrium?

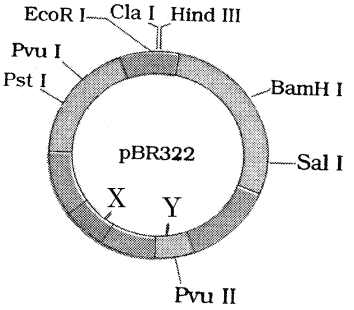
(1) Gene migration

(2) Constant gene pool

(3) Genetic recombination

(4) Genetic drift

183 The following diagram showing restriction sites in *E.coli* cloning vector pBR322. Find the role of '*X*' and '*Y*' genes :



(1) The gene 'X' is for protein involved in replication of Plasmid and '*Y*' for resistance to antibiotics.

(2) Gene '*X*' is responsible for recognition sites and '*Y*' is responsible for antibiotic resistance.

(3) The gene '*X*' is responsible for resistance to antibiotics and '*Y*' for protein involved in the replication of Plasmid.

(4) The gene '*X*' is responsible for controlling the copy number of the linked DNA and '*Y*' for protein involved in the replication of Plasmid.

184 Match List I with List II :

	List I		**List II**
A.	Non-medicated IUD	I.	Multiload 375
B.	Copper releasing IUD	II.	Progestogens
C.	Hormone releasing IUD	III.	Lippes loop
D.	Implants	IV.	LNG-20

Choose the correct answer from the options given below :

(1) A-IV, B-I, C-II, D-III

(2) A-III, B-I, C-IV, D-II

(3) A-III, B-I, C-II, D-IV

(4) A-I, B-III, C-IV, D-II

185 Following are the stages of cell division :

A. Gap 2 phase

B. Cytokinesis

C. Synthesis phase

D. Karyokinesis

E. Gap 1 phase

Choose the correct sequence of stages from the options given below :

(1) B-D-E-A-C (2) E-C-A-D-B

(3) C-E-D-A-B (4) E-B-D-A-C

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Zoology : Section-B (Q. No. 186 to 200)

186 Choose the correct statement given below regarding juxta medullary nephron.

(1) Loop of Henle of juxta medullary nephron runs deep into medulla.

(2) Juxta medullary nephrons outnumber the cortical nephrons.

(3) Juxta medullary nephrons are located in the columns of Bertini.

(4) Renal corpuscle of juxta medullary nephron lies in the outer portion of the renal medulla.

187 The following are the statements about non-chordates :

A. Pharynx is perforated by gill slits.

B. Notochord is absent.

C. Central nervous system is dorsal.

D. Heart is dorsal if present.

E. Post anal tail is absent.

Choose the most appropriate answer from the options given below :

(1) B, D & E only

(2) B, C & D only

(3) A & C only

(4) A, B & D only

188 Given below are two statements :

Statement I : Mitochondria and chloroplasts are both double membrane bound organelles.

Statement II : Inner membrane of mitochondria is relatively less permeable, as compared to chloroplast.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect.

(2) Statement I is incorrect but Statement II is correct.

(3) Both Statement I and Statement II are correct.

(4) Both Statement I and Statement II are incorrect.

189 Regarding catalytic cycle of an enzyme action, select the correct sequential steps :

A. Substrate enzyme complex formation.

B. Free enzyme ready to bind with another substrate.

C. Release of products.

D. Chemical bonds of the substrate broken.

E. Substrate binding to active site.

Choose the correct answer from the options given below :

(1) B, A, C, D, E

(2) E, D, C, B, A

(3) E, A, D, C, B

(4) A, E, B, D, C

190 Match List I with List II :

List I	**List II**
A. P wave	I. Heart muscles are electrically silent.
B. QRS complex	II. Depolarisation of ventricles.
C. T wave	III. Depolarisation of atria.
D. T-P gap	IV. Repolarisation of ventricles.

Choose the correct answer from the options given below :

(1) A-II, B-III, C-I, D-IV

(2) A-IV, B-II, C-I, D-III

(3) A-I, B-III, C-IV, D-II

(4) A-III, B-II, C-IV, D-I

191 Given below are two statements :

Statement I : Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced.

Statement II : Both bone marrow and thymus provide micro environments for the development and maturation of T-lymphocytes.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect.

(2) Statement I is incorrect but Statement II is correct.

(3) Both Statement I and Statement II are correct.

(4) Both Statement I and Statement II are incorrect.

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192 Match List I with List II :

	List I		List II
A.	Unicellular glandular epithelium	I.	Salivary glands
B.	Compound epithelium	II.	Pancreas
C.	Multicellular glandular epithelium	III.	Goblet cells of alimentary canal
D.	Endocrine glandular epithelium	IV.	Moist surface of buccal cavity

Choose the correct answer from the options given below :

(1) A-III, B-IV, C-I, D-II
(2) A-II, B-I, C-IV, D-III
(3) A-II, B-I, C-III, D-IV
(4) A-IV, B-III, C-I, D-II

193 Given below are two statements :

Statement I : The cerebral hemispheres are connected by nerve tract known as corpus callosum.

Statement II : The brain stem consists of the medulla oblongata, pons and cerebrum.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect.
(2) Statement I is incorrect but Statement II is correct.
(3) Both Statement I and Statement II are correct.
(4) Both Statement I and Statement II are incorrect.

194 Match List I with List II :

	List I		List II
A.	RNA polymerase III	I.	snRNPs
B.	Termination of transcription	II.	Promotor
C.	Splicing of Exons	III.	Rho factor
D.	TATA box	IV.	SnRNAs, tRNA

Choose the correct answer from the options given below :

(1) A-III, B-IV, C-I, D-II
(2) A-IV, B-III, C-I, D-II
(3) A-II, B-IV, C-I, D-III
(4) A-III, B-II, C-IV, D-I

195 Match List I with List II :

	List I		List II
A.	Mesozoic Era	I.	Lower invertebrates
B.	Proterozoic Era	II.	Fish & Amphibia
C.	Cenozoic Era	III.	Birds & Reptiles
D.	Paleozoic Era	IV.	Mammals

Choose the correct answer from the options given below :

(1) A-I, B-II, C-IV, D-III
(2) A-III, B-I, C-IV, D-II
(3) A-II, B-I, C-III, D-IV
(4) A-III, B-I, C-II, D-IV

196 Given below are two statements :

Statement I : Gause's competitive exclusion principle states that two closely related species competing for different resources cannot exist indefinitely.

Statement II : According to Gause's principle, during competition, the inferior will be eliminated. This may be true if resources are limiting.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Both Statement I and Statement II are false.

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197 Match List I with List II :

	List I		List II
A.	Exophthalmic goiter	I.	Excess secretion of cortisol, moon face & hyperglycemia
B.	Acromegaly	II.	Hypo-secretion of thyroid hormone and stunted growth.
C.	Cushing's syndrome	III.	Hyper secretion of thyroid hormone & protruding eye balls.
D.	Cretinism	IV.	Excessive secretion of growth hormone.

Choose the correct answer from the options given below :

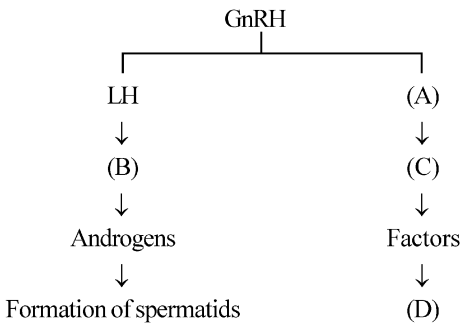
(1) A-III, B-IV, C-II, D-I

(2) A-III, B-IV, C-I, D-II

(3) A-I, B-III, C-II, D-IV

(4) A-IV, B-II, C-I, D-III

198 Identify the correct option (A), (B), (C), (D) with respect to spermatogenesis.



(1) FSH, Sertoli cells, Leydig cells, spermatogenesis.

(2) ICSH, Leydig cells, Sertoli cells, spermatogenesis.

(3) FSH, Leydig cells, Sertoli cells, spermiogenesis

(4) ICSH, Interstitial cells, Leydig cells, spermiogenesis.

199 As per ABO blood grouping system, the blood group of father is B^+, mother is A^+ and child is O^+. Their respective genotype can be

A. I^Bi / I^Ai / ii

B. I^BI^B / I^AI^A / ii

C. I^AI^B / iI^A / I^Bi

D. I^Ai / I^Bi / I^Ai

E. iI^B / iI^A / I^AI^B

Choose the most appropriate answer from the options given below :

(1) C & B only (2) D & E only

(3) A only (4) B only

200 Match List I with List II related to digestive system of cockroach.

	List I		List II
A.	The structures used for storing of food.	I.	Gizzard
B.	Ring of 6-8 blind tubules at junction of foregut and midgut.	II.	Gastric Caeca
C.	Ring of 100-150 yellow coloured thin filaments at junction of midgut and hindgut.	III.	Malpighian tubules
D.	The structures used for grinding the food.	IV.	Crop

Choose the correct answer from the options given below :

(1) A-IV, B-III, C-II, D-I

(2) A-III, B-II, C-IV, D-I

(3) A-IV, B-II, C-III, D-I

(4) A-I, B-II, C-III, D-IV

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2023

Test Booklet Code

← Test Booklet No. **ENGLISH**

E1

ADI

This Booklet contains **32** pages, including Rough Page.

Do not open this Test Booklet until you are asked to do so.

Important Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on ORIGINAL Copy carefully with **blue/black** ball point pen only.
2. The test is of **3 hours 20 minutes** duration and the Test Booklet contains **200** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology). 50** questions in each subject are divided into **two Sections (A and B)** as per details given below:
   (a) **Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos – 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.
   (b) **Section B** shall consist of **15 (Fifteen)** questions in each subject (Question Nos – 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.
   Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.**
3. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one** mark will be deducted from the total scores. **The maximum marks are 720.**
4. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.
5. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
6. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy) to the Invigilator** before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.
7. **The CODE for this Booklet is E1. Make sure that the CODE printed on the Original Copy of the Answer Sheet is the same as that on this Test Booklet.** In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
8. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
9. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
10. Each candidate must show on-demand his/her Admit Card to the Invigilator.
11. No candidate, without special permission of the centre Superintendent or Invigilator, would leave his/her seat.
12. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign (with time) the Attendance Sheet **twice. Cases, where a candidate has not signed the Attendance Sheet second time, will be deemed not to have handed over the Answer Sheet and dealt with as an Unfair Means case.**
13. Use of Electronic/Manual Calculator is prohibited.
14. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per the Rules and Regulations of this examination.
15. **No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
16. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
17. Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of Scribe or not.

Name of the Candidate (in Capitals): _____

Roll Number : In figures _____

: In words _____

Centre of Examination (in Capitals): _____

Candidate's Signature: _____ Invigilator's Signature: _____

Facsimile signature stamp of Centre Superintendent

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Physics : Section-A (Q. No. 1 to 35)

1 Let a wire be suspended from the ceiling (rigid support) and stretched by a weight W attached at its free end. The longitudinal stress at any point of cross-sectional area A of the wire is :

(1) $2W/A$ (2) W/A

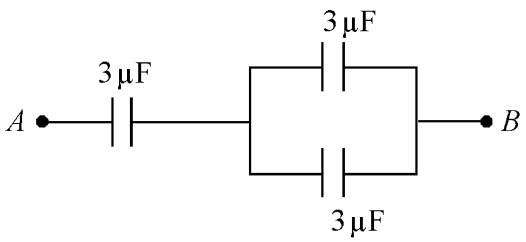
(3) $W/2A$ (4) Zero

2 The ratio of radius of gyration of a solid sphere of mass M and radius R about its own axis to the radius of gyration of the thin hollow sphere of same mass and radius about its axis is :

(1) 3 : 5 (2) 5 : 3

(3) 2 : 5 (4) 5 : 2

3 The equivalent capacitance of the system shown in the following circuit is :



(1) 2 μF (2) 3 μF

(3) 6 μF (4) 9 μF

4 A football player is moving southward and suddenly turns eastward with the same speed to avoid an opponent. The force that acts on the player while turning is :

(1) along eastward

(2) along northward

(3) along north-east

(4) along south-west

5 If $\oint_s \vec{E} \cdot \vec{dS} = 0$ over a surface, then :

(1) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.

(2) the magnitude of electric field on the surface is constant.

(3) all the charges must necessarily be inside the surface.

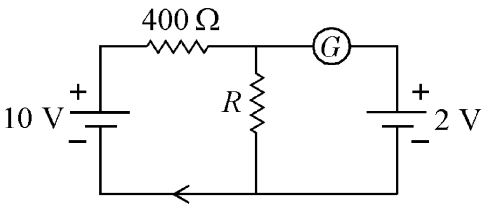
(4) the electric field inside the surface is necessarily uniform.

6 The potential energy of a long spring when stretched by 2 cm is U. If the spring is stretched by 8 cm, potential energy stored in it will be :

(1) 2U (2) 4U

(3) 8U (4) 16U

7 If the galvanometer G does not show any deflection in the circuit shown, the value of R is given by :



(1) 200 Ω (2) 50 Ω

(3) 100 Ω (4) 400 Ω

8 A 12 V, 60 W lamp is connected to the secondary of a step down transformer, whose primary is connected to ac mains of 220 V. Assuming the transformer to be ideal, what is the current in the primary winding?

(1) 0.27 A (2) 2.7 A

(3) 3.7 A (4) 0.37 A

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9 A full wave rectifier circuit consists of two p-n junction diodes, a centre-tapped transformer, capacitor and a load resistance. Which of these components remove the ac ripple from the rectified output?

(1) A centre-tapped transformer
(2) p-n junction diodes
(3) Capacitor
(4) Load resistance

10 Light travels a distance x in time t_1 in air and $10x$ in time t_2 in another denser medium. What is the critical angle for this medium?

(1) $\sin^{-1}\left(\frac{t_2}{t_1}\right)$ (2) $\sin^{-1}\left(\frac{10\,t_2}{t_1}\right)$

(3) $\sin^{-1}\left(\frac{t_1}{10\,t_2}\right)$ (4) $\sin^{-1}\left(\frac{10\,t_1}{t_2}\right)$

11 Resistance of a carbon resistor determined from colour codes is $(22000 \pm 5\%)\,\Omega$. The colour of third band must be :

(1) Red (2) Green
(3) Orange (4) Yellow

12 Given below are two statements:

Statement I : Photovoltaic devices can convert optical radiation into electricity.

Statement II : Zener diode is designed to operate under reverse bias in breakdown region.

In the light of the above statements, choose the ***most appropriate*** answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct.
(2) Both **Statement I** and **Statement II** are incorrect.
(3) **Statement I** is correct but **Statement II** is incorrect.
(4) **Statement I** is incorrect but **Statement II** is correct.

13 The magnetic energy stored in an inductor of inductance $4\ \mu H$ carrying a current of 2 A is :

(1) $4\ \mu J$ (2) $4\ mJ$
(3) $8\ mJ$ (4) $8\ \mu J$

14 The angular acceleration of a body, moving along the circumference of a circle, is :

(1) along the radius, away from centre
(2) along the radius towards the centre
(3) along the tangent to its position
(4) along the axis of rotation

15 A Carnot engine has an efficiency of 50% when its source is at a temperature 327° C. The temperature of the sink is :

(1) 27° C (2) 15° C
(3) 100° C (4) 200° C

16 Two bodies of mass m and $9m$ are placed at a distance R. The gravitational potential on the line joining the bodies where the gravitational field equals zero, will be (G = gravitational constant) :

(1) $-\frac{8\,Gm}{R}$ (2) $-\frac{12\,Gm}{R}$

(3) $-\frac{16\,Gm}{R}$ (4) $-\frac{20\,Gm}{R}$

17 A vehicle travels half the distance with speed ϑ and the remaining distance with speed 2ϑ. Its average speed is:

(1) $\frac{\vartheta}{3}$ (2) $\frac{2\vartheta}{3}$

(3) $\frac{4\vartheta}{3}$ (4) $\frac{3\vartheta}{4}$

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18 The amount of energy required to form a soap bubble of radius 2 cm from a soap solution is nearly : (surface tension of soap solution = 0.03 N m^{-1})

(1) 30.16×10^{-4}J (2) 5.06×10^{-4}J

(3) 3.01×10^{-4}J (4) 50.1×10^{-4}J

19 The minimum wavelength of *X*-rays produced by an electron accelerated through a potential difference of *V* volts is proportional to:

(1) $\sqrt{V}$ (2) $\frac{1}{V}$

(3) $\frac{1}{\sqrt{V}}$ (4) V^2

20 The half life of a radioactive substance is 20 minutes. In how much time, the activity of substance drops to $\left(\frac{1}{16}\right)^{th}$ of its initial value?

(1) 20 minutes (2) 40 minutes

(3) 60 minutes (4) 80 minutes

21 A metal wire has mass (0.4 ± 0.002) g, radius (0.3 ± 0.001) mm and length (5 ± 0.02) cm. The maximum possible percentage error in the measurement of density will nearly be:

(1) 1.2% (2) 1.3%

(3) 1.6% (4) 1.4%

22 In a plane electromagnetic wave travelling in free space, the electric field component oscillates sinusoidally at a frequency of 2.0×10^{10}Hz and amplitude 48 V m^{-1}. Then the amplitude of oscillating magnetic field is : (Speed of light in free space = 3×10^8 m s^{-1})

(1) 1.6×10^{-9}T (2) 1.6×10^{-8}T

(3) 1.6×10^{-7}T (4) 1.6×10^{-6}T

23 The temperature of a gas is –50° C. To what temperature the gas should be heated so that the rms speed is increased by 3 times?

(1) 669° C (2) 3295° C

(3) 3097 K (4) 223 K

24 An ac source is connected to a capacitor C. Due to decrease in its operating frequency :

(1) capacitive reactance decreases.

(2) displacement current increases.

(3) displacement current decreases.

(4) capacitive reactance remains constant

25 For Young's double slit experiment, two statements are given below:

Statement I : If screen is moved away from the plane of slits, angular separation of the fringes remains constant.

Statement II : If the monochromatic source is replaced by another monochromatic source of larger wavelength, the angular separation of fringes decreases.

In the light of the above statements, choose the *correct* answer from the options given below:

(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

(3) **Statement I** is true but **Statement II** is false.

(4) **Statement I** is false but **Statement II** is true.

26 In hydrogen spectrum, the shortest wavelength in the Balmer series is λ. The shortest wavelength in the Bracket series is :

(1) 2λ (2) 4λ

(3) 9λ (4) 16λ

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27 The work functions of Caesium (Cs), Potassium (K) and Sodium (Na) are 2.14 eV, 2.30 eV and 2.75 eV respectively. If incident electromagnetic radiation has an incident energy of 2.20 eV, which of these photosensitive surfaces may emit photoelectrons?

(1) Cs only
(2) Both Na and K
(3) K only
(4) Na only

28 The errors in the measurement which arise due to unpredictable fluctuations in temperature and voltage supply are :

(1) Instrumental errors
(2) Personal errors
(3) Least count errors
(4) Random errors

29 In a series *LCR* circuit, the inductance L is 10 mH, capacitance C is $1\ \mu F$ and resistance R is $100\ \Omega$. The frequency at which resonance occurs is :

(1) 15.9 rad/s (2) 15.9 kHz
(3) 1.59 rad/s (4) 1.59 kHz

30 The venturi-meter works on :

(1) Huygen's principle
(2) Bernoulli's principle
(3) The principle of parallel axes
(4) The principle of perpendicular axes

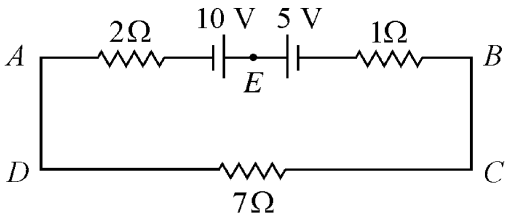
31 The ratio of frequencies of fundamental harmonic produced by an open pipe to that of closed pipe having the same length is :

(1) 1 : 2 (2) 2 : 1
(3) 1 : 3 (4) 3 : 1

32 An electric dipole is placed at an angle of 30° with an electric field of intensity $2\times10^5\ N\ C^{-1}$. It experiences a torque equal to 4 N m. Calculate the magnitude of charge on the dipole, if the dipole length is 2 cm.

(1) 8 mC (2) 6 mC
(3) 4 mC (4) 2 mC

33 The magnitude and direction of the current in the following circuit is



(1) 0.2 A from B to A through E
(2) 0.5 A from A to B through E
(3) $\frac{5}{9}$ A from A to B through E
(4) 1.5 A from B to A through E

34 The net magnetic flux through any closed surface is :

(1) Zero (2) Positive
(3) Infinity (4) Negative

35 A bullet is fired from a gun at the speed of $280\ m\ s^{-1}$ in the direction 30° above the horizontal. The maximum height attained by the bullet is $\left(g = 9.8\ m\ s^{-2},\ \sin 30° = 0.5\right)$:

(1) 2800 m (2) 2000 m
(3) 1000 m (4) 3000 m

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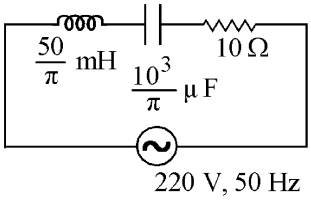
36 Two thin lenses are of same focal lengths (f), but one is convex and the other one is concave. When they are placed in contact with each other, the equivalent focal length of the combination will be :

(1) Zero (2) $f/4$

(3) $f/2$ (4) Infinite

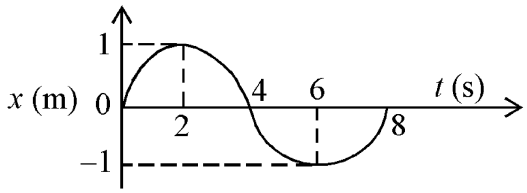
37 The net impedance of circuit (as shown in figure) will be :



(1) $10\sqrt{2}\ \Omega$ (2) $15\ \Omega$

(3) $5\sqrt{5}\ \Omega$ (4) $25\ \Omega$

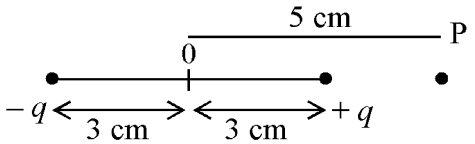
38 The x-t graph of a particle performing simple harmonic motion is shown in the figure. The acceleration of the particle at $t = 2$ s is :



(1) $\frac{\pi^2}{8}\ m\,s^{-2}$ (2) $-\frac{\pi^2}{8}\ m\,s^{-2}$

(3) $\frac{\pi^2}{16}\ m\,s^{-2}$ (4) $-\frac{\pi^2}{16}\ m\,s^{-2}$

39 An electric dipole is placed as shown in the figure.



The electric potential (in 10^2 V) at point P due to the dipole is ($\in_0$ = permittivity of free space and $\frac{1}{4\pi\in_0} = K$):

(1) $\left(\frac{3}{8}\right)qK$ (2) $\left(\frac{5}{8}\right)qK$

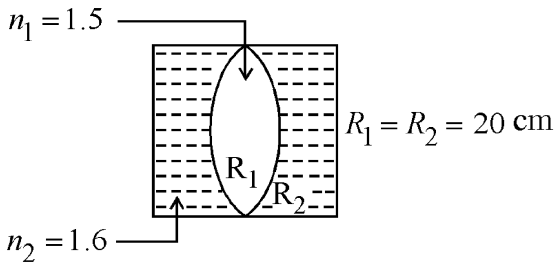
(3) $\left(\frac{8}{5}\right)qK$ (4) $\left(\frac{8}{3}\right)qK$

40 A bullet from a gun is fired on a rectangular wooden block with velocity u. When bullet travels 24 cm through the block along its length horizontally, velocity of bullet becomes $\frac{u}{3}$. Then it further penetrates into the block in the same direction before coming to rest exactly at the other end of the block. The total length of the block is :

(1) 27 cm (2) 24 cm

(3) 28 cm (4) 30 cm

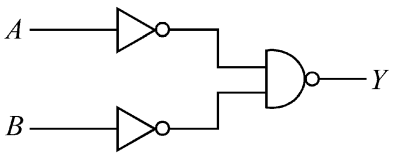
41 In the figure shown here, what is the equivalent focal length of the combination of lenses (Assume that all layers are thin)?



(1) 40 cm (2) − 40 cm

(3) − 100 cm (4) − 50 cm

42 For the following logic circuit, the truth table is:



(1)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(2)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(3)

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

(4)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

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43 A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity $4\ \text{m s}^{-1}$. The ball strikes the water surface after $4\ \text{s}$. The height of bridge above water surface is (Take $g = 10\ \text{m s}^{-2}$) :

(1) 56 m (2) 60 m

(3) 64 m (4) 68 m

44 10 resistors, each of resistance R are connected in series to a battery of emf E and negligible internal resistance. Then those are connected in parallel to the same battery, the current is increased n times. The value of n is :

(1) 10 (2) 100

(3) 1 (4) 1000

45 A wire carrying a current I along the positive x-axis has length L. It is kept in a magnetic field $\vec{B} = (2\hat{i} + 3\hat{j} - 4\hat{k})$ T. The magnitude of the magnetic force acting on the wire is :

(1) $3\ IL$ (2) $\sqrt{5}\ IL$

(3) $5\ IL$ (4) $\sqrt{3}\ IL$

46 A satellite is orbiting just above the surface of the earth with period T. If d is the density of the earth and G is the universal constant of gravitation, the quantity $\frac{3\pi}{Gd}$ represents :

(1) T (2) T^2

(3) T^3 (4) $\sqrt{T}$

47 Calculate the maximum acceleration of a moving car so that a body lying on the floor of the car remains stationary. The coefficient of static friction between the body and the floor is 0.15 ($g = 10\ \text{m s}^{-2}$).

(1) $1.2\ \text{m s}^{-2}$ (2) $150\ \text{m s}^{-2}$

(3) $1.5\ \text{m s}^{-2}$ (4) $50\ \text{m s}^{-2}$

48 The resistance of platinum wire at 0°C is 2Ω and 6.8Ω at 80°C. The temperature coefficient of resistance of the wire is :

(1) $3\times10^{-4}\ °\text{C}^{-1}$ (2) $3\times10^{-3}\ °\text{C}^{-1}$

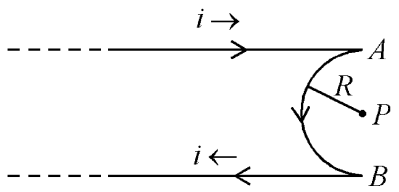
(3) $3\times10^{-2}\ °\text{C}^{-1}$ (4) $3\times10^{-1}\ °\text{C}^{-1}$

49 The radius of inner most orbit of hydrogen atom is $5.3\times10^{-11}\ \text{m}$. What is the radius of third allowed orbit of hydrogen atom?

(1) 0.53 Å (2) 1.06 Å

(3) 1.59 Å (4) 4.77 Å

50 A very long conducting wire is bent in a semi-circular shape from A to B as shown in figure. The magnetic field at point P for steady current configuration is given by :



(1) $\frac{\mu_0 i}{4R}$ pointed into the page

(2) $\frac{\mu_0 i}{4R}$ pointed away from the page

(3) $\frac{\mu_0 i}{4R}\left[1-\frac{2}{\pi}\right]$ pointed away from page

(4) $\frac{\mu_0 i}{4R}\left[1-\frac{2}{\pi}\right]$ pointed into the page

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51 Which of the following reactions will NOT give primary amine as the product?

(1) $CH_3\,CONH_2 \xrightarrow{Br_2\,/\,KOH}$ Product

(2) $CH_3CN \xrightarrow[(ii)\ H_3O\oplus]{(i)\ LiAlH_4}$ Product

(3) $CH_3NC \xrightarrow[(ii)\ H_3O\oplus]{(i)\ LiAlH_4}$ Product

(4) $CH_3CONH_2 \xrightarrow[(ii)\ H_3O\oplus]{(i)\ LiAlH_4}$ Product

52 Match **List - I** with **List - II** :

	List - I		**List - II**
A.	Coke	I.	Carbon atoms are sp^3 hybridised.
B.	Diamond	II.	Used as a dry lubricant
C.	Fullerene	III.	Used as a reducing agent
D.	Graphite	IV.	Cage like molecules

Choose the **correct** answer from the options given below :

(1) A-II, B-IV, C-I, D-III
(2) A-IV, B-I, C-II, D-III
(3) A-III, B-I, C-IV, D-II
(4) A-III, B-IV, C-I, D-II

53 Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : Metallic sodium dissolves in liquid ammonia giving a deep blue solution, which is paramagnetic.

Reasons R : The deep blue solution is due to the formation of amide.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.
(2) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**.
(3) **A** is true but **R** is false.
(4) **A** is false but **R** is true.

54 In Lassaigne's extract of an organic compound, both nitrogen and sulphur are present, which gives blood red colour with Fe^{3+} due to the formation of -

(1) $Fe_4\left[Fe(CN)_6\right]_3 \cdot x\,H_2O$

(2) NaSCN

(3) $\left[Fe(CN)_5\,NOS\right]^{4-}$

(4) $\left[Fe(SCN)\right]^{2+}$

55 The conductivity of centimolar solution of KCl at 25°C is 0.0210 $ohm^{-1}\ cm^{-1}$ and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is -

(1) 1.34 cm^{-1} (2) 3.28 cm^{-1}
(3) 1.26 cm^{-1} (4) 3.34 cm^{-1}

56 Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : A reaction can have zero activation energy.

Reasons R : The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.
(2) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**.
(3) **A** is true but **R** is false.
(4) **A** is false but **R** is true.

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57 Which one is an example of heterogenous catalysis?

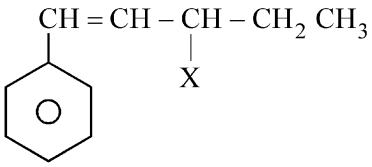
(1) Oxidation of sulphur dioxide into sulphur trioxide in the presence of oxides of nitrogen.

(2) Hydrolysis of sugar catalysed by H^+ ions.

(3) Decomposition of ozone in presence of nitrogen monoxide.

(4) Combination between dinitrogen and dihydrogen to form ammonia in the presence of finely divided iron.

58 The given compound



is an example of _____.

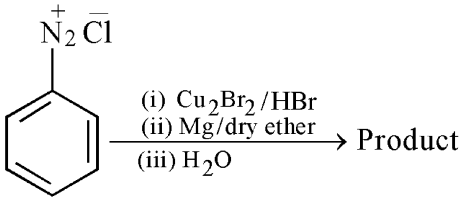
(1) benzylic halide

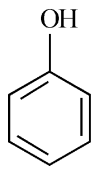
(2) aryl halide

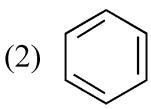
(3) allylic halide

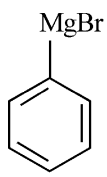
(4) vinylic halide

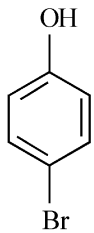
59 Identify the product in the following reaction:



(1) 

(2) 

(3) 

(4) 

60 Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : Helium is used to dilute oxygen in diving apparatus.

Reasons R : Helium has high solubility in O_2.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**.

(3) **A** is true but **R** is false.

(4) **A** is false but **R** is true.

61 A compound is formed by two elements A and B. The element B forms cubic close packed structure and atoms of A occupy 1/3 of tetrahedral voids. If the formula of the compound is A_xB_y, then the value of $x + y$ is in option

(1) 5 (2) 4

(3) 3 (4) 2

62 Given below are two statements :

Statement I : A unit formed by the attachment of a base to 1' position of sugar is known as nucleoside

Statement II : When nucleoside is linked to phosphorous acid at 5'-position of sugar moiety, we get nucleotide.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both Statement **I** and Statement **II** are true.

(2) Both Statement **I** and Statement **II** are false.

(3) Statement **I** is true but Statement **II** is false.

(4) Statement **I** is false but Statement **II** is true.

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63 The relation between n_m, (n_m = the number of permissible values of magnetic quantum number (m)) for a given value of azimuthal quantum number (l), is

(1) $l = \frac{n_m - 1}{2}$ (2) $l = 2n_m + 1$

(3) $n_m = 2l^2 + 1$ (4) $n_m = l + 2$

64 Amongst the following, the total number of species NOT having eight electrons around central atom in its outer most shell, is

$NH_3, AlCl_3, BeCl_2, CCl_4, PCl_5$:

(1) 3 (2) 2

(3) 4 (4) 1

65 The **correct** order of energies of molecular orbitals of N_2 molecule, is :

(1) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$

(2) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$

(3) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < \sigma^* 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y)$

(4) $\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma 2p_z < \sigma^* 2p_z$

66 The number of σ bonds, π bonds and lone pair of electrons in pyridine, respectively are:

(1) 11, 2, 0 (2) 12, 3, 0

(3) 11, 3, 1 (4) 12, 2, 1

67 Intermolecular forces are forces of attraction and repulsion between interacting particles that will include :

A. dipole - dipole forces.

B. dipole - induced dipole forces.

C. hydrogen bonding.

D. covalent bonding.

E. dispersion forces.

Choose the **most appropriate** answer from the options given below :

(1) B, C, D, E are correct.

(2) A, B, C, D are correct.

(3) A, B, C, E are correct.

(4) A, C, D, E are correct.

68 Which of the following statements are **NOT** correct?

A. Hydrogen is used to reduce heavy metal oxides to metals.

B. Heavy water is used to study reaction mechanism.

C. Hydrogen is used to make saturated fats from oils.

D. The H-H bond dissociation enthalpy is lowest as compared to a single bond between two atoms of any element.

E. Hydrogen reduces oxides of metals that are more active than iron.

Choose the **most appropriate** answer from the options given below :

(1) B, C, D, E only

(2) B, D only

(3) D, E only

(4) A, B, C only

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69 Which amongst the following molecules on polymerization produces neoprene?

(1) $H_2C = CH - CH = CH_2$

(2) $H_2C = \underset{\displaystyle Cl}{\underset{|}{C}} - CH = CH_2$

(3) $H_2C = CH - C \equiv CH$

(4) $H_2C = \underset{\displaystyle CH_3}{\underset{|}{C}} - CH = CH_2$

70 Some tranquilizers are listed below. Which one from the following belongs to barbiturates?

(1) Chlordiazepoxide
(2) Meprobamate
(3) Valium
(4) Veronal

71 The element expected to form largest ion to achieve the nearest noble gas configuration is :

(1) O (2) F
(3) N (4) Na

72 Select the **correct** statements from the following :

A. Atoms of all elements are composed of two fundamental particles.
B. The mass of the electron is 9.10939×10^{-31} kg.
C. All the isotopes of a given element show same chemical properties.
D. Protons and electrons are collectively known as nucleons.
E. Dalton's atomic theory, regarded the atom as an ultimate particle of matter.

Choose the **correct** answer from the options given below :

(1) A, B and C only
(2) C, D and E only
(3) A and E only
(4) B, C and E only

73 Consider the following reaction and identify the product (P).

$$\underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3 \xrightarrow{HBr} \text{Product (P)}$$

3 – Methylbutan – 2 – ol

(1) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle Br}{\overset{|}{C}}}} - CH_2 - CH_3$

(2) $CH_3\,CH = CH - CH_3$

(3) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3$

(4) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}} - CH_2\,Br$

74 The stability of Cu^{2+} is more than Cu^{+} salts in aqueous solution due to -

(1) first ionisation enthalpy.
(2) enthalpy of atomization.
(3) hydration energy.
(4) second ionisation enthalpy.

75 Which one of the following statements is **correct**?

(1) The daily requirement of Mg and Ca in the human body is estimated to be 0.2 - 0.3 g.
(2) All enzymes that utilise ATP in phosphate transfer require Ca as the cofactor.
(3) The bone in human body is an inert and unchanging substance.
(4) Mg plays roles in neuromuscular function and interneuronal transmission.

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76 Weight (g) of two moles of the organic compound, which is obtained by heating sodium ethanoate with sodium hydroxide in presence of calcium oxide is :

(1) 16 (2) 32

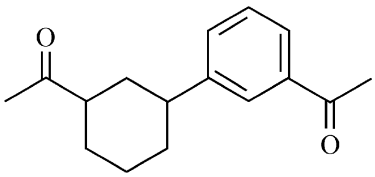
(3) 30 (4) 18

77 Amongst the given options which of the following molecules / ion acts as a Lewis acid?

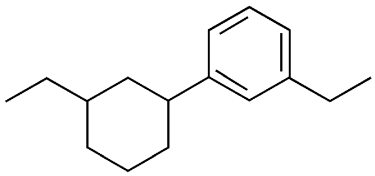
(1) NH_3 (2) H_2O

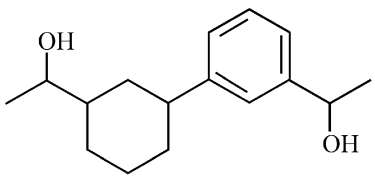
(3) BF_3 (4) OH^-

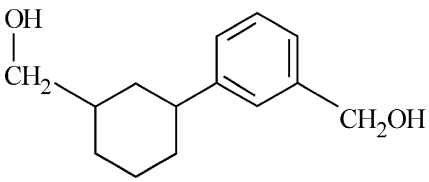
78 Identify product (A) in the following reaction:

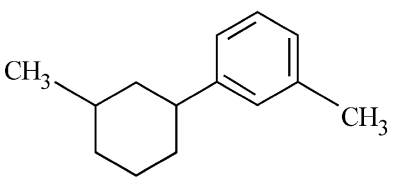


$$\xrightarrow[\text{conc. HCl}]{\text{Zn–Hg}} (A) + 2H_2O$$

(1) 

(2) 

(3) 

(4) 

79 Taking stability as the factor, which one of the following represents **correct** relationship?

(1) $TlCl_3 > TlCl$

(2) $InI_3 > InI$

(3) $AlCl > AlCl_3$

(4) $TlI > TlI_3$

80 Homoleptic complex from the following complexes is :

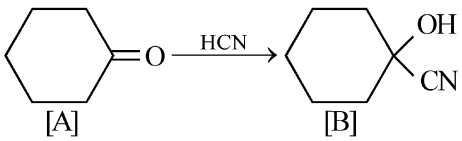
(1) Potassium trioxalatoaluminate (III)

(2) Diamminechloridonitrito - N - platinum (II)

(3) Pentaamminecarbonatocobalt (III) chloride

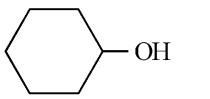
(4) Triamminetriaquachromium (III) chloride

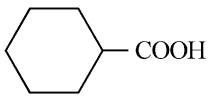
81 Complete the following reaction :

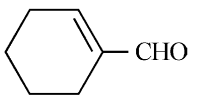


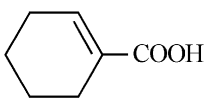
$$\xrightarrow[\Delta]{\text{conc. } H_2SO_4} [C]$$

[C] is _____.

(1) 

(2) 

(3) 

(4) 

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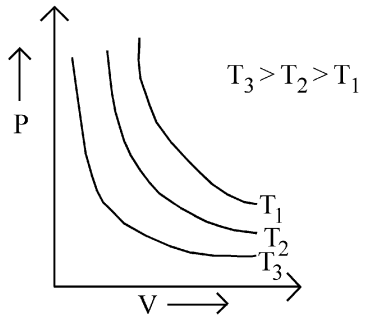
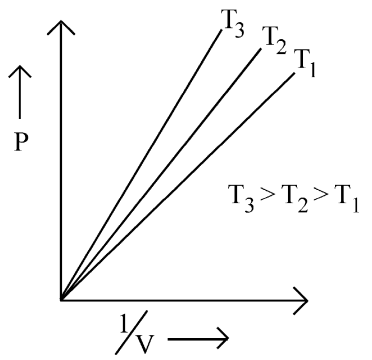
82 Which amongst the following options is **correct** graphical representation of Boyle's Law?

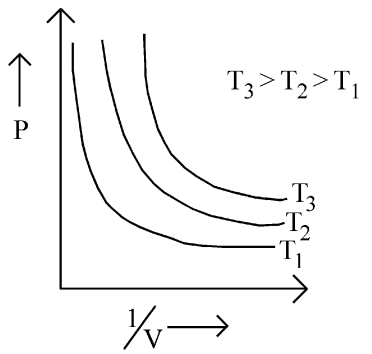
(1)



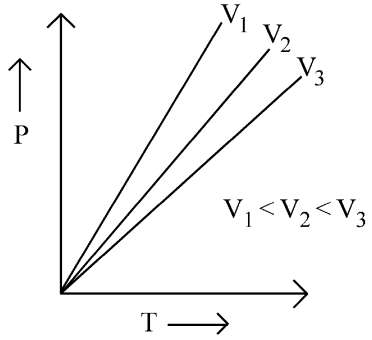
(2)



(3)



(4)



83 The **right** option for the mass of CO_2 produced by heating 20 g of 20% pure limestone is (Atomic mass of Ca = 40)

$$\left[CaCO_3 \xrightarrow{1200\ K} CaO + CO_2\right]$$

(1) 1.12 g (2) 1.76 g

(3) 2.64 g (4) 1.32 g

84 For a certain reaction, the rate = $k[A]^2[B]$, when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would

(1) decrease by a factor of nine.

(2) increase by a factor of six.

(3) increase by a factor of nine.

(4) increase by a factor of three.

85 Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : In equation $\Delta_r G = -nFE_{cell}$, value of $\Delta_r G$ depends on n.

Reasons R : E_{cell} is an intensive property and $\Delta_r G$ is an extensive property.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) Both **A** and **R** are true and **R** is **NOT** the correct explanation of **A**.

(3) **A** is true but **R** is false.

(4) **A** is false but **R** is true.

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86 Match **List - I** with **List - II** :

List - I (Oxoacids of Sulphur)	**List - II (Bonds)**
A. Peroxodisulphuric acid	I. Two S-OH, Four S=O, One S-O-S
B. Sulphuric acid	II. Two S-OH, One S=O
C. Pyrosulphuric acid	III. Two S-OH, Four S=O, One S-O-O-S
D. Sulphurous acid	IV. Two S-OH, Two S=O

Choose the **correct** answer from the options given below :

(1) A-I, B-III, C-II, D-IV

(2) A-III, B-IV, C-I, D-II

(3) A-I, B-III, C-IV, D-II

(4) A-III, B-IV, C-II, D-I

87 Which of the following statements are **INCORRECT**?

A. All the transition metals except scandium form MO oxides which are ionic.

B. The highest oxidation number corresponding to the group number in transition metal oxides is attained in Sc_2O_3 to Mn_2O_7.

C. Basic character increases from V_2O_3 to V_2O_4 to V_2O_5.

D. V_2O_4 dissolves in acids to give VO_4^{3-} salts.

E. CrO is basic but Cr_2O_3 is amphoteric.

Choose the **correct** answer from the options given below :

(1) A and E only

(2) B and D only

(3) C and D only

(4) B and C only

88 Which complex compound is most stable?

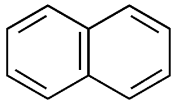
(1) $\left[Co(NH_3)_4(H_2O)Br\right](NO_3)_2$

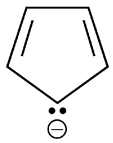
(2) $\left[Co(NH_3)_3(NO_3)_3\right]$

(3) $\left[CoCl_2(en)_2\right]NO_3$

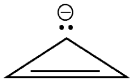
(4) $\left[Co(NH_3)_6\right]_2(SO_4)_3$

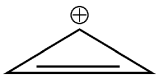
89 Consider the following compounds/species:

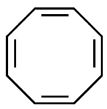
i. 

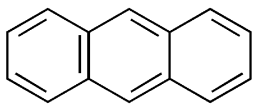
ii. 

iii.

iv. 

v. 

vi. 

vii. 

The number of compounds/species which obey Huckel's rule is _____.

(1) 4 (2) 6

(3) 2 (4) 5

90 What fraction of one edge centred octahedral void lies in one unit cell of fcc?

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$

(3) $\frac{1}{4}$ (4) $\frac{1}{12}$

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91 Which amongst the following options is the **correct** relation between change in enthalpy and change in internal energy?

(1) $\Delta H = \Delta U - \Delta n_g RT$

(2) $\Delta H = \Delta U + \Delta n_g RT$

(3) $\Delta H - \Delta U = -\Delta nRT$

(4) $\Delta H + \Delta U = \Delta nR$

92 On balancing the given redox reaction,

$$a\ Cr_2O_7^{2-} + b\ SO_3^{2-}(aq) + c\ H^+(aq) \rightarrow$$

$$2a\ Cr^{3+}(aq) + b\ SO_4^{2-}(aq) + \frac{c}{2} H_2O(\ell)$$

the coefficients a, b and c are found to be, respectively -

(1) 1, 3, 8 (2) 3, 8, 1

(3) 1, 8, 3 (4) 8, 1, 3

93 The equilibrium concentrations of the species in the reaction $A + B \rightleftharpoons C + D$ are 2, 3, 10 and 6 mol L^{-1}, respectively at 300 K. $\Delta G°$ for the reaction is (R = 2 cal / mol K)

(1) 1372.60 cal (2) – 137.26 cal

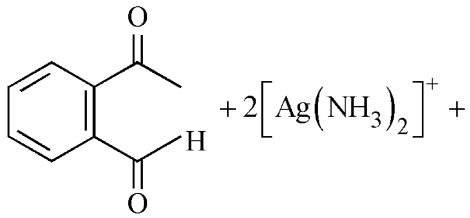
(3) – 1381.80 cal (4) – 13.73 cal

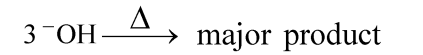
94 Pumice stone is an example of -

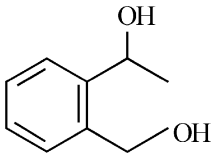
(1) sol (2) gel

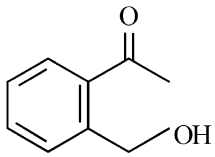
(3) solid sol (4) foam

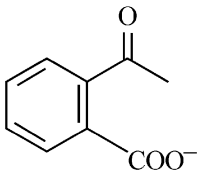
95 Identify the major product obtained in the following reaction :

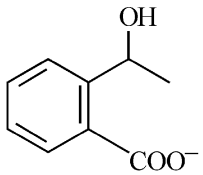




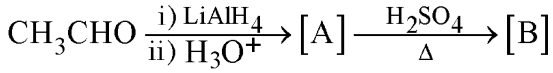
(1) 

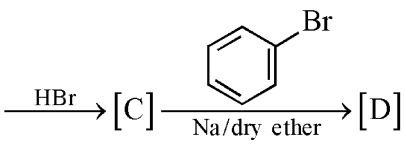
(2) 

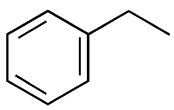
(3) 

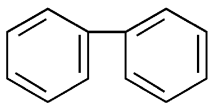
(4) 

96 Identify the final product [D] obtained in the following sequence of reactions.





(1) 

(2) 

(3) C_4H_{10}

(4) $HC \equiv C^{\ominus}\ Na^+$

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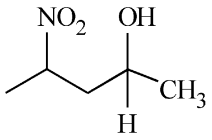
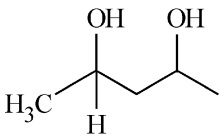
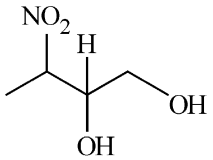
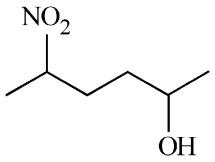
97 Which amongst the following will be most readily dehydrated under acidic conditions ?

(1) 

(2) 

(3) 

(4) 

98 Given below are two statements :

Statement I : The nutrient deficient water bodies lead to eutrophication.

Statement II : Eutrophication leads to decrease in the level of oxygen in the water bodies.

In the light of the above statements, choose the **correct** answer from the options given below :

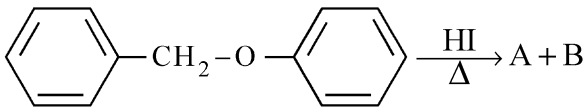
(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

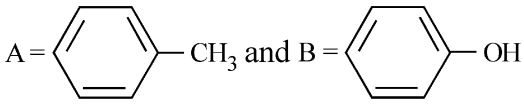
(3) **Statement I** is correct but **Statement II** is false.

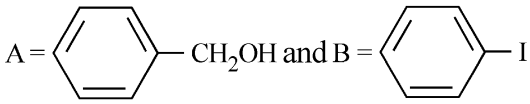
(4) **Statement I** is incorrect but **Statement II** is true.

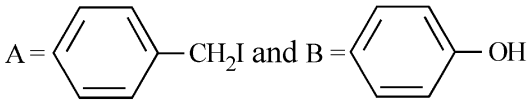
99 Consider the following reaction :

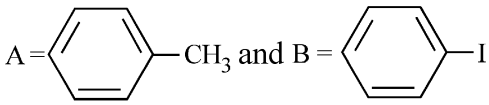


Identify products A and B.

(1) 

(2) 

(3) 

(4) 

100 The reaction that does **NOT** take place in a blast furnace between 900 K to 1500 K temperature range during extraction of iron is :

(1) $Fe_2O_3 + CO \rightarrow 2FeO + CO_2$

(2) $FeO + CO \rightarrow Fe + CO_2$

(3) $C + CO_2 \rightarrow 2CO$

(4) $CaO + SiO_2 \rightarrow CaSiO_3$

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Botany : Section-A (Q. No. 101 to 135)

101 Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R** :
Assertion A : The first stage of gametophyte in the life cycle of moss is protonema stage.
Reason R : Protonema develops directly from spores produced in capsule.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both **A** and **R** are correct and **R** is the correct explanation of **A**.
(2) Both **A** and **R** are correct but **R** is NOT the correct explanation of **A**.
(3) **A** is correct but **R** is not correct.
(4) **A** is not correct but **R** is correct.

102 In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are :
(1) Synergids, Primary endosperm nucleus and zygote
(2) Antipodals, synergids, and primary endosperm nucleus
(3) Synergids, Zygote and Primary endosperm nucleus
(4) Synergids, antipodals and Polar nuclei

103 Movement and accumulation of ions across a membrane against their concentration gradient can be explained by
(1) Osmosis
(2) Facilitated Diffusion
(3) Passive Transport
(4) Active Transport

104 Large, colourful, fragrant flowers with nectar are seen in :
(1) insect pollinated plants
(2) bird pollinated plants
(3) bat pollinated plants
(4) wind pollinated plants

105 The phenomenon of pleiotropism refers to
(1) presence of several alleles of a single gene controlling a single crossover.
(2) presence of two alleles, each of the two genes controlling a single trait.
(3) a single gene affecting multiple phenotypic expression.
(4) more than two genes affecting a single character.

106 Which hormone promotes internode/petiole elongation in deep water rice?
(1) GA_3 (2) Kinetin
(3) Ethylene (4) 2, 4-D

107 Among 'The Evil Quartet', which one is considered the most important cause driving extinction of species?
(1) Habitat loss and fragmentation
(2) Over exploitation for economic gain
(3) Alien species invasions
(4) Co-extinctions

108 Upon exposure to UV radiation, DNA stained with ethidium bromide will show
(1) Bright red colour
(2) Bright blue colour
(3) Bright yellow colour
(4) Bright orange colour

109 Which micronutrient is required for splitting of water molecule during photosynthesis?
(1) manganese (2) molybdenum
(3) magnesium (4) copper

110 Axile placentation is observed in
(1) Mustard, Cucumber and Primrose
(2) China rose, Beans and Lupin
(3) Tomato, Dianthus and Pea
(4) China rose, Petunia and Lemon

111 The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis?
(1) Zygotene (2) Pachytene
(3) Diplotene (4) Diakinesis

112 The reaction centre in PS II has an absorption maxima at
(1) 680 nm (2) 700 nm
(3) 660 nm (4) 780 nm

113 Unequivocal proof that DNA is the genetic material was first proposed by
(1) Frederick Griffith
(2) Alfred Hershey and Martha Chase
(3) Avery, Macleoid and McCarthy
(4) Wilkins and Franklin

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114 Among eukaryotes, replication of DNA takes place in -
(1) M phase (2) S phase
(3) G_1 phase (4) G_2 phase

115 In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as -
(1) Differentiation
(2) Dedifferentiation
(3) Development
(4) Senescence

116 Cellulose does not form blue colour with Iodine because
(1) It is a disaccharide.
(2) It is a helical molecule.
(3) It does not contain complex helices and hence cannot hold iodine molecules.
(4) It breakes down when iodine reacts with it.

117 Spraying of which of the following phytohormone on juvenile conifers helps in hastening the maturity period, that leads to early seed production?
(1) Indole-3-butyric Acid
(2) Gibberellic Acid
(3) Zeatin
(4) Abscisic Acid

118 Given below are two statements :
Statement I : The forces generated by transpiration can lift a xylem-sized column of water over 130 meters height.
Statement II : Transpiration cools leaf surfaces sometimes 10 to 15 degrees, by evaporative cooling.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both **Statement I** and **Statement II** are correct.
(2) Both **Statement I** and **Statement II** are incorrect.
(3) **Statement I** is correct but **Statement II** is incorrect.
(4) **Statement I** is incorrect but **Statement II** is correct.

119 Family Fabaceae differs from Solanaceae and Liliaceae. With respect to the stamens, pick out the characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae.
(1) Diadelphous and Dithecous anthers
(2) Polyadelphous and epipetalous stamens
(3) Monoadelphous and Monothecous anthers
(4) Epiphyllous and Dithecous anthers

120 Expressed Sequence Tags (ESTs) refers to
(1) All genes that are expressed as RNA.
(2) All genes that are expressed as proteins.
(3) All genes whether expressed or unexpressed.
(4) Certain important expressed genes.

121 Identify the **correct** statements :
A. Detrivores perform fragmentation.
B. The humus is further degraded by some microbes during mineralization.
C. Water soluble inorganic nutrients go down into the soil and get precipitated by a process called leaching.
D. The detritus food chain begins with living organisms.
E. Earthworms break down detritus into smaller particles by a process called catabolism.
Choose the **correct** answer from the options given below :
(1) A, B, C only (2) B, C, D only
(3) C, D, E only (4) D, E, A only

122 The thickness of ozone in a column of air in the atmosphere is measured in terms of :
(1) Dobson units (2) Decibels
(3) Decameter (4) Kilobase

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123 Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R** :
Assertion A : Late wood has fewer xylary elements with narrow vessels.
Reason R : Cambium is less active in winters.
In the light of the above statements, choose the **correct** answer from the options given below :
(1) Both **A** and **R** are true and R is the correct explanation of **A**.
(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
(3) **A** is true but **R** is false.
(4) **A** is false but **R** is true.

124 Which of the following stages of meiosis involves division of centromere?
(1) Metaphase I (2) Metaphase II
(3) Anaphase II (4) Telophase

125 The historic Convention on Biological Diversity, 'The Earth Summit' was held in Rio de Janeiro in the year :
(1) 1985 (2) 1992
(3) 1986 (4) 2002

126 How many ATP and $NADPH_2$ are required for the synthesis of one molecule of Glucose during Calvin cycle?
(1) 12 ATP and 12 $NADPH_2$
(2) 18 ATP and 12 $NADPH_2$
(3) 12 ATP and 16 $NADPH_2$
(4) 18 ATP and 16 $NADPH_2$

127 In the equation

$$\boxed{GPP - R = NPP}$$

GPP is Gross Primary Productivity
NPP is Net Primary Productivity
R here is _____.
(1) Photosynthetically active radiation
(2) Respiratory quotient
(3) Respiratory loss
(4) Reproductive allocation

128 During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out
(1) RNA (2) DNA
(3) Histones (4) Polysaccharides

129 What is the role of RNA polymerase III in the process of transcription in Eukaryotes?
(1) Transcription of rRNAs (28S, 18S and 5.8S)
(2) Transcription of tRNA, 5 srRNA and snRNA
(3) Transcription of precursor of mRNA
(4) Transcription of only snRNAs

130 What is the function of tassels in the corn cob?
(1) To attract insects
(2) To trap pollen grains
(3) To disperse pollen grains
(4) To protect seeds

131 Identify the pair of heterosporous pteridophytes among the following :
(1) *Lycopodium* and *Selaginella*
(2) *Selaginella* and *Salvinia*
(3) *Psilotum* and *Salvinia*
(4) *Equisetum* and *Salvinia*

132 In gene gun method used to introduce alien DNA into host cells, microparticles of _____ metal are used.
(1) Copper
(2) Zinc
(3) Tungsten or gold
(4) Silver

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133 Given below are two statements :
Statement I : Endarch and exarch are the terms often used for describing the position of secondary xylem in the plant body.
Statement II : Exarch condition is the most common feature of the root system.
In the light of the above statements, choose the **correct** answer from the options given below :
(1) Both **Statement I** and **Statement II** are true.
(2) Both **Statement I** and **Statement II** are false.
(3) **Statement I** is correct but **Statement II** is false.
(4) **Statement I** is incorrect but **Statement II** is true.

134 Frequency of recombination between gene pairs on same chromosome as a measure of the distance between genes to map their position on chromosome, was used for the first time by
(1) Thomas Hunt Morgan
(2) Sutton and Boveri
(3) Alfred Sturtevant
(4) Henking

135 Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R** :
Assertion A : ATP is used at two steps in glycolysis.
Reason R : First ATP is used in converting glucose into glucose-6-phosphate and second ATP is used in conversion of fructose-6-phosphate into fructose-1-6-diphosphate.
In the light of the above statements, choose the **correct** answer from the options given below :
(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.
(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
(3) **A** is true but **R** is false.
(4) **A** is false but **R** is true.

136 Which one of the following statements is **NOT** correct?
(1) The micro-organisms involved in biodegradation of organic matter in a sewage polluted water body consume a lot of oxygen causing the death of aquatic organisms.
(2) Algal blooms caused by excess of organic matter in water improve water quality and promote fisheries.
(3) Water hyacinth grows abundantly in eutrophic water bodies and leads to an imbalance in the ecosystem dynamics of the water body.
(4) The amount of some toxic substances of industrial waste water increases in the organisms at successive trophic levels.

137 How many different proteins does the ribosome consist of?
(1) 80 (2) 60
(3) 40 (4) 20

138 Which of the following statements are correct about Klinefelter's Syndrome?
A. This disorder was first described by Langdon Down (1866).
B. Such an individual has overall masculine development. However, the feminine development is also expressed.
C. The affected individual is short statured.
D. Physical, psychomotor and mental development is retarded.
E. Such individuals are sterile.
Choose the **correct** answer from the options given below :
(1) A and B only (2) C and D only
(3) B and E only (4) A and E only

139 Match **List I** with **List II** :

List I	**List II**
A. Oxidative decarboxylation	I. Citrate synthase
B. Glycolysis	II. Pyruvate dehydrogenase
C. Oxidative phosphorylation	III. Electron transport system
D. Tricarboxylic acid cycle	IV. EMP pathway

Choose the correct answer from the options given below :
(1) A-III, B-IV, C-II, D-I
(2) A-II, B-IV, C-I, D-III
(3) A-III, B-I, C-II, D-IV
(4) A-II, B-IV, C-III, D-I

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140 Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : A flower is defined as modified shoot wherein the shoot apical meristem changes to floral meristem.

Reason R : Internode of the shoot gets condensed to produce different floral appendages laterally at successive nodes instead of leaves.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and R is the correct explanation of **A**.

(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

(3) **A** is true but **R** is false.

(4) **A** is false but **R** is true.

141 Given below are two statements : One is labelled as **Assertion A** and the other is labelled as **Reason R** :

Assertion A : In gymnosperms the pollen grains are released from the microsporangium and carried by air currents.

Reason R : Air currents carry the pollen grains to the mouth of the archegonia where the male gametes are discharged and pollen tube is not formed.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

(3) **A** is true but **R** is false.

(4) **A** is false but **R** is true.

142 Match **List I** with **List II** :

	List I		**List II**
A.	Cohesion	I.	More attraction in liquid phase
B.	Adhesion	II.	Mutual attraction among water molecules
C.	Surface tension	III.	Water loss in liquid phase
D.	Guttation	IV.	Attraction towards polar surfaces

Choose the **correct** answer from the options given below :

(1) A-II, B-IV, C-I, D-III
(2) A-IV, B-III, C-II, D-I
(3) A-III, B-I, C-IV, D-II
(4) A-II, B-I, C-IV, D-III

143 Which of the following combinations is required for chemiosmosis?

(1) membrane, proton pump, proton gradient, ATP synthase
(2) membrane, proton pump, proton gradient, NADP synthase
(3) proton pump, electron gradient, ATP synthase
(4) proton pump, electron gradient, NADP synthase

144 Melonate inhibits the growth of pathogenic bacteria by inhibiting the activity of

(1) Succinic dehydrogenase
(2) Amylase
(3) Lipase
(4) Dinitrogenase

145 Identify the **correct** statements :

A. Lenticels are the lens-shaped openings permitting the exchange of gases.
B. Bark formed early in the season is called hard bark.
C. Bark is a technical term that refers to all tissues exterior to vascular cambium.
D. Bark refers to periderm and secondary phloem.
E. Phellogen is single-layered in thickness.

Choose the correct answer from the options given below :

(1) B, C and E only
(2) A and D only
(3) A, B and D only
(4) B and C only

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146 Match **List I** with **List II** :

	List I		**List II**
A.	M Phase	I.	Proteins are synthesized
B.	G_2 Phase	II.	Inactive phase
C.	Quiescent stage	III.	Interval between mitosis and initiation of DNA replication
D.	G_1 Phase	IV.	Equational division

Choose the correct answer from the options given below :

(1) A-III, B-II, C-IV, D-I

(2) A-IV, B-II, C-I, D-III

(3) A-IV, B-I, C-II, D-III

(4) A-II, B-IV, C-I, D-III

147 Match **List I** with **List II** :

List I (Interaction)		**List II (Species A and B)**
A.	Mutualism	I. +(A), O(B)
B.	Commensalism	II. −(A), O(B)
C.	Amensalism	III. +(A), −(B)
D.	Parasitism	IV. +(A), +(B)

Choose the **correct** answer from the options given below :

(1) A-IV, B-II, C-I, D-III

(2) A-IV, B-I, C-II, D-III

(3) A-IV, B-III, C-I, D-II

(4) A-III, B-I, C-IV, D-II

148 Given below are two statements :

Statement I : Gause's 'Competitive Exclusion Principle' states that two closely related species competing for the same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually.

Statement II : In general, carnivores are more adversely affected by competition than herbivores.

In the light of the above statements, choose the **correct** answer from the options given below :

(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

(3) **Statement I** is correct but **Statement II** is false.

(4) **Statement I** is incorrect but **Statement II** is true.

149 Match **List I** with **List II** :

List I		**List II**
A.	Iron	I. Synthesis of auxin
B.	Zinc	II. Component of nitrate reductase
C.	Boron	III. Activator of catalase
D.	Molybdenum	IV. Cell elongation and differentiation

Choose the correct answer from the options given below :

(1) A-III, B-II, C-I, D-IV

(2) A-II, B-III, C-IV, D-I

(3) A-III, B-I, C-IV, D-II

(4) A-II, B-IV, C-I, D-III

150 Main steps in the formation of Recombinant DNA are given below. Arrange these steps in a correct sequence.

A. Insertion of recombinant DNA into the host cell.

B. Cutting of DNA at specific location by restriction enzyme.

C. Isolation of desired DNA fragment.

D. Amplification of gene of interest using PCR.

Choose the correct answer from the options given below :

(1) B, C, D, A (2) C, A, B, D

(3) C, B, D, A (4) B, D, A, C

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151 Match **List I** with **List II**.

	List I		List II
A.	Vasectomy	I.	Oral method
B.	Coitus interruptus	II.	Barrier method
C.	Cervical caps	III.	Surgical method
D.	Saheli	IV.	Natural method

Choose the **correct** answer from the options given below:

(1) A-III, B-I, C-IV, D-II
(2) A-III, B-IV, C-II, D-I
(3) A-II, B-III, C-I, D-IV
(4) A-IV, B-II, C-I, D-III

152 Given below are two statements:

Statement I: Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.

Statement II: The cavity of the cervix is called cervical canal which along with vagina forms birth canal.

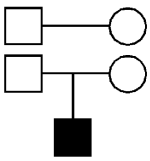
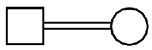
In the light of the above statements, choose the **correct** answer from the options given below:

(1) Both **Statement I** and **Statement II** are true.
(2) Both **Statement I** and **Statement II** are false.
(3) **Statement I** is correct but **Statement II** is false.
(4) **Statement I** incorrect but **Statement II** is true.

153 Which of the following statements is correct?

(1) Eutrophication refers to increase in domestic sewage and waste water in lakes.
(2) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.
(3) Presence of large amount of nutrients in water restricts 'Algal Bloom'
(4) Algal Bloom decreases fish mortality

154 Which one of the following symbols represents mating between relatives in human pedigree analysis?

(1) 
(2) 
(3)
(4)

155 Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?

(1) Genital herpes (2) Gonorrhoea
(3) Hepatitis-B (4) HIV Infection

156 Match **List I** with **List II**.

	List I		List II
A.	Heroin	I.	Effect on cardiovascular system
B.	Marijuana	II.	Slow down body function
C.	Cocaine	III.	Painkiller
D.	Morphine	IV.	Interfere with transport of dopamine

Choose the **correct** answer from the options given below:

(1) A-II, B-I, C-IV, D-III
(2) A-I, B-II, C-III, D-IV
(3) A-IV, B-III, C-II, D-I
(4) A-III, B-IV, C-I, D-II

157 Match **List I** with **List II**.

	List I (Type of Joint)		List II (Found between)
A.	Cartilaginous Joint	I.	Between flat skull bones
B.	Ball and Socket Joint	II.	Between adjacent vertebrae in vertebral column
C.	Fibrous Joint	III.	Between carpal and metacarpal of thumb
D.	Saddle Joint	IV.	Between Humerus and Pectoral girdle

Choose the **correct** answer from the options given below:

(1) A-III, B-I, C-II, D-IV
(2) A-II, B-IV, C-I, D-III
(3) A-I, B-IV, C-III, D-II
(4) A-II, B-IV, C-III, D-I

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158 Given below are two statements:
Statement I: A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N-terminal)
Statement II: Adult human haemoglobin, consists of 4 subunits (two subunits of α type and two subunits of β type.)
In the light of the above statements, choose the **correct** answer from the options given below:
(1) Both **Statement I** and **Statement II** are true.
(2) Both **Statement I** and **Statement II** are false.
(3) **Statement I** is true but **Statement II** is false.
(4) **Statement I** is false but **Statement II** is true.

159 Which of the following are NOT considered as the part of endomembrane system?
A. Mitochondria B. Endoplasmic Reticulum
C. Chloroplasts D. Golgi complex
E. Peroxisomes
Choose the **most appropriate** answer from the options given below:
(1) B and D only
(2) A, C and E only
(3) A and D only
(4) A, D and E only

160 Given below are two statements:
Statement I: RNA mutates at a faster rate.
Statement II: Viruses having RNA genome and shorter life span mutate and evolve faster.
In the light of the above statements, choose the **correct** answer from the options given below:
(1) Both **Statement I** and **Statement II** are true.
(2) Both **Statement I** and **Statement II** are false.
(3) **Statement I** is true but **Statement II** is false.
(4) **Statement I** false but **Statement II** is true.

161 Match **List I** with **List II**.

List I		**List II**	
A.	CCK	I.	Kidney
B.	GIP	II.	Heart
C.	ANF	III.	Gastric gland
D.	ADH	IV.	Pancreas

Choose the **correct** answer from the options given below:
(1) A-IV, B-III, C-II, D-I
(2) A-III, B-II, C-IV, D-I
(3) A-II, B-IV, C-I, D-III
(4) A-IV, B-II, C-III, D-I

162 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R.**
Assertion A: Endometrium is necessary for implantation of blastocyst.
Reason R: In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium.
In the light of the above statements, choose the **correct** answer from the options given below:
(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.
(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
(3) **A** is true but **R** is false.
(4) **A** is false but **R** is true.

163 Match **List I** with **List II**.

List I		**List II**	
A.	Ringworm	I.	*Haemophilus influenzae*
B.	Filariasis	II.	*Trichophyton*
C.	Malaria	III.	*Wuchereria bancrofti*
D.	Pneumonia	IV.	*Plasmodium vivax*

Choose the **correct** answer from the options given below:
(1) A-II, B-III, C-IV, D-I
(2) A-II, B-III, C-I, D-IV
(3) A-III, B-II, C-I, D-IV
(4) A-III, B-II, C-IV, D-I

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164 Given below are two statements:

Statement I: Low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity because proteins are denatured by heat.

Statement II: When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor.

In the light of the above statements, choose the **correct** answer from the options given below:

(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

(3) **Statement I** is true but **Statement II** is false.

(4) **Statement I** is false but **Statement II** is true.

165 Match **List I** with **List II**.

	List I		**List II**
A.	*Taenia*	I.	Nephridia
B.	*Paramoecium*	II.	Contractile vacuole
C.	*Periplaneta*	III.	Flame cells
D.	*Pheretima*	IV.	Urecose gland

Choose the **correct** answer from the options give below:

(1) A-I, B-II, C-III, D-IV

(2) A-I, B-II, C-IV, D-III

(3) A-III, B-II, C-IV, D-I

(4) A-II, B-I, C-IV, D-III

166 Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?

(1) Recombinant DNA Technology

(2) Serum and Urine analysis

(3) Polymerase Chain Reaction (PCR) technique

(4) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique

167 Match **List I** with **List II**.

	List I (Interacting species)		**List II (Name of Interaction)**
A.	A Leopard and a Lion in a forest/ grassland	I.	Competition
B.	A Cuckoo laying egg in a Crow's nest	II.	Brood parasitism
C.	Fungi and root of a higher plant in Mycorrtizae	III.	Mutualism
D.	A cattle egret and a Cattle in a field	IV.	Commensalism

Choose the **correct** answer from the options given below:

(1) A-I, B-II, C-III, D-IV

(2) A-I, B-II, C-IV, D-III

(3) A-III, B-IV, C-I, D-II

(4) A-II, B-III, C-I, D-IV

168 Given below are two statements:

Statement I: Ligaments are dense irregular tissue.

Statement II: Cartilage is dense regular tissue.

In the light of the above statements, choose the **correct** answer from the options given below:

(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

(3) **Statement I** is true but **Statement II** is false.

(4) **Statement I** is false but **Statement II** is true.

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169 Given below are two statements:

Statement I: In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.

Statement II: In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome.

In the light of the above statements, choose the **correct** answer from the options given below:

(1) Both **Statement I** and **Statement II** are true.
(2) Both **Statement I** and **Statement II** are false.
(3) **Statement I** is correct but **Statement II** is false.
(4) **Statement I** incorrect but **Statement II** is true.

170 Match **List I** with **List II** with respect to human eye.

List I		**List II**
A. Fovea	I.	Visible coloured portion of eye that regulates diameter of pupil.
B. Iris	II.	External layer of eye formed of dense connective tissue.
C. Blind spot	III.	Point of greatest visual acuity or resolution.
D. Sclera	IV.	Point where optic nerve leaves the eyeball and photoreceptor cells are absent.

Choose the **correct** answer from the options given below:

(1) A-III, B-I, C-IV, D-II
(2) A-IV, B-III, C-II, D-I
(3) A-I, B-IV, C-III, D-II
(4) A-II, B-I, C-III, D-IV

171 Select the correct group/set of Australian Marsupials exhibiting adaptive radiation.

(1) Tasmanian wolf, Bobcat, Marsupial mole
(2) Numbat, Spotted cuscus, Flying phalanger
(3) Mole, Flying squirrel, Tasmanian tiger cat
(4) Lemur, Anteater, Wolf

172 Which of the following statements are correct regarding female reproductive cycle?

A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle.
B. First menstrual cycle begins at puberty and is called menopause.
C. Lack of menstruation may be indicative of pregnancy.
D. Cyclic menstruation extends between menarche and menopause.

Choose the **most appropriate** answer from the options given below:

(1) A and D only
(2) A and B only
(3) A, B and C only
(4) A, C and D only

173 Vital capacity of lung is _____.

(1) IRV + ERV
(2) IRV + ERV + TV + RV
(3) IRV + ERV + TV – RV
(4) IRV + ERV + TV

174 Match **List I** with **List II**.

List I		**List II**
A. P - wave	I.	Beginning of systole
B. Q - wave	II.	Repolarisation of ventricles
C. QRS complex	III.	Depolarisation of atria
D. T - wave	IV.	Depolarisation of ventricles

Choose the **correct** answer from the options given below:

(1) A-III, B-I, C-IV, D-II
(2) A-IV, B-III, C-II, D-I
(3) A-II, B-IV, C-I, D-III
(4) A-I, B-II, C-III, D-IV

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175 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R.**

Assertion A: Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme.

Reason R: Ban on amniocentesis checks increasing menace of female foeticide.

In the light of the above statements, choose the **correct** answer from the options given below:

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) Both **A** and **R** are true and **R** is NOT the correct explanation of **A**.

(3) **A** is true but **R** is false.

(4) **A** is false but **R** is true.

176 Once the undigested and unabsorbed substances enter the caecum, their backflow is prevented by-

(1) Sphincter of Oddi

(2) Ileo - caecal valve

(3) Gastro - oesophageal sphincter

(4) Pyloric sphincter

177 Match **List I** with **List II**.

	List I		**List II**
A.	Gene 'a'	I.	β-galactosidase
B.	Gene 'y'	II.	Transacetylase
C.	Gene 'i'	III.	Permease
D.	Gene 'z'	IV.	Repressor protein

Choose the **correct** answer from the options given below:

(1) A-II, B-I, C-IV, D-III

(2) A-II, B-III, C-IV, D-I

(3) A-III, B-IV, C-I, D-II

(4) A-III, B-I, C-IV, D-II

178 Match **List I** with **List II**.

	List I (Cells)		**List II (Secretion)**
A.	Peptic cells	I.	Mucus
B.	Goblet cells	II.	Bile juice
C.	Oxyntic cells	III.	Proenzyme pepsinogen
D.	Hepatic cells	IV.	HCl and intrinsic factor for absorption of vitamin B_{12}

Choose the **correct** answer from the options given below:

(1) A-IV, B-III, C-II, D-I

(2) A-II, B-I, C-III, D-IV

(3) A-III, B-I, C-IV, D-II

(4) A-II, B-IV, C-I, D-III

179 Which of the following functions is carried out by cytoskeleton in a cell?

(1) Nuclear division

(2) Protein synthesis

(3) Motility

(4) Transportation

180 Given below are statements: one is labelled as **Assertion A** and the other is labelled as **Reason R.**

Assertion A: Nephrons are of two types: Cortical & Juxta medullary, based on their relative position in cortex and medulla.

Reason R: Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle.

In the light of the above statements, choose the **correct** answer from the options given below:

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**.

(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

(3) **A** is true but **R** is false.

(4) **A** is false but **R** is true.

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181 Given below are two statements:

Statement I: Electrostatic precipitator is most widely used in thermal power plant.

Statement II: Electrostatic precipitator in thermal power plant removes ionising radiations

In the light of the above statements, choose the ***most appropriate*** answer from the options given below:

(1) Both **Statement I** and **Statement II** are correct.

(2) Both **Statement I** and **Statement II** are incorrect.

(3) **Statement I** is correct but **Statement II** is incorrect.

(4) **Statement I** incorrect but **Statement II** is correct.

182 Broad palm with single palm crease is visible in a person suffering from-

(1) Down's syndrome

(2) Turner's syndrome

(3) Klinefelter's syndrome

(4) Thalassemia

183 Radial symmetry is NOT found in adults of phylum _____.

(1) Ctenophora (2) Hemichordata

(3) Coelenterata (4) Echinodermata

184 In which blood corpuscles, the HIV undergoes replication and produces progeny viruses?

(1) T_H cells (2) B-lymphocytes

(3) Basophils (4) Eosinophils

185 Which of the following is not a cloning vector?

(1) BAC (2) YAC

(3) pBR322 (4) Probe

186 Match **List I** with **List II**.

	List I		**List II**
A.	Logistic growth	I.	Unlimited resource availability condition
B.	Exponential growth	II.	Limited resource availability condition
C.	Expanding age pyramid	III.	The percent individuals of pre-reproductive age is largest followed by reproductive and post reproductive age groups
D.	Stable age pyramid	IV.	The percent individuals of pre-reproductives and reproductive age group are same

Choose the **correct** answer from the options given below:

(1) A-II, B-I, C-III, D-IV

(2) A-II, B-III, C-I, D-IV

(3) A-II, B-IV, C-I, D-III

(4) A-II, B-IV, C-III, D-I

187 Select the correct statements with reference to chordates.

A. Presence of a mid-dorsal, solid and double nerve cord.

B. Presence of closed circulatory system.

C. Presence of paired pharyngeal gillslits.

D. Presence of dorsal heart

E. Triploblastic pseudocoelomate animals.

Choose the **correct** answer from the options given below:

(1) A, C and D only

(2) B and C only

(3) B, D and E only

(4) C, D and E only

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188 The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are :
(1) Limbic system & hypothalamus
(2) Corpora quadrigemina & hippocampus
(3) Brain stem & epithalamus
(4) Corpus callosum and thalamus

189 The unique mammalian characteristics are:
(1) hairs, tympanic membrane and mammary glands
(2) hairs, pinna and mammary glands
(3) hairs, pinna and indirect development
(4) pinna, monocondylic skull and mammary glands

190 Which of the following are NOT under the control of thyroid hormone?
A. Maintenance of water and electrolyte balance
B. Regulation of basal metabolic rate
C. Normal rhythm of sleep-wake cycle
D. Development of immune system
E. Support the process of R.B.Cs formation
Choose the **correct** answer from the options given below:
(1) A and D only (2) B and C only
(3) C and D only (4) D and E only

191 Select the correct statements.
A. Tetrad formation is seen during Leptotene.
B. During Anaphase, the centromeres split and chromatids separate.
C. Terminalization takes place during Pachytene.
D. Nucleolus, Golgi complex and ER are reformed during Telophase.
E. Crossing over takes place between sister chromatids of homologous chromosome.
Choose the **correct** answer from the options given below:
(1) A and C only
(2) B and D only
(3) A, C and E only
(4) B and E only

192 Match **List I** with **List II**.

List I		**List II**	
A.	Mast cells	I.	Ciliated epithelium
B.	Inner surface of bronchiole	II.	Areolar connective tissue
C.	Blood	III.	Cuboidal epithelium
D.	Tubular parts of nephron	IV.	specialised connective tissue

Choose the **correct** answer from the options give below:
(1) A-I, B-II, C-IV, D-III
(2) A-II, B-III, C-I, D-IV
(3) A-II, B-I, C-IV, D-III
(4) A-III, B-IV, C-II, D-I

193 Which of the following is characteristic feature of cockroach regarding sexual dimorphism ?
(1) Dark brown body colour and anal cerci
(2) Presence of anal styles
(3) Presence of sclerites
(4) Presence of anal cerci

194 Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows
5' AUCGAUCGAUCGAUCGAUCG AUCG AUCG 3'?
(1) 5' UAGCUAGCUAGCUAGCUA GCUAGC UAGC 3'
(2) 3' UAGCUAGCUAGCUAGCUA GCUAGCUAGC 5'
(3) 5' ATCGATCGATCGATCGATCG ATCGATCG 3'
(4) 3' ATCGATCGATCGATCGATCG ATCGATCG 5'

195 In cockroach, excretion is brought about by-
A. Phallic gland B. Urecose gland
C. Nephrocytes D. Fat body
E. Collaterial glands
Choose the **correct** answer from the options given below:
(1) A and E only
(2) A, B and E only
(3) B, C and D only
(4) B and D only

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196 Given below are two statements:

Statement I: During G_0 phase of cell cycle, the cell is metabolically inactive.

Statement II: The centrosome undergoes duplication during S phase of interphase.

In the light of the above statements, choose the ***most appropriate*** answer from the options given below:

(1) Both **Statement I** and **Statement II** are correct.

(2) Both **Statement I** and **Statement II** are incorrect.

(3) **Statement I** is correct but **Statement II** is incorrect.

(4) **Statement I** is incorrect but **Statement II** is correct.

197 Which one of the following is NOT an advantage of inbreeding?

(1) It decreases homozygosity.

(2) It exposes harmful recessive genes that are eliminated by selection.

(3) Elimination of less desirable genes and accumulation of superior genes takes place due to it.

(4) It decreases the productivity of inbred population, after continuous inbreeding.

198 Which of the following statements are correct?

A. An excessive loss of body fluid from the body switches off osmoreceptors.

B. ADH facilitates water reabsorption to prevent diuresis.

C. ANF causes vasodilation.

D. ADH causes increase in blood pressure.

E. ADH is responsible for decrease in GFR.

Choose the **correct** answer from the options given below:

(1) A and B only

(2) B, C and D only

(3) A, B and E only

(4) C, D and E only

199 Which of the following statements are correct regarding skeletal muscle?

A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.

B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.

C. Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.

D. M line is considered as functional unit of contraction called sarcomere.

Choose the ***most appropriate*** answer from the options given below:

(1) A, B and C only

(2) B and C only

(3) A, C and D only

(4) C and D only

200 Which of the following statements are correct ?

A. Basophils are most abundant cells of the total WBCs

B. Basophils secrete histamine, serotonin and heparin

C. Basophils are involved in inflammatory response

D. Basophils have kidney shaped nucleus

E. Basophils are agranulocytes

Choose the **correct** answer from the options given below:

(1) D and E only

(2) C and E only

(3) B and C only

(4) A and B only

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2022

AOLBH

No.: 7096007

Test Booklet Code

S5

This Booklet contains 28 pages.

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on ORIGINAL Copy carefully with **blue/black** ball point pen only.
2. The test is of **3 hours 20 minutes** duration and the Test Booklet contains 200 multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. 50 questions in each subject are divided into **two Sections (A and B)** as per details given below :
   (a) **Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos – 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.
   (b) **Section B** shall consist of **15 (Fifteen)** questions in each subject (Question Nos – 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.
   Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.**
3. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one** mark will be deducted from the total scores. **The maximum marks are 720.**
4. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.
5. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
6. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy) to the Invigilator** before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.
7. **The CODE for this Booklet is S5. Make sure that the CODE printed on the Original Copy of the Answer Sheet is the same as that on this Test Booklet.** In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
8. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
9. Use of white fluid for correction is NOT permissible on the Answer Sheet.
10. Each candidate must show on-demand his/her Admit Card to the Invigilator.
11. No candidate, without special permission of the centre Superintendent or Invigilator, would leave his/her seat.
12. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign (with time) the Attendance Sheet **twice. Cases, where a candidate has not signed the Attendance Sheet second time, will be deemed not to have handed over the Answer Sheet and dealt with as an Unfair Means case.**
13. Use of Electronic/Manual Calculator is prohibited.
14. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per the Rules and Regulations of this examination.
15. **No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
16. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
17. Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of scribe or not.

SEAL

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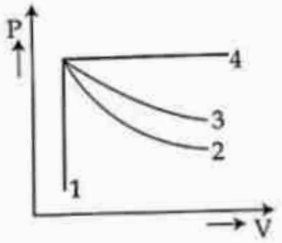
Section - A (Physics)

1. The dimensions $[MLT^{-2}A^{-2}]$ belong to the :
   (1) magnetic permeability
   (2) electric permittivity
   (3) magnetic flux
   (4) self inductance

2. An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is :



   (1) 3
   (2) 4
   (3) 1
   (4) 2

3. A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is :
   (1) +5D
   (2) infinity
   (3) +2D
   (4) +20 D

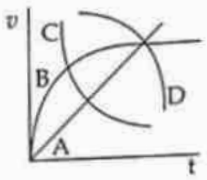
4. The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is :
   (1) 4 : 1
   (2) $1 : \sqrt{2}$
   (3) 2 : 1
   (4) $\sqrt{2} : 1$

5. The angle between the electric lines of force and the equipotential surface is :
   (1) 90°
   (2) 180°
   (3) 0°
   (4) 45°

6. Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is :
   (1) 10 m
   (2) 5 m
   (3) $\frac{10}{3}$ m
   (4) $\frac{20}{3}$ m

7. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second :
   (1) 1 : 3 : 5 : 7
   (2) 1 : 1 : 1 : 1
   (3) 1 : 2 : 3 : 4
   (4) 1 : 4 : 9 : 16

8. A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (v) as a function of time (t) is :



   (1) C
   (2) D
   (3) A
   (4) B

9. The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is :
   (1) 12π
   (2) 104π
   (3) 2π
   (4) 4π

10. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is :
   (1) 9
   (2) 12
   (3) 6
   (4) 8

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11. Match List - I with List - II :

List - I (Electromagnetic waves)		List - II (Wavelength)	
(a)	AM radio waves	(i)	10^{-10} m
(b)	Microwaves	(ii)	10^{2} m
(c)	Infrared radiations	(iii)	10^{-2} m
(d)	X-rays	(iv)	10^{-4} m

Choose the **correct answer** from the options given below :

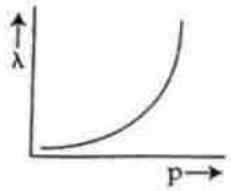
(1) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

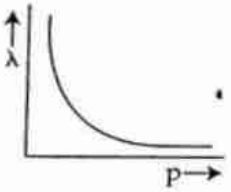
(2) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

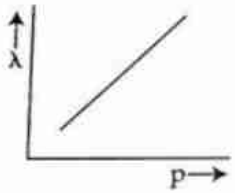
(3) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

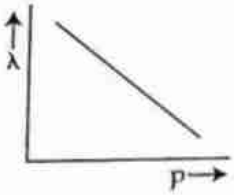
(4) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

12. The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (p) is :

(1) 

(2) 

(3) 

(4) 

13. When light propagates through a material medium of relative permittivity ϵ_r and relative permeability μ_r, the velocity of light, v is given by : (c - velocity of light in vacuum)

(1) $v = \sqrt{\frac{\epsilon_r}{\mu_r}}$

(2) $v = \frac{c}{\sqrt{\epsilon_r \mu_r}}$

(3) $v = c$

(4) $v = \sqrt{\frac{\mu_r}{\epsilon_r}}$

14. If a soap bubble expands, the pressure inside the bubble :

(1) remains the same

(2) is equal to the atmospheric pressure

(3) decreases

(4) increases

15. A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is :

(1) 20 N/kg

(2) 180 N/kg

(3) 0.05 N/kg

(4) 50 N/kg

16. In the given nuclear reaction, the element X is :

$^{22}_{11}Na \rightarrow X + e^{+} + \nu$

(1) $^{22}_{10}Ne$

(2) $^{22}_{12}Mg$

(3) $^{23}_{11}Na$

(4) $^{23}_{10}Ne$

17. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is :

(1) 4 : 9

(2) 9 : 4

(3) 1 : 4

(4) 4 : 1

18. When two monochromatic lights of frequency, ν and $\frac{\nu}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\frac{V_s}{2}$ and V_s respectively. The threshold frequency for this metal is :

(1) $\frac{2}{3}\nu$

(2) $\frac{3}{2}\nu$

(3) 2ν

(4) 3ν

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19. A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle 60°. The angle between the refracted and reflected rays would be :

(1) 90°
(2) 120°
(3) 30°
(4) 60°

20. A shell of mass m is at rest initially. It explodes into three fragments having mass in the ratio 2 : 2 : 1. If the fragments having equal mass fly off along mutually perpendicular directions with speed v, the speed of the third (lighter) fragment is :

(1) $2\sqrt{2}\ v$
(2) $3\sqrt{2}\ v$
(3) v
(4) $\sqrt{2}\ v$

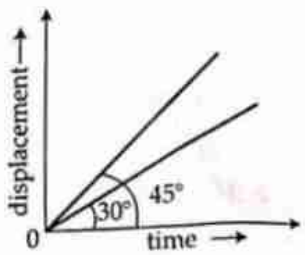
21. Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be :

(1) equal on both the spheres
(2) dependent on the material property of the sphere
(3) more on bigger sphere
(4) more on smaller sphere

22. As the temperature increases, the electrical resistance :

(1) increases for conductors but decreases for semiconductors
(2) decreases for conductors but increases for semiconductors
(3) increases for both conductors and semiconductors
(4) decreases for both conductors and semiconductors

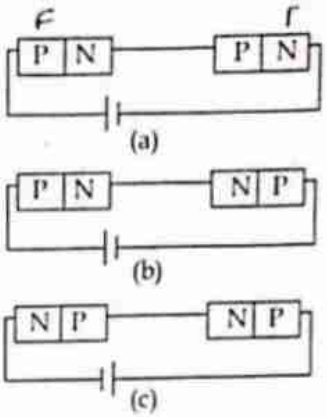
23. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is :



(1) 1 : 2
(2) 1 : $\sqrt{3}$
(3) $\sqrt{3}$: 1
(4) 1 : 1

24. A square loop of side 1 m and resistance 1 Ω is placed in a magnetic field of 0.5 T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is :

(1) 1 weber
(2) zero weber
(3) 2 weber
(4) 0.5 weber

25. 

In the given circuits (a), (b) and (c), the potential drop across the two p-n junctions are equal in :

(1) Circuit (c) only
(2) Both circuits (a) and (c)
(3) Circuit (a) only
(4) Circuit (b) only

26. A copper wire of length 10 m and radius $(10^{-2}/\sqrt{\pi})$ m has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of 10 (V/m) is :

(1) 10^{-5} A/m^2
(2) 10^{5} A/m^2
(3) 10^{4} A/m^2
(4) 10^{6} A/m^2

27. An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1}. The frictional force opposing the motion is 3000 N. The minimum power delivered by the motor to the lift in watts is : ($g = 10$ ms^{-2})

(1) 34500
(2) 23500
(3) 23000
(4) 20000

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28. Given below are two statements :

Statement I :

Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.

Statement II :

Biot-Savart's law is analogous to Coulomb's inverse square law of charge q, with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q.

In light of above statements choose the **most appropriate** answer from the options given below :

(1) **Statement I** is correct and **Statement II** is incorrect

(2) **Statement I** is incorrect and **Statement II** is correct

(3) Both **Statement I** and **Statement II** are correct

(4) Both **Statement I** and **Statement II** are incorrect

29. Two resistors of resistance, 100 Ω and 200 Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100 Ω to that in 200 Ω in a given time is :

(1) 1 : 4

(2) 4 : 1

(3) 1 : 2

(4) 2 : 1

30. The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is :

(1) 36×10^5 J

(2) 1×10^5 J

(3) 36×10^7 J

(4) 36×10^4 J

31. A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is :

(1) 12.56×10^{-4} T

(2) 6.28×10^{-4} T

(3) 6.28×10^{-2} T

(4) 12.56×10^{-2} T

32. Plane angle and solid angle have :

(1) No units and no dimensions

(2) Both units and dimensions

(3) Units but no dimensions

(4) Dimensions but no units

33. In half wave rectification, if the input frequency is 60 Hz, then the output frequency would be :

(1) 60 Hz

(2) 120 Hz

(3) zero

(4) 30 Hz

34. The peak voltage of the ac source is equal to :

(1) $\sqrt{2}$ times the rms value of the ac source

(2) $1/\sqrt{2}$ times the rms value of the ac source

(3) the value of voltage supplied to the circuit

(4) the rms value of the ac source

35. If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse wave along the string is :

(1) $1 : \sqrt{2}$

(2) 1 : 2

(3) 1 : 1

(4) $\sqrt{2} : 1$

Section - B (Physics)

36. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is :

(1) 10

(2) 8

(3) 11

(4) 9

37. A ball is projected with a velocity, 10 ms^{-1}, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be :

(1) 5 ms^{-1}

(2) 10 ms^{-1}

(3) Zero

(4) $5\sqrt{3}$ ms^{-1}

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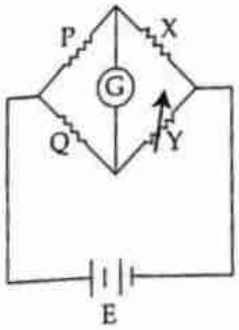
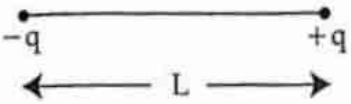
38. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q:



(1) should be very large and unequal
(2) do not play any significant role
(3) should be approximately equal to 2X
(4) should be approximately equal and are small

39. Two point charges $-q$ and $+q$ are placed at a distance of L, as shown in the figure.



The magnitude of electric field intensity at a distance R (R>>L) varies as :

(1) $\frac{1}{R^4}$
(2) $\frac{1}{R^6}$
(3) $\frac{1}{R^2}$
(4) $\frac{1}{R^3}$

40. Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

The stretching of a spring is determined by the shear modulus of the material of the spring.

Reason (R) :

A coil spring of copper has more tensile strength than a steel spring of same dimensions.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **(A)** is true but **(R)** is false
(2) **(A)** is false but **(R)** is true
(3) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**
(4) Both **(A)** and **(R)** are true and **(R)** is **not** the correct explanation of **(A)**

41. A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is :

(1) 5 : 4
(2) 25 : 16
(3) 1 : 1
(4) 4 : 5

42. Match **List - I** with **List - II** :

	List - I		List - II
(a)	Gravitational constant (G)	(i)	$[L^2T^{-2}]$
(b)	Gravitational potential energy	(ii)	$[M^{-1}L^3T^{-2}]$
(c)	Gravitational potential	(iii)	$[LT^{-2}]$
(d)	Gravitational intensity	(iv)	$[ML^2T^{-2}]$

Choose the **correct answer** from the options given below :

(1) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(2) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)
(3) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)
(4) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

43. The area of a rectangular field (in m^2) of length 55.3 m and breadth 25 m after rounding off the value for correct significant digits is :

(1) 1382.5
(2) 14×10^2
(3) 138×10^1
(4) 1382

44. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1}. If the vertical component of earth's magnetic field at that place is 2×10^{-5} T and electrical resistance of the coil is 12.56 Ω, then the maximum induced current in the coil will be :

(1) 1 A
(2) 2 A
(3) 0.25 A
(4) 1.5 A

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45. Two transparent media A and B are separated by a plane boundary. The speed of light in those media are 1.5×10^8 m/s and 2.0×10^8 m/s, respectively. The critical angle for a ray of light for these two media is :

(1) $\tan^{-1}(0.500)$

(2) $\tan^{-1}(0.750)$

(3) $\sin^{-1}(0.500)$

(4) $\sin^{-1}(0.750)$

46. A series LCR circuit with inductance 10 H, capacitance 10 μF, resistance 50 Ω is connected to an ac source of voltage, $V = 200\sin(100\,t)$ volt. If the resonant frequency of the LCR circuit is ν_0 and the frequency of the ac source is ν, then :

(1) $\nu_0 = \frac{50}{\pi}$ Hz, $\nu = 50$ Hz

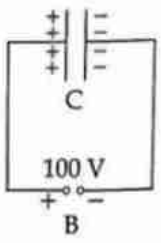
(2) $\nu = 100$ Hz ; $\nu_0 = \frac{100}{\pi}$ Hz

(3) $\nu_0 = \nu = 50$ Hz

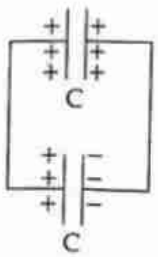
(4) $\nu_0 = \nu = \frac{50}{\pi}$ Hz

47. A capacitor of capacitance C = 900 pF is charged fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance C = 900 pF as shown in figure (b). The electrostatic energy stored by the system (b) is :

(a)



(b)



(1) 2.25×10^{-6} J

(2) 1.5×10^{-6} J

(3) 4.5×10^{-6} J

(4) 3.25×10^{-6} J

48. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is :

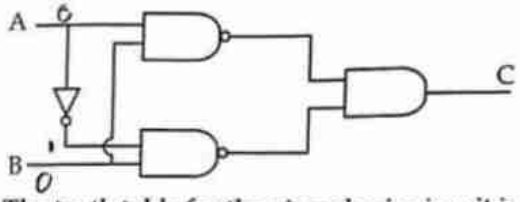
(1) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with 1/r dependence for the outside region.

(2) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.

(3) uniform and remains constant for both the regions.

(4) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.

49.



The truth table for the given logic circuit is :

(1)

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0

(2)

A	B	C
0	0	0
0	1	1
1	0	0
1	1	1

(3)

A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

(4)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	1

50. The volume occupied by the molecules contained in 4.5 kg water at STP, if the intermolecular forces vanish away is :

(1) 5.6×10^{-3} m^3

(2) 5.6 m^3

(3) 5.6×10^{6} m^3

(4) 5.6×10^{3} m^3

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Section - A (Chemistry)

51. Which of the following statement is not correct about diborane ?
(1) The four terminal Hydrogen atoms and the two Boron atoms lie in one plane.
(2) Both the Boron atoms are sp^2 hybridised.
(3) There are two 3-centre-2-electron bonds.
(4) The four terminal B-H bonds are two centre two electron bonds.

52. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : ICl is more reactive than I_2.
Reason (R) : I-Cl bond is weaker than I-I bond.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) **(A)** is correct but **(R)** is not correct.
(2) **(A)** is not correct but **(R)** is correct.
(3) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.
(4) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.

53. In one molal solution that contains 0.5 mole of a solute, there is
(1) 100 mL of solvent
(2) 1000 g of solvent
(3) 500 mL of solvent
(4) 500 g of solvent

54. Given below are half cell reactions :
$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$,
$E^\circ_{Mn^{2+}/MnO_4^-} = -1.510$ V
$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$,
$E^\circ_{O_2/H_2O} = +1.223$ V
Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid ?
(1) Yes, because $E^\circ_{cell} = +2.733$ V
(2) No, because $E^\circ_{cell} = -2.733$ V
(3) Yes, because $E^\circ_{cell} = +0.287$ V
(4) No, because $E^\circ_{cell} = -0.287$ V

55. Identify the **incorrect** statement from the following.
(1) In an atom, all the five 3*d* orbitals are equal in energy in free state.
(2) The shapes of d_{xy}, d_{yz}, and d_{zx} orbitals are similar to each other ; and $d_{x^2-y^2}$ and d_{z^2} are similar to each other.
(3) All the five 5*d* orbitals are different in size, when compared to the respective 4*d* orbitals.
(4) All the five 4*d* orbitals have shapes similar to the respective 3*d* orbitals.

56. What mass of 95% pure $CaCO_3$ will be required to neutralise 50 mL of 0.5 M HCl solution according to the following reaction ?
$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + 2H_2O_{(l)}$
[Calculate upto second place of decimal point]
(1) 3.65 g
(2) 9.50 g
(3) 1.25 g
(4) 1.32 g

57. $RMgX + CO_2 \xrightarrow[\text{ether}]{\text{dry}} Y \xrightarrow{H_3O^+} RCOOH$
What is Y in the above reaction ?
(1) $RCOO^-X^+$
(2) $(RCOO)_2Mg$
(3) $RCOO^-Mg^+X$
(4) $R_3CO^-Mg^+X$

58. Match **List - I** with **List - II**.

	List - I		List - II
(a)	Li	(i)	absorbent for carbon dioxide
(b)	Na	(ii)	electrochemical cells
(c)	KOH	(iii)	coolant in fast breeder reactors
(d)	Cs	(iv)	photoelectric cell

Choose the **correct answer** from the options given below :
(1) (a) - (i), (b) - (iii), (c) - (iv), (d) - (ii)
(2) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)
(3) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)
(4) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

59. Match **List - I** with **List - II**.

	List - I (Drug class)		List - II (Drug molecule)
(a)	Antacids	(i)	Salvarsan
(b)	Antihistamines	(ii)	Morphine
(c)	Analgesics	(iii)	Cimetidine
(d)	Antimicrobials	(iv)	Seldane

Choose the **correct answer** from the options given below :
(1) (a) - (i), (b) - (iv), (c) - (ii), (d) - (iii)
(2) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)
(3) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)
(4) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

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60. Which one is **not** correct mathematical equation for Dalton's Law of partial pressure ? Here p = total pressure of gaseous mixture

(1) $p_i = \chi_i p$, where p_i = partial pressure of i^{th} gas, χ_i = mole fraction of i^{th} gas in gaseous mixture

(2) $p_i = \chi_i p_i^o$, where χ_i = mole fraction of i^{th} gas in gaseous mixture, p_i^o = pressure of i^{th} gas in pure state

(3) $p = p_1 + p_2 + p_3$

(4) $p = n_1 \frac{RT}{V} + n_2 \frac{RT}{V} + n_3 \frac{RT}{V}$,

61. Which statement regarding polymers is **not correct** ?

(1) Thermoplastic polymers are capable of repeatedly softening and hardening on heating and cooling respectively.

(2) Thermosetting polymers are reusable.

(3) Elastomers have polymer chains held together by weak intermolecular forces.

(4) Fibers possess high tensile strength.

62. Given below are two statements :

Statement I :

The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole - dipole interactions.

Statement II :

The boiling points of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.

In the light of the above statements, choose the most **appropriate** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect.

(2) **Statement I** is incorrect but **Statement II** is correct.

(3) Both **Statement I** and **Statement II** are correct.

(4) Both **Statement I** and **Statement II** are incorrect.

63. The IUPAC name of an element with atomic number 119 is

(1) ununununnium

(2) ununoctium

(3) unun ennium

(4) unnilennium

64. At 298 K, the standard electrode potentials of Cu^{2+}/Cu, Zn^{2+}/Zn, Fe^{2+}/Fe and Ag^{+}/Ag, are 0.34 V, −0.76 V, −0.44 V and 0.80 V, respectively

On the basis of standard electrode potential, predict which of the following reaction can not occur ?

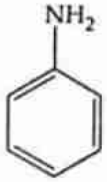
(1) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

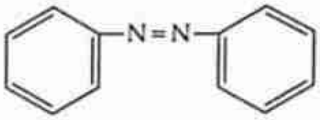
(2) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$

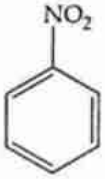
(3) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$

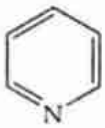
(4) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

65. The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds ?

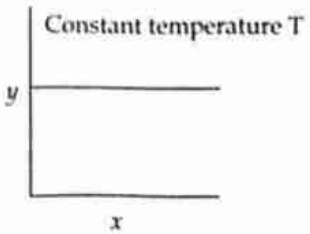
(1) 

(2) 

(3) 

(4) 

66. The given graph is a representation of kinetics of a reaction.



The y and x axes for zero and first order reactions, respectively are

(1) zero order (y = rate and x = concentration), first order ($y = t_{1/2}$ and x = concenration)

(2) zero order (y = rate and x = concentration), first order (y = rate and $x = t_{1/2}$)

(3) zero order (y = concentration and x = time), first order ($y = t_{1/2}$ and x = concentration)

(4) zero order (y = concentration and x = time), first order (y = rate constant and x = concentration)

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67. Identify the **incorrect** statement from the following

(1) Ionisation enthalpy of alkali metals decreases from top to bottom in the group.

(2) Lithium is the strongest reducing agent among the alkali metals.

(3) Alkali metals react with water to form their hydroxides.

(4) The oxidation number of K in KO_2 is +4.

68. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

In a particular point defect, an ionic solid is electrically neutral, even if few of its cations are missing from its unit cells.

Reason (R) :

In an ionic solid, Frenkel defect arises due to dislocation of cation from its lattice site to interstitial site, maintaining overall electrical neutrality.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **(A)** is correct but **(R)** is not correct

(2) **(A)** is not correct but **(R)** is correct

(3) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

(4) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**

69. The IUPAC name of the complex -

$[Ag(H_2O)_2][Ag(CN)_2]$ is :

(1) dicyanidosilver(I) diaquaargentate(I)

(2) diaquasilver(I) dicyanidoargentate(I)

(3) dicyanidosilver(II) diaquaargentate(II)

(4) diaquasilver(II) dicyanidoargentate(II)

70. Choose the **correct** statement :

(1) Diamond is sp^3 hybridised and graphite is sp^2 hybridized.

(2) Both diamond and graphite are used as dry lubricants.

(3) Diamond and graphite have two dimensional network.

(4) Diamond is covalent and graphite is ionic.

71. Given below are two statements :

Statement I :

In the coagulation of a negative sol, the flocculating power of the three given ions is in the order -

$Al^{3+} > Ba^{2+} > Na^+$

Statement II :

In the coagulation of a positive sol, the flocculating power of the three given salts is in the order -

$NaCl > Na_2SO_4 > Na_3PO_4$

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect.

(2) **Statement I** is incorrect but **Statement II** is correct.

(3) Both **Statement I** and **Statement II** are correct.

(4) Both **Statement I** and **Statement II** are incorrect.

72. Given below are two statements :

Statement I :

Primary aliphatic amines react with HNO_2 to give unstable diazonium salts.

Statement II :

Primary aromatic amines react with HNO_2 to form diazonium salts which are stable even above 300 K.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect.

(2) **Statement I** is incorrect but **Statement II** is correct.

(3) Both **Statement I** and **Statement II** are correct.

(4) Both **Statement I** and **Statement II** are incorrect.

73. Gadolinium has a low value of third ionisation enthalpy because of

(1) high electronegativity

(2) high basic character

(3) small size

(4) high exchange enthalpy

74. Match **List - I** with **List - II**.

	List - I (Hydrides)		**List - II (Nature)**
(a)	MgH_2	(i)	Electron precise
(b)	GeH_4	(ii)	Electron deficient
(c)	B_2H_6	(iii)	Electron rich
(d)	HF	(iv)	Ionic

Choose the **correct answer** from the options given below :

(1) (a) - (i), (b) - (ii), (c) - (iv), (d) - (iii)

(2) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

(3) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

(4) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

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75. Match List - I with List - II.

List - I (Products formed)		List - II (Reaction of carbonyl compound with)	
(a)	Cyanohydrin	(i)	NH_2OH
(b)	Acetal	(ii)	RNH_2
(c)	Schiff's base	(iii)	alcohol
(d)	Oxime	(iv)	HCN

Choose the correct answer from the options given below :

(1) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

(2) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

(3) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

(4) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

76. Given below are two statements :

Statement I :

The boiling points of the following hydrides of group 16 elements increases in the order -

$H_2O < H_2S < H_2Se < H_2Te$.

Statement II :

The boiling points of these hydrides increase with increase in molar mass.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect

(2) Statement I is incorrect but Statement II is correct

(3) Both Statement I and Statement II are correct

(4) Both Statement I and Statement II are incorrect

77. The pH of the solution containing 50 mL each of 0.10 M sodium acetate and 0.01 M acetic acid is

[Given pK_a of $CH_3COOH = 4.57$]

(1) 4.57

(2) 2.57

(3) 5.57

(4) 3.57

78. Amongst the following which one will have maximum 'lone pair - lone pair' electron repulsions ?

(1) SF_4

(2) XeF_2

(3) ClF_3

(4) IF_5

79. The incorrect statement regarding chirality is

(1) Enantiomers are superimposable mirror images on each other.

(2) A racemic mixture shows zero optical rotation.

(3) S_N1 reaction yields 1 : 1 mixture of both enantiomers.

(4) The product obtained by S_N2 reaction of haloalkane having chirality at the reactive site shows inversion of configuration.

80. Which amongst the following is incorrect statement ?

(1) H_2^+ ion has one electron.

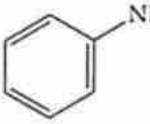
(2) O_2^+ ion is diamagnetic.

(3) The bond orders of O_2^+, O_2, O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively.

(4) C_2 molecule has four electrons in its two degenerate π molecular orbitals.

81. Which of the following is suitable to synthesize chlorobenzene ?

(1) , HCl

(2)  , HCl, Heating

(3) Benzene, Cl_2, anhydrous $FeCl_3$

(4) Phenol, $NaNO_2$, HCl, CuCl

82. Which compound amongst the following is not an aromatic compound ?

(1)

(2)

(3)

(4)

83. The incorrect statement regarding enzymes is :

(1) Enzymes are polysaccharides.

(2) Enzymes are very specific for a particular reaction and substrate.

(3) Enzymes are biocatalysts.

(4) Like chemical catalysts enzymes reduce the activation energy of bio processes.

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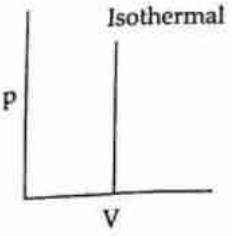
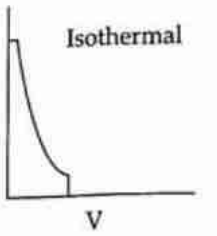
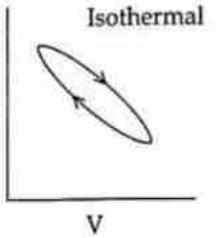
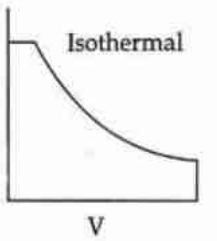
84. Which of the following p-V curve represents maximum work done ?

(1)


(2)


(3)


(4)


85. Given below are two statements :

Statement I :

The acidic strength of monosubstituted nitrophenol is higher than phenol because of electron withdrawing nitro group.

Statement II :

o-nitrophenol, *m*-nitrophenol and *p*-nitrophenol will have same acidic strength as they have one nitro group attached to the phenolic ring.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect.

(2) **Statement I** is incorrect but **Statement II** is correct.

(3) Both **Statement I** and **Statement II** are correct.

(4) Both **Statement I** and **Statement II** are incorrect.

Section - B (Chemistry)

86. Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is :

(1) 2-Methylbut-2-ene

(2) Pent-2-ene

(3) 3-Methylbut-1-ene

(4) 2-Methylbut-1-ene

87. $3\,O_2(g) \rightleftharpoons 2\,O_3(g)$

for the above reaction at 298 K, K_c is found to be 3.0×10^{-59}. If the concentration of O_2 at equilibrium is 0.040 M then concentration of O_3 in M is

(1) 2.4×10^{31}

(2) 1.2×10^{21}

(3) 4.38×10^{-32}

(4) 1.9×10^{-63}

88. A 10.0 L flask contains 64 g of oxygen at 27°C. (Assume O_2 gas is behaving ideally). The pressure inside the flask in bar is

(Given R = 0.0831 L bar K^{-1} mol^{-1})

(1) 49.8

(2) 4.9

(3) 2.5

(4) 498.6

89. Match **List - I** with **List - II.**

	List - I (Ores)		**List - II (Composition)**
(a)	Haematite	(i)	Fe_3O_4
(b)	Magnetite	(ii)	$ZnCO_3$
(c)	Calamine	(iii)	Fe_2O_3
(d)	Kaolinite	(iv)	$[Al_2(OH)_4 Si_2O_5]$

Choose the **correct answer** from the options given below :

(1) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

(2) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

(3) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

(4) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

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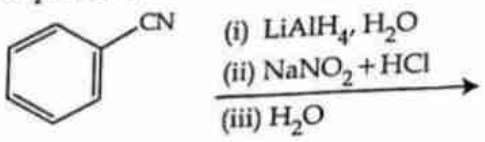
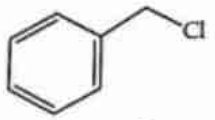
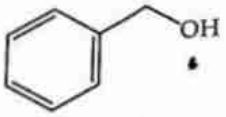
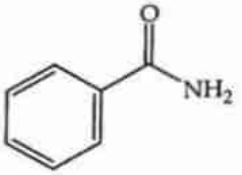
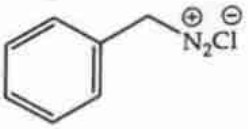
90. The product formed from the following reaction sequence is



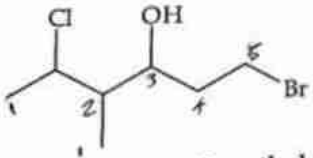
(1) 

(2) 

(3) 

(4) 

91. The correct IUPAC name of the following compound is :



(1) 1-bromo-4-methyl-5-chlorohexan-3-ol
(2) 6-bromo-4-methyl-2-chlorohexan-4-ol
(3) 1-bromo-5-chloro-4-methylhexan-3-ol
(4) 6-bromo-2-chloro-4-methylhexan-4-ol

92. The order of energy absorbed which is responsible for the color of complexes

(A) $[Ni(H_2O)_2(en)_2]^{2+}$
(B) $[Ni(H_2O)_4(en)]^{2+}$ and
(C) $[Ni(en)_3]^{2+}$

is

(1) (C) > (A) > (B)
(2) (B) > (A) > (C)
(3) (A) > (B) > (C)
(4) (C) > (B) > (A)

93. For a first order reaction A → Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min^{-1} is

(1) 0.4606
(2) 0.2303
(3) 1.3818
(4) 0.9212

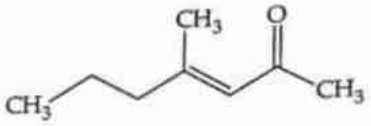
length of 3.608×10^{-8} cm. ... $8.92\ g\ cm^{-3}$. Calculate the atomic mass of copper.

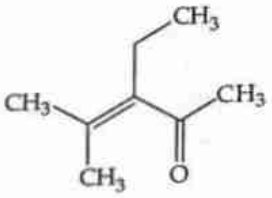
(1) 60 u
(2) 65 u
(3) 63.1 u
(4) 31.55 u

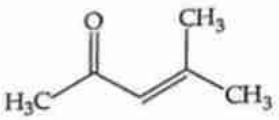
95. If radius of second Bohr orbit of the He^+ ion is 105.8 pm, what is the radius of third Bohr orbit of Li^{2+} ion ?

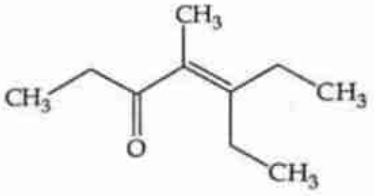
(1) 1.587 pm
(2) 158.7 Å
(3) 158.7 pm
(4) 15.87 pm

96. Which one of the following is **not** formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating ?

(1) 

(2) 

(3) 

(4) 

97. Find the emf of the cell in which the following reaction takes place at 298 K

$Ni(s) + 2\,Ag^+\,(0.001\ M) \rightarrow Ni^{2+}\,(0.001\ M) + 2\,Ag(s)$

(Given that $E^\circ_{cell} = 10.5\ V$, $\frac{2.303\ RT}{F} = 0.059$ at 298 K)

(1) 0.9615 V
(2) 1.05 V
(3) 1.0385 V
(4) 1.385 V

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98. Given below are two statements :

Statement I :

In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. $HCl + ZnCl_2$, known as Lucas Reagent.

Statement II :

Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect.

(2) **Statement I** is incorrect but **Statement II** is correct.

(3) Both **Statement I** and **Statement II** are correct.

(4) Both **Statement I** and **Statement II** are incorrect.

99. In the neutral or faintly alkaline medium, $KMnO_4$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from

(1) +7 to +3

(2) +6 to +5

(3) +7 to +4

(4) +6 to +4

100. The pollution due to oxides of sulphur gets enhanced due to the presence of :

(a) particulate matter

(b) ozone

(c) hydrocarbons

(d) hydrogen peroxide

Choose the **most appropriate** answer from the options given below :

(1) (b), (c), (d) only

(2) (a), (c), (d) only

(3) (a), (d) only

(4) (a), (b), (d) only

Section - A (Biology : Botany)

101. Which one of the following statement **is not true** regarding gel electrophoresis technique ?

(1) The presence of chromogenic substrate gives blue coloured DNA bands on the gel.

(2) Bright orange coloured bands of DNA can be observed in the gel when exposed to UV light.

(3) The process of extraction of separated DNA strands from gel is called elution.

(4) The separated DNA fragments are stained by using ethidium bromide.

102. Given below are two statements :

Statement I :

Mendel studied seven pairs of contrasting traits in pea plants and proposed the Laws of Inheritance

Statement II :

Seven characters examined by Mendel in his experiment on pea plants were seed shape and colour, flower colour, pod shape and colour, flower position and stem height

In the light of the above statements, choose the **correct** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect

(2) **Statement I** is incorrect but **Statement II** is correct

(3) Both **Statement I** and **Statement II** are correct

(4) Both **Statement I** and **Statement II** are incorrect

103. Which of the following is **incorrectly** matched ?

(1) *Porphyra* – Floridian Starch

(2) *Volvox* – Starch

(3) *Ectocarpus* – Fucoxanthin

(4) *Ulothrix* – Mannitol

104. XO type of sex determination can be found in :

(1) Grasshoppers

(2) Monkeys

(3) *Drosophila*

(4) Birds

105. The appearance of recombination nodules on homologous chromosomes during meiosis characterizes :

(1) Sites at which crossing over occurs

(2) Terminalization

(3) Synaptonemal complex

(4) Bivalent

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106. Which of the following is not a method of *ex situ* conservation ?
(1) Micropropagation
(2) Cryopreservation
(3) *In vitro* fertilization
(4) National Parks

107. Identify the incorrect statement related to Pollination :
(1) Flowers produce foul odours to attract flies and beetles to get pollinated
(2) Moths and butterflies are the most dominant pollinating agents among insects
(3) Pollination by water is quite rare in flowering plants
(4) Pollination by wind is more common amongst abiotic pollination

108. Given below are two statements :
Statement I :
The primary CO_2 acceptor in C_4 plants is phosphoenolpyruvate and is found in the mesophyll cells.
Statement II :
Mesophyll cells of C_4 plants lack RuBisCo enzyme.
In the light of the above statements, choose the **correct** answer from the options given below :
(1) **Statement I** is correct but **Statement II** is incorrect
(2) **Statement I** is incorrect but **Statement II** is correct
(3) Both **Statement I** and **Statement II** are correct
(4) Both **Statement I** and **Statement II** are incorrect

109. In old trees the greater part of secondary xylem is dark brown and resistant to insect attack due to :
(a) secretion of secondary metabolities and their deposition in the lumen of vessels.
(b) deposition of organic compounds like tannins and resins in the central layers of stem.
(c) deposition of suberin and aromatic substances in the outer layer of stem.
(d) deposition of tannins, gum, resin and aromatic substances in the peripheral layers of stem.
(e) presence of parenchyma cells, functionally active xylem elements and essential oils.
Choose the **correct answer** from the options given below :
(1) (d) and (e) Only
(2) (b) and (d) Only
(3) (a) and (b) Only
(4) (c) and (d) Only

110. Which one of the following produces nitrogen fixing nodules on the roots of *Alnus* ?
(1) *Rhodospirillum*
(2) *Beijernickia*
(3) *Rhizobium*
(4) *Frankia*

111. Given below are two statements :
Statement I :
Decomposition is a process in which the detritus is degraded into simpler substances by microbes.
Statement II :
Decomposition is faster if the detritus is rich in lignin and chitin
In the light of the above statements, choose the **correct** answer from the options given below :
(1) **Statement I** is correct but **Statement II** is incorrect
(2) **Statement I** is incorrect but **Statement II** is correct
(3) Both **Statement I** and **Statement II** are correct
(4) Both **Statement I** and **Statement II** are incorrect

112. Habitat loss and fragmentation, over exploitation, alien species invasion and co-extinction are causes for :
(1) Biodiversity loss
(2) Natality
(3) Population explosion
(4) Competition

113. Hydrocolloid carrageen is obtained from :
(1) Rhodophyceae only
(2) Phaeophyceae only
(3) Chlorophyceae and Phaeophyceae
(4) Phaeophyceae and Rhodophyceae

114. "Girdling Experiment" was performed by Plant Physiologists to identify the plant tissue through which :
(1) for both water and food transportation
(2) osmosis is observed
(3) water is transported
(4) food is transported

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115. The flowers are Zygomorphic in :

(a) Mustard
(b) Gulmohar
(c) *Cassia*
(d) *Datura*
(e) Chilly

Choose the **correct answer** from the options given below :

(1) (d), (e) Only
(2) (c), (d), (e) Only
(3) (a), (b), (c) Only
(4) (b), (c) Only

116. Which one of the following is **not** true regarding the release of energy during ATP synthesis through chemiosmosis ? It involves :

(1) Movement of protons across the membrane to the stroma
(2) Reduction of NADP to $NADPH_2$ on the stroma side of the membrane
(3) Breakdown of proton gradient
(4) Breakdown of electron gradient

117. The device which can remove particulate matter present in the exhaust from a thermal power plant is :

(1) Electrostatic Precipitator
(2) Catalytic Convertor
(3) STP
(4) Incinerator

118. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

Polymerase chain reaction is used in DNA amplification

Reason (R) :

The ampicillin resistant gene is used as a selectable marker to check transformation

In the light of the above statements, choose the **correct** answer from the options given below :

(1) **(A)** is correct but **(R)** is not correct
(2) **(A)** is not correct but **(R)** is correct
(3) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(4) Both **(A)** and **(R)** are correct but **(R)** is **not** the correct explanation of **(A)**

119. Which one of the following plants does **not** show plasticity ?

(1) Buttercup
(2) Maize
(3) Cotton
(4) Coriander

120. The process of translation of mRNA to proteins begins as soon as :

(1) Both the subunits join together to bind with mRNA
(2) The tRNA is activated and the larger subunit of ribosome encounters mRNA
(3) The small subunit of ribosome encounters mRNA
(4) The larger subunit of ribosome encounters mRNA

121. Read the following statements and choose the set of **correct** statements :

(a) Euchromatin is loosely packed chromatin
(b) Heterochromatin is transcriptionally active
(c) Histone octomer is wrapped by negatively charged DNA in nucleosome
(d) Histones are rich in lysine and arginine
(e) A typical nucleosome contains 400 bp of DNA helix

Choose the **correct answer** from the options given below :

(1) (b), (e) Only
(2) (a), (c), (e) Only
(3) (b), (d), (e) Only
(4) (a), (c), (d) Only

122. Read the following statements about the vascular bundles :

(a) In roots, xylem and phloem in a vascular bundle are arranged in an alternate manner along the different radii.
(b) Conjoint closed vascular bundles do not possess cambium
(c) In open vascular bundles, cambium is present in between xylem and phloem
(d) The vascular bundles of dicotyledonous stem possess endarch protoxylem
(e) In monocotyledonous root, usually there are more than six xylem bundles present

Choose the **correct answer** from the options given below :

(1) (a), (b), (c) and (d) Only
(2) (a), (c), (d) and (e) Only
(3) (a), (b) and (d) Only
(4) (b), (c), (d) and (e) Only

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123. Exoskeleton of arthropods is composed of :
(1) Chitin
(2) Glucosamine
(3) Cutin
(4) Cellulose

124. What is the net gain of ATP when each molecule of glucose is converted to two molecules of pyruvic acid ?
(1) Two
(2) Eight
(3) Four
(4) Six

125. Which of the following is not observed during apoplastic pathway ?
(1) The movement is aided by cytoplasmic streaming
(2) Apoplast is continuous and does not provide any barrier to water movement.
(3) Movement of water occurs through intercellular spaces and wall of the cells.
(4) The movement does not involve crossing of cell membrane

126. Which one of the following plants shows vexillary aestivation and diadelphous stamens ?
(1) *Allium cepa*
(2) *Solanum nigrum*
(3) *Colchicum autumnale*
(4) *Pisum sativum*

127. DNA polymorphism forms the basis of :
(1) Both genetic mapping and DNA finger printing
(2) Translation
(3) Genetic mapping
(4) DNA finger printing

128. What amount of energy is released from glucose during lactic acid fermentation ?
(1) About 10%
(2) Less than 7%
(3) Approximately 15%
(4) More than 18%

129. Identify the **correct** set of statements
(a) The leaflets are modified into pointed hard thorns in *Citrus* and *Bougainvillea*
(b) Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin
(c) Stem is flattened and fleshy in *Opuntia* and modified to perform the function of leaves
(d) *Rhizophora* shows vertically upward growing roots that help to get oxygen for respiration
(e) Subaerially growing stems in grasses and strawberry help in vegetative propagation

Choose the **correct answer** from the options given below :
(1) (b), (c), (d) and (e) Only
(2) (a), (b), (d) and (e) Only
(3) (b) and (c) Only
(4) (a) and (d) Only

130. Which one of the following statements cannot be connected to Predation ?
(1) Both the interacting species are negatively impacted
(2) It is necessitated by nature to maintain the ecological balance
(3) It helps in maintaining species diversity in a community
(4) It might lead to extinction of a species

131. Given below are two statements :
Statement I :
Cleistogamous flowers are invariably autogamous
Statement II :
Cleistogamy is disadvantageous as there is no chance for cross pollination
In the light of the above statements, choose the **correct** answer from the options given below :
(1) **Statement I** is correct but **Statement II** is incorrect
(2) **Statement I** is incorrect but **Statement II** is correct
(3) Both **Statement I** and **Statement II** are correct
(4) Both **Statement I** and **Statement II** are incorrect

132. Production of Cucumber has increased manifold in recent years. Application of which of the following phytohormones has resulted in this increased yield as the hormone is known to produce female flowers in the plants :
(1) Ethylene
(2) Cytokinin
(3) ABA
(4) Gibberellin

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133. Match List - I with List - II.

	List - I		List - II
(a)	Manganese	(i)	Activates the enzyme catalase
(b)	Magnesium	(ii)	Required for pollen germination
(c)	Boron	(iii)	Activates enzymes of respiration
(d)	Iron	(iv)	Functions in splitting of water during photosynthesis

Choose the correct answer from the options given below :

(1) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
(2) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)
(3) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
(4) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

134. Which one of the following never occurs during mitotic cell division ?

(1) Pairing of homologous chromosomes
(2) Coiling and condensation of the chromatids
(3) Spindle fibres attach to kinetochores of chromosomes
(4) Movement of centrioles towards opposite poles

135. The gaseous plant growth regulator is used in plants to :

(1) help overcome apical dominance
(2) kill dicotyledonous weeds in the fields
(3) speed up the malting process
(4) promote root growth and roothair formation to increase the absorption surface

Section - B (Biology : Botany)

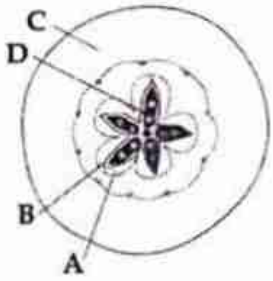
136. Match the plant with the kind of life cycle it exhibits :

	List - I		List - II
(a)	*Spirogyra*	(i)	Dominant diploid sporophyte vascular plant, with highly reduced male or female gametophyte
(b)	Fern	(ii)	Dominant haploid free-living gametophyte
(c)	*Funaria*	(iii)	Dominant diploid sporophyte alternating with reduced gametophyte called prothallus
(d)	*Cycas*	(iv)	Dominant haploid leafy gametophyte alternating with partially dependent multicellular sporophyte

Choose the correct answer from the options given below :

(1) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
(2) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
(3) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)
(4) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

137. Which part of the fruit, labelled in the given figure makes it a false fruit ?



(1) C → Thalamus
(2) D → Seed
(3) A → Mesocarp
(4) B → Endocarp

138. Which one of the following will accelerate phosphorus cycle ?

(1) Weathering of rocks
(2) Rain fall and storms
(3) Burning of fossil fuels
(4) Volcanic activity

139. Match List - I with List - II.

	List - I		List - II
(a)	Metacentric chromosome	(i)	Centromere situated close to the end forming one extremely short and one very long arms
(b)	Acrocentric chromosome	(ii)	Centromere at the terminal end
(c)	Sub-metacentric	(iii)	Centromere in the middle forming two equal arms of chromosomes
(d)	Telocentric chromosome	(iv)	Centromere slightly away from the middle forming one shorter arm and one longer arm

Choose the correct answer from the options given below :

(1) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(2) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)
(3) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)
(4) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

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40. The anatomy of springwood shows some peculiar features. Identify the **correct** set of statements about springwood.
(a) It is also called as the earlywood
(b) In spring season cambium produces xylem elements with narrow vessels
(c) It is lighter in colour
(d) The springwood along with autumnwood shows alternate concentric rings forming annual rings
(e) It has lower density
Choose the **correct answer** from the options given below :
(1) (a), (b) and (d) Only
(2) (c), (d) and (e) Only
(3) (a), (b), (d) and (e) Only
(4) (a), (c), (d) and (e) Only

41. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) :
Mendel's law of Independent assortment does not hold good for the genes that are located closely on the same chromosome.
Reason (R) :
Closely located genes assort independently.
In the light of the above statements, choose the **correct** answer from the options given below :
(1) **(A)** is correct but **(R)** is not correct
(2) **(A)** is not correct but **(R)** is correct
(3) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(4) Both **(A)** and **(R)** are correct but **(R)** is **not** the correct explanation of **(A)**

142. Read the following statements on lipids and find out **correct** set of statements :
(a) Lecithin found in the plasma membrane is a glycolipid
(b) Saturated fatty acids possess one or more c=c bonds
(c) Gingely oil has lower melting point, hence remains as oil in winter
(d) Lipids are generally insoluble in water but soluble in some organic solvents
(e) When fatty acid is esterified with glycerol, monoglycerides are formed
Choose the **correct answer** from the options given below :
(1) (c), (d) and (e) only
(2) (a), (b) and (d) only
(3) (a), (b) and (c) only
(4) (a), (d) and (e) only

143. What is the role of large bundle shealth cells found around the vascular bundles in C_4 plants ?
(1) To enable the plant to tolerate high temperature
(2) To protect the vascular tissue from high light intensity
(3) To provide the site for photorespiratory pathway
(4) To increase the number of chloroplast for the operation of Calvin cycle

144. In the following palindromic base sequences of DNA, which one can be cut easily by particular restriction enzyme ?
(1) 5′ C T C A G T 3′ ; 3′ G A G T C A 5′
(2) 5′ G T A T T C 3′ ; 3′ C A T A A G 5′
(3) 5′ G A T A C T 3′ ; 3′ C T A T G A 5′
(4) 5′ G A A T T C 3′ ; 3′ C T T A A G 5′

145. The entire fleet of buses in Delhi were converted to CNG from diesel. In reference to this, which one of the following statements is **false** ?
(1) It is cheaper than diesel
(2) It can not be adulterated like diesel
(3) CNG burns more efficiently than diesel
(4) The same diesel engine is used in CNG buses making the cost of conversion low

146. Addition of more solutes in a given solution will :
(1) make its water potential zero
(2) not affect the water potential at all
(3) raise its water potential
(4) lower its water potential

147. Transposons can be used during which one of the following ?
(1) Autoradiography
(2) Gene sequencing
(3) Polymerase Chain Reaction
(4) Gene silencing

148. While explaining interspecific interaction of population, (+) sign is assigned for beneficial interaction, (−) sign is assigned for detrimental interaction and (0) for neutral interaction. Which of the following interactions can be assigned (+) for one species and (−) for another species involved in the interaction ?
(1) Commensalism
(2) Competition
(3) Predation
(4) Amensalism

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149. If a geneticist uses the blind approach for sequencing the whole genome of an organism, followed by assignment of function to different segments, the methodology adopted by him is called as :

(1) Expressed sequence tags
(2) Bioinformatics
(3) Sequence annotation
(4) Gene mapping

150. Which of the following occurs due to the presence of autosome linked dominant trait ?

(1) Haemophilia
(2) Thalessemia
(3) Sickle cell anaemia
(4) Myotonic dystrophy

Section - A (Biology : Zoology)

151. Natural selection where more individuals acquire specific character value other than the mean character value, leads to :

(1) Disruptive change
(2) Random change
(3) Stabilising change
(4) Directional change

152. Given below are two statements :

Statement I :

Mycoplasma can pass through less than 1 micron filter size.

Statement II :

Mycoplasma are bacteria with cell wall

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect
(2) **Statement I** is incorrect but **Statement II** is correct
(3) Both **Statement I** and **Statement II** are correct
(4) Both **Statement I** and **Statement II** are incorrect

153. A dehydration reaction links two glucose molecules to produce maltose. If the formula for glucose is $C_6H_{12}O_6$ then what is the formula for maltose ?

(1) $C_{12}H_{22}O_{11}$
(2) $C_{12}H_{24}O_{11}$
(3) $C_{12}H_{20}O_{10}$
(4) $C_{12}H_{24}O_{12}$

154. Which of the following statements with respect to Endoplasmic Reticulum is **incorrect** ?

(1) In prokaryotes only RER are present
(2) SER are the sites for lipid synthesis
(3) RER has ribosomes attached to ER
(4) SER is devoid of ribosomes

155. Tegmina in cockroach, arises from :

(1) Metathorax
(2) Prothorax and Mesothorax
(3) Prothorax
(4) Mesothorax

156. If the length of a DNA molecule is 1.1 metres, what will be the approximate number of base pairs ?

(1) 3.3×10^6 bp
(2) 6.6×10^6 bp
(3) 3.3×10^9 bp
(4) 6.6×10^9 bp

157. Identify the asexual reproductive structure associated with *Penicillium* :

(1) Gemmules
(2) Buds
(3) Zoospores
(4) Conidia

158. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

All vertebrates are chordates but all chordates are not vertebrates.

Reason (R) :

Notochord is replaced by vertebral column in the adult vertebrates.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) **(A)** is correct but **(R)** is not correct
(2) **(A)** is not correct but **(R)** is correct
(3) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(4) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**

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9. Breeding crops with higher levels of vitamins and minerals or higher proteins and healthier fats is called :

(1) Bio-fortification
(2) Bio-accumulation
(3) Bio-magnification
(4) Bio-remediation

60. Under normal physiological conditions in human being every 100 ml of oxygenated blood can deliver _____ ml of O_2 to the tissues.

(1) 4 ml
(2) 10 ml
(3) 2 ml
(4) 5 ml

61. In which of the following animals, digestive tract has additional chambers like crop and gizzard ?

(1) *Catla, Columba, Crocodilus*
(2) *Pavo, Psittacula, Corvus*
(3) *Corvus, Columba, Chameleon*
(4) *Bufo, Balaenoptera, Bangarus*

162. Which of the following functions is not performed by secretions from salivary glands ?

(1) Lubrication of oral cavity
(2) Digestion of disaccharides
(3) Control bacterial population in mouth
(4) Digestion of complex carbohydrates

163. Nitrogenous waste is excreted in the form of pellet or paste by :

(1) *Hippocampus*
(2) *Pavo*
(3) *Ornithorhynchus*
(4) *Salamandra*

164. In an *E.coli* strain *i* gene gets mutated and its product can not bind the inducer molecule. If growth medium is provided with lactose, what will be the outcome ?

(1) *z, y, a* genes will not be translated
(2) RNA polymerase will bind the promoter region
(3) Only *z* gene will get transcribed
(4) *z, y, a* genes will be transcribed

165. Which of the following is present between the adjacent bones of the vertebral column ?

(1) Areolar tissue
(2) Smooth muscle
(3) Intercalated discs
(4) Cartilage

166. Given below are two statements :

Statement I :

Fatty acids and glycerols cannot be absorbed into the blood.

Statement II :

Specialized lymphatic capillaries called lacteals carry chylomicrons into lymphatic vessels and ultimately into the blood.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect
(2) Statement I is incorrect but Statement II is correct
(3) Both Statement I and Statement II are correct
(4) Both Statement I and Statement II are incorrect

167. Select the incorrect statement with reference to mitosis :

(1) Chromosomes decondense at telophase.
(2) Splitting of centromere occurs at anaphase.
(3) All the chromosomes lie at the equator at metaphase.
(4) Spindle fibres attach to centromere of chromosomes.

168. Given below are two statements :

Statement I :

The release of sperms into the seminiferous tubules is called spermiation.

Statement II :

Spermiogenesis is the process of formation of sperms from spermatogonia.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect
(2) Statement I is incorrect but Statement II is correct
(3) Both Statement I and Statement II are correct
(4) Both Statement I and Statement II are incorrect

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169. Given below are two statements :

Statement I :

The coagulum is formed of network of threads called thrombins.

Statement II :

Spleen is the graveyard of erythrocytes.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect

(2) **Statement I** is incorrect but **Statement II** is correct

(3) Both **Statement I** and **Statement II** are correct

(4) Both **Statement I** and **Statement II** are incorrect

170. Identify the microorganism which is responsible for the production of an immunosuppressive molecule cyclosporin A :

(1) *Aspergillus niger*

(2) *Streptococcus cerevisiae*

(3) *Trichoderma polysporum*

(4) *Clostridium butylicum*

171. Which of the following statements are true for spermatogenesis but do not hold true for Oogenesis ?

(a) It results in the formation of haploid gametes

(b) Differentiation of gamete occurs after the completion of meiosis

(c) Meiosis occurs continuously in a mitotically dividing stem cell population

(d) It is controlled by the Luteinising hormone (LH) and Follicle Stimulating Hormone (FSH) secreted by the anterior pituitary

(e) It is initiated at puberty.

Choose the **most appropriate** answer from the options given below :

(1) (b), (d) and (e) only

(2) (b), (c) and (e) only

(3) (c) and (e) only

(4) (b) and (c) only

172. *In-situ* conservation refers to :

(1) Conserve only endangered species

(2) Conserve only extinct species

(3) Protect and conserve the whole ecosystem

(4) Conserve only high risk species

173. Lippe's loop is a type of contraceptive used as

(1) Non-Medicated IUD

(2) Copper releasing IUD

(3) Cervical barrier

(4) Vault barrier

174. Which of the following is a **correct** match for disease and its symptoms ?

(1) Myasthenia gravis - Genetic disorder resulting in weakening and paralysis of skeletal muscle

(2) Muscular dystrophy - An auto immune disorder causing progressive degeneration of skeletal muscle

(3) Arthritis - Inflammed joints

(4) Tetany - high Ca^{2+} level causing rapid spasms.

175. Which of the following is **not** the function of conducting part of respiratory system ?

(1) Temperature of inhaled air is brought to body temperature

(2) Provides surface for diffusion of O_2 and CO_2

(3) It clears inhaled air from foreign particles

(4) Inhaled air is humidified

176. Regarding Meiosis, which of the statements is **incorrect** ?

(1) Pairing of homologous chromosomes and recombination occurs in Meiosis-I

(2) Four haploid cells are formed at the end of Meiosis-II

(3) There are two stages in Meiosis, Meiosis-I and II

(4) DNA replication occurs in S phase of Meiosis-II

177. Detritivores breakdown detritus into smaller particles. This process is called :

(1) Humification

(2) Decomposition

(3) Catabolism

(4) Fragmentation

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178. Which of the following is **not** a connective tissue ?
(1) Cartilage
(2) Neuroglia
(3) Blood
(4) Adipose tissue

179. In the taxonomic categories which hierarchial arrangement in ascending order is **correct** in case of animals ?
(1) Kingdom, Order, Class, Phylum, Family, Genus, Species
(2) Kingdom, Order, Phylum, Class, Family, Genus, Species
(3) Kingdom, Phylum, Class, Order, Family, Genus, Species
(4) Kingdom, Class, Phylum, Family, Order, Genus, Species

180. Given below are two statements :

Statement I :

Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.

Statement II :

Restriction endonucleases cut the DNA strand a little away from the centre of the palindromic site.

In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) **Statement I** is correct but **Statement II** is incorrect
(2) **Statement I** is incorrect but **Statement II** is correct
(3) Both **Statement I** and **Statement II** are correct
(4) Both **Statement I** and **Statement II** are incorrect

181. In gene therapy of Adenosine Deaminase (ADA) deficiency, the patient requires periodic infusion of genetically engineered lymphocytes because :
(1) Lymphocytes from patient's blood are grown in culture, outside the body.
(2) Genetically engineered lymphocytes are not immortal cells.
(3) Retroviral vector is introduced into these lymphocytes.
(4) Gene isolated from marrow cells producing ADA is introduced into cells at embryonic stages

182. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

Osteoporosis is characterised by decreased bone mass and increased chances of fractures.

Reason (R) :

Common cause of osteoporosis is increased levels of estrogen.

In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) **(A)** is correct but **(R)** is not correct
(2) **(A)** is not correct but **(R)** is correct
(3) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**
(4) Both **(A)** and **(R)** are correct but **(R)** is **not** the correct explanation of **(A)**

183. At which stage of life the oogenesis process is initiated ?
(1) Birth
(2) Adult
(3) Puberty
(4) Embryonic development stage

184. If '8' *Drosophila* in a laboratory population of '80' died during a week, the death rate in the population is _____ individuals per *Drosophila* per week.
(1) 1.0
(2) zero
(3) 0.1
(4) 10

185. Given below are two statements :

Statement I :

Autoimmune disorder is a condition where body defense mechanism recognizes its own cells as foreign bodies.

Statement II :

Rheumatoid arthritis is a condition where body does not attack self cells.

In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) **Statement I** is correct but **Statement II** is incorrect
(2) **Statement I** is incorrect but **Statement II** is correct
(3) Both **Statement I** and **Statement II** are correct
(4) Both **Statement I** and **Statement II** are incorrect

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S5

Section - B (Biology : Zoology)

186. The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%. What will be the sequence of these genes on a linear chromosome ?

(1) a, b, c, d
(2) a, c, b, d
(3) a, d, b, c
(4) d, b, a, c

187. Match List - I with List - II.

	List - I (Biological Molecules)		List - II (Biological functions)
(a)	Glycogen	(i)	Hormone
(b)	Globulin	(ii)	Biocatalyst
(c)	Steroids	(iii)	Antibody
(d)	Thrombin	(iv)	Storage product

Choose the **correct answer** from the options given below :

(1) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(2) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)
(3) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)
(4) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)

188. Which of the following are **not** the effects of Parathyroid hormone ?

(a) Stimulates the process of bone resorption
(b) Decreases Ca^{2+} level in blood
(c) Reabsorption of Ca^{2+} by renal tubules
(d) Decreases the absorption of Ca^{2+} from digested food
(e) Increases metabolism of carbohydrates

Choose the **most appropriate** answer from the options given below :

(1) (a) and (e) only
(2) (b) and (c) only
(3) (a) and (c) only
(4) (b), (d) and (e) only

189. Which of the following is **not** a desirable feature of a cloning vector ?

(1) Presence of single restriction enzyme site
(2) Presence of two or more recognition sites
(3) Presence of origin of replication
(4) Presence of a marker gene

190. Match List - I with List - II with respect to methods of Contraception and their respective actions.

	List - I		List - II
(a)	Diaphragms	(i)	Inhibit ovulation and Implantation
(b)	Contraceptive Pills	(ii)	Increase phagocytosis of sperm within Uterus
(c)	Intra Uterine Devices	(iii)	Absence of Menstrual cycle and ovulation following parturition
(d)	Lactational Amenorrhea	(iv)	They cover the cervix blocking the entry of sperms

Choose the **correct answer** from the options given below :

(1) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)
(2) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)
(3) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)
(4) (a) - (iv), (b) - (i), (c) - (ii), (d) - (iii)

191. If a colour blind female marries a man whose mother was also colour blind, what are the chances of her progeny having colour blindness ?

(1) 75%
(2) 100%
(3) 25%
(4) 50%

192. Which of the following statements is **not** true ?

(1) Homology indicates common ancestry
(2) Flippers of penguins and dolphins are a pair of homologous organs
(3) Analogous structures are a result of convergent evolution
(4) Sweet potato and potato is an example of analogy

193. Which of the following is a **correct** statement ?

(1) Slime moulds are saprophytic organisms classified under Kingdom Monera.
(2) Mycoplasma have DNA, Ribosome and cell wall
(3) Cyanobacteria are a group of autotrophic organisms classified under Kingdom Monera.
(4) Bacteria are exclusively heterotrophic organisms.

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194. Select the **incorrect** statement with respect to acquired immunity.

(1) Anamnestic response is due to memory of first encounter.

(2) Acquired immunity is non-specific type of defense present at the time of birth.

(3) Primary response is produced when our body encounters a pathogen for the first time.

(4) Anamnestic response is elicited on subsequent encounters with the same pathogen.

195. Match **List - I** with **List - II**.

List - I	List - II
(a) Bronchioles	(i) Dense Regular Connective Tissue
(b) Goblet cell	(ii) Loose Connective Tissue
(c) Tendons	(iii) Glandular Tissue
(d) Adipose Tissue	(iv) Ciliated Epithelium

Choose the **correct answer** from the options given below :

(1) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

(2) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

(3) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

(4) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

196. Statements related to human Insulin are given below. Which statement(s) is/are **correct** about genetically engineered Insulin ?

(a) Pro-hormone insulin contain extra stretch of C-peptide

(b) A-peptide and B-peptide chains of insulin were produced separately in *E.coli*, extracted and combined by creating disulphide bond between them.

(c) Insulin used for treating Diabetes was extracted from Cattles and Pigs.

(d) Pro-hormone Insulin needs to be processed for converting into a mature and functional hormone.

(e) Some patients develop allergic reactions to the foreign insulin.

Choose the **most appropriate** answer from the options given below :

(1) (c) and (d) only

(2) (c), (d) and (e) only

(3) (a), (b) and (d) only

(4) (b) only

197. Given below are two statements

Statement I :

In a scrubber the exhaust from the thermal plant is passed through the electric wires to charge the dust particles.

Statement II :

Particulate matter (PM 2.5) can not be removed by scrubber but can be removed by an electrostatic precipitator.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

(1) **Statement I** is correct but **Statement II** is incorrect

(2) **Statement I** is incorrect but **Statement II** is correct

(3) Both **Statement I** and **Statement II** are correct

(4) Both **Statement I** and **Statement II** are incorrect

198. Ten *E.coli* cells with ^{15}N - dsDNA are incubated in medium containing ^{14}N nucleotide. After 60 minutes, how many *E.coli* cells will have DNA totally free from ^{15}N ?

(1) 60 cells

(2) 80 cells

(3) 20 cells

(4) 40 cells

199. Select the **incorrect** statement regarding synapses :

(1) Chemical synapses use neurotransmitters

(2) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse.

(3) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse.

(4) Electrical current can flow directly from one neuron into the other across the electrical synapse.

200. Which one of the following statements is **correct** ?

(1) Blood moves freely from atrium to the ventricle during joint diastole.

(2) Increased ventricular pressure causes closing of the semilunar valves.

(3) The atrio-ventricular node (AVN) generates an action potential to stimulate atrial contraction

(4) The tricuspid and the bicuspid valves open due to the pressure exerted by the simultaneous contraction of the atria

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AGAJHA

No. :

Test Booklet Code

M4

This Booklet contains 28 pages.

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on OFFICE Copy carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and the Test Booklet contains **200** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. **50** questions in each subject are divided into **two Sections (A and B)** as per details given below :
   (a) **Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos – 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.
   (b) **Section B** shall consist of **15 (Fifteen)** questions in each subject (Question Nos – 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.
   Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated**.
3. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one** mark will be deducted from the total scores. **The maximum marks are 720.**
4. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.
5. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
6. On completion of the test, the candidate **must hand over the Answer Sheet (ORIGINAL and OFFICE Copy) to the Invigilator** before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.
7. **The CODE for this Booklet is M4. Make sure that the CODE printed on the Original Copy of the Answer Sheet is the same as that on this Test Booklet.** In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
8. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
9. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
10. Each candidate must show on-demand his/her Admit Card to the Invigilator.
11. No candidate, without special permission of the centre Superintendent or Invigilator, would leave his/her seat.
12. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign (with time) the Attendance Sheet **twice**. **Cases, where a candidate has not signed the Attendance Sheet second time, will be deemed not to have handed over the Answer Sheet and dealt with as an Unfair Means case.**
13. Use of Electronic/Manual Calculator is prohibited.
14. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per the Rules and Regulations of this examination.
15. **No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
16. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : _____

Roll Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

Candidate's Signature : _____ **Invigilator's Signature :** _____

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Section - A (Physics)

1. Consider the following **statements (A)** and **(B)** and identify the **correct** answer.

(A) A zener diode is connected in reverse bias, when used as a voltage regulator.

(B) The potential barrier of p-n junction lies between 0.1 V to 0.3 V.

(1) **(A)** and **(B)** both are correct.

(2) **(A)** and **(B)** both are incorrect.

(3) **(A)** is correct and **(B)** is incorrect.

(4) **(A)** is incorrect but **(B)** is correct.

2. A capacitor of capacitance 'C', is connected across an ac source of voltage V, given by

$V = V_0 \sin\omega t$

The displacement current between the plates of the capacitor, would then be given by :

(1) $I_d = V_0 \omega C \cos\omega t$

(2) $I_d = \frac{V_0}{\omega C}\cos\omega t$

(3) $I_d = \frac{V_0}{\omega C}\sin\omega t$

(4) $I_d = V_0 \omega C \sin\omega t$

3. A body is executing simple harmonic motion with frequency 'n', the frequency of its potential energy is :

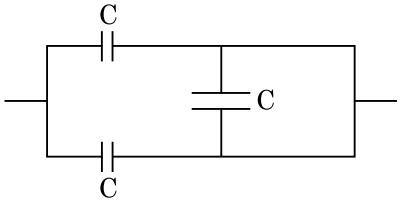
(1) n

(2) 2n

(3) 3n

(4) 4n

4. The equivalent capacitance of the combination shown in the figure is :



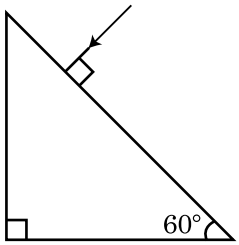
(1) 3C

(2) 2C

(3) C/2

(4) 3C/2

5. Find the value of the angle of emergence from the prism. Refractive index of the glass is $\sqrt{3}$.



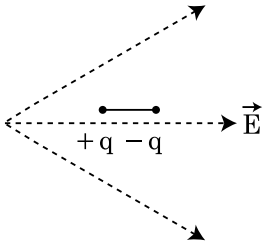
(1) 60°

(2) 30°

(3) 45°

(4) 90°

6. A dipole is placed in an electric field as shown. In which direction will it move ?



(1) towards the left as its potential energy will increase.

(2) towards the right as its potential energy will decrease.

(3) towards the left as its potential energy will decrease.

(4) towards the right as its potential energy will increase.

7. Match **Column - I** and **Column - II** and choose the **correct** match from the given choices.

	Column - I	**Column - II**
(A)	Root mean square speed of gas molecules	(P) $\frac{1}{3}nm\bar{v}^2$
(B)	Pressure exerted by ideal gas	(Q) $\sqrt{\frac{3\,RT}{M}}$
(C)	Average kinetic energy of a molecule	(R) $\frac{5}{2}RT$
(D)	Total internal energy of 1 mole of a diatomic gas	(S) $\frac{3}{2}k_BT$

(1) (A) - (R), (B) - (P), (C) - (S), (D) - (Q)

(2) (A) - (Q), (B) - (R), (C) - (S), (D) - (P)

(3) (A) - (Q), (B) - (P), (C) - (S), (D) - (R)

(4) (A) - (R), (B) - (Q), (C) - (P), (D) - (S)

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8. A convex lens 'A' of focal length 20 cm and a concave lens 'B' of focal length 5 cm are kept along the same axis with a distance 'd' between them. If a parallel beam of light falling on 'A' leaves 'B' as a parallel beam, then the distance 'd' in cm will be :

(1) 25

(2) 15

(3) 50

(4) 30

9. If force [F], acceleration [A] and time [T] are chosen as the fundamental physical quantities. Find the dimensions of energy.

(1) [F] [A] [T]

(2) [F] [A] [T^2]

(3) [F] [A] [T^{-1}]

(4) [F] [A^{-1}] [T]

10. A cup of coffee cools from 90°C to 80°C in t minutes, when the room temperature is 20°C. The time taken by a similar cup of coffee to cool from 80°C to 60°C at a room temperature same at 20°C is :

(1) $\frac{13}{10}t$

(2) $\frac{13}{5}t$

(3) $\frac{10}{13}t$

(4) $\frac{5}{13}t$

11. A particle is released from height S from the surface of the Earth. At a certain height its kinetic energy is three times its potential energy. The height from the surface of earth and the speed of the particle at that instant are respectively :

(1) $\frac{S}{4}, \frac{3gS}{2}$

(2) $\frac{S}{4}, \frac{\sqrt{3gS}}{2}$

(3) $\frac{S}{2}, \frac{\sqrt{3gS}}{2}$

(4) $\frac{S}{4}, \sqrt{\frac{3gS}{2}}$

12. The velocity of a small ball of mass M and density d, when dropped in a container filled with glycerine becomes constant after some time. If the density of glycerine is $\frac{d}{2}$, then the viscous force acting on the ball will be :

(1) $\frac{Mg}{2}$

(2) Mg

(3) $\frac{3}{2}Mg$

(4) 2Mg

13. For a plane electromagnetic wave propagating in x-direction, which one of the following combination gives the correct possible directions for electric field (E) and magnetic field (B) respectively ?

(1) $\hat{j}+\hat{k}, \hat{j}+\hat{k}$

(2) $-\hat{j}+\hat{k}, -\hat{j}-\hat{k}$

(3) $\hat{j}+\hat{k}, -\hat{j}-\hat{k}$

(4) $-\hat{j}+\hat{k}, -\hat{j}+\hat{k}$

14. **Column - I** gives certain physical terms associated with flow of current through a metallic conductor. **Column - II** gives some mathematical relations involving electrical quantities. Match **Column - I** and **Column - II** with appropriate relations.

	Column - I		**Column - II**
(A)	Drift Velocity	(P)	$\frac{m}{ne^2\rho}$
(B)	Electrical Resistivity	(Q)	$ne\upsilon_d$
(C)	Relaxation Period	(R)	$\frac{eE}{m}\tau$
(D)	Current Density	(S)	$\frac{E}{J}$

(1) (A)-(R), (B)-(S), (C)-(P), (D)-(Q)
(2) (A)-(R), (B)-(S), (C)-(Q), (D)-(P)
(3) (A)-(R), (B)-(P), (C)-(S), (D)-(Q)
(4) (A)-(R), (B)-(Q), (C)-(S), (D)-(P)

15. A spring is stretched by 5 cm by a force 10 N. The time period of the oscillations when a mass of 2 kg is suspended by it is :

(1) 0.0628 s
(2) 6.28 s
(3) 3.14 s
(4) 0.628 s

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16. A parallel plate capacitor has a uniform electric field '$\vec{E}$' in the space between the plates. If the distance between the plates is 'd' and the area of each plate is 'A', the energy stored in the capacitor is : (ε_0 = permittivity of free space)

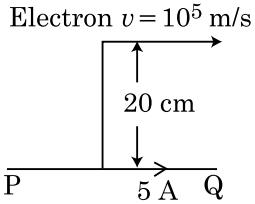
(1) $\frac{1}{2}\varepsilon_0 E^2$

(2) $\varepsilon_0 EAd$

(3) $\frac{1}{2}\varepsilon_0 E^2 Ad$

(4) $\frac{E^2 Ad}{\varepsilon_0}$

17. An infinitely long straight conductor carries a current of 5 A as shown. An electron is moving with a speed of 10^5 m/s parallel to the conductor. The perpendicular distance between the electron and the conductor is 20 cm at an instant. Calculate the magnitude of the force experienced by the electron at that instant.



(1) 4×10^{-20} N

(2) $8\pi \times 10^{-20}$ N

(3) $4\pi \times 10^{-20}$ N

(4) 8×10^{-20} N

18. A lens of large focal length and large aperture is best suited as an objective of an astronomical telescope since :

(1) a large aperture contributes to the quality and visibility of the images.

(2) a large area of the objective ensures better light gathering power.

(3) a large aperture provides a better resolution.

(4) all of the above.

19. A radioactive nucleus ${}^{A}_{Z}X$ undergoes spontaneous decay in the sequence

${}^{A}_{Z}X \rightarrow {}_{Z-1}B \rightarrow {}_{Z-3}C \rightarrow {}_{Z-2}D$, where Z is the atomic number of element X. The possible decay particles in the sequence are :

(1) α, β^-, β^+

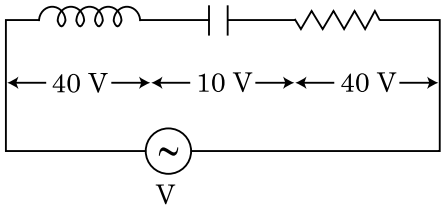
(2) α, β^+, β^-

(3) β^+, α, β^-

(4) β^-, α, β^+

20. An inductor of inductance L, a capacitor of capacitance C and a resistor of resistance 'R' are connected in series to an ac source of potential difference 'V' volts as shown in figure.

Potential difference across L, C and R is 40 V, 10 V and 40 V, respectively. The amplitude of current flowing through LCR series circuit is $10\sqrt{2}$ A. The impedance of the circuit is :



(1) $4\sqrt{2}\ \Omega$

(2) $5/\sqrt{2}\ \Omega$

(3) $4\ \Omega$

(4) $5\ \Omega$

21. The escape velocity from the Earth's surface is v. The escape velocity from the surface of another planet having a radius, four times that of Earth and same mass density is :

(1) v

(2) $2v$

(3) $3v$

(4) $4v$

22. A screw gauge gives the following readings when used to measure the diameter of a wire

Main scale reading : 0 mm

Circular scale reading : 52 divisions

Given that 1 mm on main scale corresponds to 100 divisions on the circular scale. The diameter of the wire from the above data is :

(1) 0.52 cm

(2) 0.026 cm

(3) 0.26 cm

(4) 0.052 cm

23. Water falls from a height of 60 m at the rate of 15 kg/s to operate a turbine. The losses due to frictional force are 10% of the input energy. How much power is generated by the turbine ? ($g = 10$ m/s^2)

(1) 10.2 kW

(2) 8.1 kW

(3) 12.3 kW

(4) 7.0 kW

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24. A small block slides down on a smooth inclined plane, starting from rest at time t = 0. Let S_n be the distance travelled by the block in the interval t = n − 1 to t = n. Then, the ratio $\frac{S_n}{S_{n+1}}$ is :

(1) $\frac{2n-1}{2n}$

(2) $\frac{2n-1}{2n+1}$

(3) $\frac{2n+1}{2n-1}$

(4) $\frac{2n}{2n-1}$

25. Polar molecules are the molecules :

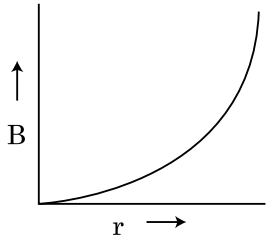
(1) having zero dipole moment.

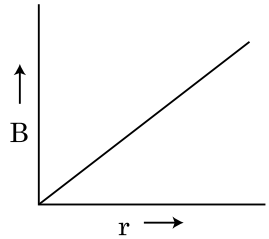
(2) acquire a dipole moment only in the presence of electric field due to displacement of charges.

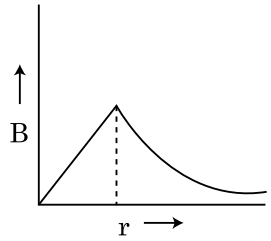
(3) acquire a dipole moment only when magnetic field is absent.

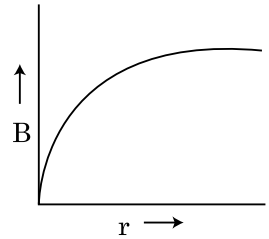
(4) having a permanent electric dipole moment.

26. A thick current carrying cable of radius 'R' carries current 'I' uniformly distributed across its cross-section. The variation of magnetic field B(r) due to the cable with the distance 'r' from the axis of the cable is represented by :

(1) 

(2) 

(3) 

(4) 

27. In a potentiometer circuit a cell of EMF 1.5 V gives balance point at 36 cm length of wire. If another cell of EMF 2.5 V replaces the first cell, then at what length of the wire, the balance point occurs ?

(1) 60 cm

(2) 21.6 cm

(3) 64 cm

(4) 62 cm

28. Two charged spherical conductors of radius R_1 and R_2 are connected by a wire. Then the ratio of surface charge densities of the spheres (σ_1/σ_2) is :

(1) $\frac{R_1}{R_2}$

(2) $\frac{R_2}{R_1}$

(3) $\sqrt{\left(\frac{R_1}{R_2}\right)}$

(4) $\frac{R_1^2}{R_2^2}$

29. An electromagnetic wave of wavelength 'λ' is incident on a photosensitive surface of negligible work function. If 'm' mass is of photoelectron emitted from the surface has de-Broglie wavelength λ_d, then :

(1) $\lambda = \left(\frac{2m}{hc}\right)\lambda_d^{\,2}$

(2) $\lambda_d = \left(\frac{2mc}{h}\right)\lambda^2$

(3) $\lambda = \left(\frac{2mc}{h}\right)\lambda_d^{\,2}$

(4) $\lambda = \left(\frac{2h}{mc}\right)\lambda_d^{\,2}$

30. The electron concentration in an n-type semiconductor is the same as hole concentration in a p-type semiconductor. An external field (electric) is applied across each of them. Compare the currents in them.

(1) current in n-type = current in p-type.

(2) current in p-type > current in n-type.

(3) current in n-type > current in p-type.

(4) No current will flow in p-type, current will only flow in n-type.

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31. The number of photons per second on an average emitted by the source of monochromatic light of wavelength 600 nm, when it delivers the power of 3.3×10^{-3} watt will be : ($h = 6.6 \times 10^{-34}$ Js)

(1) 10^{18}

(2) 10^{17}

(3) 10^{16}

(4) 10^{15}

32. If E and G respectively denote energy and gravitational constant, then $\frac{E}{G}$ has the dimensions of :

(1) $[M^2]\,[L^{-1}]\,[T^0]$

(2) $[M]\,[L^{-1}]\,[T^{-1}]$

(3) $[M]\,[L^0]\,[T^0]$

(4) $[M^2]\,[L^{-2}]\,[T^{-1}]$

33. The effective resistance of a parallel connection that consists of four wires of equal length, equal area of cross-section and same material is 0.25 Ω. What will be the effective resistance if they are connected in series ?

(1) 0.25 Ω

(2) 0.5 Ω

(3) 1 Ω

(4) 4 Ω

34. The half-life of a radioactive nuclide is 100 hours. The fraction of original activity that will remain after 150 hours would be :

(1) 1/2

(2) $\frac{1}{2\sqrt{2}}$

(3) $\frac{2}{3}$

(4) $\frac{2}{3\sqrt{2}}$

35. A nucleus with mass number 240 breaks into two fragments each of mass number 120, the binding energy per nucleon of unfragmented nuclei is 7.6 MeV while that of fragments is 8.5 MeV. The total gain in the Binding Energy in the process is :

(1) 0.9 MeV

(2) 9.4 MeV

(3) 804 MeV

(4) 216 MeV

Section - B (Physics)

36. Two conducting circular loops of radii R_1 and R_2 are placed in the same plane with their centres coinciding. If $R_1 >> R_2$, the mutual inductance M between them will be directly proportional to :

(1) $\frac{R_1}{R_2}$

(2) $\frac{R_2}{R_1}$

(3) $\frac{R_1^2}{R_2}$

(4) $\frac{R_2^2}{R_1}$

37. In the product

$$\vec{F} = q\left(\vec{v} \times \vec{B}\right)$$
$$= q\,\vec{v} \times \left(B\hat{i} + B\hat{j} + B_0\hat{k}\right)$$

For $q = 1$ and $\vec{v} = 2\hat{i} + 4\hat{j} + 6\hat{k}$ and $\vec{F} = 4\hat{i} - 20\hat{j} + 12\hat{k}$

What will be the complete expression for $\vec{B}$?

(1) $-8\hat{i} - 8\hat{j} - 6\hat{k}$

(2) $-6\hat{i} - 6\hat{j} - 8\hat{k}$

(3) $8\hat{i} + 8\hat{j} - 6\hat{k}$

(4) $6\hat{i} + 6\hat{j} - 8\hat{k}$

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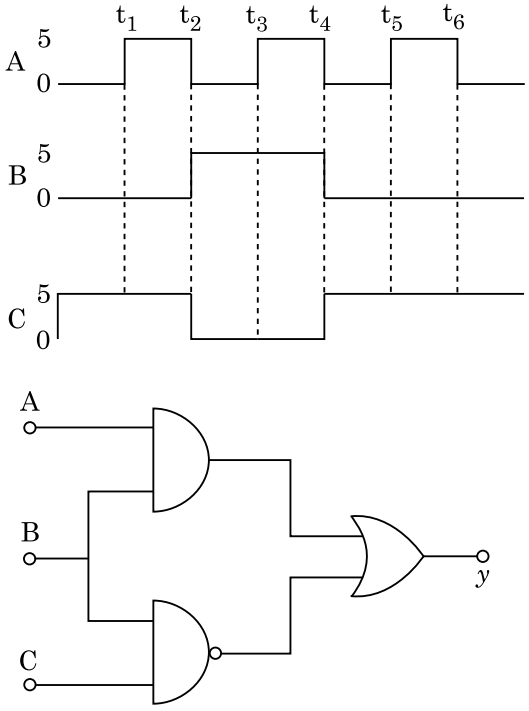
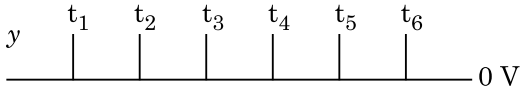
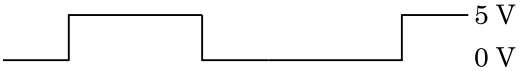
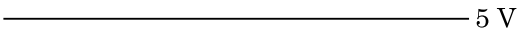
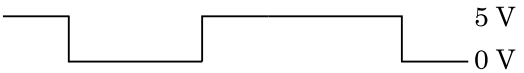
38. For the given circuit, the input digital signals are applied at the terminals A, B and C. What would be the output at the terminal y ?



(1) 

(2) 

(3) 

(4) 

39. A series LCR circuit containing 5.0 H inductor, 80 μF capacitor and 40 Ω resistor is connected to 230 V variable frequency ac source. The angular frequencies of the source at which power transferred to the circuit is half the power at the resonant angular frequency are likely to be :

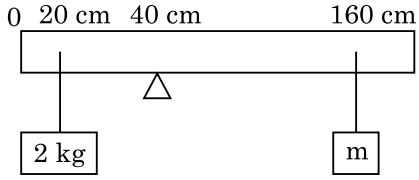
(1) 25 rad/s and 75 rad/s

(2) 50 rad/s and 25 rad/s

(3) 46 rad/s and 54 rad/s

(4) 42 rad/s and 58 rad/s

40. A uniform rod of length 200 cm and mass 500 g is balanced on a wedge placed at 40 cm mark. A mass of 2 kg is suspended from the rod at 20 cm and another unknown mass 'm' is suspended from the rod at 160 cm mark as shown in the figure. Find the value of 'm' such that the rod is in equilibrium. ($g = 10\ m/s^2$)



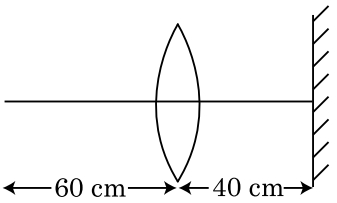
(1) $\frac{1}{2}$ kg

(2) $\frac{1}{3}$ kg

(3) $\frac{1}{6}$ kg

(4) $\frac{1}{12}$ kg

41. A point object is placed at a distance of 60 cm from a convex lens of focal length 30 cm. If a plane mirror were put perpendicular to the principal axis of the lens and at a distance of 40 cm from it, the final image would be formed at a distance of :



(1) 20 cm from the lens, it would be a real image.

(2) 30 cm from the lens, it would be a real image.

(3) 30 cm from the plane mirror, it would be a virtual image.

(4) 20 cm from the plane mirror, it would be a virtual image.

42. A car starts from rest and accelerates at 5 m/s^2. At t = 4 s, a ball is dropped out of a window by a person sitting in the car. What is the velocity and acceleration of the ball at t = 6 s ?
(Take $g = 10\ m/s^2$)

(1) 20 m/s, 5 m/s^2

(2) 20 m/s, 0

(3) $20\sqrt{2}$ m/s, 0

(4) $20\sqrt{2}$ m/s, 10 m/s^2

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43. Twenty seven drops of same size are charged at 220 V each. They combine to form a bigger drop. Calculate the potential of the bigger drop.

(1) 660 V

(2) 1320 V

(3) 1520 V

(4) 1980 V

44. A uniform conducting wire of length 12a and resistance 'R' is wound up as a current carrying coil in the shape of,

(i) an equilateral triangle of side 'a'.

(ii) a square of side 'a'.

The magnetic dipole moments of the coil in each case respectively are :

(1) $\sqrt{3}\,Ia^2$ and $3\,Ia^2$

(2) $3\,Ia^2$ and Ia^2

(3) $3\,Ia^2$ and $4\,Ia^2$

(4) $4\,Ia^2$ and $3\,Ia^2$

45. A ball of mass 0.15 kg is dropped from a height 10 m, strikes the ground and rebounds to the same height. The magnitude of impulse imparted to the ball is ($g = 10\ m/s^2$) nearly :

(1) 0 kg m/s

(2) 4.2 kg m/s

(3) 2.1 kg m/s

(4) 1.4 kg m/s

46. A step down transformer connected to an ac mains supply of 220 V is made to operate at 11 V, 44 W lamp. Ignoring power losses in the transformer, what is the current in the primary circuit ?

(1) 0.2 A

(2) 0.4 A

(3) 2 A

(4) 4 A

47. A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution.

If this particle were projected with the same speed at an angle 'θ' to the horizontal, the maximum height attained by it equals 4R. The angle of projection, θ, is then given by :

(1) $\theta = \cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{1/2}$

(2) $\theta = \cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$

(3) $\theta = \sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$

(4) $\theta = \sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$

48. A particle of mass 'm' is projected with a velocity $v = kV_e (k < 1)$ from the surface of the earth.

(V_e = escape velocity)

The maximum height above the surface reached by the particle is :

(1) $R\left(\frac{k}{1-k}\right)^2$

(2) $R\left(\frac{k}{1+k}\right)^2$

(3) $\frac{R^2 k}{1+k}$

(4) $\frac{Rk^2}{1-k^2}$

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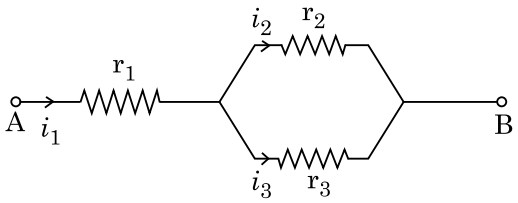
49. Three resistors having resistances r_1, r_2 and r_3 are connected as shown in the given circuit. The ratio $\frac{i_3}{i_1}$ of currents in terms of resistances used in the circuit is :



(1) $\frac{r_1}{r_2+r_3}$

(2) $\frac{r_2}{r_2+r_3}$

(3) $\frac{r_1}{r_1+r_2}$

(4) $\frac{r_2}{r_1+r_3}$

50. From a circular ring of mass 'M' and radius 'R' an arc corresponding to a 90° sector is removed. The moment of inertia of the remaining part of the ring about an axis passing through the centre of the ring and perpendicular to the plane of the ring is 'K' times 'MR^2'. Then the value of 'K' is :

(1) $\frac{3}{4}$

(2) $\frac{7}{8}$

(3) $\frac{1}{4}$

(4) $\frac{1}{8}$

Section - A (Chemistry)

51. Which one among the following is the correct option for right relationship between C_P and C_V for one mole of ideal gas ?

(1) $C_P + C_V = R$

(2) $C_P - C_V = R$

(3) $C_P = RC_V$

(4) $C_V = RC_P$

52. The correct option for the number of body centred unit cells in all 14 types of Bravais lattice unit cells is :

(1) 7

(2) 5

(3) 2

(4) 3

53. Noble gases are named because of their inertness towards reactivity. Identify an **incorrect** statement about them.

(1) Noble gases are sparingly soluble in water.

(2) Noble gases have very high melting and boiling points.

(3) Noble gases have weak dispersion forces.

(4) Noble gases have large positive values of electron gain enthalpy.

54. The major product formed in dehydrohalogenation reaction of 2-Bromo pentane is Pent-2-ene. This product formation is based on ?

(1) Saytzeff's Rule

(2) Hund's Rule

(3) Hofmann Rule

(4) Huckel's Rule

55. The compound which shows metamerism is :

(1) C_5H_{12}

(2) C_3H_8O

(3) C_3H_6O

(4) $C_4H_{10}O$

56. BF_3 is planar and electron deficient compound. Hybridization and number of electrons around the central atom, respectively are :

(1) sp^3 and 4

(2) sp^3 and 6

(3) sp^2 and 6

(4) sp^2 and 8

57. The right option for the statement "Tyndall effect is exhibited by", is :

(1) NaCl solution

(2) Glucose solution

(3) Starch solution

(4) Urea solution

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58. Among the following alkaline earth metal halides, one which is covalent and soluble in organic solvents is :

(1) Calcium chloride

(2) Strontium chloride

(3) Magnesium chloride

(4) Beryllium chloride

59. Which one of the following methods can be used to obtain highly pure metal which is liquid at room temperature ?

(1) Electrolysis

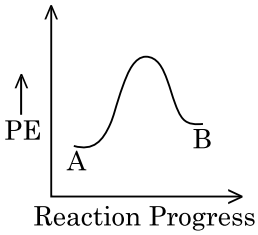
(2) Chromatography

(3) Distillation

(4) Zone refining

60. For a reaction A→B, enthalpy of reaction is -4.2 kJ mol^{-1} and enthalpy of activation is 9.6 kJ mol^{-1}. The correct potential energy profile for the reaction is shown in option.

(1)



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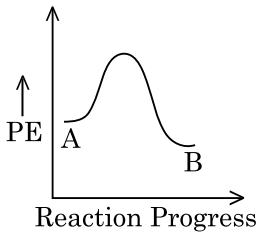

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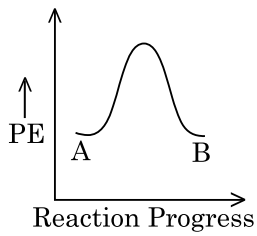

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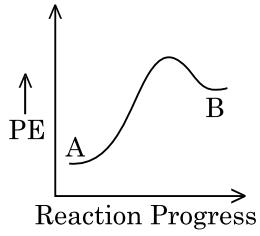


61. Which one of the following polymers is prepared by addition polymerisation ?

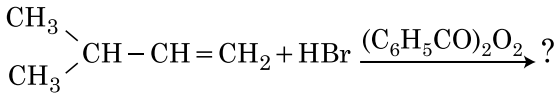
(1) Teflon

(2) Nylon-66

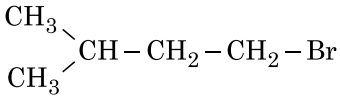
(3) Novolac

(4) Dacron

62. The major product of the following chemical reaction is :



(1)



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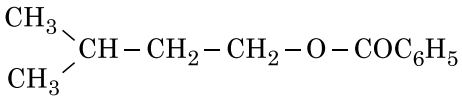

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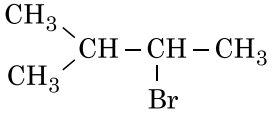

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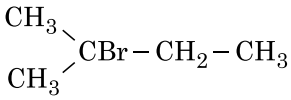

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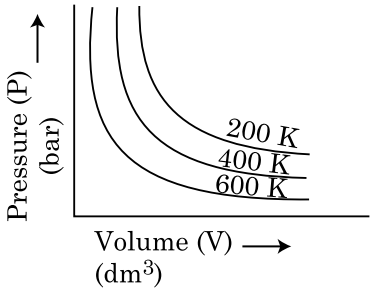
63. Choose the correct option for graphical representation of Boyle's law, which shows a graph of pressure vs. volume of a gas at different temperatures :

(1)


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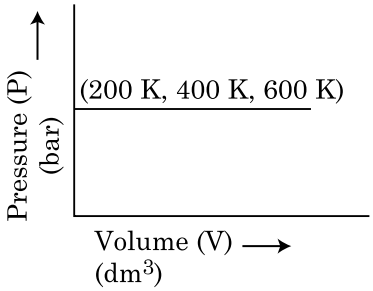

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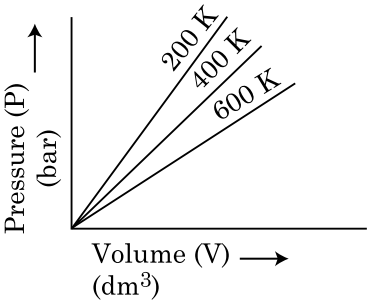

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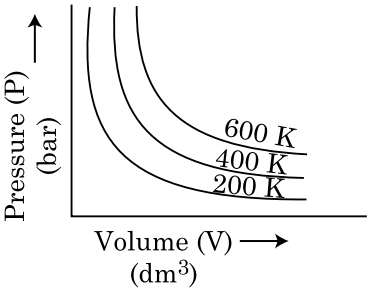

64. Dihedral angle of least stable conformer of ethane is :
(1) 120°
(2) 180°
(3) 60°
(4) 0°

65. An organic compound contains 78% (by wt.) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is : [Atomic wt. of C is 12, H is 1]
(1) CH
(2) CH_2
(3) CH_3
(4) CH_4

66. The maximum temperature that can be achieved in blast furnace is :
(1) upto 1200 K
(2) upto 2200 K
(3) upto 1900 K
(4) upto 5000 K

67. The following solutions were prepared by dissolving 10 g of glucose ($C_6H_{12}O_6$) in 250 ml of water (P_1), 10 g of urea (CH_4N_2O) in 250 ml of water (P_2) and 10 g of sucrose ($C_{12}H_{22}O_{11}$) in 250 ml of water (P_3). The right option for the decreasing order of osmotic pressure of these solutions is :
(1) $P_2 > P_1 > P_3$
(2) $P_1 > P_2 > P_3$
(3) $P_2 > P_3 > P_1$
(4) $P_3 > P_1 > P_2$

68. Zr (Z = 40) and Hf (Z = 72) have similar atomic and ionic radii because of :
(1) belonging to same group
(2) diagonal relationship
(3) lanthanoid contraction
(4) having similar chemical properties

69. The molar conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91.0 S cm^2 mol^{-1} respectively. The molar conductance of CH_3COOH at infinite dilution is. Choose the right option for your answer.
(1) 201.28 S cm^2 mol^{-1}
(2) 390.71 S cm^2 mol^{-1}
(3) 698.28 S cm^2 mol^{-1}
(4) 540.48 S cm^2 mol^{-1}

70. Right option for the number of tetrahedral and octahedral voids in hexagonal primitive unit cell are :
(1) 8, 4
(2) 6, 12
(3) 2, 1
(4) 12, 6

71. A particular station of All India Radio, New Delhi, broadcasts on a frequency of 1,368 kHz (kilohertz). The wavelength of the electromagnetic radiation emitted by the transmitter is : [speed of light, $c = 3.0 \times 10^8$ ms^{-1}]
(1) 219.3 m
(2) 219.2 m
(3) 2192 m
(4) 21.92 cm

72. Ethylene diaminetetraacetate (EDTA) ion is :
(1) Hexadentate ligand with four "O" and two "N" donor atoms
(2) Unidentate ligand
(3) Bidentate ligand with two "N" donor atoms
(4) Tridentate ligand with three "N" donor atoms

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73. The correct sequence of bond enthalpy of 'C–X' bond is :

(1) $CH_3-F < CH_3-Cl < CH_3-Br < CH_3-I$

(2) $CH_3-F > CH_3-Cl > CH_3-Br > CH_3-I$

(3) $CH_3-F < CH_3-Cl > CH_3-Br > CH_3-I$

(4) $CH_3-Cl > CH_3-F > CH_3-Br > CH_3-I$

74. The pK_b of dimethylamine and pK_a of acetic acid are 3.27 and 4.77 respectively at T (K). The correct option for the pH of dimethylammonium acetate solution is :

(1) 8.50

(2) 5.50

(3) 7.75

(4) 6.25

75. The structures of beryllium chloride in solid state and vapour phase, are :

(1) Chain and dimer, respectively

(2) Linear in both

(3) Dimer and Linear, respectively

(4) Chain in both

76. Given below are two statements :

Statement I :

Aspirin and Paracetamol belong to the class of narcotic analgesics.

Statement II :

Morphine and Heroin are non-narcotic analgesics.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

(3) **Statement I** is correct but **Statement II** is false.

(4) **Statement I** is incorrect but **Statement II** is true.

77. Match **List - I** with **List - II**.

	List - I		**List - II**
(a)	PCl_5	(i)	Square pyramidal
(b)	SF_6	(ii)	Trigonal planar
(c)	BrF_5	(iii)	Octahedral
(d)	BF_3	(iv)	Trigonal bipyramidal

Choose the **correct** answer from the options given below.

(1) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

78. **Statement I :**

Acid strength increases in the order given as HF << HCl << HBr << HI.

Statement II :

As the size of the elements F, Cl, Br, I increases down the group, the bond strength of HF, HCl, HBr and HI decreases and so the acid strength increases.

In the light of the above statements, choose the **correct** answer from the options given below.

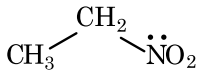
(1) Both **Statement I** and **Statement II** are true.

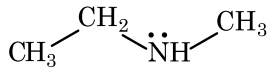
(2) Both **Statement I** and **Statement II** are false.

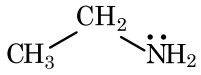
(3) **Statement I** is correct but **Statement II** is false.

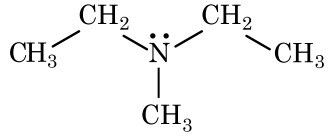
(4) **Statement I** is incorrect but **Statement II** is true.

79. Identify the compound that will react with Hinsberg's reagent to give a solid which dissolves in alkali.

(1) 

(2) 

(3) 

(4) 

80. What is the IUPAC name of the organic compound formed in the following chemical reaction ?

$$\text{Acetone} \xrightarrow[\text{(ii) } H_2O,\ H^+]{\text{(i) } C_2H_5MgBr,\ \text{dry Ether}} \text{Product}$$

(1) 2-methyl propan-2-ol

(2) pentan-2-ol

(3) pentan-3-ol

(4) 2-methyl butan-2-ol

81. Which of the following reactions is the metal displacement reaction ? Choose the right option.

(1) $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

(2) $Cr_2O_3 + 2Al \xrightarrow{\Delta} Al_2O_3 + 2Cr$

(3) $Fe + 2HCl \rightarrow FeCl_2 + H_2\uparrow$

(4) $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2\uparrow$

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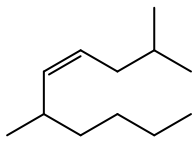
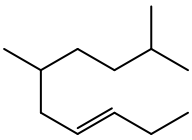
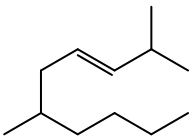
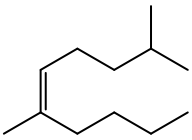
82. The correct structure of 2,6-Dimethyl-dec-4-ene is :

(1) 

(2) 

(3) 

(4) 

83. The **incorrect** statement among the following is :

(1) Actinoid contraction is greater for element to element than Lanthanoid contraction.

(2) Most of the trivalent Lanthanoid ions are colorless in the solid state.

(3) Lanthanoids are good conductors of heat and electricity.

(4) Actinoids are highly reactive metals, especially when finely divided.

84. The RBC deficiency is deficiency disease of :

(1) Vitamin B_{12}

(2) Vitamin B_6

(3) Vitamin B_1

(4) Vitamin B_2

85. Tritium, a radioactive isotope of hydrogen, emits which of the following particles ?

(1) Beta (β^-)

(2) Alpha (α)

(3) Gamma (γ)

(4) Neutron (n)

Section - B (Chemistry)

86. Match **List - I** with **List - II**.

	List - I		**List - II**
(a)	$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	(i)	Acid rain
(b)	$HOCl(g) \xrightarrow{h\nu} \dot{O}H + \dot{C}l$	(ii)	Smog
(c)	$CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$	(iii)	Ozone depletion
(d)	$NO_2(g) \xrightarrow{h\nu} NO(g) + O(g)$	(iv)	Tropospheric pollution

Choose the **correct** answer from the options given below.

(1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

(4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

87. $CH_3CH_2COO^-Na^+ \xrightarrow[\text{Heat}]{\text{NaOH, + ?}} CH_3CH_3 + Na_2CO_3$.

Consider the above reaction and identify the missing reagent/chemical.

(1) B_2H_6

(2) Red Phosphorus

(3) CaO

(4) DIBAL-H

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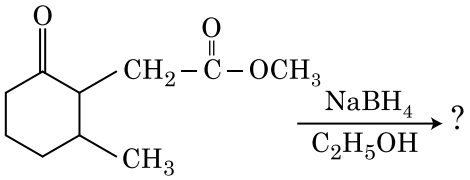
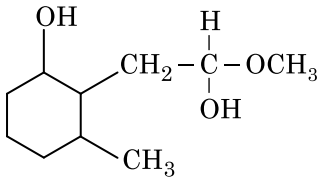
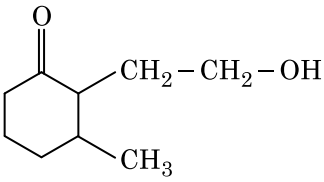
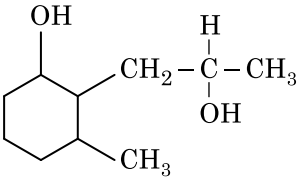
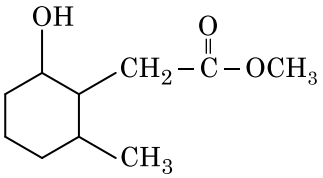
88. The product formed in the following chemical reaction is :



(1) 

(2) 

(3) 

(4) 

89. Match **List - I** with **List - II**.

	List - I		**List - II**
(a)	$[Fe(CN)_6]^{3-}$	(i)	5.92 BM
(b)	$[Fe(H_2O)_6]^{3+}$	(ii)	0 BM
(c)	$[Fe(CN)_6]^{4-}$	(iii)	4.90 BM
(d)	$[Fe(H_2O)_6]^{2+}$	(iv)	1.73 BM

Choose the **correct** answer from the options given below.

(1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

(2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

(4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

90. From the following pairs of ions which one is not an iso-electronic pair ?

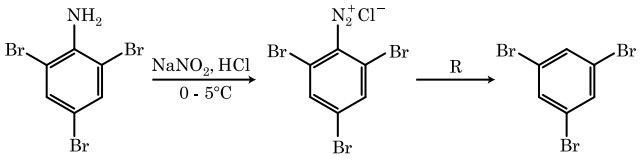
(1) O^{2-}, F^-

(2) Na^+, Mg^{2+}

(3) Mn^{2+}, Fe^{3+}

(4) Fe^{2+}, Mn^{2+}

91. The reagent 'R' in the given sequence of chemical reaction is :



(1) H_2O

(2) CH_3CH_2OH

(3) HI

(4) CuCN/KCN

92. Choose the correct option for the total pressure (in atm.) in a mixture of 4 g O_2 and 2 g H_2 confined in a total volume of one litre at 0°C is :

[Given R = 0.082 L atm $mol^{-1}K^{-1}$, T = 273 K]

(1) 2.518

(2) 2.602

(3) 25.18

(4) 26.02

93. Which of the following molecules is non-polar in nature ?

(1) $POCl_3$

(2) CH_2O

(3) $SbCl_5$

(4) NO_2

94. In which one of the following arrangements the given sequence is not strictly according to the properties indicated against it ?

(1)	HF < HCl < HBr < HI	:	Increasing acidic strength
(2)	$H_2O < H_2S < H_2Se < H_2Te$	:	Increasing pK_a values
(3)	$NH_3 < PH_3 < AsH_3 < SbH_3$	:	Increasing acidic character
(4)	$CO_2 < SiO_2 < SnO_2 < PbO_2$	:	Increasing oxidizing power

95. The correct option for the value of vapour pressure of a solution at 45°C with benzene to octane in molar ratio 3 : 2 is :

[At 45°C vapour pressure of benzene is 280 mm Hg and that of octane is 420 mm Hg. Assume Ideal gas]

(1) 160 mm of Hg

(2) 168 mm of Hg

(3) 336 mm of Hg

(4) 350 mm of Hg

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96. The molar conductivity of 0.007 M acetic acid is 20 S cm^2 mol^{-1}. What is the dissociation constant of acetic acid ? Choose the correct option.

$$\left[\begin{array}{l}\Lambda^\circ_{H^+} = 350 \text{ S cm}^2 \text{ mol}^{-1} \\ \Lambda^\circ_{CH_3COO^-} = 50 \text{ S cm}^2 \text{ mol}^{-1}\end{array}\right]$$

(1) 1.75×10^{-4} mol L^{-1}

(2) 2.50×10^{-4} mol L^{-1}

(3) 1.75×10^{-5} mol L^{-1}

(4) 2.50×10^{-5} mol L^{-1}

97. The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T}\right)$ of first order reaction is -5×10^3 K. The value of E_a of the reaction is. Choose the correct option for your answer.

[Given $R = 8.314$ $JK^{-1}mol^{-1}$]

(1) 41.5 kJ mol^{-1}

(2) 83.0 kJ mol^{-1}

(3) 166 kJ mol^{-1}

(4) -83 kJ mol^{-1}

98. Match **List - I** with **List - II**.

List - I		List - II
(a) $\xrightarrow[\text{Anhyd.}AlCl_3/\text{CuCl}]{\text{CO, HCl}}$	(i)	Hell-Volhard-Zelinsky reaction
(b) $R-\overset{\overset{O}{\|}}{C}-CH_3 + NaOX \longrightarrow$	(ii)	Gattermann-Koch reaction
(c) $R-CH_2-OH + R'COOH \xrightarrow{\text{Conc. } H_2SO_4}$	(iii)	Haloform reaction
(d) $R-CH_2COOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } X_2/\text{Red P}}$	(iv)	Esterification

Choose the **correct** answer from the options given below.

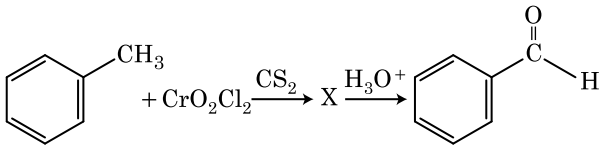
(1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

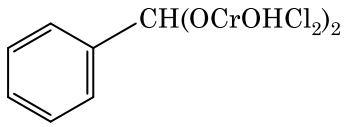
(2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

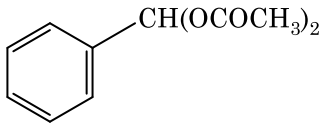
(3) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

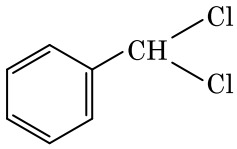
(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

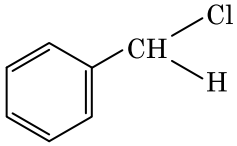
99. The intermediate compound 'X' in the following chemical reaction is :



(1) 

(2) 

(3) 

(4) 

100. For irreversible expansion of an ideal gas under isothermal condition, the correct option is :

(1) $\Delta U = 0$, $\Delta S_{total} = 0$

(2) $\Delta U \neq 0$, $\Delta S_{total} \neq 0$

(3) $\Delta U = 0$, $\Delta S_{total} \neq 0$

(4) $\Delta U \neq 0$, $\Delta S_{total} = 0$

Section - A (Biology : Botany)

101. In the equation GPP – R = NPP

R represents :

(1) Radiant energy

(2) Retardation factor

(3) Environment factor

(4) Respiration losses

102. Inspite of interspecific competition in nature, which mechanism the competing species might have evolved for their survival ?

(1) Resource partitioning

(2) Competitive release

(3) Mutualism

(4) Predation

103. Amensalism can be represented as :

(1) Species A (–) ; Species B (0)

(2) Species A (+) ; Species B (+)

(3) Species A (–) ; Species B (–)

(4) Species A (+) ; Species B (0)

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104. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Cells with active cell division capacity	(i)	Vascular tissues
(b)	Tissue having all cells similar in structure and function	(ii)	Meristematic tissue
(c)	Tissue having different types of cells	(iii)	Sclereids
(d)	Dead cells with highly thickened walls and narrow lumen	(iv)	Simple tissue

Select the **correct** answer from the options given below.

	(a)	(b)	(c)	(d)
(1)	(ii)	(iv)	(i)	(iii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(iii)	(ii)	(iv)	(i)

105. The production of gametes by the parents, formation of zygotes, the F_1 and F_2 plants, can be understood from a diagram called :

(1) Bullet square
(2) Punch square
(3) Punnett square
(4) Net square

106. DNA strands on a gel stained with ethidium bromide when viewed under UV radiation, appear as :

(1) Yellow bands
(2) Bright orange bands
(3) Dark red bands
(4) Bright blue bands

107. Gemmae are present in :

(1) Mosses
(2) Pteridophytes
(3) Some Gymnosperms
(4) Some Liverworts

108. Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called :

(1) Elasticity
(2) Flexibility
(3) Plasticity
(4) Maturity

109. Which of the following is an **incorrect** statement ?

(1) Mature sieve tube elements possess a conspicuous nucleus and usual cytoplasmic organelles.
(2) Microbodies are present both in plant and animal cells.
(3) The perinuclear space forms a barrier between the materials present inside the nucleus and that of the cytoplasm.
(4) Nuclear pores act as passages for proteins and RNA molecules in both directions between nucleus and cytoplasm.

110. A typical angiosperm embryo sac at maturity is :

(1) 8-nucleate and 7-celled
(2) 7-nucleate and 8-celled
(3) 7-nucleate and 7-celled
(4) 8-nucleate and 8-celled

111. The plant hormone used to destroy weeds in a field is :

(1) IAA
(2) NAA
(3) 2, 4-D
(4) IBA

112. Which of the following algae produce Carrageen ?

(1) Green algae
(2) Brown algae
(3) Red algae
(4) Blue-green algae

113. Mutations in plant cells can be induced by :

(1) Kinetin
(2) Infrared rays
(3) Gamma rays
(4) Zeatin

114. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Protoplast fusion	(i)	Totipotency
(b)	Plant tissue culture	(ii)	Pomato
(c)	Meristem culture	(iii)	Somaclones
(d)	Micropropagation	(iv)	Virus free plants

Choose the **correct** answer from the options given below.

	(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(ii)	(i)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(ii)	(i)

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115. Which of the following stages of meiosis involves division of centromere ?
(1) Metaphase I
(2) Metaphase II
(3) Anaphase II
(4) Telophase II

116. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Lenticels	(i)	Phellogen
(b)	Cork cambium	(ii)	Suberin deposition
(c)	Secondary cortex	(iii)	Exchange of gases
(d)	Cork	(iv)	Phelloderm

Choose the **correct** answer from the options given below.

	(a)	(b)	(c)	(d)
(1)	(iv)	(i)	(iii)	(ii)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(iv)	(ii)	(i)	(iii)

117. The site of perception of light in plants during photoperiodism is :
(1) Shoot apex
(2) Stem
(3) Axillary bud
(4) Leaf

118. Which of the following plants is monoecious ?
(1) *Carica papaya*
(2) Chara
(3) *Marchantia polymorpha*
(4) *Cycas circinalis*

119. When the centromere is situated in the middle of two equal arms of chromosomes, the chromosome is referred as :
(1) Metacentric
(2) Telocentric
(3) Sub-metacentric
(4) Acrocentric

120. Which of the following is **not** an application of PCR (Polymerase Chain Reaction) ?
(1) Molecular diagnosis
(2) Gene amplification
(3) Purification of isolated protein
(4) Detection of gene mutation

121. Genera like *Selaginella* and *Salvinia* produce two kinds of spores. Such plants are known as :
(1) Homosorus
(2) Heterosorus
(3) Homosporous
(4) Heterosporous

122. Complete the flow chart on central dogma.

(a) DNA $\xrightarrow{(b)}$ mRNA $\xrightarrow{(c)}$ (d)

(1) (a)-Replication; (b)-Transcription; (c)-Transduction; (d)-Protein
(2) (a)-Translation; (b)-Replication; (c)-Transcription; (d)-Transduction
(3) (a)-Replication; (b)-Transcription; (c)-Translation; (d)-Protein
(4) (a)-Transduction; (b)-Translation; (c)-Replication; (d)-Protein

123. Which of the following statements is **not** correct ?
(1) Pyramid of biomass in sea is generally inverted.
(2) Pyramid of biomass in sea is generally upright.
(3) Pyramid of energy is always upright.
(4) Pyramid of numbers in a grassland ecosystem is upright.

124. Which of the following algae contains mannitol as reserve food material ?
(1) *Ectocarpus*
(2) *Gracilaria*
(3) *Volvox*
(4) *Ulothrix*

125. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out :
(1) RNA
(2) DNA
(3) Histones
(4) Polysaccharides

126. The factor that leads to Founder effect in a population is :
(1) Natural selection
(2) Genetic recombination
(3) Mutation
(4) Genetic drift

127. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Cohesion	(i)	More attraction in liquid phase
(b)	Adhesion	(ii)	Mutual attraction among water molecules
(c)	Surface tension	(iii)	Water loss in liquid phase
(d)	Guttation	(iv)	Attraction towards polar surfaces

Choose the **correct** answer from the options given below.

	(a)	(b)	(c)	(d)
(1)	(ii)	(iv)	(i)	(iii)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(ii)	(i)	(iv)	(iii)

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128. Diadelphous stamens are found in :
(1) China rose
(2) Citrus
(3) Pea
(4) China rose and citrus

129. Which of the following are **not** secondary metabolites in plants ?
(1) Morphine, codeine
(2) Amino acids, glucose
(3) Vinblastin, curcumin
(4) Rubber, gums

130. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Cristae	(i)	Primary constriction in chromosome
(b)	Thylakoids	(ii)	Disc-shaped sacs in Golgi apparatus
(c)	Centromere	(iii)	Infoldings in mitochondria
(d)	Cisternae	(iv)	Flattened membranous sacs in stroma of plastids

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(i)	(iv)	(iii)	(ii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(ii)	(iii)	(iv)	(i)

131. When gene targetting involving gene amplification is attempted in an individual's tissue to treat disease, it is known as :
(1) Biopiracy
(2) Gene therapy
(3) Molecular diagnosis
(4) Safety testing

132. The term used for transfer of pollen grains from anthers of one plant to stigma of a different plant which, during pollination, brings genetically different types of pollen grains to stigma, is :
(1) Xenogamy
(2) Geitonogamy
(3) Chasmogamy
(4) Cleistogamy

133. Which of the following is a **correct** sequence of steps in a PCR (Polymerase Chain Reaction) ?
(1) Denaturation, Annealing, Extension
(2) Denaturation, Extension, Annealing
(3) Extension, Denaturation, Annealing
(4) Annealing, Denaturation, Extension

134. The amount of nutrients, such as carbon, nitrogen, phosphorus and calcium present in the soil at any given time, is referred as :
(1) Climax
(2) Climax community
(3) Standing state
(4) Standing crop

135. The first stable product of CO_2 fixation in sorghum is :
(1) Pyruvic acid
(2) Oxaloacetic acid
(3) Succinic acid
(4) Phosphoglyceric acid

Section - B (Biology : Botany)

136. Which of the following statements is **incorrect** ?
(1) Both ATP and $NADPH + H^+$ are synthesized during non-cyclic photophosphorylation.
(2) Stroma lamellae have PS I only and lack NADP reductase.
(3) Grana lamellae have both PS I and PS II.
(4) Cyclic photophosphorylation involves both PS I and PS II.

137. Identify the **correct** statement.
(1) In capping, methyl guanosine triphosphate is added to the 3′ end of hnRNA.
(2) RNA polymerase binds with Rho factor to terminate the process of transcription in bacteria.
(3) The coding strand in a transcription unit is copied to an mRNA.
(4) Split gene arrangement is characteristic of prokaryotes.

138. Match **Column - I** with **Column - II**.

Column - I	**Column - II**
(a) $\%\,\male\female K_{(5)}C_{1+2+(2)}A_{(9)+1}\underline{G}_1$	(i) Brassicaceae
(b) $\oplus\male\female K_{(5)}\overbrace{C_{(5)}A_5}\underline{G}_2$	(ii) Liliaceae
(c) $\oplus\male\female\overbrace{P_{(3+3)}A_{3+3}}\underline{G}_{(3)}$	(iii) Fabaceae
(d) $\oplus\male\female K_{2+2}C_4A_{2-4}\underline{G}_{(2)}$	(iv) Solanaceae

Select the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(iv)	(ii)	(i)	(iii)

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139. Select the **correct** pair.

(1) Large colorless empty cells in the epidermis of grass leaves - Subsidiary cells

(2) In dicot leaves, vascular bundles are surrounded by large thick-walled cells - Conjunctive tissue

(3) Cells of medullary rays that form part of cambial ring - Interfascicular cambium

(4) Loose parenchyma cells rupturing the epidermis and forming a lens-shaped opening in bark - Spongy parenchyma

140. In the exponential growth equation

$N_t = N_o e^{rt}$, e represents :

(1) The base of number logarithms

(2) The base of exponential logarithms

(3) The base of natural logarithms

(4) The base of geometric logarithms

141. What is the role of RNA polymerase III in the process of transcription in eukaryotes ?

(1) Transcribes rRNAs (28S, 18S and 5.8S)

(2) Transcribes tRNA, 5s rRNA and snRNA

(3) Transcribes precursor of mRNA

(4) Transcribes only snRNAs

142. Plasmid pBR322 has PstI restriction enzyme site within gene amp^R that confers ampicillin resistance. If this enzyme is used for inserting a gene for β-galactoside production and the recombinant plasmid is inserted in an *E.coli* strain

(1) it will not be able to confer ampicillin resistance to the host cell.

(2) the transformed cells will have the ability to resist ampicillin as well as produce β-galactoside.

(3) it will lead to lysis of host cell.

(4) it will be able to produce a novel protein with dual ability.

143. Match **List - I** with **List - II**.

List - I		List - II	
(a)	S phase	(i)	Proteins are synthesized
(b)	G_2 phase	(ii)	Inactive phase
(c)	Quiescent stage	(iii)	Interval between mitosis and initiation of DNA replication
(d)	G_1 phase	(iv)	DNA replication

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iv)	(ii)	(iii)	(i)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(ii)	(iv)	(iii)	(i)

144. Which of the following statements is **correct** ?

(1) Fusion of two cells is called Karyogamy.

(2) Fusion of protoplasms between two motile on non-motile gametes is called plasmogamy.

(3) Organisms that depend on living plants are called saprophytes.

(4) Some of the organisms can fix atmospheric nitrogen in specialized cells called sheath cells.

145. Which of the following statements is **incorrect** ?

(1) During aerobic respiration, role of oxygen is limited to the terminal stage.

(2) In ETC (Electron Transport Chain), one molecule of $NADH + H^+$ gives rise to 2 ATP molecules, and one $FADH_2$ gives rise to 3 ATP molecules.

(3) ATP is synthesized through complex V.

(4) Oxidation-reduction reactions produce proton gradient in respiration.

146. In some members of which of the following pairs of families, pollen grains retain their viability for months after release ?

(1) Poaceae ; Rosaceae

(2) Poaceae ; Leguminosae

(3) Poaceae ; Solanaceae

(4) Rosaceae ; Leguminosae

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147. Match **Column - I** with **Column - II**.

Column - I		Column - II	
(a)	*Nitrococcus*	(i)	Denitrification
(b)	*Rhizobium*	(ii)	Conversion of ammonia to nitrite
(c)	*Thiobacillus*	(iii)	Conversion of nitrite to nitrate
(d)	*Nitrobacter*	(iv)	Conversion of atmospheric nitrogen to ammonia

Choose the **correct** answer from options given below.

	(a)	(b)	(c)	(d)
(1)	(ii)	(iv)	(i)	(iii)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(iv)	(iii)	(ii)	(i)

148. Now a days it is possible to detect the mutated gene causing cancer by allowing radioactive probe to hybridise its complimentary DNA in a clone of cells, followed by its detection using autoradiography because :

(1) mutated gene partially appears on a photographic film.
(2) mutated gene completely and clearly appears on a photographic film.
(3) mutated gene does not appear on a photographic film as the probe has no complimentarity with it.
(4) mutated gene does not appear on photographic film as the probe has complimentarity with it.

149. DNA fingerprinting involves identifying differences in some specific regions in DNA sequence, called as :

(1) Satellite DNA
(2) Repetitive DNA
(3) Single nucleotides
(4) Polymorphic DNA

150. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Protein	(i)	C = C double bonds
(b)	Unsaturated fatty acid	(ii)	Phosphodiester bonds
(c)	Nucleic acid	(iii)	Glycosidic bonds
(d)	Polysaccharide	(iv)	Peptide bonds

Choose the **correct** answer from the options given below.

	(a)	(b)	(c)	(d)
(1)	(iv)	(i)	(ii)	(iii)
(2)	(i)	(iv)	(iii)	(ii)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(iv)	(iii)	(i)	(ii)

Section - A (Biology : Zoology)

151. Which one of the following organisms bears hollow and pneumatic long bones ?

(1) *Neophron*
(2) *Hemidactylus*
(3) *Macropus*
(4) *Ornithorhynchus*

152. Chronic auto immune disorder affecting neuro muscular junction leading to fatigue, weakening and paralysis of skeletal muscle is called as :

(1) Arthritis
(2) Muscular dystrophy
(3) Myasthenia gravis
(4) Gout

153. Which one of the following is an example of Hormone releasing IUD ?

(1) CuT
(2) LNG 20
(3) Cu 7
(4) Multiload 375

154. Which of the following characteristics is **incorrect** with respect to cockroach ?

(1) A ring of gastric caeca is present at the junction of midgut and hind gut.
(2) Hypopharynx lies within the cavity enclosed by the mouth parts.
(3) In females, 7^{th}-9^{th} sterna together form a genital pouch.
(4) 10^{th} abdominal segment in both sexes, bears a pair of anal cerci.

155. Select the favourable conditions required for the formation of oxyhaemoglobin at the alveoli.

(1) High pO_2, low pCO_2, less H^+, lower temperature
(2) Low pO_2, high pCO_2, more H^+, higher temperature
(3) High pO_2, high pCO_2, less H^+, higher temperature
(4) Low pO_2, low pCO_2, more H^+, higher temperature

156. Sphincter of oddi is present at :

(1) Ileo-caecal junction
(2) Junction of hepato-pancreatic duct and duodenum
(3) Gastro-oesophageal junction
(4) Junction of jejunum and duodenum

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157. The organelles that are included in the endomembrane system are :

(1) Endoplasmic reticulum, Mitochondria, Ribosomes and Lysosomes

(2) Endoplasmic reticulum, Golgi complex, Lysosomes and Vacuoles

(3) Golgi complex, Mitochondria, Ribosomes and Lysosomes

(4) Golgi complex, Endoplasmic reticulum, Mitochondria and Lysosomes

158. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Metamerism	(i)	Coelenterata
(b)	Canal system	(ii)	Ctenophora
(c)	Comb plates	(iii)	Annelida
(d)	Cnidoblasts	(iv)	Porifera

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(i)	(ii)	(iii)

159. A specific recognition sequence identified by endonucleases to make cuts at specific positions within the DNA is :

(1) Degenerate primer sequence

(2) Okazaki sequences

(3) Palindromic Nucleotide sequences

(4) Poly(A) tail sequences

160. Which of the following RNAs is not required for the synthesis of protein ?

(1) mRNA

(2) tRNA

(3) rRNA

(4) siRNA

161. The partial pressures (in mm Hg) of oxygen (O_2) and carbon dioxide (CO_2) at alveoli (the site of diffusion) are :

(1) $pO_2 = 104$ and $pCO_2 = 40$

(2) $pO_2 = 40$ and $pCO_2 = 45$

(3) $pO_2 = 95$ and $pCO_2 = 40$

(4) $pO_2 = 159$ and $pCO_2 = 0.3$

162. Which of the following statements wrongly represents the nature of smooth muscle ?

(1) These muscle have no striations

(2) They are involuntary muscles

(3) Communication among the cells is performed by intercalated discs

(4) These muscles are present in the wall of blood vessels

163. Match the following :

List - I		List - II	
(a)	*Physalia*	(i)	Pearl oyster
(b)	*Limulus*	(ii)	Portuguese Man of War
(c)	*Ancylostoma*	(iii)	Living fossil
(d)	*Pinctada*	(iv)	Hookworm

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iii)	(i)	(iv)
(2)	(iv)	(i)	(iii)	(ii)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(i)	(iv)	(iii)	(ii)

164. Succus entericus is referred to as :

(1) Pancreatic juice

(2) Intestinal juice

(3) Gastric juice

(4) Chyme

165. Which of the following is **not** an objective of Biofortification in crops ?

(1) Improve protein content

(2) Improve resistance to diseases

(3) Improve vitamin content

(4) Improve micronutrient and mineral content

166. Veneral diseases can spread through :

(a) Using sterile needles

(b) Transfusion of blood from infected person

(c) Infected mother to foetus

(d) Kissing

(e) Inheritance

Choose the **correct** answer from the options given below.

(1) (a), (b) and (c) only

(2) (b), (c) and (d) only

(3) (b) and (c) only

(4) (a) and (c) only

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167. With regard to insulin choose correct options.
(a) C-peptide is not present in mature insulin.
(b) The insulin produced by rDNA technology has C-peptide.
(c) The pro-insulin has C-peptide.
(d) A-peptide and B-peptide of insulin are interconnected by disulphide bridges.
Choose the **correct** answer from the options given below.
(1) (b) and (d) only
(2) (b) and (c) only
(3) (a), (c) and (d) only
(4) (a) and (d) only

168. The fruit fly has 8 chromosomes (2n) in each cell. During interphase of Mitosis if the number of chromosomes at G_1 phase is 8, what would be the number of chromosomes after S phase ?
(1) 8
(2) 16
(3) 4
(4) 32

169. Which is the "Only enzyme" that has "Capability" to catalyse Initiation, Elongation and Termination in the process of transcription in prokaryotes ?
(1) DNA dependent DNA polymerase
(2) DNA dependent RNA polymerase
(3) DNA Ligase
(4) DNase

170. In a cross between a male and female, both heterozygous for sickle cell anaemia gene, what percentage of the progeny will be diseased ?
(1) 50%
(2) 75%
(3) 25%
(4) 100%

171. For effective treatment of the disease, early diagnosis and understanding its pathophysiology is very important. Which of the following molecular diagnostic techniques is very useful for early detection ?
(1) Western Blotting Technique
(2) Southern Blotting Technique
(3) ELISA Technique
(4) Hybridization Technique

172. Which stage of meiotic prophase shows terminalisation of chiasmata as its distinctive feature ?
(1) Leptotene
(2) Zygotene
(3) Diakinesis
(4) Pachytene

173. Read the following statements.
(a) Metagenesis is observed in Helminths.
(b) Echinoderms are triploblastic and coelomate animals.
(c) Round worms have organ-system level of body organization.
(d) Comb plates present in ctenophores help in digestion.
(e) Water vascular system is characteristic of Echinoderms.
Choose the **correct** answer from the options given below.
(1) (c), (d) and (e) are correct
(2) (a), (b) and (c) are correct
(3) (a), (d) and (e) are correct
(4) (b), (c) and (e) are correct

174. Dobson units are used to measure thickness of :
(1) CFCs
(2) Stratosphere
(3) Ozone
(4) Troposphere

175. During the process of gene amplification using PCR, if very high temperature is not maintained in the beginning, then which of the following steps of PCR will be affected first ?
(1) Annealing
(2) Extension
(3) Denaturation
(4) Ligation

176. Identify the **incorrect** pair.
(1) Alkaloids - Codeine
(2) Toxin - Abrin
(3) Lectins - Concanavalin A
(4) Drugs - Ricin

177. Persons with 'AB' blood group are called as "Universal recipients". This is due to :
(1) Absence of antigens A and B on the surface of RBCs
(2) Absence of antigens A and B in plasma
(3) Presence of antibodies, anti-A and anti-B, on RBCs
(4) Absence of antibodies, anti-A and anti-B, in plasma

178. Which one of the following belongs to the family Muscidae ?
(1) Fire fly
(2) Grasshopper
(3) Cockroach
(4) House fly

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179. The centriole undergoes duplication during :

(1) S-phase

(2) Prophase

(3) Metaphase

(4) G_2 phase

180. Receptors for sperm binding in mammals are present on :

(1) Corona radiata

(2) Vitelline membrane

(3) Perivitelline space

(4) Zona pellucida

181. Which enzyme is responsible for the conversion of inactive fibrinogens to fibrins ?

(1) Thrombin

(2) Renin

(3) Epinephrine

(4) Thrombokinase

182. Match **List - I** with **List - II**.

List - I		List - II	
(a)	*Aspergillus niger*	(i)	Acetic Acid
(b)	*Acetobacter aceti*	(ii)	Lactic Acid
(c)	*Clostridium butylicum*	(iii)	Citric Acid
(d)	*Lactobacillus*	(iv)	Butyric Acid

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(i)	(ii)	(iii)	(iv)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(iv)	(ii)	(i)	(iii)

183. Erythropoietin hormone which stimulates R.B.C. formation is produced by :

(1) Alpha cells of pancreas

(2) The cells of rostral adenohypophysis

(3) The cells of bone marrow

(4) Juxtaglomerular cells of the kidney

184. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Vaults	(i)	Entry of sperm through Cervix is blocked
(b)	IUDs	(ii)	Removal of Vas deferens
(c)	Vasectomy	(iii)	Phagocytosis of sperms within the Uterus
(d)	Tubectomy	(iv)	Removal of fallopian tube

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(ii)	(i)	(iii)
(2)	(i)	(iii)	(ii)	(iv)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iii)	(i)	(iv)	(ii)

185. If Adenine makes 30% of the DNA molecule, what will be the percentage of Thymine, Guanine and Cytosine in it ?

(1) T : 20 ; G : 30 ; C : 20

(2) T : 20 ; G : 20 ; C : 30

(3) T : 30 ; G : 20 ; C : 20

(4) T : 20 ; G : 25 ; C : 25

Section - B (Biology : Zoology)

186. Which of the following secretes the hormone, relaxin, during the later phase of pregnancy ?

(1) Graafian follicle

(2) Corpus luteum

(3) Foetus

(4) Uterus

187. Identify the types of cell junctions that help to stop the leakage of the substances across a tissue and facilitation of communication with neighbouring cells via rapid transfer of ions and molecules.

(1) Gap junctions and Adhering junctions, respectively.

(2) Tight junctions and Gap junctions, respectively.

(3) Adhering junctions and Tight junctions, respectively.

(4) Adhering junctions and Gap junctions, respectively.

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188. Which one of the following statements about Histones is **wrong** ?

(1) Histones are organized to form a unit of 8 molecules.

(2) The pH of histones is slightly acidic.

(3) Histones are rich in amino acids - Lysine and Arginine.

(4) Histones carry positive charge in the side chain.

189. Which of these is not an important component of initiation of parturition in humans ?

(1) Increase in estrogen and progesterone ratio

(2) Synthesis of prostaglandins

(3) Release of Oxytocin

(4) Release of Prolactin

190. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Allen's Rule	(i)	Kangaroo rat
(b)	Physiological adaptation	(ii)	Desert lizard
(c)	Behavioural adaptation	(iii)	Marine fish at depth
(d)	Biochemical adaptation	(iv)	Polar seal

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(ii)	(iii)	(i)
(2)	(iv)	(i)	(iii)	(ii)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(iv)	(iii)	(ii)	(i)

191. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Filariasis	(i)	*Haemophilus influenzae*
(b)	Amoebiasis	(ii)	*Trichophyton*
(c)	Pneumonia	(iii)	*Wuchereria bancrofti*
(d)	Ringworm	(iv)	*Entamoeba histolytica*

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(iii)	(ii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(ii)	(iii)	(i)	(iv)

192. Which of the following is **not** a step in Multiple Ovulation Embryo Transfer Technology (MOET) ?

(1) Cow is administered hormone having LH like activity for super ovulation

(2) Cow yields about 6-8 eggs at a time

(3) Cow is fertilized by artificial insemination

(4) Fertilized eggs are transferred to surrogate mothers at 8-32 cell stage

193. **Statement I :**

The codon 'AUG' codes for methionine and phenylalanine.

Statement II :

'AAA' and 'AAG' both codons code for the amino acid lysine.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **Statement I** and **Statement II** are true

(2) Both **Statement I** and **Statement II** are false

(3) **Statement I** is correct but **Statement II** is false

(4) **Statement I** is incorrect but **Statement II** is true

194. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Scapula	(i)	Cartilaginous joints
(b)	Cranium	(ii)	Flat bone
(c)	Sternum	(iii)	Fibrous joints
(d)	Vertebral column	(iv)	Triangular flat bone

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iii)	(ii)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(iv)	(ii)	(iii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

195. The Adenosine deaminase deficiency results into :

(1) Dysfunction of Immune system

(2) Parkinson's disease

(3) Digestive disorder

(4) Addison's disease

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196. **Assertion (A) :**

A person goes to high altitude and experiences 'altitude sickness' with symptoms like breathing difficulty and heart palpitations.

Reason (R) :

Due to low atmospheric pressure at high altitude, the body does not get sufficient oxygen.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

(2) Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**

(3) **(A)** is true but **(R)** is false

(4) **(A)** is false but **(R)** is true

197. Match **List - I** with **List - II**.

List - I		List - II	
(a)	Adaptive radiation	(i)	Selection of resistant varieties due to excessive use of herbicides and pesticides
(b)	Convergent evolution	(ii)	Bones of forelimbs in Man and Whale
(c)	Divergent evolution	(iii)	Wings of Butterfly and Bird
(d)	Evolution by anthropo-genic action	(iv)	Darwin Finches

Choose the **correct** answer from the options given below.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(i)	(iv)	(iii)	(ii)

198. Following are the statements with reference to 'lipids'.

(a) Lipids having only single bonds are called unsaturated fatty acids.

(b) Lecithin is a phospholipid.

(c) Trihydroxy propane is glycerol.

(d) Palmitic acid has 20 carbon atoms including carboxyl carbon.

(e) Arachidonic acid has 16 carbon atoms.

Choose the **correct** answer from the options given below.

(1) (a) and (b) only

(2) (c) and (d) only

(3) (b) and (c) only

(4) (b) and (e) only

199. During muscular contraction which of the following events occur ?

(a) 'H' zone disappears

(b) 'A' band widens

(c) 'I' band reduces in width

(d) Myosine hydrolyzes ATP, releasing the ADP and Pi

(e) Z-lines attached to actins are pulled inwards

Choose the **correct** answer from the options given below.

(1) (a), (c), (d), (e) only

(2) (a), (b), (c), (d) only

(3) (b), (c), (d), (e) only

(4) (b), (d), (e), (a) only

200. Following are the statements about prostomium of earthworm.

(a) It serves as a covering for mouth.

(b) It helps to open cracks in the soil into which it can crawl.

(c) It is one of the sensory structures.

(d) It is the first body segment.

Choose the **correct** answer from the options given below.

(1) (a), (b) and (c) are correct

(2) (a), (b) and (d) are correct

(3) (a), (b), (c) and (d) are correct

(4) (b) and (c) are correct

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Test Booklet Code

G1

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Important Instructions :

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2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
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8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
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10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
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13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
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Candidate's Signature : _____ Invigilator's Signature : _____

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1. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

(1) $\frac{Mg(L_1 - L)}{AL}$

(2) $\frac{MgL}{AL_1}$

(3) $\frac{MgL}{A(L_1 - L)}$

(4) $\frac{MgL_1}{AL}$

2. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

Its density is : $(R = 8.3\ J\ mol^{-1}\ K^{-1})$

(1) $0.2\ kg/m^3$

(2) $0.1\ kg/m^3$

(3) $0.02\ kg/m^3$

(4) $0.5\ kg/m^3$

3. Light with an average flux of $20\ W/cm^2$ falls on a non-reflecting surface at normal incidence having surface area $20\ cm^2$. The energy received by the surface during time span of 1 minute is :

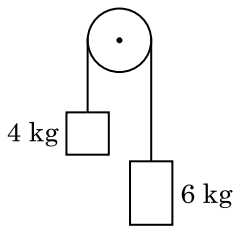
(1) $12 \times 10^3\ J$

(2) $24 \times 10^3\ J$

(3) $48 \times 10^3\ J$

(4) $10 \times 10^3\ J$

4. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g/2

(2) g/5

(3) g/10

(4) g

5. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

(1) $\frac{1}{\sqrt{2}\ n\pi d^2}$

(2) $\frac{1}{\sqrt{2}\ n^2\pi d^2}$

(3) $\frac{1}{\sqrt{2}\ n^2\pi^2 d^2}$

(4) $\frac{1}{\sqrt{2}\ n\pi d}$

6. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : $(g = 10\ m/s^2)$

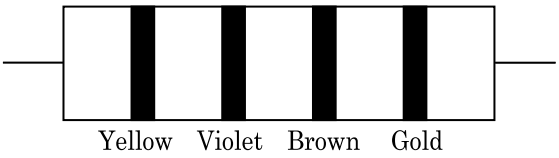
(1) 340 m

(2) 320 m

(3) 300 m

(4) 360 m

7. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

(1) 47 kΩ, 10%

(2) 4.7 kΩ, 5%

(3) 470 Ω, 5%

(4) 470 kΩ, 5%

8. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

(1) $^{91}_{40}Zr$

(2) $^{101}_{36}Kr$

(3) $^{103}_{36}Kr$

(4) $^{144}_{56}Ba$

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9. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$\left(\frac{1}{4\pi\epsilon_0}=9\times10^9\ \text{N m}^2/\text{C}^2\right)$

(1) 1.28×10^5 N/C

(2) 1.28×10^6 N/C

(3) 1.28×10^7 N/C

(4) 1.28×10^4 N/C

10. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

(1) $\frac{2A}{\mu}$

(2) μA

(3) $\frac{\mu A}{2}$

(4) $\frac{A}{2\mu}$

11. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

(1) adiabatic

(2) isochoric

(3) isobaric

(4) isothermal

12. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0=4\pi\times10^{-7}$ T m A^{-1})

(1) 8.0×10^{-5} T m A^{-1}

(2) $2.4\pi\times10^{-5}$ T m A^{-1}

(3) $2.4\pi\times10^{-7}$ T m A^{-1}

(4) $2.4\pi\times10^{-4}$ T m A^{-1}

13. The energy equivalent of 0.5 g of a substance is :

(1) 4.5×10^{13} J

(2) 1.5×10^{13} J

(3) 0.5×10^{13} J

(4) 4.5×10^{16} J

14. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 2.05 A

(2) 2.5 A

(3) 25.1 A

(4) 1.7 A

15. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(1) 1 : 1

(2) 1 : c

(3) 1 : c^2

(4) c : 1

16. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

(1) 50 cm

(2) 67 cm

(3) 80 cm

(4) 33 cm

17. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.0×10^{-1} m

(2) 1.5×10^{-1} m

(3) 1.5×10^{-2} m

(4) 1.0×10^{-2} m

18. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) half

(2) four times

(3) one-fourth

(4) double

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19. A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in $m^2\ V^{-1}\ s^{-1}$ of :

(1) 2.5×10^{6}

(2) 2.5×10^{-6}

(3) 2.25×10^{-15}

(4) 2.25×10^{15}

20. Dimensions of stress are :

(1) $[ML^2T^{-2}]$

(2) $[ML^0T^{-2}]$

(3) $[ML^{-1}T^{-2}]$

(4) $[MLT^{-2}]$

21. For which one of the following, Bohr model is **not** valid ?

(1) Singly ionised helium atom (He^+)

(2) Deuteron atom

(3) Singly ionised neon atom (Ne^+)

(4) Hydrogen atom

22. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

(1) 0.5

(2) 1.0

(3) -1.0

(4) zero

23. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is :

(1) 5.0 g

(2) 10.0 g

(3) 20.0 g

(4) 2.5 g

24. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 1.83×10^{-7} rad

(2) 7.32×10^{-7} rad

(3) 6.00×10^{-7} rad

(4) 3.66×10^{-7} rad

25. The solids which have the negative temperature coefficient of resistance are :

(1) insulators only

(2) semiconductors only

(3) insulators and semiconductors

(4) metals

26. The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :

($\epsilon_0 = 8.85 \times 10^{-12}\ C^2\ N^{-1}\ m^{-2}$)

(1) $1.77 \times 10^{-12}\ C^2\ N^{-1}\ m^{-2}$

(2) $0.44 \times 10^{-10}\ C^2\ N^{-1}\ m^{-2}$

(3) $5.00\ C^2\ N^{-1}\ m^{-2}$

(4) $0.44 \times 10^{-13}\ C^2\ N^{-1}\ m^{-2}$

27. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :

(1) 0.6

(2) 0.06

(3) 0.006

(4) 6

28. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) reverse bias only

(2) both forward bias and reverse bias

(3) increase in forward current

(4) forward bias only

29. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :

(1) $\frac{9}{4}$

(2) $\frac{3}{2}$

(3) $\frac{5}{3}$

(4) $\frac{27}{8}$

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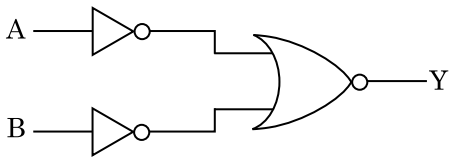
30. For the logic circuit shown, the truth table is :



(1)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(2)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(3)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(4)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

31. For transistor action, which of the following statements is **correct** ?

(1) Base, emitter and collector regions should have same size.

(2) Both emitter junction as well as the collector junction are forward biased.

(3) The base region must be very thin and lightly doped.

(4) Base, emitter and collector regions should have same doping concentrations.

32. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

(1) 524 Hz

(2) 536 Hz

(3) 537 Hz

(4) 523 Hz

33. A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 200 V

(2) 400 V

(3) zero

(4) 50 V

34. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

(1) 32 N

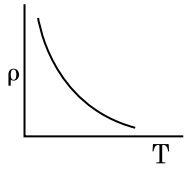
(2) 30 N

(3) 24 N

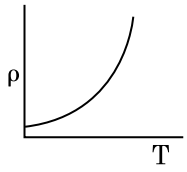
(4) 48 N

35. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

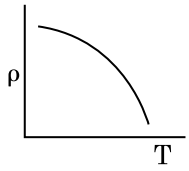
(1)



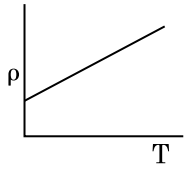
(2)



(3)



(4)



36. In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

(1) 0.5 N/C

(2) 1 N/C

(3) 5 N/C

(4) zero

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37. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T, absolute temperature)

(1) $\frac{3}{2} k_B T$

(2) $\frac{5}{2} k_B T$

(3) $\frac{7}{2} k_B T$

(4) $\frac{1}{2} k_B T$

38. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m.

(1) $6\hat{j}$ N m

(2) $-6\hat{i}$ N m

(3) $6\hat{k}$ N m

(4) $6\hat{i}$ N m

39. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

(1) four times

(2) one-fourth

(3) zero

(4) doubled

40. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 3.14×10^{-4} T

(2) 6.28×10^{-5} T

(3) 3.14×10^{-5} T

(4) 6.28×10^{-4} T

41. The Brewsters angle i_b for an interface should be :

(1) $30° < i_b < 45°$

(2) $45° < i_b < 90°$

(3) $i_b = 90°$

(4) $0° < i_b < 30°$

42. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

(1) 10^2 V

(2) 10^3 V

(3) 10^4 V

(4) 10 V

43. Taking into account of the significant figures, what is the value of 9.99 m – 0.0099 m ?

(1) 9.98 m

(2) 9.980 m

(3) 9.9 m

(4) 9.9801 m

44. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

(1) 0.25 mm

(2) 0.5 mm

(3) 1.0 mm

(4) 0.01 mm

45. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) $\frac{3\pi}{2}$ rad

(2) $\frac{\pi}{2}$ rad

(3) zero

(4) π rad

46. Match the organism with its use in biotechnology.

(a)	*Bacillus thuringiensis*	(i)	Cloning vector
(b)	*Thermus aquaticus*	(ii)	Construction of first rDNA molecule
(c)	*Agrobacterium tumefaciens*	(iii)	DNA polymerase
(d)	*Salmonella typhimurium*	(iv)	Cry proteins

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(ii)	(iv)	(iii)	(i)

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47. Match the following :

(a)	Inhibitor of catalytic activity	(i)	Ricin
(b)	Possess peptide bonds	(ii)	Malonate
(c)	Cell wall material in fungi	(iii)	Chitin
(d)	Secondary metabolite	(iv)	Collagen

Choose the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(ii)	(iv)	(iii)	(i)

48. The plant parts which consist of two generations - one within the other :

(a) Pollen grains inside the anther

(b) Germinated pollen grain with two male gametes

(c) Seed inside the fruit

(d) Embryo sac inside the ovule

(1) (a), (b) and (c)

(2) (c) and (d)

(3) (a) and (d)

(4) (a) only

49. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

(1) 1 molecule of 3-C compound

(2) 1 molecule of 6-C compound

(3) 1 molecule of 4-C compound and 1 molecule of 2-C compound

(4) 2 molecules of 3-C compound

50. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

(1) Gross primary productivity is always more than net primary productivity.

(2) Gross primary productivity and Net primary productivity are one and same.

(3) There is no relationship between Gross primary productivity and Net primary productivity.

(4) Gross primary productivity is always less than net primary productivity.

51. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

(1) Nitrate alone

(2) Ammonia and oxygen

(3) Ammonia and hydrogen

(4) Ammonia alone

52. Identify the **incorrect** statement.

(1) Sapwood is involved in conduction of water and minerals from root to leaf.

(2) Sapwood is the innermost secondary xylem and is lighter in colour.

(3) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.

(4) Heart wood does not conduct water but gives mechanical support.

53. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

(1) Fungal diseases

(2) Plant nematodes

(3) Insect predators

(4) Insect pests

54. Which of the following pairs is of unicellular algae ?

(1) *Gelidium* and *Gracilaria*

(2) *Anabaena* and *Volvox*

(3) *Chlorella* and *Spirulina*

(4) *Laminaria* and *Sargassum*

55. Strobili or cones are found in :

(1) *Pteris*

(2) *Marchantia*

(3) *Equisetum*

(4) *Salvinia*

56. Name the enzyme that facilitates opening of DNA helix during transcription.

(1) DNA helicase

(2) DNA polymerase

(3) RNA polymerase

(4) DNA ligase

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57. Identify the **wrong** statement with reference to transport of oxygen.

(1) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.

(2) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

(3) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

(4) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2.

58. Identify the **correct** statement with regard to G_1 phase (Gap 1) of interphase.

(1) Reorganisation of all cell components takes place.

(2) Cell is metabolically active, grows but does not replicate its DNA.

(3) Nuclear Division takes place.

(4) DNA synthesis or replication takes place.

59. Which of the following statements about inclusion bodies is **incorrect** ?

(1) These are involved in ingestion of food particles.

(2) They lie free in the cytoplasm.

(3) These represent reserve material in cytoplasm.

(4) They are not bound by any membrane.

60. Match the following diseases with the causative organism and select the **correct** option.

	Column - I		**Column - II**
(a)	Typhoid	(i)	*Wuchereria*
(b)	Pneumonia	(ii)	*Plasmodium*
(c)	Filariasis	(iii)	*Salmonella*
(d)	Malaria	(iv)	*Haemophilus*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(ii)	(i)	(iii)	(iv)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(i)	(iii)	(ii)	(iv)

61. Meiotic division of the secondary oocyte is completed :

(1) At the time of copulation

(2) After zygote formation

(3) At the time of fusion of a sperm with an ovum

(4) Prior to ovulation

62. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

(1) Mutational breeding

(2) Cross breeding

(3) Inbreeding

(4) Out crossing

63. The number of substrate level phosphorylations in one turn of citric acid cycle is :

(1) One

(2) Two

(3) Three

(4) Zero

64. Choose the **correct** pair from the following :

(1) Polymerases - Break the DNA into fragments

(2) Nucleases - Separate the two strands of DNA

(3) Exonucleases - Make cuts at specific positions within DNA

(4) Ligases - Join the two DNA molecules

65. The infectious stage of *Plasmodium* that enters the human body is :

(1) Sporozoites

(2) Female gametocytes

(3) Male gametocytes

(4) Trophozoites

66. Which of the following is **not** an attribute of a population ?

(1) Natality

(2) Mortality

(3) Species interaction

(4) Sex ratio

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67. Select the **correct** events that occur during inspiration.

(a) Contraction of diaphragm

(b) Contraction of external inter-costal muscles

(c) Pulmonary volume decreases

(d) Intra pulmonary pressure increases

(1) (c) and (d)

(2) (a), (b) and (d)

(3) only (d)

(4) (a) and (b)

68. According to Robert May, the global species diversity is about :

(1) 20 million

(2) 50 million

(3) 7 million

(4) 1.5 million

69. The QRS complex in a standard ECG represents :

(1) Depolarisation of auricles

(2) Depolarisation of ventricles

(3) Repolarisation of ventricles

(4) Repolarisation of auricles

70. Which of the following statements is **not correct** ?

(1) The proinsulin has an extra peptide called C-peptide.

(2) The functional insulin has A and B chains linked together by hydrogen bonds.

(3) Genetically engineered insulin is produced in *E-Coli*.

(4) In man insulin is synthesised as a proinsulin.

71. The transverse section of a plant shows following anatomical features :

(a) Large number of scattered vascular bundles surrounded by bundle sheath.

(b) Large conspicuous parenchymatous ground tissue.

(c) Vascular bundles conjoint and closed.

(d) Phloem parenchyma absent.

Identify the category of plant and its part :

(1) Monocotyledonous root

(2) Dicotyledonous stem

(3) Dicotyledonous root

(4) Monocotyledonous stem

72. Select the **correct** statement.

(1) Glucagon is associated with hypoglycemia.

(2) Insulin acts on pancreatic cells and adipocytes.

(3) Insulin is associated with hyperglycemia.

(4) Glucocorticoids stimulate gluconeogenesis.

73. Montreal protocol was signed in 1987 for control of :

(1) Emission of ozone depleting substances

(2) Release of Green House gases

(3) Disposal of e-wastes

(4) Transport of Genetically modified organisms from one country to another

74. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	6 - 15 pairs of gill slits	(i)	*Trygon*
(b)	Heterocercal caudal fin	(ii)	Cyclostomes
(c)	Air Bladder	(iii)	Chondrichthyes
(d)	Poison sting	(iv)	Osteichthyes

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(ii)	(iii)	(i)
(3)	(i)	(iv)	(iii)	(ii)
(4)	(ii)	(iii)	(iv)	(i)

75. Identify the **wrong** statement with regard to Restriction Enzymes.

(1) They cut the strand of DNA at palindromic sites.

(2) They are useful in genetic engineering.

(3) Sticky ends can be joined by using DNA ligases.

(4) Each restriction enzyme functions by inspecting the length of a DNA sequence.

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76. Match the following with respect to meiosis :

(a)	Zygotene	(i)	Terminalization
(b)	Pachytene	(ii)	Chiasmata
(c)	Diplotene	(iii)	Crossing over
(d)	Diakinesis	(iv)	Synapsis

Select the **correct** option from the following :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iii)	(iv)	(i)	(ii)

77. Cuboidal epithelium with brush border of microvilli is found in :

(1) ducts of salivary glands
(2) proximal convoluted tubule of nephron
(3) eustachian tube
(4) lining of intestine

78. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

(1) Gibberellin
(2) Ethylene
(3) Abscisic acid
(4) Cytokinin

79. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Bt cotton	(i)	Gene therapy
(b)	Adenosine deaminase deficiency	(ii)	Cellular defence
(c)	RNAi	(iii)	Detection of HIV infection
(d)	PCR	(iv)	*Bacillus thuringiensis*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(iv)	(i)	(ii)	(iii)

80. The ovary is half inferior in :

(1) Mustard
(2) Sunflower
(3) Plum
(4) Brinjal

81. Which one of the following is the most abundant protein in the animals ?

(1) Collagen
(2) Lectin
(3) Insulin
(4) Haemoglobin

82. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is 6.6×10^9 bp, then the length of the DNA is approximately :

(1) 2.5 meters
(2) 2.2 meters
(3) 2.7 meters
(4) 2.0 meters

83. The first phase of translation is :

(1) Recognition of DNA molecule
(2) Aminoacylation of tRNA
(3) Recognition of an anti-codon
(4) Binding of mRNA to ribosome

84. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

(1) High concentration of Progesterone
(2) Low concentration of LH
(3) Low concentration of FSH
(4) High concentration of Estrogen

85. Flippers of Penguins and Dolphins are examples of :

(1) Convergent evolution
(2) Industrial melanism
(3) Natural selection
(4) Adaptive radiation

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86. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

(1) A person will have only two of the three alleles.

(2) When I^A and I^B are present together, they express same type of sugar.

(3) Allele 'i' does not produce any sugar.

(4) The gene (I) has three alleles.

87. Select the option including all sexually transmitted diseases.

(1) Gonorrhoea, Malaria, Genital herpes

(2) AIDS, Malaria, Filaria

(3) Cancer, AIDS, Syphilis

(4) Gonorrhoea, Syphilis, Genital herpes

88. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Eosinophils	(i)	Immune response
(b)	Basophils	(ii)	Phagocytosis
(c)	Neutrophils	(iii)	Release histaminase, destructive enzymes
(d)	Lymphocytes	(iv)	Release granules containing histamine

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(iii)	(iv)	(ii)	(i)

89. Match the trophic levels with their **correct** species examples in grassland ecosystem.

(a)	Fourth trophic level	(i)	Crow
(b)	Second trophic level	(ii)	Vulture
(c)	First trophic level	(iii)	Rabbit
(d)	Third trophic level	(iv)	Grass

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(i)	(ii)	(iii)	(iv)
(4)	(ii)	(iii)	(iv)	(i)

90. In light reaction, plastoquinone facilitates the transfer of electrons from :

(1) $Cytb_6f$ complex to PS-I

(2) PS-I to $NADP^+$

(3) PS-I to ATP synthase

(4) PS-II to $Cytb_6f$ complex

91. Embryological support for evolution was disapproved by :

(1) Alfred Wallace

(2) Charles Darwin

(3) Oparin

(4) Karl Ernst von Baer

92. Bilaterally symmetrical and acoelomate animals are exemplified by :

(1) Platyhelminthes

(2) Aschelminthes

(3) Annelida

(4) Ctenophora

93. Which of the following would help in prevention of diuresis ?

(1) Reabsorption of Na^+ and water from renal tubules due to aldosterone

(2) Atrial natriuretic factor causes vasoconstriction

(3) Decrease in secretion of renin by JG cells

(4) More water reabsorption due to undersecretion of ADH

94. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	*Clostridium butylicum*	(i)	Cyclosporin-A
(b)	*Trichoderma polysporum*	(ii)	Butyric Acid
(c)	*Monascus purpureus*	(iii)	Citric Acid
(d)	*Aspergillus niger*	(iv)	Blood cholesterol lowering agent

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iv)	(iii)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iii)	(iv)	(ii)	(i)

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95. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G_0). This process occurs at the end of :

(1) G_1 phase

(2) S phase

(3) G_2 phase

(4) M phase

96. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

(1) GIFT and ZIFT

(2) ICSI and ZIFT

(3) GIFT and ICSI

(4) ZIFT and IUT

97. Which of the following statements are **true** for the phylum-Chordata ?

(a) In Urochordata notochord extends from head to tail and it is present throughout their life.

(b) In Vertebrata notochord is present during the embryonic period only.

(c) Central nervous system is dorsal and hollow.

(d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

(1) (c) and (a)

(2) (a) and (b)

(3) (b) and (c)

(4) (d) and (c)

98. Snow-blindness in Antarctic region is due to :

(1) Inflammation of cornea due to high dose of UV-B radiation

(2) High reflection of light from snow

(3) Damage to retina caused by infra-red rays

(4) Freezing of fluids in the eye by low temperature

99. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Pituitary gland	(i)	Grave's disease
(b)	Thyroid gland	(ii)	Diabetes mellitus
(c)	Adrenal gland	(iii)	Diabetes insipidus
(d)	Pancreas	(iv)	Addison's disease

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(iv)	(iii)	(i)	(ii)

100. Which of the following statements is **correct** ?

(1) Adenine pairs with thymine through one H-bond.

(2) Adenine pairs with thymine through three H-bonds.

(3) Adenine does not pair with thymine.

(4) Adenine pairs with thymine through two H-bonds.

101. Match the following concerning essential elements and their functions in plants :

(a)	Iron	(i)	Photolysis of water
(b)	Zinc	(ii)	Pollen germination
(c)	Boron	(iii)	Required for chlorophyll biosynthesis
(d)	Manganese	(iv)	IAA biosynthesis

Select the **correct** option :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(iii)	(ii)	(i)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(iv)	(i)	(ii)	(iii)
(4)	(ii)	(i)	(iv)	(iii)

102. Which of the following is **not** an inhibitory substance governing seed dormancy ?

(1) Abscisic acid

(2) Phenolic acid

(3) Para-ascorbic acid

(4) Gibberellic acid

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103. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

(1) CH_3, H_2, NH_4 and water vapor at 800°C

(2) CH_4, H_2, NH_3 and water vapor at 600°C

(3) CH_3, H_2, NH_3 and water vapor at 600°C

(4) CH_4, H_2, NH_3 and water vapor at 800°C

104. Experimental verification of the chromosomal theory of inheritance was done by :

(1) Sutton

(2) Boveri

(3) Morgan

(4) Mendel

105. The body of the ovule is fused within the funicle at :

(1) Micropyle

(2) Nucellus

(3) Chalaza

(4) Hilum

106. Identify the **correct** statement with reference to human digestive system.

(1) Serosa is the innermost layer of the alimentary canal.

(2) Ileum is a highly coiled part.

(3) Vermiform appendix arises from duodenum.

(4) Ileum opens into small intestine.

107. Dissolution of the synaptonemal complex occurs during :

(1) Zygotene

(2) Diplotene

(3) Leptotene

(4) Pachytene

108. Floridean starch has structure similar to :

(1) Amylopectin and glycogen

(2) Mannitol and algin

(3) Laminarin and cellulose

(4) Starch and cellulose

109. The specific palindromic sequence which is recognized by EcoRI is :

(1) 5' - GGAACC - 3'
3' - CCTTGG - 5'

(2) 5' - CTTAAG - 3'
3' - GAATTC - 5'

(3) 5' - GGATCC - 3'
3' - CCTAGG - 5'

(4) 5' - GAATTC - 3'
3' - CTTAAG - 5'

110. Select the **correct** match.

(1)	Phenylketonuria	-	Autosomal dominant trait
(2)	Sickle cell anaemia	-	Autosomal recessive trait, chromosome-11
(3)	Thalassemia	-	X linked
(4)	Haemophilia	-	Y linked

111. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

(1) Glycerol, trypsin

(2) Cellulose, lecithin

(3) Inulin, insulin

(4) Chitin, cholesterol

112. The process of growth is maximum during :

(1) Lag phase

(2) Senescence

(3) Dormancy

(4) Log phase

113. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Organ of Corti	(i)	Connects middle ear and pharynx
(b)	Cochlea	(ii)	Coiled part of the labyrinth
(c)	Eustachian tube	(iii)	Attached to the oval window
(d)	Stapes	(iv)	Located on the basilar membrane

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iv)	(ii)	(i)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(ii)	(iii)	(i)	(iv)

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114. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

(1) Root pressure
(2) Imbibition
(3) Plasmolysis
(4) Transpiration

115. Identify the **wrong** statement with reference to immunity.

(1) When ready-made antibodies are directly given, it is called "Passive immunity".
(2) Active immunity is quick and gives full response.
(3) Foetus receives some antibodies from mother, it is an example for passive immunity.
(4) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

116. In water hyacinth and water lily, pollination takes place by :

(1) water currents only
(2) wind and water
(3) insects and water
(4) insects or wind

117. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

(1) Peroxisomes
(2) Golgi bodies
(3) Polysomes
(4) Endoplasmic reticulum

118. Which of the following regions of the globe exhibits highest species diversity ?

(1) Madagascar
(2) Himalayas
(3) Amazon forests
(4) Western Ghats of India

119. Goblet cells of alimentary canal are modified from :

(1) Columnar epithelial cells
(2) Chondrocytes
(3) Compound epithelial cells
(4) Squamous epithelial cells

120. Which of the following is **correct** about viroids ?

(1) They have free RNA without protein coat.
(2) They have DNA with protein coat.
(3) They have free DNA without protein coat.
(4) They have RNA with protein coat.

121. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

(1) Growth response
(2) Defence action
(3) Effect on reproduction
(4) Nutritive value

122. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Placenta	(i)	Androgens
(b)	Zona pellucida	(ii)	Human Chorionic Gonadotropin (hCG)
(c)	Bulbo-urethral glands	(iii)	Layer of the ovum
(d)	Leydig cells	(iv)	Lubrication of the Penis

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iv)	(ii)	(iii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(ii)	(iii)	(iv)	(i)
(4)	(iv)	(iii)	(i)	(ii)

123. Ray florets have :

(1) Superior ovary
(2) Hypogynous ovary
(3) Half inferior ovary
(4) Inferior ovary

124. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

(1) Floating debris
(2) Effluents of primary treatment
(3) Activated sludge
(4) Primary sludge

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125. The enzyme enterokinase helps in conversion of :

(1) trypsinogen into trypsin

(2) caseinogen into casein

(3) pepsinogen into pepsin

(4) protein into polypeptides

126. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Gregarious, polyphagous pest	(i)	*Asterias*
(b)	Adult with radial symmetry and larva with bilateral symmetry	(ii)	Scorpion
(c)	Book lungs	(iii)	*Ctenoplana*
(d)	Bioluminescence	(iv)	*Locusta*

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(i)	(iii)	(ii)	(iv)

127. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

(1) Uremia and Renal Calculi

(2) Ketonuria and Glycosuria

(3) Renal calculi and Hyperglycaemia

(4) Uremia and Ketonuria

128. Match the following columns and select the **correct** option.

	Column - I		**Column - II**
(a)	Floating Ribs	(i)	Located between second and seventh ribs
(b)	Acromion	(ii)	Head of the Humerus
(c)	Scapula	(iii)	Clavicle
(d)	Glenoid cavity	(iv)	Do not connect with the sternum

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iv)	(iii)	(i)	(ii)
(4)	(ii)	(iv)	(i)	(iii)

129. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

(1) 2

(2) 14

(3) 8

(4) 4

130. If the head of cockroach is removed, it may live for few days because :

(1) the cockroach does not have nervous system.

(2) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

(3) the head holds a $1/3^{rd}$ of a nervous system while the rest is situated along the dorsal part of its body.

(4) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

131. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

(a) Darwin's Finches of Galapagos islands.

(b) Herbicide resistant weeds.

(c) Drug resistant eukaryotes.

(d) Man-created breeds of domesticated animals like dogs.

(1) (a) and (c)

(2) (b), (c) and (d)

(3) only (d)

(4) only (a)

132. Identify the basic amino acid from the following.

(1) Glutamic Acid

(2) Lysine

(3) Valine

(4) Tyrosine

133. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

(1) Ethidium bromide in UV radiation

(2) Acetocarmine in UV radiation

(3) Ethidium bromide in infrared radiation

(4) Acetocarmine in bright blue light

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134. The sequence that controls the copy number of the linked DNA in the vector, is termed :

(1) Ori site

(2) Palindromic sequence

(3) Recognition site

(4) Selectable marker

135. The roots that originate from the base of the stem are :

(1) Primary roots

(2) Prop roots

(3) Lateral roots

(4) Fibrous roots

136. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 4.90 BM

(2) 5.92 BM

(3) 2.84 BM

(4) 3.87 BM

137. Match the following and identify the **correct** option.

(a)	$CO(g) + H_2(g)$	(i)	$Mg(HCO_3)_2 + Ca(HCO_3)_2$
(b)	Temporary hardness of water	(ii)	An electron deficient hydride
(c)	B_2H_6	(iii)	Synthesis gas
(d)	H_2O_2	(iv)	Non-planar structure

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(i)	(iii)	(ii)	(iv)
(4)	(iii)	(i)	(ii)	(iv)

138. The mixture which shows positive deviation from Raoult's law is :

(1) Benzene + Toluene

(2) Acetone + Chloroform

(3) Chloroethane + Bromoethane

(4) Ethanol + Acetone

139. Identify the **correct** statement from the following :

(1) Blister copper has blistered appearance due to evolution of CO_2.

(2) Vapour phase refining is carried out for Nickel by Van Arkel method.

(3) Pig iron can be moulded into a variety of shapes.

(4) Wrought iron is impure iron with 4% carbon.

140. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu^{2+} (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

(1) $[Cu(NH_3)_4]^{2+}$

(2) $Cu(OH)_2$

(3) $CuCO_3 \cdot Cu(OH)_2$

(4) $CuSO_4$

141. Hydrolysis of sucrose is given by the following reaction.

$$\text{Sucrose} + H_2O \rightleftharpoons \text{Glucose} + \text{Fructose}$$

If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^{\ominus}$ at the same temperature will be :

(1) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

(2) $8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(3 \times 10^{13})$

(3) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(4 \times 10^{13})$

(4) $-8.314\ J\ mol^{-1}K^{-1} \times 300\ K \times \ln(2 \times 10^{13})$

142. Identify the **incorrect** match.

	Name	**IUPAC Official Name**	
(a)	Unnilunium	(i)	Mendelevium
(b)	Unniltrium	(ii)	Lawrencium
(c)	Unnilhexium	(iii)	Seaborgium
(d)	Unununnium	(iv)	Darmstadtium

(1) (b), (ii)

(2) (c), (iii)

(3) (d), (iv)

(4) (a), (i)

143. Which of the following is a basic amino acid ?

(1) Alanine

(2) Tyrosine

(3) Lysine

(4) Serine

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144. What is the change in oxidation number of carbon in the following reaction ?

$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$

(1) 0 to +4
(2) −4 to +4
(3) 0 to −4
(4) +4 to +4

145. Sucrose on hydrolysis gives :

(1) α-D-Glucose + β-D-Glucose
(2) α-D-Glucose + β-D-Fructose
(3) α-D-Fructose + β-D-Fructose
(4) β-D-Glucose + α-D-Fructose

146. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is :

(1) 2
(2) 3
(3) 4
(4) 1

147. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the **correct** option is :

(1) $\Delta_r H > 0$ and $\Delta_r S < 0$
(2) $\Delta_r H < 0$ and $\Delta_r S > 0$
(3) $\Delta_r H < 0$ and $\Delta_r S < 0$
(4) $\Delta_r H > 0$ and $\Delta_r S > 0$

148. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

(1) Copper
(2) Calcium
(3) Potassium
(4) Iron

149. Identify the **incorrect** statement.

(1) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
(2) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
(3) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.
(4) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

150. An increase in the concentration of the reactants of a reaction leads to change in :

(1) heat of reaction
(2) threshold energy
(3) collision frequency
(4) activation energy

151. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

(1) Cannizzaro's reaction
(2) Cross Cannizzaro's reaction
(3) Cross Aldol condensation
(4) Aldol condensation

152. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

(1) +R effect of $-CH_3$ groups
(2) −R effect of $-CH_3$ groups
(3) Hyperconjugation
(4) −I effect of $-CH_3$ groups

153. Find out the solubility of $Ni(OH)_2$ in 0.1 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.

(1) 2×10^{-8} M
(2) 1×10^{-13} M
(3) 1×10^{8} M
(4) 2×10^{-13} M

154. Identify a molecule which does **not** exist.

(1) Li_2
(2) C_2
(3) O_2
(4) He_2

155. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

(a) β-Elimination reaction
(b) Follows Zaitsev rule
(c) Dehydrohalogenation reaction
(d) Dehydration reaction

(1) (a), (c), (d)
(2) (b), (c), (d)
(3) (a), (b), (d)
(4) (a), (b), (c)

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156. Measuring Zeta potential is useful in determining which property of colloidal solution ?

(1) Solubility

(2) Stability of the colloidal particles

(3) Size of the colloidal particles

(4) Viscosity

157. The number of protons, neutrons and electrons in $^{175}_{71}Lu$, respectively, are :

(1) 104, 71 and 71

(2) 71, 71 and 104

(3) 175, 104 and 71

(4) 71, 104 and 71

158. Identify the **correct** statements from the following :

(a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.

(b) The structure of C_{60} contains twelve six carbon rings and twenty five carbon rings.

(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.

(d) CO is colorless and odourless gas.

(1) (a) and (c) only

(2) (b) and (c) only

(3) (c) and (d) only

(4) (a), (b) and (c) only

159. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

(1) $\frac{\sqrt{2}}{4} \times 288$ pm

(2) $\frac{4}{\sqrt{3}} \times 288$ pm

(3) $\frac{4}{\sqrt{2}} \times 288$ pm

(4) $\frac{\sqrt{3}}{4} \times 288$ pm

160. Paper chromatography is an example of :

(1) Partition chromatography

(2) Thin layer chromatography

(3) Column chromatography

(4) Adsorption chromatography

161. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?

(1) H_2SO_4, sulphuric acid

(2) $H_2S_2O_8$, peroxodisulphuric acid

(3) $H_2S_2O_7$, pyrosulphuric acid

(4) H_2SO_3, sulphurous acid

162. The rate constant for a first order reaction is $4.606 \times 10^{-3}\ s^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 200 s

(2) 500 s

(3) 1000 s

(4) 100 s

163. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

(1) 2,3-Dimethylbutane

(2) n-Heptane

(3) n-Butane

(4) n-Hexane

164. Match the following :

	Oxide		**Nature**
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

Which of the following is **correct** option ?

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(i)	(iv)	(iii)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(i)	(ii)	(iii)	(iv)

165. A mixture of N_2 and Ar gases in a cylinder contains 7 g of N_2 and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N_2 is :

[Use atomic masses (in g mol^{-1}) : N = 14, Ar = 40]

(1) 12 bar

(2) 15 bar

(3) 18 bar

(4) 9 bar

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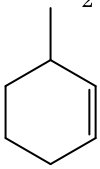
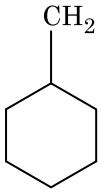
166. An alkene on ozonolysis gives methanal as one of the product. Its structure is :

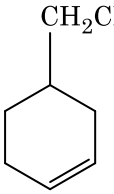
(1) $CH_2-CH_2-CH_3$



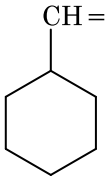
(2) $CH_2-CH=CH_2$



(3) $CH_2CH_2CH_3$



(4) $CH=CH-CH_3$



167. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol^{-1}. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

(1) 0.80 K

(2) 0.40 K

(3) 0.60 K

(4) 0.20 K

168. The correct option for free expansion of an ideal gas under adiabatic condition is :

(1) $q = 0$, $\Delta T < 0$ and $w > 0$

(2) $q < 0$, $\Delta T = 0$ and $w = 0$

(3) $q > 0$, $\Delta T > 0$ and $w > 0$

(4) $q = 0$, $\Delta T = 0$ and $w = 0$

169. Which one of the followings has maximum number of atoms ?

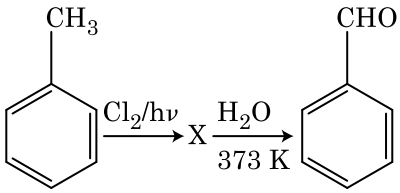
(1) 1 g of Mg(s) [Atomic mass of Mg = 24]

(2) 1 g of O_2(g) [Atomic mass of O = 16]

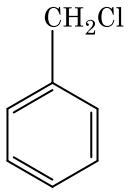
(3) 1 g of Li(s) [Atomic mass of Li = 7]

(4) 1 g of Ag(s) [Atomic mass of Ag = 108]

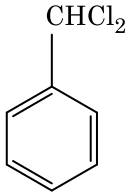
170. Identify compound X in the following sequence of reactions :



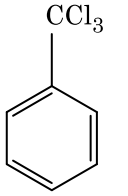
(1)



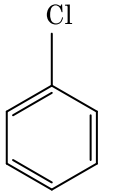
(2)



(3)



(4)



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171. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?

(1) $SCN^- < F^- < CN^- < C_2O_4^{2-}$

(2) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

(3) $CN^- < C_2O_4^{2-} < SCN^- < F^-$

(4) $SCN^- < F^- < C_2O_4^{2-} < CN^-$

172. Which of the following is a natural polymer ?

(1) poly (Butadiene-styrene)

(2) polybutadiene

(3) poly (Butadiene-acrylonitrile)

(4) *cis*-1,4-polyisoprene

173. Which of the following set of molecules will have zero dipole moment ?

(1) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene

(2) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene

(3) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene

(4) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

174. HCl was passed through a solution of $CaCl_2$, $MgCl_2$ and NaCl. Which of the following compound(s) crystallise(s) ?

(1) Only NaCl

(2) Only $MgCl_2$

(3) NaCl, $MgCl_2$ and $CaCl_2$

(4) Both $MgCl_2$ and $CaCl_2$

175. Which of the following is **not** correct about carbon monoxide ?

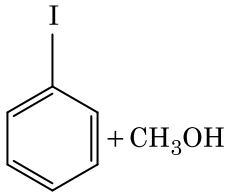
(1) It reduces oxygen carrying ability of blood.

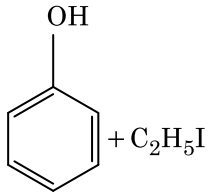
(2) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.

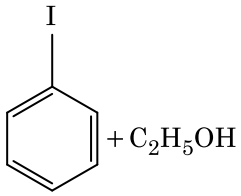
(3) It is produced due to incomplete combustion.

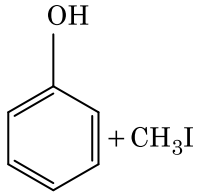
(4) It forms carboxyhaemoglobin.

176. Anisole on cleavage with HI gives :

(1) 

(2) 

(3) 

(4) 

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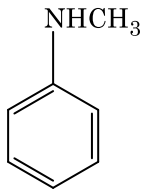
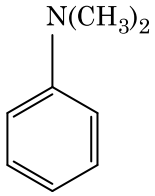
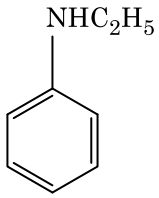
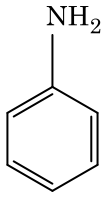
177. Which of the following amine will give the carbylamine test ?

(1) 

(2) 

(3) 

(4) 

178. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

(1) Sec. butyl alcohol

(2) Tert. butyl alcohol

(3) Isobutyl alcohol

(4) Isopropyl alcohol

179. On electrolysis of dil.sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

(1) Oxygen gas

(2) H_2S gas

(3) SO_2 gas

(4) Hydrogen gas

180. Which of the following is a cationic detergent ?

(1) Sodium stearate

(2) Cetyltrimethyl ammonium bromide

(3) Sodium dodecylbenzene sulphonate

(4) Sodium lauryl sulphate

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2019

SURYAA

परीक्षा पुस्तिका संकेत
Test Booklet Code

P1

Hindi+English

No. : 5239773

इस पुस्तिका में 44 पृष्ठ हैं।
This Booklet contains 44 pages.

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए।
Do not open this Test Booklet until you are asked to do so.
इस परीक्षा पुस्तिका के पिछले आवरण पर दिए निर्देशों को ध्यान से पढ़ें।
Read carefully the Instructions on the Back Cover of this Test Booklet.

महत्वपूर्ण निर्देश :

1. उत्तर पत्र इस परीक्षा पुस्तिका के अन्दर रखा है। जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर पत्र निकाल कर ध्यानपूर्वक **पृष्ठ-1** एवं **पृष्ठ-2** पर केवल **नीले / काले** बॉल पॉइंट पेन से विवरण भरें।
2. परीक्षा की अवधि **3 घंटे** है एवं परीक्षा पुस्तिका में **180** प्रश्न हैं। प्रत्येक प्रश्न **4** अंक का है। प्रत्येक सही उत्तर के लिए परीक्षार्थी को **4** अंक दिए जाएंगे। प्रत्येक गलत उत्तर के लिए कुल योग में से **एक अंक** घटाया जाएगा। अधिकतम अंक **720** हैं।
3. इस पृष्ठ पर विवरण अंकित करने एवं उत्तर पत्र पर निशान लगाने के लिए **केवल नीले / काले बॉल पॉइंट पेन** का प्रयोग करें।
4. रफ कार्य इस परीक्षा पुस्तिका में निर्धारित स्थान पर ही करें।
5. **परीक्षा सम्पन्न होने पर, परीक्षार्थी कक्ष / हॉल छोड़ने से पूर्व उत्तर पत्र कक्ष निरीक्षक को अवश्य सौंप दें। परीक्षार्थी अपने साथ प्रश्न पुस्तिका को ले जा सकते हैं।**
6. इस पुस्तिका का संकेत है **P1**। यह सुनिश्चित कर लें कि इस पुस्तिका का संकेत, उत्तर पत्र के **पृष्ठ-2** पर छपे संकेत से मिलता है। अगर यह भिन्न हो तो परीक्षार्थी दूसरी परीक्षा पुस्तिका और उत्तर पत्र लेने के लिए निरीक्षक को तुरन्त अवगत कराएं।
7. परीक्षार्थी सुनिश्चित करें कि इस उत्तर पत्र को मोड़ा न जाए एवं उस पर कोई अन्य निशान न लगाएं। परीक्षार्थी अपना अनुक्रमांक प्रश्न पुस्तिका / उत्तर पत्र में निर्धारित स्थान के अतिरिक्त अन्यत्र ना लिखें।
8. उत्तर पत्र पर किसी प्रकार के संशोधन हेतु व्हाइट फ़्लूइड के प्रयोग की अनुमति **नहीं** है।

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **P1**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.

SEAL

प्रश्नों के अनुवाद में किसी अस्पष्टता की स्थिति में, अंग्रेजी संस्करण को ही अंतिम माना जायेगा।
In case of any ambiguity in translation of any question, English version shall be treated as final.

परीक्षार्थी का नाम (बड़े अक्षरों में) :
Name of the Candidate (in Capitals) : _____

अनुक्रमांक : अंकों में
Roll Number : in figures _____
: शब्दों में
: in words _____

परीक्षा केन्द्र (बड़े अक्षरों में) :
Centre of Examination (in Capitals) : _____

परीक्षार्थी के हस्ताक्षर :
Candidate's Signature : _____

निरीक्षक के हस्ताक्षर :
Invigilator's Signature : _____

Fascimile signature stamp of
Centre Superintendent : _____

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1. जब द्रव्यमान M के किसी गुटके को L लम्बाई के किसी तार से निलंबित किया जाता है, तो तार की लम्बाई $(L+l)$ हो जाती है। विस्तारित तार में संचयित प्रत्यास्थ स्थितिज ऊर्जा है :
(1) Mgl
(2) MgL
(3) $\frac{1}{2}Mgl$
(4) $\frac{1}{2}MgL$

2. किसी पतले तार से जुड़े द्रव्यमान m को किसी ऊर्ध्वाधर वृत्त में तीव्रता से घुमाया जा रहा है। इस तार के टूटने की अधिक संभावना तब है जब :
(1) द्रव्यमान उच्चतम बिन्दु पर हो।
(2) तार क्षैतिज हो।
(3) द्रव्यमान निम्नतम बिन्दु पर हो।
(4) तार ऊर्ध्वाधर से 60° के झुकाव पर हो।

3. आयनीकृत हाइड्रोजन परमाणु तथा α-कण समान संवेग से किसी नियत चुम्बकीय क्षेत्र, B में लम्बवत प्रवेश करते हैं। इनके पथों की त्रिज्याओं का अनुपात, $r_H : r_\alpha$ होगा :
(1) 2 : 1
(2) 1 : 2
(3) 4 : 1
(4) 1 : 4

4. चाल u से गतिमान 4m द्रव्यमान का कोई पिण्ड A विराम में स्थित 2m द्रव्यमान के किसी पिण्ड B से आमने-सामने सीधे प्रत्यास्थ प्रकृति का संघट्ट करता है। संघट्ट के पश्चात संघट्ट करने वाले पिण्ड A की क्षयित ऊर्जा का भाग है :
(1) $\frac{1}{9}$
(2) $\frac{8}{9}$
(3) $\frac{4}{9}$
(4) $\frac{5}{9}$

5. किसी द्वि झिरी प्रयोग में, जब 400 nm तरंगदैर्ध्य के प्रकाश का उपयोग किया गया, तो 1 m दूरी पर स्थित पर्दे पर बने पहले निम्निष्ठ की कोणीय चौड़ाई 0.2° पायी गयी। यदि समस्त उपकरण को जल में डुबो दिया, तो पहले निम्निष्ठ की कोणीय चौड़ाई कितनी होगी ? $(\mu_{जल} = 4/3)$
(1) 0.266°
(2) 0.15°
(3) 0.05°
(4) 0.1°

1. When a block of mass M is suspended by a long wire of length L, the length of the wire becomes $(L+l)$. The elastic potential energy stored in the extended wire is :
(1) Mgl
(2) MgL
(3) $\frac{1}{2}Mgl$
(4) $\frac{1}{2}MgL$

2. A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when :
(1) the mass is at the highest point
(2) the wire is horizontal
(3) the mass is at the lowest point
(4) inclined at an angle of 60° from vertical

3. Ionized hydrogen atoms and α-particles with same momenta enters perpendicular to a constant magnetic field, B. The ratio of their radii of their paths $r_H : r_\alpha$ will be :
(1) 2 : 1
(2) 1 : 2
(3) 4 : 1
(4) 1 : 4

4. Body A of mass 4m moving with speed u collides with another body B of mass 2m, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is :
(1) $\frac{1}{9}$
(2) $\frac{8}{9}$
(3) $\frac{4}{9}$
(4) $\frac{5}{9}$

5. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1 m away, was found to be 0.2°. What will be the angular width of the first minima, if the entire experimental apparatus is immersed in water ? $(\mu_{water} = 4/3)$
(1) 0.266°
(2) 0.15°
(3) 0.05°
(4) 0.1°

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6. नीचे दी गयी युक्तियों में से किसमें भंवर धारा प्रभाव का उपयोग **नहीं** किया जाता ?

(1) प्रेरण भट्टी

(2) ट्रेन में चुम्बकीय ब्रेक

(3) विद्युत चुम्बक

(4) विद्युत हीटर

7. पृष्ठीय तनाव 2.5×10^{-2} N/m के किसी डिटरजैन्ट-विलयन से 1 mm त्रिज्या का कोई साबुन का बुलबुला फुलाया गया है। इस बुलबुले के भीतर का दाब किसी पात्र में भरे जल के मुक्त पृष्ठ के नीचे किसी बिन्दु Z_0 पर दाब के बराबर है। $g = 10$ m/s^2 तथा जल का घनत्व $= 10^3$ kg/m^3 लेते हुए, Z_0 का मान है :

(1) 100 cm

(2) 10 cm

(3) 1 cm

(4) 0.5 cm

8. निम्नलिखित में से प्रकाश के किस वर्ण की तरंगदैर्घ्य सबसे लम्बी होती है ?

(1) लाल

(2) नीला

(3) हरा

(4) बैंगनी

9. द्रव्यमान 100 kg और त्रिज्या 2 m की कोई चकती किसी क्षैतिज फर्श पर लुढ़कती है। इसके संहति केन्द्र की चाल 20 cm/s है। इसे रोकने के लिए कितने कार्य की आवश्यकता होगी ?

(1) 3 J

(2) 30 kJ

(3) 2 J

(4) 1 J

10. सरल आवर्त गति करते किसी कण का विस्थापन $y = A_0 + A \sin\omega t + B \cos\omega t$ द्वारा निरूपित किया गया है। तब इसके दोलन का आयाम होगा :

(1) $A_0 + \sqrt{A^2 + B^2}$

(2) $\sqrt{A^2 + B^2}$

(3) $\sqrt{A_0^2 + (A + B)^2}$

(4) A+B

6. In which of the following devices, the eddy current effect is **not** used ?

(1) induction furnace

(2) magnetic braking in train

(3) electromagnet

(4) electric heater

7. A soap bubble, having radius of 1 mm, is blown from a detergent solution having a surface tension of 2.5×10^{-2} N/m. The pressure inside the bubble equals at a point Z_0 below the free surface of water in a container. Taking $g = 10$ m/s^2, density of water $= 10^3$ kg/m^3, the value of Z_0 is :

(1) 100 cm

(2) 10 cm

(3) 1 cm

(4) 0.5 cm

8. Which colour of the light has the longest wavelength ?

(1) red

(2) blue

(3) green

(4) violet

9. A disc of radius 2 m and mass 100 kg rolls on a horizontal floor. Its centre of mass has speed of 20 cm/s. How much work is needed to stop it ?

(1) 3 J

(2) 30 kJ

(3) 2 J

(4) 1 J

10. The displacement of a particle executing simple harmonic motion is given by

$y = A_0 + A \sin\omega t + B \cos\omega t$.

Then the amplitude of its oscillation is given by :

(1) $A_0 + \sqrt{A^2 + B^2}$

(2) $\sqrt{A^2 + B^2}$

(3) $\sqrt{A_0^2 + (A + B)^2}$

(4) A+B

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11. फोकस दूरी f के दो समान पतले समतलोत्तल लेंस एक दूसरे के सम्पर्क में समाक्ष इस प्रकार रखे गए हैं कि संयोजन की फोकस दूरी F_1 है। जब इन दोनों के बीच के स्थान में ग्लिसरीन (जिसका अपवर्तनांक कांच के अपवर्तनांक ($\mu = 1.5$) के बराबर है) भर दी जाती है, तो तुल्य फोकस दूरी F_2 है। अनुपात $F_1 : F_2$ होगा :

(1) 2 : 1
(2) 1 : 2
(3) 2 : 3
(4) 3 : 4

12. किसी पात्र में भरी गैस के ताप में वृद्धि होने से क्या होगा ?

(1) इसके द्रव्यमान में वृद्धि
(2) इसकी गतिज ऊर्जा में वृद्धि
(3) इसके दाब में कमी
(4) अंतराअणुक दूरी में कमी

13. किसी इलेक्ट्रॉन को 10,000 V के विभवान्तर द्वारा त्वरित किया गया है। इसकी दे ब्राग्ली तरंगदैर्घ्य है (लगभग) : ($m_e = 9 \times 10^{-31}$ kg)

(1) 12.2×10^{-13} m
(2) 12.2×10^{-12} m
(3) 12.2×10^{-14} m
(4) 12.2 nm

14. 88 cm की कॉपर की छड़ तथा अज्ञात लम्बाई की किसी एलुमिनियम की छड़ की लम्बाई में वृद्धि ताप वृद्धि पर निर्भर नहीं हैं। एलुमिनियम की छड़ की लम्बाई है : ($\alpha_{Cu} = 1.7 \times 10^{-5} K^{-1}$ तथा $\alpha_{Al} = 2.2 \times 10^{-5} K^{-1}$)

(1) 6.8 cm
(2) 113.9 cm
(3) 88 cm
(4) 68 cm

15. इन्द्रधनुष के संदर्भ में **गलत** उत्तर चुनिए।

(1) जब किसी जल की बूंद में प्रकाश की किरणें दो बार आंतरिक परावर्तन करती हैं, तो कोई द्वितीयक इन्द्रधनुष बनता है।
(2) द्वितीयक इन्द्रधनुष में वर्णों का क्रम उत्क्रमित हो जाता है।
(3) कोई प्रेक्षक इन्द्रधनुष तब देख सकता है जब सूर्य उसके सामने होता है।
(4) इन्द्रधनुष सूर्य के प्रकाश के विक्षेपण, अपवर्तन और परावर्तन का संयुक्त प्रभाव है।

11. Two similar thin equi-convex lenses, of focal length f each, are kept coaxially in contact with each other such that the focal length of the combination is F_1. When the space between the two lenses is filled with glycerin (which has the same refractive index ($\mu = 1.5$) as that of glass) then the equivalent focal length is F_2. The ratio $F_1 : F_2$ will be :

(1) 2 : 1
(2) 1 : 2
(3) 2 : 3
(4) 3 : 4

12. Increase in temperature of a gas filled in a container would lead to :

(1) increase in its mass
(2) increase in its kinetic energy
(3) decrease in its pressure
(4) decrease in intermolecular distance

13. An electron is accelerated through a potential difference of 10,000 V. Its de Broglie wavelength is, (nearly) : ($m_e = 9 \times 10^{-31}$ kg)

(1) 12.2×10^{-13} m
(2) 12.2×10^{-12} m
(3) 12.2×10^{-14} m
(4) 12.2 nm

14. A copper rod of 88 cm and an aluminium rod of unknown length have their increase in length independent of increase in temperature. The length of aluminium rod is : ($\alpha_{Cu} = 1.7 \times 10^{-5} K^{-1}$ and $\alpha_{Al} = 2.2 \times 10^{-5} K^{-1}$)

(1) 6.8 cm
(2) 113.9 cm
(3) 88 cm
(4) 68 cm

15. Pick the **wrong** answer in the context with rainbow.

(1) When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.
(2) The order of colours is reversed in the secondary rainbow.
(3) An observer can see a rainbow when his front is towards the sun.
(4) Rainbow is a combined effect of dispersion, refraction and reflection of sunlight.

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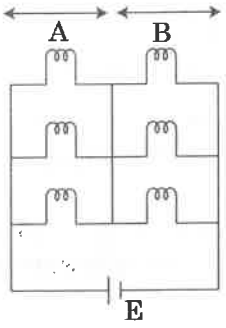
16. किसी पिण्ड का पृथ्वी के पृष्ठ पर भार 200 N है। पृथ्वी के केन्द्र की ओर आधी दूरी पर इसका भार कितना होगा ?
(1) 150 N
(2) 200 N
(3) 250 N
(4) 100 N

17. आरेख में दर्शाए अनुसार छः एकसमान बल्ब शून्य आन्तरिक प्रतिरोध और विद्युत वाहक बल E के किसी दिष्ट धारा स्रोत से संयोजित है।
इन बल्बों द्वारा उपभुक्त शक्ति का अनुपात जब
(i) सभी बल्ब दीप्यमान हैं और (ii) वह परिस्थिति जिसमें दो A भाग से तथा एक B भाग से दीप्यमान हैं, होगा :



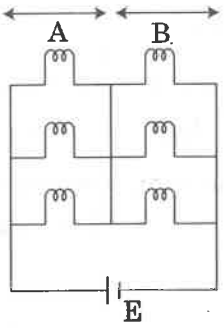
(1) 4 : 9
(2) 9 : 4
(3) 1 : 2
(4) 2 : 1

18. किसी p-प्रकार के अर्धचालक के लिए निम्नलिखित में से कौनसा कथन **सही** है ?
(1) इलेक्ट्रॉन बहुसंख्यक वाहक हैं तथा त्रिकसंयोजक परमाणु मादक (डोपैन्ट) हैं।
(2) विवर बहुसंख्यक वाहक हैं तथा त्रिकसंयोजक परमाणु मादक (डोपैन्ट) हैं।
(3) विवर बहुसंख्यक वाहक हैं तथा पंचसंयोजक परमाणु मादक (डोपैन्ट) हैं।
(4) इलेक्ट्रॉन बहुसंख्यक वाहक हैं तथा पंचसंयोजक परमाणु मादक (डोपैन्ट) हैं।

19. एक पूर्ण दोलन में सरल आवर्त गति करते किसी कण का औसत वेग होता है :
(1) $\frac{A\omega}{2}$
(2) $A\omega$
(3) $\frac{A\omega^2}{2}$
(4) शून्य

16. A body weighs 200 N on the surface of the earth. How much will it weigh half way down to the centre of the earth ?
(1) 150 N
(2) 200 N
(3) 250 N
(4) 100 N

17. Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance.
The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be :



(1) 4 : 9
(2) 9 : 4
(3) 1 : 2
(4) 2 : 1

18. For a p-type semiconductor, which of the following statements is **true** ?
(1) Electrons are the majority carriers and trivalent atoms are the dopants.
(2) Holes are the majority carriers and trivalent atoms are the dopants.
(3) Holes are the majority carriers and pentavalent atoms are the dopants.
(4) Electrons are the majority carriers and pentavalent atoms are the dopants.

19. Average velocity of a particle executing SHM in one complete vibration is :
(1) $\frac{A\omega}{2}$
(2) $A\omega$
(3) $\frac{A\omega^2}{2}$
(4) zero

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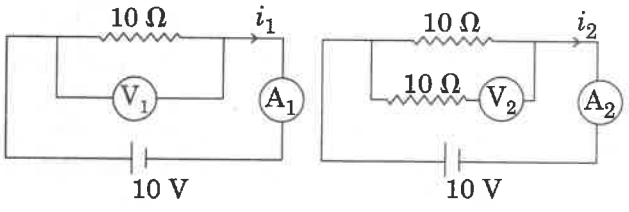
20. ऊष्मा चालकता का मात्रक है :
(1) $J\ m\ K^{-1}$
(2) $J\ m^{-1}\ K^{-1}$
(3) $W\ m\ K^{-1}$
(4) $W\ m^{-1}\ K^{-1}$

21. 4 cm त्रिज्या और 2 kg द्रव्यमान का कोई ठोस बेलन अपने अक्ष के परित: 3 rpm की दर से घूर्णन कर रहा है। 2π परिक्रमण करने के पश्चात इसे रोकने के लिए आवश्यक बल आघूर्ण है :
(1) 2×10^{-6} N m
(2) 2×10^{-3} N m
(3) 12×10^{-4} N m
(4) 2×10^{6} N m

22. किसी कण पर y-दिशा में कोई बल $F=20+10y$ कार्य कर रहा है, यहाँ F न्यूटन में तथा y मीटर में हैं। इस कण को $y=0$ से $y=1$ m तक गति कराने में किया गया कार्य है :
(1) 30 J
(2) 5 J
(3) 25 J
(4) 20 J

23. निम्नलिखित में से कौनसा एक, परिपथ सुरक्षा युक्ति के रूप में कार्य करता है ?
(1) चालक
(2) प्रेरक
(3) स्विच
(4) फ्यूज़

24. नीचे दर्शाए गए परिपथ में वोल्टमीटरों और एमीटरों के पाठ्यांक होंगे :



परिपथ 1 परिपथ 2

(1) $V_2 > V_1$ तथा $i_1 = i_2$
(2) $V_1 = V_2$ तथा $i_1 > i_2$
(3) $V_1 = V_2$ तथा $i_1 = i_2$
(4) $V_2 > V_1$ तथा $i_1 > i_2$

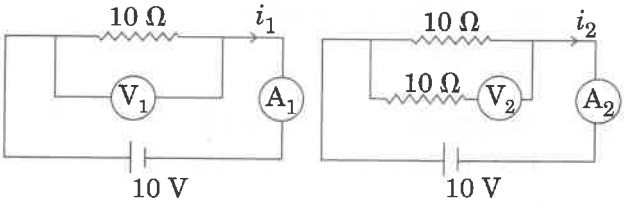
20. The unit of thermal conductivity is :
(1) $J\ m\ K^{-1}$
(2) $J\ m^{-1}\ K^{-1}$
(3) $W\ m\ K^{-1}$
(4) $W\ m^{-1}\ K^{-1}$

21. A solid cylinder of mass 2 kg and radius 4 cm is rotating about its axis at the rate of 3 rpm. The torque required to stop after 2π revolutions is :
(1) 2×10^{-6} N m
(2) 2×10^{-3} N m
(3) 12×10^{-4} N m
(4) 2×10^{6} N m

22. A force $F=20+10y$ acts on a particle in y-direction where F is in newton and y in meter. Work done by this force to move the particle from $y=0$ to $y=1$ m is :
(1) 30 J
(2) 5 J
(3) 25 J
(4) 20 J

23. Which of the following acts as a circuit protection device ?
(1) conductor
(2) inductor
(3) switch
(4) fuse

24. In the circuits shown below, the readings of the voltmeters and the ammeters will be :



Circuit 1 Circuit 2

(1) $V_2 > V_1$ and $i_1 = i_2$
(2) $V_1 = V_2$ and $i_1 > i_2$
(3) $V_1 = V_2$ and $i_1 = i_2$
(4) $V_2 > V_1$ and $i_1 > i_2$

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25. त्रिज्या R के किसी खोखले धातु के गोले को एकसमान आवेशित किया गया है। केन्द्र से दूरी r पर गोले के कारण विद्युत क्षेत्र :
(1) जब r बढ़ता है तो $r < R$ और $r > R$ के लिए बढ़ता है।
(2) जब r बढ़ता है तो $r < R$ के लिए शून्य हो जाता है तथा $r > R$ के लिए घट जाता है।
(3) जब r बढ़ता है तो $r < R$ के लिए शून्य हो जाता है तथा $r > R$ के लिए बढ़ जाता है।
(4) जब r बढ़ता है तो $r < R$ और $r > R$ के लिए घटता है।

26. पृथ्वी के पृष्ठ के किसी बिन्दु A पर नति कोण $\delta = +25°$। पृथ्वी के किसी अन्य बिन्दु B पर नति कोण $\delta = -25°$। हम यह व्याख्या कर सकते हैं कि :
(1) A और B दोनों ही उत्तरी गोलार्ध में स्थित हैं।
(2) A दक्षिणी गोलार्ध में स्थित है तथा B उत्तरी गोलार्ध में स्थित है।
(3) A उत्तरी गोलार्ध में स्थित है तथा B दक्षिणी गोलार्ध में स्थित है।
(4) A और B दोनों दक्षिणी गोलार्ध में स्थित हैं।

27. किसी कक्षा में किसी परमाणु के इलेक्ट्रॉन की कुल ऊर्जा -3.4 eV है। इसकी गतिज और स्थितिज ऊर्जाएँ क्रमशः हैं :
(1) -3.4 eV, -3.4 eV
(2) -3.4 eV, -6.8 eV
(3) 3.4 eV, -6.8 eV
(4) 3.4 eV, 3.4 eV

28. पूर्ण आंतरिक परावर्तन में जब सम्पर्क के माध्यमों के युगल के लिए आपतन कोण क्रांतिक कोण के बराबर होता है, तो अपवर्तन कोण कितना होगा ?
(1) 180°
(2) 0°
(3) आपतन कोण के बराबर
(4) 90°

29. किसी द्रव्यमान m को पृथ्वी के पृष्ठ से ऊंचाई h, जो पृथ्वी की त्रिज्या के बराबर है, तक ऊपर उठाने में किया गया कार्य है :
(1) mgR
(2) 2 mgR
(3) $\frac{1}{2}$ mgR
(4) $\frac{3}{2}$ mgR

25. A hollow metal sphere of radius R is uniformly charged. The electric field due to the sphere at a distance r from the centre :
(1) increases as r increases for $r < R$ and for $r > R$
(2) zero as r increases for $r < R$, decreases as r increases for $r > R$
(3) zero as r increases for $r < R$, increases as r increases for $r > R$
(4) decreases as r increases for $r < R$ and for $r > R$

26. At a point A on the earth's surface the angle of dip, $\delta = +25°$. At a point B on the earth's surface the angle of dip, $\delta = -25°$. We can interpret that :
(1) A and B are both located in the northern hemisphere.
(2) A is located in the southern hemisphere and B is located in the northern hemisphere.
(3) A is located in the northern hemisphere and B is located in the southern hemisphere.
(4) A and B are both located in the southern hemisphere.

27. The total energy of an electron in an atom in an orbit is -3.4 eV. Its kinetic and potential energies are, respectively :
(1) -3.4 eV, -3.4 eV
(2) -3.4 eV, -6.8 eV
(3) 3.4 eV, -6.8 eV
(4) 3.4 eV, 3.4 eV

28. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contact, what will be angle of refraction ?
(1) 180°
(2) 0°
(3) equal to angle of incidence
(4) 90°

29. The work done to raise a mass m from the surface of the earth to a height h, which is equal to the radius of the earth, is :
(1) mgR
(2) 2 mgR
(3) $\frac{1}{2}$ mgR
(4) $\frac{3}{2}$ mgR

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30. जब क्षैतिज से 60° कोण पर रखे किसी लम्बे चिकने आनत तल की तली से किसी पिण्ड पर शाट लगाया जाता है, तो वह तल के अनुदिश x_1 दूरी चल सकता है। परन्तु जब झुकाव को घटाकर 30° कर दिया जाता है तथा इसी पिण्ड पर समान वेग से शाट लगाया जाता है, तब वह x_2 दूरी चल सकता है। तब $x_1 : x_2$ होगा :

(1) $1 : \sqrt{2}$

(2) $\sqrt{2} : 1$

(3) $1 : \sqrt{3}$

(4) $1 : 2\sqrt{3}$

31. α-कण में होते हैं :

(1) केवल 2 प्रोटॉन और 2 न्यूट्रॉन

(2) 2 इलेक्ट्रॉन, 2 प्रोटॉन और 2 न्यूट्रॉन

(3) केवल 2 इलेक्ट्रॉन और 4 प्रोटॉन

(4) केवल 2 प्रोटॉन

32. स्थिर जल में किसी तैराक की चाल 20 m/s है। नदी के जल की चाल 10 m/s है और वह ठीक पूर्व की ओर बह रहा है। यदि वह दक्षिणी किनारे पर खड़ा है और नदी को लघुतम पथ के अनुदिश पार करना चाहता है तो उत्तर के सापेक्ष उसे जिस कोण पर स्ट्रोक लगाने चाहिए वह है :

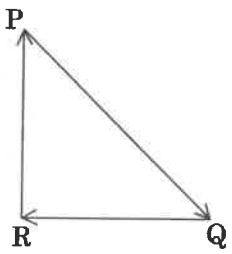
(1) 30° पश्चिम

(2) 0°

(3) 60° पश्चिम

(4) 45° पश्चिम

33. सदिश त्रिभुज PQR में दर्शाए अनुसार वेग $\vec{V}$ से गतिमान किसी कण पर तीन बल कार्य कर रहे हैं। इस कण का वेग :



(1) बढ़ेगा

(2) घटेगा

(3) नियत रहेगा

(4) लघुतम बल $\overrightarrow{QR}$ के अनुसार परिवर्तित होगा

30. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal, it can travel a distance x_1 along the plane. But when the inclination is decreased to 30° and the same object is shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be :

(1) $1 : \sqrt{2}$

(2) $\sqrt{2} : 1$

(3) $1 : \sqrt{3}$

(4) $1 : 2\sqrt{3}$

31. α-particle consists of :

(1) 2 protons and 2 neutrons only

(2) 2 electrons, 2 protons and 2 neutrons

(3) 2 electrons and 4 protons only

(4) 2 protons only

32. The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t. north is given by :

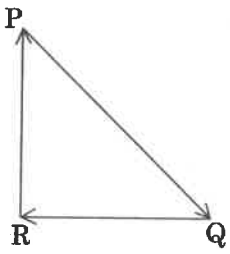
(1) 30° west

(2) 0°

(3) 60° west

(4) 45° west

33. A particle moving with velocity $\vec{V}$ is acted by three forces shown by the vector triangle PQR. The velocity of the particle will :



(1) increase

(2) decrease

(3) remain constant

(4) change according to the smallest force $\overrightarrow{QR}$

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34. r_A और r_B त्रिज्याओं के संकेन्द्री वृत्तों पर दो कण A और B क्रमशः v_A और v_B वेगों से एकसमान वृत्तीय गति कर रहे हैं। इनके घूर्णन का आवर्तकाल समान है। A और B की कोणीय चालों का अनुपात होगा :
(1) $r_A : r_B$
(2) $v_A : v_B$
(3) $r_B : r_A$
(4) 1 : 1

35. 10 kg द्रव्यमान का कोई गुटका 1 m त्रिज्या के किसी खोखले बेलनाकार ड्रम की भीतरी दीवार के सम्पर्क में है। भीतरी दीवार और गुटके के बीच घर्षण गुणांक 0.1 है। जब बेलन ऊर्ध्वाधर है और अपने अक्ष के परितः घूर्णन कर रहा है, तो गुटके को स्थिर रखने के लिए आवश्यक निम्नतम कोणीय वेग, होगा : $(g = 10\ m/s^2)$
(1) $\sqrt{10}$ rad/s
(2) $\frac{10}{2\pi}$ rad/s
(3) 10 rad/s
(4) 10π rad/s

36. दो समान्तर अनन्त रैखिक आवेश जिनके रैखिक आवेश घनत्व $+\lambda$ C/m और $-\lambda$ C/m हैं, मुक्त अवकाश में 2R दूरी पर रखे गए हैं। इन दो रैखिक आवेशों के बीच, मध्य में विद्युत क्षेत्र कितना है ?
(1) शून्य
(2) $\frac{2\lambda}{\pi\epsilon_0 R}$ N/C
(3) $\frac{\lambda}{\pi\epsilon_0 R}$ N/C
(4) $\frac{\lambda}{2\pi\epsilon_0 R}$ N/C

37. दो बिन्दु आवेश A और B जिन पर क्रमशः $+Q$ और $-Q$ आवेश हैं, एक दूसरे से कुछ दूरी पर स्थित हैं और इनके बीच लगने वाला बल F है। यदि A का 25% आवेश B को स्थानान्तरित कर दिया जाए, तो आवेशों के बीच बल हो जाएगा :
(1) F
(2) $\frac{9F}{16}$
(3) $\frac{16F}{9}$
(4) $\frac{4F}{3}$

34. Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed v_A and v_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be :
(1) $r_A : r_B$
(2) $v_A : v_B$
(3) $r_B : r_A$
(4) 1 : 1

35. A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1 m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be : $(g = 10\ m/s^2)$
(1) $\sqrt{10}$ rad/s
(2) $\frac{10}{2\pi}$ rad/s
(3) 10 rad/s
(4) 10π rad/s

36. Two parallel infinite line charges with linear charge densities $+\lambda$ C/m and $-\lambda$ C/m are placed at a distance of 2R in free space. What is the electric field mid-way between the two line charges ?
(1) zero
(2) $\frac{2\lambda}{\pi\epsilon_0 R}$ N/C
(3) $\frac{\lambda}{\pi\epsilon_0 R}$ N/C
(4) $\frac{\lambda}{2\pi\epsilon_0 R}$ N/C

37. Two point charges A and B, having charges $+Q$ and $-Q$ respectively, are placed at certain distance apart and force acting between them is F. If 25% charge of A is transferred to B, then force between the charges becomes :
(1) F
(2) $\frac{9F}{16}$
(3) $\frac{16F}{9}$
(4) $\frac{4F}{3}$

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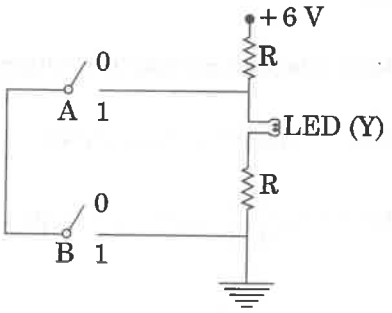
38. 2 m ऊंचाई के पूर्ण रूप से जल से भरे किसी खुले टैंक में तली के निकट 2 mm^2 अनुप्रस्थ काट क्षेत्रफल का कोई छोटा छिद्र उपस्थित है। $g = 10\ m/s^2$ लेते हुए खुले छिद्र से प्रवाहित जल की दर होगी लगभग :

(1) $12.6 \times 10^{-6}\ m^3/s$

(2) $8.9 \times 10^{-6}\ m^3/s$

(3) $2.23 \times 10^{-6}\ m^3/s$

(4) $6.4 \times 10^{-6}\ m^3/s$

39. 

आरेख के परिपथ द्वारा निरूपित **सही** बूलीय प्रचालन है :

(1) AND

(2) OR

(3) NAND

(4) NOR

40. निम्नलिखित में से किस एक प्रक्रिया में, किस निकाय द्वारा न तो ऊष्मा का अवशोषण होता है और न ही ऊष्मा विमुक्त होती है ?

(1) समतापीय

(2) एडियाबेटिक (रुद्धोष्म)

(3) समदाबीय

(4) आइसोकोरिक (समआयतनिक)

41. प्रभावी क्षेत्रफल 0.05 m^2 की 800 फेरों की कोई कुण्डली 5×10^{-5} T के किसी चुम्बकीय क्षेत्र के लम्बवत रखी है। जब इस कुण्डली के तल को, 0.1 s में इसके किसी समतलीय अक्ष के चारों ओर, 90° पर घूर्णित किया जाता है, तो इस कुण्डली में प्रेरित विद्युत वाहक बल होगा :

(1) 2 V

(2) 0.2 V

(3) 2×10^{-3} V

(4) 0.02 V

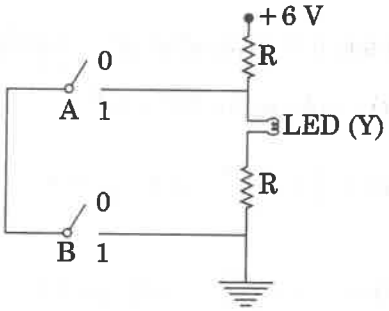
38. A small hole of area of cross-section 2 mm^2 is present near the bottom of a fully filled open tank of height 2 m. Taking $g = 10\ m/s^2$, the rate of flow of water through the open hole would be nearly :

(1) $12.6 \times 10^{-6}\ m^3/s$

(2) $8.9 \times 10^{-6}\ m^3/s$

(3) $2.23 \times 10^{-6}\ m^3/s$

(4) $6.4 \times 10^{-6}\ m^3/s$

39. 

The **correct** Boolean operation represented by the circuit diagram drawn is :

(1) AND

(2) OR

(3) NAND

(4) NOR

40. In which of the following processes, heat is neither absorbed nor released by a system ?

(1) isothermal

(2) adiabatic

(3) isobaric

(4) isochoric

41. A 800 turn coil of effective area 0.05 m^2 is kept perpendicular to a magnetic field 5×10^{-5} T. When the plane of the coil is rotated by 90° around any of its coplanar axis in 0.1 s, the emf induced in the coil will be :

(1) 2 V

(2) 0.2 V

(3) 2×10^{-3} V

(4) 0.02 V

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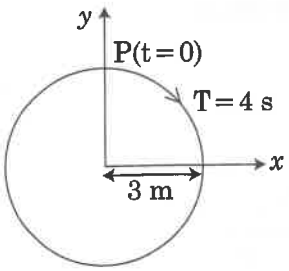
42. आरेख में वृत्त की त्रिज्या, परिक्रमण का आवर्तकाल, आरम्भिक स्थिति और परिक्रमण की दिशा इंगित की गयी हैं।



घूर्णन करते कण P के त्रिज्या सदिश का y - प्रक्षेपण है :

(1) $y(t) = -3\cos 2\pi t$, यहाँ y m में है

(2) $y(t) = 4\sin\left(\frac{\pi t}{2}\right)$, यहाँ y m में है

(3) $y(t) = 3\cos\left(\frac{3\pi t}{2}\right)$, यहाँ y m में है

(4) $y(t) = 3\cos\left(\frac{\pi t}{2}\right)$, यहाँ y m में है

43. 20 μF धारिता के किसी समान्तर पट्टिका संधारित्र को किसी ऐसे वोल्टता स्रोत द्वारा आवेशित किया जा रहा है जिसका विभव 3 V/s की दर से परिवर्तित हो रहा है। संयोजक तारों से प्रवाहित चालक धारा, और पट्टिकाओं से गुजरने वाली विस्थापन धारा क्रमशः होंगी :

(1) शून्य, 60 μA

(2) 60 μA, 60 μA

(3) 60 μA, शून्य

(4) शून्य, शून्य

44. किसी प्रयोग में भौतिक राशियों A, B, C और D की माप में होने वाली त्रुटि की प्रतिशतता क्रमशः 1%, 2%, 3% और 4% है। तब X की माप, जबकि $X = \frac{A^2 B^{1/2}}{C^{1/3} D^3}$ है, में अधिकतम प्रतिशत त्रुटि होगी :

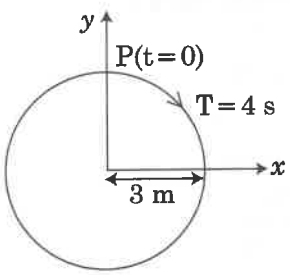
(1) $\left(\frac{3}{13}\right)\%$

(2) 16%

(3) -10%

(4) 10%

42. The radius of circle, the period of revolution, initial position and sense of revolution are indicated in the fig.



y - projection of the radius vector of rotating particle P is :

(1) $y(t) = -3\cos 2\pi t$, where y in m

(2) $y(t) = 4\sin\left(\frac{\pi t}{2}\right)$, where y in m

(3) $y(t) = 3\cos\left(\frac{3\pi t}{2}\right)$, where y in m

(4) $y(t) = 3\cos\left(\frac{\pi t}{2}\right)$, where y in m

43. A parallel plate capacitor of capacitance 20 μF is being charged by a voltage source whose potential is changing at the rate of 3 V/s. The conduction current through the connecting wires, and the displacement current through the plates of the capacitor, would be, respectively :

(1) zero, 60 μA

(2) 60 μA, 60 μA

(3) 60 μA, zero

(4) zero, zero

44. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where $X = \frac{A^2 B^{1/2}}{C^{1/3} D^3}$, will be :

(1) $\left(\frac{3}{13}\right)\%$

(2) 16%

(3) -10%

(4) 10%

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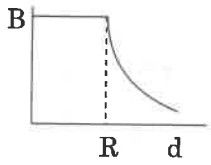
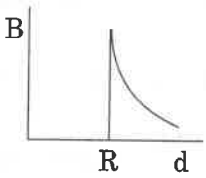
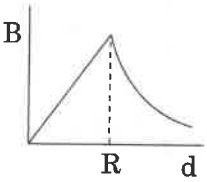
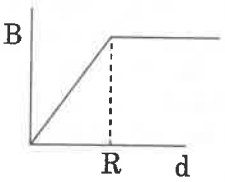
45. त्रिज्या R के किसी बेलनाकार चालक से कोई नियत धारा प्रवाहित हो रही है। चुम्बकीय क्षेत्र, B के परिमाण तथा चालक के केन्द्र से दूरी, d के बीच ग्राफ का **सही** निरूपण निम्नलिखित में से किस आरेख द्वारा किया गया है ?

(1) 

(2) 

(3) 

(4) 

46. पेंट-2-ईन-4-आइन में सिग्मा (σ) तथा पाई (π) आबन्धों की संख्या है :

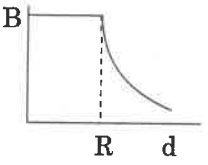
(1) 10 σ आबन्ध तथा 3 π आबन्ध

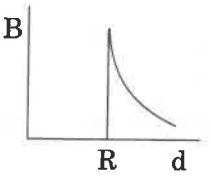
(2) 8 σ आबन्ध तथा 5 π आबन्ध

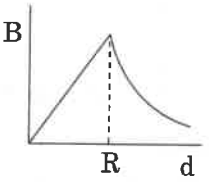
(3) 11 σ आबन्ध तथा 2 π आबन्ध

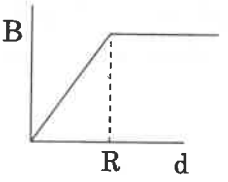
(4) 13 σ आबन्ध तथा कोई भी π आबन्ध नहीं

45. A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field, B with the distance, d, from the centre of the conductor, is **correctly** represented by the figure :

(1) 

(2) 

(3) 

(4) 

46. The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is :

(1) 10 σ bonds and 3 π bonds

(2) 8 σ bonds and 5 π bonds

(3) 11 σ bonds and 2 π bonds

(4) 13 σ bonds and no π bond

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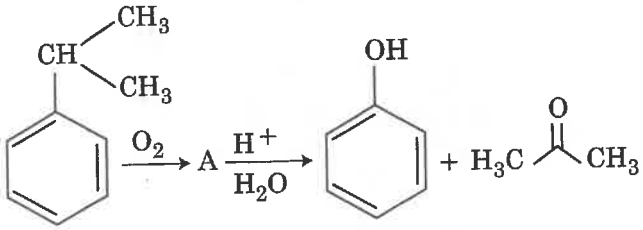
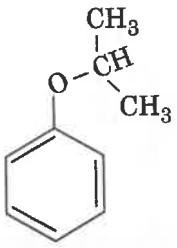
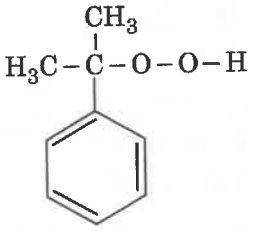
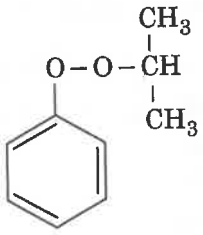
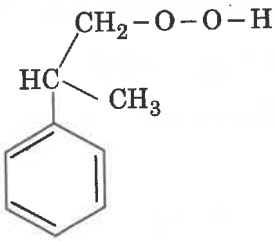
47. निम्न अभिक्रिया में मध्यवर्ती A की संरचना है :



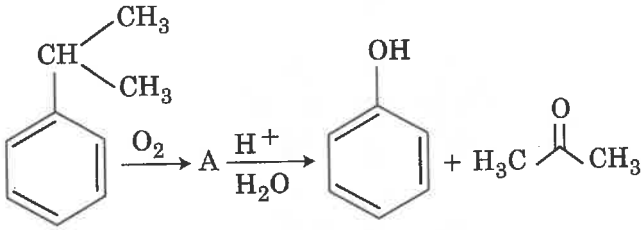
(1) 

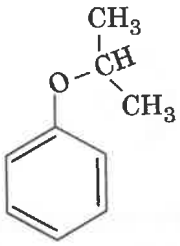
(2) 

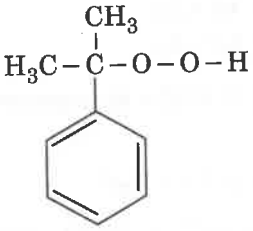
(3) 

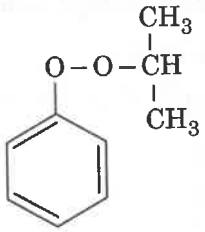
(4) 

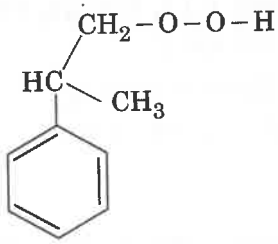
47. The structure of intermediate A in the following reaction, is :



(1) 

(2) 

(3) 

(4) 

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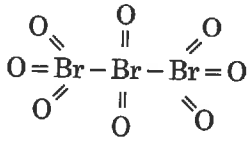
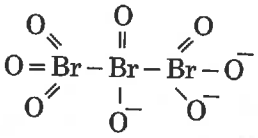
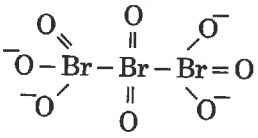
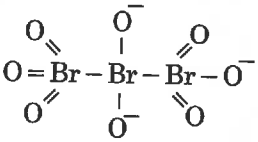
48. ट्राईब्रोमोआक्टाआक्साइड की **सही** संरचना है :

(1) 

(2) 

(3) 

(4) 

49. 4d, 5p, 5f तथा 6p कक्षक घटती ऊर्जा के क्रम में व्यवस्थित किये गये हैं। **सही** विकल्प है :

(1) 5f > 6p > 5p > 4d
(2) 6p > 5f > 5p > 4d
(3) 6p > 5f > 4d > 5p
(4) 5f > 6p > 4d > 5p

50. निम्न अभिक्रियाओं में से कौन सी असमानुपातन अभिक्रियायें हैं ?

(a) $2Cu^{+} \rightarrow Cu^{2+} + Cu^{0}$

(b) $3MnO_4^{2-} + 4H^{+} \rightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

(c) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

(d) $2MnO_4^{-} + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{\oplus}$

निम्न में से **सही** विकल्प चुनिये :

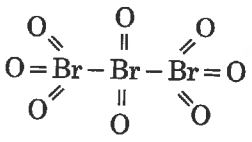
(1) केवल (a) तथा (b)
(2) (a), (b) तथा (c)
(3) (a), (c) तथा (d)
(4) केवल (a) तथा (d)

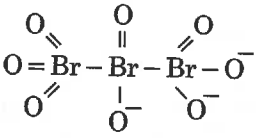
51. समतापीय अवस्था में, 300 K पर एक गैस 2 बार के एक स्थिर बाह्य दाब के विरुद्ध, 0.1 L से 0.25 L तक प्रसार करती है। गैस द्वारा किया गया कार्य है :

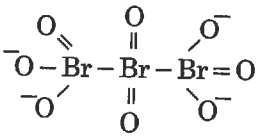
[दिया गया है 1 लिटर बार = 100 J]

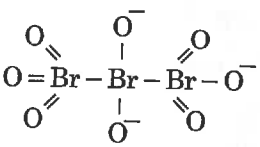
(1) − 30 J
(2) 5 kJ
(3) 25 J
(4) 30 J

48. The **correct** structure of tribromooctaoxide is :

(1) 

(2) 

(3) 

(4) 

49. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The **correct** option is :

(1) 5f > 6p > 5p > 4d
(2) 6p > 5f > 5p > 4d
(3) 6p > 5f > 4d > 5p
(4) 5f > 6p > 4d > 5p

50. Which of the following reactions are disproportionation reaction ?

(a) $2Cu^{+} \rightarrow Cu^{2+} + Cu^{0}$

(b) $3MnO_4^{2-} + 4H^{+} \rightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

(c) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

(d) $2MnO_4^{-} + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{\oplus}$

Select the **correct** option from the following :

(1) (a) and (b) only
(2) (a), (b) and (c)
(3) (a), (c) and (d)
(4) (a) and (d) only

51. Under isothermal condition, a gas at 300 K expands from 0.1 L to 0.25 L against a constant external pressure of 2 bar. The work done by the gas is :

[Given that 1 L bar = 100 J]

(1) − 30 J
(2) 5 kJ
(3) 25 J
(4) 30 J

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52. निम्न में से वह जो ग्रीन हाउस गैस **नहीं** है, होगी :

(1) नाइट्रस ऑक्साइड

(2) मिथेन

(3) ओज़ोन

(4) सल्फर डाइऑक्साइड

53. सेल अभिक्रिया के लिए

$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$

298 K पर, $E^{\ominus}_{cell} = 0.24$ V है। सेल अभिक्रिया की मानक गिब्ज ऊर्जा ($\Delta_r G^{\ominus}$) होगी :

[दिया गया है, फैराडे स्थिरांक $F = 96500\ C\ mol^{-1}$]

(1) $-46.32\ kJ\ mol^{-1}$

(2) $-23.16\ kJ\ mol^{-1}$

(3) $46.32\ kJ\ mol^{-1}$

(4) $23.16\ kJ\ mol^{-1}$

54. वह एन्जाइम जो ए.टी.पी. (ATP) का उपयोग फास्फेट के स्थानान्तरण में करता है उसे सहकारक के रूप में एक क्षारीय मृदा धातु (M) की आवश्यकता होती है, M है :

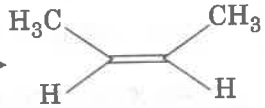
(1) Be

(2) Mg

(3) Ca

(4) Sr

55. निम्न रूपान्तरण के लिए सबसे ज्यादा उपयुक्त अभिकारक है :

$H_3C-C\equiv C-CH_3 \longrightarrow$ 

सिस-2-ब्यूटीन

(1) Na / द्रव अमोनिया

(2) H_2, Pd / C, क्यूनोलिन

(3) Zn / HCl

(4) Hg^{2+} / H^+, H_2O

56. H_2E (E = O, S, Se, Te तथा Po) के लिए तापीय स्थायित्व का **सही** क्रम है :

(1) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$

(2) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$

(3) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$

(4) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

52. Among the following, the one that is **not** a green house gas is :

(1) nitrous oxide

(2) methane

(3) ozone

(4) sulphur dioxide

53. For the cell reaction

$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$

$E^{\ominus}_{cell} = 0.24$ V at 298 K. The standard Gibbs energy ($\Delta_r G^{\ominus}$) of the cell reaction is :

[Given that Faraday constant $F = 96500\ C\ mol^{-1}$]

(1) $-46.32\ kJ\ mol^{-1}$

(2) $-23.16\ kJ\ mol^{-1}$

(3) $46.32\ kJ\ mol^{-1}$

(4) $23.16\ kJ\ mol^{-1}$

54. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor. M is :

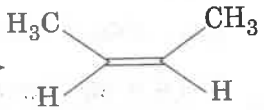
(1) Be

(2) Mg

(3) Ca

(4) Sr

55. The most suitable reagent for the following conversion, is :

$H_3C-C\equiv C-CH_3 \longrightarrow$ 

cis-2-butene

(1) Na / liquid NH_3

(2) H_2, Pd / C, quinoline

(3) Zn / HCl

(4) Hg^{2+} / H^+, H_2O

56. Which is the **correct** thermal stability order for H_2E (E = O, S, Se, Te and Po) ?

(1) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$

(2) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$

(3) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$

(4) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

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57. निम्न में से कौन सा कथन **असत्य** है ?

(1) PbF_4 की प्रकृति सहसंयोजक है।

(2) $SiCl_4$ आसानी से जल-अपघटित हो जाता है।

(3) GeX_4 (X = F, Cl, Br, I), GeX_2 की तुलना में ज्यादा स्थायी है।

(4) SnF_4 की प्रकृति आयनिक है।

58. निम्न को सुमेल कीजिये :

(a)	विशुद्ध नाइट्रोजन	(i)	क्लोरीन
(b)	हैबर प्रक्रम	(ii)	सल्फ्यूरिक अम्ल
(c)	संस्पर्श प्रक्रम	(iii)	अमोनिया
(d)	डीकन विधि	(iv)	सोडियम ऐज़ाइड अथवा बेरियम ऐज़ाइड

निम्न में से कौन सा विकल्प **सही** है ?

	(a)	(b)	(c)	(d)
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

59. अणु कक्षक सिद्धान्त के अनुसार निम्न में से किस द्विपरमाण्विक आण्विक स्पीशीज़ में मात्र π-आबन्ध हैं ?

(1) O_2

(2) N_2

(3) C_2

(4) Be_2

60. द्वितीय आवर्तक के तत्वों के लिये प्रथम आयनन एन्थैल्पी का **सही** बढ़ता क्रम होगा :

(1) Li < Be < B < C < N < O < F < Ne

(2) Li < B < Be < C < O < N < F < Ne

(3) Li < B < Be < C < N < O < F < Ne

(4) Li < Be < B < C < O < N < F < Ne

61. जैवनिम्नीकरणीय बहुलक है :

(1) नायलॉन-6, 6

(2) नायलॉन 2-नायलॉन 6

(3) नायलॉन-6

(4) ब्यूना-S

57. Which of the following is **incorrect** statement ?

(1) PbF_4 is covalent in nature

(2) $SiCl_4$ is easily hydrolysed

(3) GeX_4 (X = F, Cl, Br, I) is more stable than GeX_2

(4) SnF_4 is ionic in nature

58. Match the following :

(a)	Pure nitrogen	(i)	Chlorine
(b)	Haber process	(ii)	Sulphuric acid
(c)	Contact process	(iii)	Ammonia
(d)	Deacon's process	(iv)	Sodium azide or Barium azide

Which of the following is the **correct** option ?

	(a)	(b)	(c)	(d)
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

59. Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory ?

(1) O_2

(2) N_2

(3) C_2

(4) Be_2

60. For the second period elements the **correct** increasing order of first ionisation enthalpy is :

(1) Li < Be < B < C < N < O < F < Ne

(2) Li < B < Be < C < O < N < F < Ne

(3) Li < B < Be < C < N < O < F < Ne

(4) Li < Be < B < C < O < N < F < Ne

61. The biodegradable polymer is :

(1) nylon-6, 6

(2) nylon 2-nylon 6

(3) nylon-6

(4) Buna-S

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62. $Ca(OH)_2$ के एक संतृप्त विलयन का pH, 9 है। $Ca(OH)_2$ का विलेयता गुणनफल (K_{sp}) है :

(1) 0.5×10^{-15}

(2) 0.25×10^{-10}

(3) 0.125×10^{-15}

(4) 0.5×10^{-10}

63. प्रथम कोटि अभिक्रिया के लिए यदि वेग नियतांक k हो तो अभिक्रिया के 99% को पूरा करने के लिए आवश्यक समय (t) इसके द्वारा दिया जायेगा :

(1) $t = 0.693/k$

(2) $t = 6.909/k$

(3) $t = 4.606/k$

(4) $t = 2.303/k$

64. निम्न में अनावश्यक एमीनो अम्ल है :

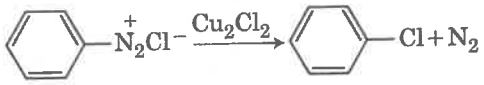
(1) वैलीन

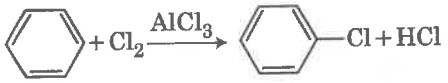
(2) ल्यूसीन

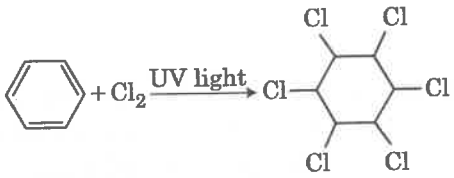
(3) एलानिन

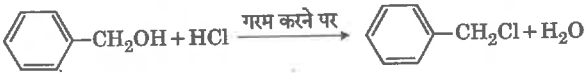
(4) लाइसीन

65. निम्न में से वह अभिक्रिया जो इलेक्ट्रॉनस्नेही प्रतिस्थापन से सम्पादित होती है, है :

(1) 

(2) 

(3) 

(4) 

66. वह मिश्रण जो उच्चतम क्वथनांक वाला स्थिरक्वाथी बनाता है, होगा :

(1) जल + नाइट्रिक अम्ल

(2) एथनॉल + जल

(3) एसीटोन + कार्बन डाइसल्फाइड

(4) हेप्टेन + आक्टेन

62. pH of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$ is :

(1) 0.5×10^{-15}

(2) 0.25×10^{-10}

(3) 0.125×10^{-15}

(4) 0.5×10^{-10}

63. If the rate constant for a first order reaction is k, the time (t) required for the completion of 99% of the reaction is given by :

(1) $t = 0.693/k$

(2) $t = 6.909/k$

(3) $t = 4.606/k$

(4) $t = 2.303/k$

64. The non-essential amino acid among the following is :

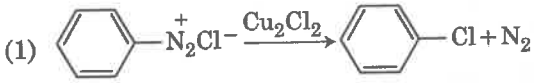
(1) valine

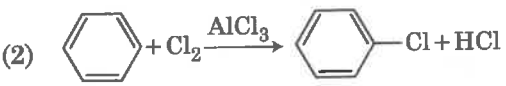
(2) leucine

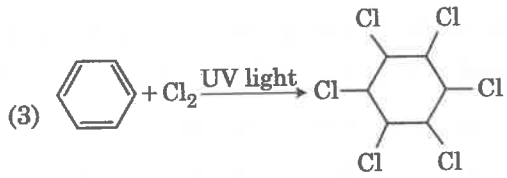
(3) alanine

(4) lysine

65. Among the following, the reaction that proceeds through an electrophilic substitution, is :

(1) 

(2) 

(3) 

(4)

66. The mixture that forms maximum boiling azeotrope is :

(1) Water + Nitric acid

(2) Ethanol + Water

(3) Acetone + Carbon disulphide

(4) Heptane + Octane

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67. रासायनिक अभिक्रिया,

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, के लिए

सही विकल्प है :

(1) $-\frac{1}{3}\frac{d[H_2]}{dt} = -\frac{1}{2}\frac{d[NH_3]}{dt}$

(2) $-\frac{d[N_2]}{dt} = 2\frac{d[NH_3]}{dt}$

(3) $-\frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(4) $3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$

68. हैबर प्रक्रम द्वारा, अमोनिया के 20 मोल बनाने के लिए आवश्यक हाइड्रोजन अणुओं के मोलों की संख्या होगी :

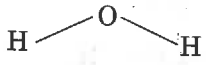
(1) 10

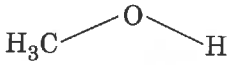
(2) 20

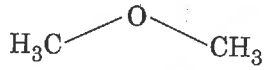
(3) 30

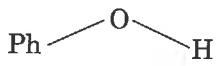
(4) 40

69. वह यौगिक जिसको प्रोटोनित करना सर्वाधिक कठिन है, है :

(1) 

(2) 

(3) 

(4) 

70. एक आदर्श विलयन के लिये, **सही** विकल्प है :

(1) $\Delta_{mix} S = 0$ स्थिर T तथा P पर

(2) $\Delta_{mix} V \neq 0$ स्थिर T तथा P पर

(3) $\Delta_{mix} H = 0$ स्थिर T तथा P पर

(4) $\Delta_{mix} G = 0$ स्थिर T तथा P पर

71. ब्रान्स्टेड एसिड H_2O तथा HF के लिए संयुग्मी क्षारक हैं :

(1) क्रमश: OH^- तथा H_2F^+

(2) क्रमश: H_3O^+ तथा F^-

(3) क्रमश: OH^- तथा F^-

(4) क्रमश: H_3O^+ तथा H_2F^+

67. For the chemical reaction

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

the **correct** option is :

(1) $-\frac{1}{3}\frac{d[H_2]}{dt} = -\frac{1}{2}\frac{d[NH_3]}{dt}$

(2) $-\frac{d[N_2]}{dt} = 2\frac{d[NH_3]}{dt}$

(3) $-\frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(4) $3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$

68. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is :

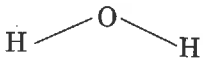
(1) 10

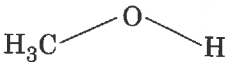
(2) 20

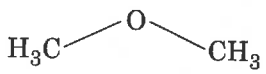
(3) 30

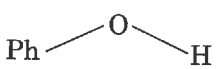
(4) 40

69. The compound that is most difficult to protonate is :

(1) 

(2) 

(3) 

(4) 

70. For an ideal solution, the **correct** option is :

(1) $\Delta_{mix} S = 0$ at constant T and P

(2) $\Delta_{mix} V \neq 0$ at constant T and P

(3) $\Delta_{mix} H = 0$ at constant T and P

(4) $\Delta_{mix} G = 0$ at constant T and P

71. Conjugate base for Brönsted acids H_2O and HF are :

(1) OH^- and H_2F^+, respectively

(2) H_3O^+ and F^-, respectively

(3) OH^- and F^-, respectively

(4) H_3O^+ and H_2F^+, respectively

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72. किस विलयन के मिश्रण से ऋण आवेशित कोलाइडी $[AgI]I^-$ सॉल का निर्माण होगा ?

(1) 1 M $AgNO_3$ का 50 mL + 1.5 M KI का 50 mL

(2) 1 M $AgNO_3$ का 50 mL + 2 M KI का 50 mL

(3) 2 M $AgNO_3$ का 50 mL + 1.5 M KI का 50 mL

(4) 0.1 M $AgNO_3$ का 50 mL + 0.1 M KI का 50 mL

73. निम्न में, नैरो (संकीर्ण) स्पेक्ट्रम ऐन्टिबायोटिक है :

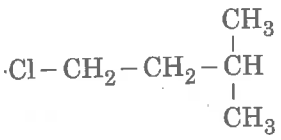
(1) पेनिसिलिन G

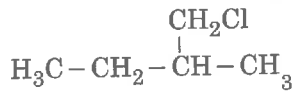
(2) एम्पीसिलिन

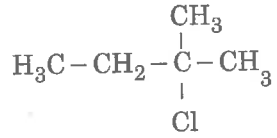
(3) एमाक्सीसिलिन

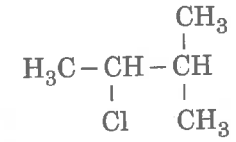
(4) क्लोरैम्फेनिकॉल

74. एक एल्कीन "A", O_3 तथा $Zn - H_2O$ के साथ अभिक्रिया करने पर सममोलर अनुपात में प्रोपेनोन तथा एथनल देता है। एल्कीन "A", HCl के मिलाने पर "B" मुख्य उत्पाद के रूप में देता है। उत्पाद "B" की संरचना है :

(1) 

(2) 

(3) 

(4) 

75. क्रिस्टल क्षेत्र सिद्धांत के आधार पर $K_4[Fe(CN)_6]$ में केन्द्रीय परमाणु का **सही** इलेक्ट्रॉनिक विन्यास क्या होगा ?

(1) $t_{2g}^4 e_g^2$

(2) $t_{2g}^6 e_g^0$

(3) $e^3 t_2^3$

(4) $e^4 t_2^2$

72. Which mixture of the solutions will lead to the formation of negatively charged colloidal $[AgI]I^-$ sol. ?

(1) 50 mL of 1 M $AgNO_3$ + 50 mL of 1.5 M KI

(2) 50 mL of 1 M $AgNO_3$ + 50 mL of 2 M KI

(3) 50 mL of 2 M $AgNO_3$ + 50 mL of 1.5 M KI

(4) 50 mL of 0.1 M $AgNO_3$ + 50 mL of 0.1 M KI

73. Among the following, the narrow spectrum antibiotic is :

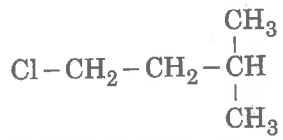
(1) penicillin G

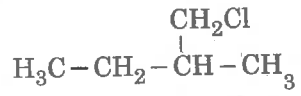
(2) ampicillin

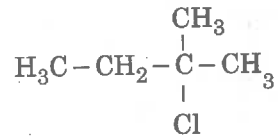
(3) amoxycillin

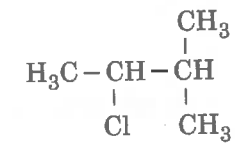
(4) chloramphenicol

74. An alkene "A" on reaction with O_3 and $Zn - H_2O$ gives propanone and ethanal in equimolar ratio. Addition of HCl to alkene "A" gives "B" as the major product. The structure of product "B" is :

(1) 

(2) 

(3) 

(4) 

75. What is the **correct** electronic configuration of the central atom in $K_4[Fe(CN)_6]$ based on crystal field theory ?

(1) $t_{2g}^4 e_g^2$

(2) $t_{2g}^6 e_g^0$

(3) $e^3 t_2^3$

(4) $e^4 t_2^2$

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76. निम्न में से PCl_5 से सम्बन्धित **गलत** कथन को पहचानिए :

(1) तीन मध्यवर्ती P – Cl आबन्ध एक दूसरे से 120° का कोण बनाते हैं।

(2) दो अक्षीय P – Cl आबन्ध एक दूसरे से 180° का कोण बनाते हैं।

(3) अक्षीय P – Cl आबन्ध, मध्यवर्ती P – Cl आबन्धों की तुलना में लम्बे होते हैं।

(4) PCl_5 अणु अनभिक्रियाशील है।

77. किससे क्षारीय बफर बनेगा ?

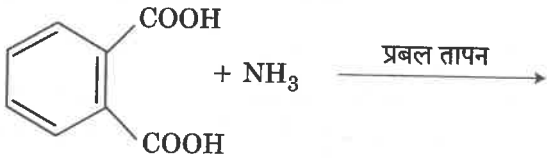
(1) 0.1 M NaOH का 50 mL + 0.1 M CH_3COOH का 25 mL

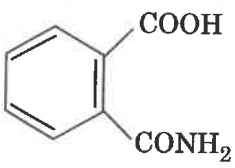
(2) 0.1 M CH_3COOH का 100 mL + 0.1 M NaOH का 100 mL

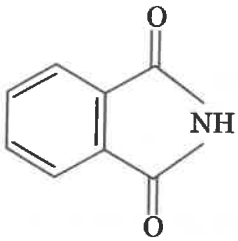
(3) 0.1 M HCl का 100 mL + 0.1 M NH_4OH का 200 mL

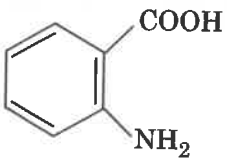
(4) 0.1 M HCl का 100 mL + 0.1 M NaOH का 100 mL

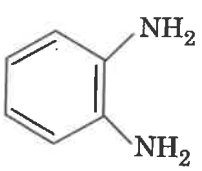
78. निम्न अभिक्रिया का मुख्य उत्पाद है :



(1) 

(2) 

(3) 

(4) 

76. Identify the **incorrect** statement related to PCl_5 from the following :

(1) Three equatorial P – Cl bonds make an angle of 120° with each other

(2) Two axial P – Cl bonds make an angle of 180° with each other

(3) Axial P – Cl bonds are longer than equatorial P – Cl bonds

(4) PCl_5 molecule is non-reactive

77. Which will make basic buffer ?

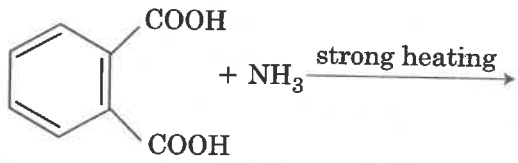
(1) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M CH_3COOH

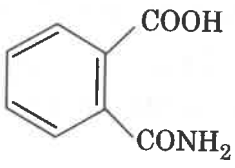
(2) 100 mL of 0.1 M CH_3COOH + 100 mL of 0.1 M NaOH

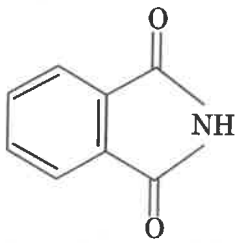
(3) 100 mL of 0.1 M HCl + 200 mL of 0.1 M NH_4OH

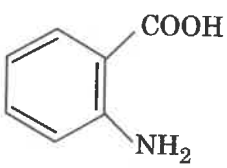
(4) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH

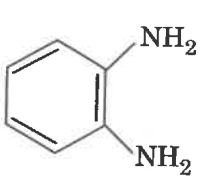
78. The major product of the following reaction is :



(1) 

(2) 

(3) 

(4) 

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79. **कॉलम - I** में दिए गये जीनॉन यौगिकों का **कॉलम - II** में दी गई उनकी संरचना से सुमेलित कीजिये और **सही** कोड निर्धारित कीजिए :

	कॉलम - I		**कॉलम - II**
(a)	XeF_4	(i)	पिरामिडी
(b)	XeF_6	(ii)	वर्ग समतली
(c)	$XeOF_4$	(iii)	विकृत अष्टफलकीय
(d)	XeO_3	(iv)	वर्ग पिरामिडी

कोड :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(iii)	(iv)	(i)	(ii)

80. मैंगनेट तथा परमैंगनेट आयन जिस कारण से चतुष्फलकीय हैं, वह है :

(1) π-आबन्धन में मैंगनीज़ के d-कक्षक के साथ ऑक्सीजन के p-कक्षक का अतिव्यापन होता है।

(2) π-आबन्धन नहीं है।

(3) π-आबन्धन में मैंगनीज़ के p-कक्षक के साथ ऑक्सीजन के p-कक्षक का अतिव्यापन होता है।

(4) π-आबन्धन में मैंगनीज़ के d-कक्षक के साथ ऑक्सीजन के d-कक्षक का अतिव्यापन होता है।

81. निम्न में से कौन सी स्पीशीज़ स्थायी **नहीं** है ?

(1) $[SiF_6]^{2-}$

(2) $[GeCl_6]^{2-}$

(3) $[Sn(OH)_6]^{2-}$

(4) $[SiCl_6]^{2-}$

82. एक सेल के लिए जिसमें एक इलेक्ट्रॉन सम्मिलित है, 298 K पर $E^{\ominus}_{cell} = 0.59$ V है। सेल अभिक्रिया के लिए साम्य स्थिरांक है :

[दिया गया है $T = 298\,K$ पर, $\frac{2.303\,RT}{F} = 0.059$ V]

(1) 1.0×10^2

(2) 1.0×10^5

(3) 1.0×10^{10}

(4) 1.0×10^{30}

79. Match the Xenon compounds in **Column - I** with its structure in **Column - II** and assign the **correct** code :

	Column - I		**Column - II**
(a)	XeF_4	(i)	pyramidal
(b)	XeF_6	(ii)	square planar
(c)	$XeOF_4$	(iii)	distorted octahedral
(d)	XeO_3	(iv)	square pyramidal

Code :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(ii)	(iii)	(i)	(iv)
(4)	(iii)	(iv)	(i)	(ii)

80. The manganate and permanganate ions are tetrahedral, due to :

(1) The π- bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese

(2) There is no π- bonding

(3) The π- bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese

(4) The π- bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese

81. Which of the following species is **not** stable ?

(1) $[SiF_6]^{2-}$

(2) $[GeCl_6]^{2-}$

(3) $[Sn(OH)_6]^{2-}$

(4) $[SiCl_6]^{2-}$

82. For a cell involving one electron $E^{\ominus}_{cell} = 0.59$ V at 298 K, the equilibrium constant for the cell reaction is :

[Given that $\frac{2.303\,RT}{F} = 0.059$ V at $T = 298$ K]

(1) 1.0×10^2

(2) 1.0×10^5

(3) 1.0×10^{10}

(4) 1.0×10^{30}

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83. निम्न में से कौन सी उभयधर्मी हाइड्रॉक्साइड है ?
(1) $Sr(OH)_2$
(2) $Ca(OH)_2$
(3) $Mg(OH)_2$
(4) $Be(OH)_2$

84. 350 K तथा 15 बार पर एक गैस का मोलर आयतन, इन्हीं शर्तों में आदर्श गैस के आयतन से 20 प्रतिशत कम है। गैस तथा इसकी संपीड्यता गुणांक (Z) के सम्बन्ध में **सही** विकल्प है :
(1) $Z > 1$ तथा आकर्षक बल प्रमुख हैं
(2) $Z > 1$ तथा प्रतिकर्षी बल प्रमुख हैं
(3) $Z < 1$ तथा आकर्षक बल प्रमुख हैं
(4) $Z < 1$ तथा प्रतिकर्षी बल प्रमुख हैं

85. एक यौगिक धनायन C तथा ऋणायन A से निर्मित है। ऋणायन षट्कोण सुसंकुलित (hcp) जालक बनाते हैं तथा धनायन अष्टफलकीय रिक्तियों के 75% तक भरते हैं, यौगिक का सूत्र है :
(1) C_2A_3
(2) C_3A_2
(3) C_3A_4
(4) C_4A_3

86. किस स्थिति में एन्ट्रापी में परिवर्तन ऋणात्मक होगा ?
(1) जल का वाष्पीकरण
(2) स्थिर ताप पर एक गैस का प्रसार
(3) ठोस से गैस में ऊर्ध्वपातन
(4) $2H(g) \rightarrow H_2(g)$

87. हाइड्रोजन परमाणु के स्पेक्ट्रम में, निम्न में से कौन सी संक्रमण श्रेणी दृश्य क्षेत्र में पड़ती है ?
(1) लायमन श्रेणी
(2) बामर श्रेणी
(3) पाशन श्रेणी
(4) ब्रैकेट श्रेणी

88. जल की अस्थायी कठोरता हटाने के लिए प्रयुक्त विधि है :
(1) कैल्गॉन विधि
(2) क्लार्क विधि
(3) आयन-विनिमय विधि
(4) संश्लिष्ट रेजिन विधि

83. Which of the following is an amphoteric hydroxide ?
(1) $Sr(OH)_2$
(2) $Ca(OH)_2$
(3) $Mg(OH)_2$
(4) $Be(OH)_2$

84. A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The **correct** option about the gas and its compressibility factor (Z) is :
(1) $Z > 1$ and attractive forces are dominant
(2) $Z > 1$ and repulsive forces are dominant
(3) $Z < 1$ and attractive forces are dominant
(4) $Z < 1$ and repulsive forces are dominant

85. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is :
(1) C_2A_3
(2) C_3A_2
(3) C_3A_4
(4) C_4A_3

86. In which case change in entropy is negative ?
(1) Evaporation of water
(2) Expansion of a gas at constant temperature
(3) Sublimation of solid to gas
(4) $2H(g) \rightarrow H_2(g)$

87. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region ?
(1) Lyman series
(2) Balmer series
(3) Paschen series
(4) Brackett series

88. The method used to remove temporary hardness of water is :
(1) Calgon's method
(2) Clark's method
(3) Ion-exchange method
(4) Synthetic resins method

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89. निम्न में से कौन एक मैलेकाइट है ?

(1) $CuFeS_2$

(2) $Cu(OH)_2$

(3) Fe_3O_4

(4) $CuCO_3.Cu(OH)_2$

90. जलीय विलयन में मेथिल प्रतिस्थापित एमीनों के क्षारीय प्रबलता का **सही** क्रम होगा :

(1) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

(2) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

(3) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$

(4) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

91. सन् 1992 में रियो दी जनैरो में सम्पन्न हुआ पृथ्वी सम्मेलन क्यों किया गया था ?

(1) CO_2 उत्सर्जन और वैश्विक ऊष्मन को कम करने के लिए।

(2) जैवविविधता के संरक्षण के लिए और इससे लाभ के धारणीय उपयोग के लिए।

(3) आक्रामक अपतृण जातियों द्वारा स्थानीय जातियों पर हुए जोखिम के मूल्यांकन के लिए।

(4) सी.एफ.सीएस (CFCs) के उपयोग को तत्काल समाप्त करने के लिए जो ओज़ोन परत का ह्रास कर रही है।

92. दुग्धस्रवण के आरंभिक दिनों में माता द्वारा स्रावित पीला तरल कोलोस्ट्रम नवजात में प्रतिरक्षा प्रदान करने के लिए अत्यंत आवश्यक है क्योंकि इसमें होती हैं :

(1) प्राकृतिक मारक कोशिकाएँ

(2) एकक्रेंद्रकाणु

(3) भक्षाणु

(4) इम्युनोग्लोबुलिन A

93. अत्याधिक शुष्क मौसम में घास की पत्तियाँ अन्दर की ओर मुड़ जाती हैं। निम्नलिखित में से इसके सबसे उपयुक्त कारण का चयन कीजिए :

(1) रन्ध्रों का बन्द होना

(2) बुलीफार्म कोशिकाओं का शिथिल होना

(3) स्पंजी पर्णमध्योतक में वायु स्थानों का सिकुड़ना

(4) वाहिकाओं में टाइलोसिस

89. Which one is malachite from the following ?

(1) $CuFeS_2$

(2) $Cu(OH)_2$

(3) Fe_3O_4

(4) $CuCO_3.Cu(OH)_2$

90. The **correct** order of the basic strength of methyl substituted amines in aqueous solution is :

(1) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

(2) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

(3) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$

(4) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

91. The Earth Summit held in Rio de Janeiro in 1992 was called :

(1) to reduce CO_2 emissions and global warming.

(2) for conservation of biodiversity and sustainable utilization of its benefits.

(3) to assess threat posed to native species by invasive weed species.

(4) for immediate steps to discontinue use of CFCs that were damaging the ozone layer.

92. Colostrum, the yellowish fluid, secreted by mother during the initial days of lactation is very essential to impart immunity to the newborn infants because it contains :

(1) Natural killer cells

(2) Monocytes

(3) Macrophages

(4) Immunoglobulin A

93. Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following :

(1) Closure of stomata

(2) Flaccidity of bulliform cells

(3) Shrinkage of air spaces in spongy mesophyll

(4) Tyloses in vessels

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94. एक उपमध्यकेन्द्री गुणसूत्र की छोटी एवं बड़ी भुजाओं को कहते हैं :

(1) क्रमश: s-भुजा एवं l-भुजा

(2) क्रमश: p-भुजा एवं q-भुजा

(3) क्रमश: q-भुजा एवं p-भुजा

(4) क्रमश: m-भुजा एवं n-भुजा

95. ट्राइपामिटिन के श्वसन गुणांक का मान कितना है ?

(1) 0.9

(2) 0.7

(3) 0.07

(4) 0.09

96. निम्न में कौन रुधिर कॉलेस्ट्राल कम करने वाला व्यवसायिक कारक है ?

(1) साइक्लोस्पोरीन A

(2) स्टैटिन

(3) स्ट्रेप्टोकाइनेज

(4) लाइपेज

97. निम्न संरचनाओं को अंगों में उनके स्थान के साथ मिलान कीजिए :

(a)	लीबरकुन-प्रगुहिका	(i)	अग्न्याशय
(b)	ग्लिसन का कैपसूल	(ii)	ग्रहणी
(c)	लैंगरहैंस द्वीप	(iii)	क्षुद्रांत
(d)	ब्रुनर ग्रंथियाँ	(iv)	यकृत

निम्न में से **उचित** विकल्प का चयन कीजिए :

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(ii)	(iv)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iii)	(ii)	(i)	(iv)

98. पादपों और जन्तुओं को विलोपन के कगार पर लाने के लिए निम्नलिखित में से कौन सा सबसे महत्वपूर्ण कारण है ?

(1) आवासीय क्षति तथा विखंडन

(2) सूखा और बाढ़

(3) आर्थिक दोहन

(4) विदेशी जातियों का आक्रमण

94. The shorter and longer arms of a submetacentric chromosome are referred to as :

(1) s-arm and l-arm respectively

(2) p-arm and q-arm respectively

(3) q-arm and p-arm respectively

(4) m-arm and n-arm respectively

95. Respiratory Quotient (RQ) value of tripalmitin is :

(1) 0.9

(2) 0.7

(3) 0.07

(4) 0.09

96. Which of the following is a commercial blood cholesterol lowering agent ?

(1) Cyclosporin A

(2) Statin

(3) Streptokinase

(4) Lipases

97. Match the following structures with their respective location in organs :

(a)	Crypts of Lieberkühn	(i)	Pancreas
(b)	Glisson's Capsule	(ii)	Duodenum
(c)	Islets of Langerhans	(iii)	Small intestine
(d)	Brunner's Glands	(iv)	Liver

Select the **correct** option from the following :

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(ii)	(iv)
(2)	(ii)	(iv)	(i)	(iii)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iii)	(ii)	(i)	(iv)

98. Which of the following is the most important cause for animals and plants being driven to extinction ?

(1) Habitat loss and fragmentation

(2) Drought and floods

(3) Economic exploitation

(4) Alien species invasion

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99. मस्तिष्क का कौन सा भाग तापमान नियंत्रण के लिए उत्तरदायी है ?
(1) सेरीब्रम
(2) हाइपोथेलेमस
(3) कार्पस कैलोसम
(4) मेडुला ऑब्लांगेटा

100. निम्नलिखित विशिष्टताओं पर विचार कीजिए।
(a) अंग तंत्र संगठन स्तर
(b) द्विपार्श्व सममिति
(c) पूर्ण प्रगुही एवं शरीर का खंडीभवन
वे जीव संघ जो सभी उपरोक्त विशिष्टताएं दर्शाते हैं के लिए **सही** विकल्प चुनिए।
(1) ऐनेलिडा, आर्थ्रोपोडा एवं कॉर्डेटा
(2) ऐनेलिडा, आर्थ्रोपोडा एवं मोलस्का
(3) आर्थ्रोपोडा, मोलस्का एवं कॉर्डेटा
(4) ऐनेलिडा, मोलस्का एवं कॉर्डेटा

101. तिलचट्टे की आहारनाल में मुख से आरंभ कर अंगों के **उचित** क्रम का चयन करो :
(1) ग्रसनी → ग्रसिका → शस्य → पेषणी → इलियम → कोलन → रैक्टम
(2) ग्रसनी → ग्रसिका → पेषणी → शस्य → इलियम → कोलन → रैक्टम
(3) ग्रसनी → ग्रसिका → पेषणी → इलियम → शस्य → कोलन → रैक्टम
(4) ग्रसनी → ग्रसिका → इलियम → शस्य → पेषणी → कोलन → रैक्टम

102. निम्नलिखित में से गैसों का कौन सा युग्म हरित गृह प्रभाव के लिए मुख्य रूप में उत्तरदायी है ?
(1) ओज़ोन और अमोनिया
(2) ऑक्सीजन और नाइट्रोजन
(3) नाइट्रोजन और सल्फर डाइऑक्साइड
(4) कार्बन डाइऑक्साइड और मिथेन

103. निम्न में कौन सा पेशीय विकार वंशागत है ?
(1) अपतानिका
(2) पेशीय दुष्पोषण
(3) माइस्थेनिया ग्रेविस
(4) बोटूलिज्म

99. Which part of the brain is responsible for thermoregulation ?
(1) Cerebrum
(2) Hypothalamus
(3) Corpus callosum
(4) Medulla oblongata

100. Consider following features :
(a) Organ system level of organisation
(b) Bilateral symmetry
(c) True coelomates with segmentation of body
Select the **correct** option of animal groups which possess all the above characteristics.
(1) Annelida, Arthropoda and Chordata
(2) Annelida, Arthropoda and Mcllusca
(3) Arthropoda, Mollusca and Chordata
(4) Annelida, Mollusca and Chordata

101. Select the **correct** sequence of organs in the alimentary canal of cockroach starting from mouth :
(1) Pharynx → Oesophagus → Crop → Gizzard → Ileum → Colon → Rectum
(2) Pharynx → Oesophagus → Gizzard → Crop → Ileum → Colon → Rectum
(3) Pharynx → Oesophagus → Gizzard → Ileum → Crop → Colon → Rectum
(4) Pharynx → Oesophagus → Ileum → Crop → Gizzard → Colon → Rectum

102. Which of the following pairs of gases is mainly responsible for green house effect ?
(1) Ozone and Ammonia
(2) Oxygen and Nitrogen
(3) Nitrogen and Sulphur dioxide
(4) Carbon dioxide and Methane

103. Which of the following muscular disorders is inherited ?
(1) Tetany
(2) Muscular dystrophy
(3) Myasthenia gravis
(4) Botulism

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104. पक्ष्माभधारी उपकला कोशिकाएं कणों अथवा श्लेष्मा को एक विशेष दिशा में संचालित करने के लिए जरूरी होती हैं। मानव में ये कोशिकाएँ उपस्थित होती हैं :

(1) पित्त वाहिनी एवं श्वसनिकाओं में

(2) डिंबवाहिनिओं एवं अग्न्याशयी वाहिनी में

(3) युस्टेशियन नली एवं लार वाहिनी में

(4) श्वसनिकाओं एवं डिंबवाहिनिओं में

105. **स्तंभ - I** का **स्तंभ - II** से मिलान कीजिए :

	स्तंभ - I		**स्तंभ - II**
(a)	P - तरंग	(i)	निलयों का विध्रुवीकरण
(b)	QRS सम्मिश्र	(ii)	निलयों का पुन: ध्रुवीकरण
(c)	T - तरंग	(iii)	कोरोनरी इशचमिया
(d)	T - तरंग के आकार में कमी	(iv)	अलिंदों का विध्रुवीकरण
		(v)	अलिंदों का पुन: ध्रुवीकरण

उचित विकल्प का चयन कीजिए।

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(iv)	(i)	(ii)	(v)
(3)	(ii)	(i)	(v)	(iii)
(4)	(ii)	(iii)	(v)	(iv)

106. निम्नलिखित में से कौन एक जैवविविधता के स्वस्थाने संरक्षण की विधि **नहीं** है ?

(1) जैवमंडल संरक्षित क्षेत्र

(2) वन्यजीव अभयारण्य

(3) वानस्पतिक उद्यान

(4) पवित्र वन

107. एक स्पीशीज में नवजात का भार 2 से 5 kg के बीच है। 3 से 3.3 kg औसत वजन वाले 97% नवजात जीवित रहे जबकि 2 से 2.5 kg भार वाले अथवा 4.5 से 5 kg वाले 99% नवजात मर गए। यहाँ किस प्रकार की वरण क्रिया हो रही है ?

(1) दिशात्मक वरण

(2) स्थायीकारक वरण

(3) विदारक वरण

(4) चक्रीय वरण

104. The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in :

(1) Bile duct and Bronchioles

(2) Fallopian tubes and Pancreatic duct

(3) Eustachian tube and Salivary duct

(4) Bronchioles and Fallopian tubes

105. Match the **Column - I** with **Column - II** :

	Column - I		**Column - II**
(a)	P - wave	(i)	Depolarisation of ventricles
(b)	QRS complex	(ii)	Repolarisation of ventricles
(c)	T - wave	(iii)	Coronary ischemia
(d)	Reduction in the size of T - wave	(iv)	Depolarisation of atria
		(v)	Repolarisation of atria

Select the **correct** option.

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iv)	(i)	(ii)	(iii)
(2)	(iv)	(i)	(ii)	(v)
(3)	(ii)	(i)	(v)	(iii)
(4)	(ii)	(iii)	(v)	(iv)

106. Which one of the following is **not** a method of *in situ* conservation of biodiversity ?

(1) Biosphere Reserve

(2) Wildlife Sanctuary

(3) Botanical Garden

(4) Sacred Grove

107. In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with weights from 2 to 2.5 kg or 4.5 to 5 kg die. Which type of selection process is taking place ?

(1) Directional Selection

(2) Stabilizing Selection

(3) Disruptive Selection

(4) Cyclical Selection

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108. कोशिका चक्रण की अवस्थाओं का **सही** क्रम कौन सा है ?

(1) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$

(2) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$

(3) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$

(4) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$

109. कोशकीय क्रियाओं को स्टेरॉयड हार्मोन किस प्रकार प्रभावित करते हैं ?

(1) कोशिका झिल्ली की पारगम्यता बदलकर।

(2) DNA से बंधकर एवं जीन-हार्मोन कॉम्प्लेक्स बनाकर।

(3) कोशिका झिल्ली में स्थित चक्रीय AMP को सक्रिय करके।

(4) एकुआपोरीन वाहिकाओं का द्वितीय संदेशक की तरह उपयोग करके।

110. निम्नलिखित में से कौन सा कथन सही **नहीं** है ?

(1) लयनकायों में बहुत से जल अपघटकीय एंजाइम होते हैं।

(2) लयनकायों के जल अपघटकीय एंजाइम अम्लीय pH में क्रियाशील होते हैं।

(3) लयनकाय झिल्ली से घिरी हुई संरचनायें हैं।

(4) लयनकाय अन्तर्द्रव्यी जालिका में समवेष्टन प्रक्रिया द्वारा बनते हैं।

111. पुष्पी पादपों में निषेचन के पश्चात विकास के विषय में निम्नलिखित में से कौन सा कथन **गलत** है ?

(1) अंडाशय, फल में विकसित होता है

(2) युग्मनज, भ्रूण में विकसित होता है

(3) केन्द्रीय कोशिका भ्रूणपोष में विकसित होती है

(4) बीजाण्ड, भ्रूण-कोश में विकसित होते हैं

112. कॉन्केनेवेलिन - A क्या है ?

(1) एल्केलाइड

(2) वाष्पशील तेल

(3) लेक्टीन

(4) वर्णक

113. एंजाइमों के बड़े पैमाने पर औद्योगिक उत्पादन के लिए सूक्ष्मजीवों को उगाने के लिए निम्नलिखित में से कौन से उपकरण की आवश्यकता होती है ?

(1) बी.ओ.डी. ऊष्मायित्र

(2) अवमल उपचारक

(3) औद्योगिक ओवन

(4) जैवरियेक्टर

108. The **correct** sequence of phases of cell cycle is :

(1) $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$

(2) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$

(3) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$

(4) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$

109. How does steroid hormone influence the cellular activities ?

(1) Changing the permeability of the cell membrane.

(2) Binding to DNA and forming a gene-hormone complex.

(3) Activating cyclic AMP located on the cell membrane.

(4) Using aquaporin channels as second messenger.

110. Which of the following statements is **not** correct ?

(1) Lysosomes have numerous hydrolytic enzymes.

(2) The hydrolytic enzymes of lysosomes are active under acidic pH.

(3) Lysosomes are membrane bound structures.

(4) Lysosomes are formed by the process of packaging in the endoplasmic reticulum.

111. Which one of the following statements regarding post-fertilization development in flowering plants is **incorrect** ?

(1) Ovary develops into fruit

(2) Zygote develops into embryo

(3) Central cell develops into endosperm

(4) Ovules develop into embryo sac

112. Concanavalin A is :

(1) an alkaloid

(2) an essential oil

(3) a lectin

(4) a pigment

113. Which one of the following equipments is essentially required for growing microbes on a large scale, for industrial production of enzymes ?

(1) BOD incubator

(2) Sludge digester

(3) Industrial oven

(4) Bioreactor

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114. निम्न कथनों को ध्यान में रखिए :

(A) सहएंजाइम अथवा धातु आयन जो एंजाइम प्रोटीन से दृढ़ता से बंधे होते हैं, प्रोस्थेटिक समूह कहलाते हैं।

(B) एक प्रोस्थेटिक समूह से बंधा पूर्ण उत्प्रेरक सक्रिय एंजाइम, एपोएंजाइम कहलाता है।

उचित विकल्प का चयन कीजिए।

(1) दोनों (A) एवं (B) सत्य हैं।

(2) (A) सत्य है लेकिन (B) असत्य है।

(3) दोनों (A) एवं (B) असत्य हैं।

(4) (A) असत्य है लेकिन (B) सत्य है।

115. डी.एन.ए. और आर.एन.ए. दोनों में पाये जाने वाले प्यूरीन कौन से हैं ?

(1) एडिनीन और थायमीन

(2) एडिनीन और ग्वानीन

(3) ग्वानीन और साइटोसीन

(4) साइटोसीन और थायमीन

116. नर जनन तंत्र में शुक्राणु कोशिकाओं के परिवहन के **सही** क्रम का चयन करो।

(1) वृषण → अधिवृषण → शुक्र वाहिकाएँ → वृषण जालिकाएँ → वंक्षण नाल → मूत्र मार्ग

(2) शुक्र जनक नलिकाएँ → वृषण जालिकाएँ → शुक्र वाहिकाएँ → अधिवृषण → शुक्र वाहक → स्खलनीय वाहिनी → मूत्र मार्ग → यूरेथ्रल मीटस

(3) शुक्रजनक नलिकाएँ → शुक्र वाहिकाएँ → अधिवृषण → वंक्षण नाल → मूत्र मार्ग

(4) वृषण → अधिवृषण → शुक्र वाहिकाएँ → शुक्र वाहक → स्खलनीय वाहिनी → वंक्षण नाल → मूत्र मार्ग → यूरेथ्रल मीटस

117. होमोनिडों को उनके **सही** मस्तिष्क माप के साथ मिलान कीजिए :

(a)	*होमो हैबिलिस*	(i)	900 cc
(b)	*होमो नियंडरथैलंसिस*	(ii)	1350 cc
(c)	*होमो इरैक्टस*	(iii)	650 - 800 cc
(d)	*होमो सैपियंस*	(iv)	1400 cc

उचित विकल्प का चयन कीजिए।

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(i)	(ii)

114. Consider the following statements :

(A) Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group.

(B) A complete catalytic active enzyme with its bound prosthetic group is called apoenzyme.

Select the **correct** option.

(1) Both **(A)** and **(B)** are true.

(2) **(A)** is true but **(B)** is false.

(3) Both **(A)** and **(B)** are false.

(4) **(A)** is false but **(B)** is true.

115. Purines found both in DNA and RNA are :

(1) Adenine and thymine

(2) Adenine and guanine

(3) Guanine and cytosine

(4) Cytosine and thymine

116. Select the **correct** sequence for transport of sperm cells in male reproductive system.

(1) Testis → Epididymis → Vasa efferentia → Rete testis→Inguinal canal → Urethra

(2) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra → Urethral meatus

(3) Seminiferous tubules → Vasa efferentia → Epididymis → Inguinal canal → Urethra

(4) Testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Inguinal canal → Urethra → Urethral meatus

117. Match the hominids with their **correct** brain size :

(a)	*Homo habilis*	(i)	900 cc
(b)	*Homo neanderthalensis*	(ii)	1350 cc
(c)	*Homo erectus*	(iii)	650 - 800 cc
(d)	*Homo sapiens*	(iv)	1400 cc

Select the **correct** option.

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(i)	(ii)

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118. जैसा कि ह्यूगो डी व्रीज ने प्रस्तावित किया कि उत्परिवर्तन के कारण विभिन्नतायें होती हैं, यह कैसी होती हैं ?

(1) यादृच्छिक और दिशात्मक

(2) यादृच्छिक और दिशारहित

(3) छोटी और दिशात्मक

(4) छोटी और दिशारहित

119. निम्न कोशिकांगकों के युग्म में किस में DNA **नहीं** होता ?

(1) सूत्रकणिका एवं लयनकाय

(2) क्लोरोप्लास्ट एवं रसधानियाँ

(3) लयनकाय एवं रसधानियाँ

(4) केन्द्रक आवरण एवं सूत्रकणिका

120. वायु द्वारा उत्पन्न ऐलर्जन एवं प्रदूषकों के कारण नगरीय स्थानों में काफी व्यक्ति श्वसनी विकार, जो घरघराहट उत्पन्न करते हैं, से पीड़ित हैं क्योंकि :

(1) नासिका गुहा में श्लेष्मा अस्तर की मामूली वृद्धि।

(2) श्वसनी एवं श्वसनिकाओं का इनफ्लेमेशन।

(3) रेशेदार ऊतकों का प्रोलिफरेशन एवं कूपिका भित्तियों की क्षति।

(4) न्यूमोसाइट के द्वारा पृष्ठ संक्रियक के स्रवण में कमी।

121. **अनुचित** कथन का चयन कीजिए :

(1) नर फलमक्खी विषमयुग्मकी होते हैं।

(2) नर टिड्डों में 50% शुक्राणुओं में लिंग-गुणसूत्र नहीं होते।

(3) पालतू मुर्गों में संतति का लिंग शुक्राणु के प्रकार पर निर्भर करता है ना की अंडाणु पर।

(4) मानव नरों में एक लिंग-गुणसूत्र दूसरे के अपेक्षाकृत बहुत छोटा होता है।

122. जैव अणुओं के एक मिश्रण में किससे उपचार करके डी.एन.ए. अवक्षेपण को प्राप्त किया जा सकता है ?

(1) आइसोप्रोपेनाल से

(2) शीतित इथेनॉल से

(3) कमरे के तापमान पर मिथेनॉल से

(4) शीतित क्लोरोफार्म से

118. Variations caused by mutation, as proposed by Hugo de Vries, are :

(1) random and directional

(2) random and directionless

(3) small and directional

(4) small and directionless

119. Which of the following pair of organelles **does not** contain DNA ?

(1) Mitochondria and Lysosomes

(2) Chloroplast and Vacuoles

(3) Lysosomes and Vacuoles

(4) Nuclear envelope and Mitochondria

120. Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to :

(1) benign growth on mucous lining of nasal cavity.

(2) inflammation of bronchi and bronchioles.

(3) proliferation of fibrous tissues and damage of the alveolar walls.

(4) reduction in the secretion of surfactants by pneumocytes.

121. Select the **incorrect** statement.

(1) Male fruit fly is heterogametic.

(2) In male grasshoppers, 50% of sperms have no sex-chromosome.

(3) In domesticated fowls, sex of progeny depends on the type of sperm rather than egg.

(4) Human males have one of their sex-chromosome much shorter than the other.

122. DNA precipitation out of a mixture of biomolecules can be achieved by treatment with :

(1) Isopropanol

(2) Chilled ethanol

(3) Methanol at room temperature

(4) Chilled chloroform

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123. जैव नियंत्रण कारकों के **सही** विकल्प का चयन करो।
(1) *बैसीलस थूरीनजिएंसीस*, टोबैको मोजेक वायरस, एफिड
(2) *ट्राइकोडर्मा, बैक्यूलोवायरस, बैसीलस थूरीनजिएंसीस*
(3) *ऑसिलेटोरिया, राइज़ोबियम, ट्राइकोडर्मा*
(4) *नॉसटॉक, एजोस्पाइरिलम, न्यूक्लिओपॉलीहीड्रोवायरस*

124. **अनुचित** कथन का चयन करो :
(1) अंत:प्रजनन समयुग्मता में वृद्धि करता है।
(2) अंत:प्रजनन किसी जानवर के शुद्ध वंशक्रम के विकसित होने के लिए आवश्यक है।
(3) अंत:प्रजनन हानिकारक अप्रभावी जीनों का चयन करता है जो जननता एवं उत्पादकता कम करते हैं।
(4) अंत:प्रजनन श्रेष्ठ जीनों के संग्रह एवं अवांछनीय जीनों के उन्मूलन में सहायता करता है।

125. निम्न जैविकों को उनके द्वारा उत्पादित वस्तुओं से सुमेलित कीजिए :

(a)	*लैक्टोबैसिलस*	(i)	पनीर
(b)	*सैकैरोमाइसीज सेरीविसी*	(ii)	दही
(c)	*ऐस्पर्जिलस निगर*	(iii)	सिट्रिक अम्ल
(d)	*ऐसीटोबैक्टर एसिटी*	(iv)	ब्रेड
		(v)	ऐसीटिक अम्ल

सही विकल्प का चयन कीजिए।

	(a)	(b)	(c)	(d)
(1)	(ii)	(iv)	(v)	(iii)
(2)	(ii)	(iv)	(iii)	(v)
(3)	(iii)	(iv)	(v)	(i)
(4)	(ii)	(i)	(iii)	(v)

126. फ्लोयम में शर्करा की गति की दिशा कौन सी होती है ?
(1) बहुदिशाहीन
(2) ऊर्ध्वगामी
(3) अधोगामी
(4) द्वि-दिशागामी

127. कुछ पादपों में मादा युग्मक बिना निषेचन के भ्रूण में परिवर्तित हो जाता है। इस घटना को क्या कहा जाता है ?
(1) स्वयुग्मन
(2) अनिषेकफलन
(3) युग्मक संलयन
(4) अनिषेकजनन

123. Select the **correct** group of biocontrol agents.
(1) *Bacillus thuringiensis*, Tobacco mosaic virus, Aphids
(2) *Trichoderma, Baculovirus, Bacillus thuringiensis*
(3) *Oscillatoria, Rhizobium, Trichoderma*
(4) *Nostoc, Azospirillium, Nucleopolyhedrovirus*

124. Select the **incorrect** statement.
(1) Inbreeding increases homozygosity.
(2) Inbreeding is essential to evolve purelines in any animal.
(3) Inbreeding selects harmful recessive genes that reduce fertility and productivity.
(4) Inbreeding helps in accumulation of superior genes and elimination of undesirable genes.

125. Match the following organisms with the products they produce :

(a)	*Lactobacillus*	(i)	Cheese
(b)	*Saccharomyces cerevisiae*	(ii)	Curd
(c)	*Aspergillus niger*	(iii)	Citric Acid
(d)	*Acetobacter aceti*	(iv)	Bread
		(v)	Acetic Acid

Select the **correct** option.

	(a)	(b)	(c)	(d)
(1)	(ii)	(iv)	(v)	(iii)
(2)	(ii)	(iv)	(iii)	(v)
(3)	(iii)	(iv)	(v)	(i)
(4)	(ii)	(i)	(iii)	(v)

126. What is the direction of movement of sugars in phloem ?
(1) Non-multidirectional
(2) Upward
(3) Downward
(4) Bi-directional

127. In some plants, the female gamete develops into embryo without fertilization. This phenomenon is known as :
(1) Autogamy
(2) Parthenocarpy
(3) Syngamy
(4) Parthenogenesis

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128. बीज में अवशिष्ट बीजाण्डकाय को क्या कहा जाता है ?
(1) निभाग
(2) परिभ्रूणपोष
(3) नाभिका
(4) अंत:कवच

129. आनुवंशिक मानचित्र के निर्माण के लिए कौन सी मानचित्र इकाई (सेंटीमॉर्गन) अपनायी गयी ?
(1) 10% क्रॉस ओवर को निरूपित करते हुए, दो अभिव्यक्त जीनों के मध्य दूरी की एक इकाई।
(2) 100% क्रॉस ओवर को निरूपित करते हुए, दो अभिव्यक्त जीनों के मध्य दूरी की एक इकाई।
(3) 1% क्रॉस ओवर को निरूपित करते हुए, गुणसूत्रों पर जीनों के बीच दूरी की एक इकाई।
(4) 50% क्रॉस ओवर को निरूपित करते हुए, गुणसूत्रों पर जीनों के मध्य की दूरी की एक इकाई।

130. यदि एक व्यक्ति का हृद निकास 5 L, अनुशिथिलन के अंत में निलयों में रुधिर आयतन 100 mL एवं निलयी प्रकुंचन के अंत में 50 mL है तब उसकी हृदय दर क्या होगी ?
(1) 50 स्पंदन प्रति मिनट
(2) 75 स्पंदन प्रति मिनट
(3) 100 स्पंदन प्रति मिनट
(4) 125 स्पंदन प्रति मिनट

131. *थियोबैसिलस,* जीवाणुओं का एक समूह है, जो निम्नलिखित में से कौन सा कार्य करने में सहायता करते हैं ?
(1) नाइट्रोजन स्थिरीकरण
(2) रसायन स्वपोषित स्थिरीकरण
(3) नाइट्रीकरण
(4) विनाइट्रीकरण

132. सांद्रित मूत्र के निर्माण के लिए निम्न में कौन सा कारक उत्तरदायी हैं ?
(1) एंटीडाइयूरेटिक हार्मोन का निम्न स्तर।
(2) वृक्कों के आंतरिक मध्यांशी इंटरस्टीशियम की तरफ अति आस्मोलरिटि बनाए रखना।
(3) जक्स्टागुच्छीय कॉम्प्लैक्स द्वारा इरिथ्रोपोईटिन का स्रवण।
(4) गुच्छीय निस्यंदन के दौरान द्रवस्थैतिक दाब।

128. Persistent nucellus in the seed is known as :
(1) Chalaza
(2) Perisperm
(3) Hilum
(4) Tegmen

129. What map unit (Centimorgan) is adopted in the construction of genetic maps ?
(1) A unit of distance between two expressed genes, representing 10% cross over.
(2) A unit of distance between two expressed genes, representing 100% cross over.
(3) A unit of distance between genes on chromosomes, representing 1% cross over.
(4) A unit of distance between genes on chromosomes, representing 50% cross over.

130. What would be the heart rate of a person if the cardiac output is 5 L, blood volume in the ventricles at the end of diastole is 100 mL and at the end of ventricular systole is 50 mL ?
(1) 50 beats per minute
(2) 75 beats per minute
(3) 100 beats per minute
(4) 125 beats per minute

131. *Thiobacillus* is a group of bacteria helpful in carrying out :
(1) Nitrogen fixation
(2) Chemoautotrophic fixation
(3) Nitrification
(4) Denitrification

132. Which of the following factors is responsible for the formation of concentrated urine ?
(1) Low levels of antidiuretic hormone.
(2) Maintaining hyperosmolarity towards inner medullary interstitium in the kidneys.
(3) Secretion of erythropoietin by Juxtaglomerular complex.
(4) Hydrostatic pressure during glomerular filtration.

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133. निम्न में सूत्रकणिका से संबंधित कौन सा कथन **अनुचित** है ?

(1) बाह्य झिल्ली कार्बोहाइड्रेटों के एकलक, वसाओं एवं प्रोटीनों के लिए पारगम्य है।

(2) इलेक्ट्रॉन परिवहन के एंजाइम बाह्य झिल्ली में अंत:स्थापित होते हैं।

(3) आंतर झिल्ली अंतरवलनों के साथ संवलित होती है।

(4) सूत्रकणिकीय आधात्री में एक वृत्तीय DNA अणु एवं राइबोसोम होते हैं।

134. जाइलम किसका स्थानान्तरण करता है ?

(1) केवल जल का

(2) केवल जल और खनिज लवणों का

(3) केवल जल, खनिज लवणों और कुछ जैवीय नाइट्रोजन का

(4) जल, खनिज लवणों, कुछ जैवीय नाइट्रोजन एवं हार्मोनों का

135. G_0 प्रावस्था में कोशिकाएँ :

(1) कोशिका चक्र से बाहर निकल जाती हैं

(2) कोशिका चक्र में प्रवेश करती हैं

(3) कोशिका चक्र को स्थगित कर देती हैं

(4) कोशिका चक्र को समाप्त कर देती हैं

136. वृक्षों में वार्षिक वलयों के बनने के विषय में निम्नलिखित में से कौन सा कथन सही **नहीं** है ?

(1) वार्षिक वलय एक वर्ष में वसंत दारु और शरद दारु के उत्पन्न होने का एक संयोजन है।

(2) एधा (कैम्बियम) की अंतरीय सक्रियता के कारण ऊतक के हल्के रंग और गहरे रंग के वलयों – क्रमश: अग्रदारु और पश्चदारु का बनना।

(3) कैम्बियम की सक्रियता, जलवायु में विभिन्नता पर निर्भर होती है।

(4) शीतोष्ण कटिबन्धीय क्षेत्रों के वृक्षों में वार्षिक वलय सुस्पष्ट नहीं होती हैं।

137. निम्नलिखित में से कौन सा पारिस्थितिकी पिरैमिड सामान्यत: उल्टा होता है ?

(1) घासभूमि में संख्या का पिरैमिड

(2) ऊर्जा का पिरैमिड

(3) एक वन में जैवभार का पिरैमिड

(4) एक समुद्र में जैवभार का पिरैमिड

133. Which of the following statements regarding mitochondria is **incorrect** ?

(1) Outer membrane is permeable to monomers of carbohydrates, fats and proteins.

(2) Enzymes of electron transport are embedded in outer membrane.

(3) Inner membrane is convoluted with infoldings.

(4) Mitochondrial matrix contains single circular DNA molecule and ribosomes.

134. Xylem translocates :

(1) Water only

(2) Water and mineral salts only

(3) Water, mineral salts and some organic nitrogen only

(4) Water, mineral salts, some organic nitrogen and hormones

135. Cells in G_0 phase :

(1) exit the cell cycle

(2) enter the cell cycle

(3) suspend the cell cycle

(4) terminate the cell cycle

136. Which of the statements given below is **not** true about formation of Annual Rings in trees ?

(1) Annual ring is a combination of spring wood and autumn wood produced in a year.

(2) Differential activity of cambium causes light and dark bands of tissue - early and late wood respectively.

(3) Activity of cambium depends upon variation in climate.

(4) Annual rings are not prominent in trees of temperate region.

137. Which of the following ecological pyramids is generally inverted ?

(1) Pyramid of numbers in grassland

(2) Pyramid of energy

(3) Pyramid of biomass in a forest

(4) Pyramid of biomass in a sea

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138. उस बीजाण्डन्यास को क्या कहा जाता है जिसमें बीजाण्ड अंडाशय की भीतरी भित्ती पर या परिधीय भाग में विकसित होते हैं ?

(1) आधारी

(2) स्तंभीय

(3) भित्तीय

(4) मुक्तस्तंभीय

139. निम्न प्रोटोकॉल में किसका उद्देश्य वायुमंडल में क्लोरोफ्लुरोकार्बनों के उत्सर्जन को कम करना था ?

(1) मॉंट्रियल प्रोटोकॉल

(2) क्योटो प्रोटोकॉल

(3) गोथनबर्ग प्रोटोकॉल

(4) जिनेवा प्रोटोकॉल

140. निम्न में किस गर्भनिरोधक तरीकों में हार्मोन भूमिका अदा करता है ?

(1) स्तनपान अनार्तव, गोलियाँ, आपातकालीन गर्भनिरोधक

(2) रोध विधियाँ, स्तनपान अनार्तव, गोलियाँ

(3) CuT, गोलियाँ, आपातकालीन गर्भनिरोधक

(4) गोलियाँ, आपातकालीन गर्भनिरोधक, रोध विधियाँ

141. एक व्यायामी के ज्वारीय आयतन एवं नि:श्वसनी सुरक्षित आयतन क्रमश: 500 mL एवं 1000 mL हैं। यदि अवशिष्ट आयतन 1200 mL हो, तब इसकी नि:श्वसन क्षमता क्या होगी ?

(1) 1500 mL

(2) 1700 mL

(3) 2200 mL

(4) 2700 mL

142. सहाय कोशिका में स्खलित हुए नर युग्मकों का परिणाम क्या होता है ?

(1) एक युग्मक, अण्ड के साथ संगलित होता है और दूसरा (दूसरे) सहाय कोशिका में ह्रसित हो जाता है/जाते हैं।

(2) सभी अण्ड के साथ संगलित होते हैं।

(3) एक अण्ड के साथ संगलित होता है और दूसरा (दूसरे) सहाय कोशिका केन्द्रक के साथ संगलित होता है/होते हैं।

(4) एक अण्ड के साथ संगलित होता है और दूसरा केन्द्रीय कोशिका के केन्द्रकों से संगलित होता है।

138. Placentation, in which ovules develop on the inner wall of the ovary or in peripheral part, is :

(1) Basal

(2) Axile

(3) Parietal

(4) Free central

139. Which of the following protocols did aim for reducing emission of chlorofluorocarbons into the atmosphere ?

(1) Montreal Protocol

(2) Kyoto Protocol

(3) Gothenburg Protocol

(4) Geneva Protocol

140. Which of the following contraceptive methods do involve a role of hormone ?

(1) Lactational amenorrhea, Pills, Emergency contraceptives

(2) Barrier method, Lactational amenorrhea, Pills

(3) CuT, Pills, Emergency contraceptives

(4) Pills, Emergency contraceptives, Barrier methods

141. Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What will be his Expiratory Capacity if the Residual Volume is 1200 mL ?

(1) 1500 mL

(2) 1700 mL

(3) 2200 mL

(4) 2700 mL

142. What is the fate of the male gametes discharged in the synergid ?

(1) One fuses with the egg, other(s) degenerate(s) in the synergid.

(2) All fuse with the egg.

(3) One fuses with the egg, other(s) fuse(s) with synergid nucleus.

(4) One fuses with the egg and other fuses with central cell nuclei.

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143. पादपों में पुष्पन को प्रेरित करने के लिए आवश्यक प्रकाश काल को बोध करने का स्थान कौन सा है?
(1) पार्श्व कलिका
(2) तल्प (पल्वीनस)
(3) प्ररोह शीर्ष
(4) पत्तियाँ

144. आम का कैरोलस लीनियस द्वारा सर्वप्रथम व्यक्त किया गया **सही** लिखित वैज्ञानिक नाम का चयन कीजिए :
(1) *Mangifera indica* Car. Linn.
(2) *Mangifera indica* Linn.
(3) *Mangifera indica*
(4) *Mangifera Indica*

145. निम्नलिखित कथन प्रतिबंधन एण्डोन्यूक्लिएज एंजाइम के लक्षणों का वर्णन करते हैं। **गलत** कथन को चुनिए।
(1) यह एंजाइम डी.एन.ए. पर पहचाने हुए स्थान पर डी.एन.ए. अणु को काटता है।
(2) यह एंजाइम डी.एन.ए. को विशेष स्थलों पर जोड़ता है और दो में से केवल एक लड़ी को काटता है।
(3) यह एंजाइम प्रत्येक लड़ी पर विशेष स्थलों पर शर्करा-फास्फेट रज्जु को काटता है।
(4) यह एंजाइम डी.एन.ए. पर एक विशिष्ट पैलीन्ड्रोमिक न्यूक्लियोटाइड अनुक्रम की पहचान करता है।

146. विकासात्मक दृष्टि से जनक बीजाणु-उद्भिद् में मादा युग्मकोद्भिद् के साथ विकासशील तरुण भ्रूण को कुछ समय के लिए धारण रखना पहली बार किसमें देखा गया?
(1) लिवरवर्ट
(2) मॉस
(3) टेरिडोफाइट
(4) अनावृतबीजी

147. *एंटीराइनम* (स्नैपड्रैगन) में एक लाल पुष्प को श्वेत पुष्प के साथ प्रजनन किया तब F_1 में गुलाबी पुष्प प्राप्त हुए। जब गुलाबी पुष्पों को स्वपरागित किया गया तब F_2 में श्वेत, लाल और गुलाबी पुष्प प्राप्त हुए। निम्नलिखित में से **गलत** कथन का चयन कीजिए :
(1) यह प्रयोग प्रभाविता के सिद्धान्त का अनुसरण नहीं करता।
(2) F_1 में गुलाबी रंग, अपूर्ण प्रभाविता के कारण आया।
(3) F_2 का अनुपात $\frac{1}{4}$ (लाल): $\frac{2}{4}$ (गुलाबी): $\frac{1}{4}$ (श्वेत) है।
(4) इस प्रयोग में पृथक्करण का नियम लागू नहीं होता।

143. What is the site of perception of photoperiod necessary for induction of flowering in plants?
(1) Lateral buds
(2) Pulvinus
(3) Shoot apex
(4) Leaves

144. Select the **correctly** written scientific name of Mango which was first described by Carolus Linnaeus :
(1) *Mangifera indica* Car. Linn.
(2) *Mangifera indica* Linn.
(3) *Mangifera indica*
(4) *Mangifera Indica*

145. Following statements describe the characteristics of the enzyme Restriction Endonuclease. Identify the **incorrect** statement.
(1) The enzyme cuts DNA molecule at identified position within the DNA.
(2) The enzyme binds DNA at specific sites and cuts only one of the two strands.
(3) The enzyme cuts the sugar-phosphate backbone at specific sites on each strand.
(4) The enzyme recognizes a specific palindromic nucleotide sequence in the DNA.

146. From evolutionary point of view, retention of the female gametophyte with developing young embryo on the parent sporophyte for some time, is first observed in :
(1) Liverworts
(2) Mosses
(3) Pteridophytes
(4) Gymnosperms

147. In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F_1 generation, pink flowers were obtained. When pink flowers were selfed, the F_2 generation showed white, red and pink flowers. Choose the **incorrect** statement from the following :
(1) This experiment does not follow the Principle of Dominance.
(2) Pink colour in F_1 is due to incomplete dominance.
(3) Ratio of F_2 is $\frac{1}{4}$ (Red) : $\frac{2}{4}$ (Pink) : $\frac{1}{4}$ (White)
(4) Law of Segregation does not apply in this experiment.

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148. ग्लूकोज़ का ग्लूकोज़-6-फास्फेट में परिवर्तन, जो ग्लाइकोलिसिस की पहली अनुत्क्रमणीय अभिक्रिया है, किसके द्वारा उत्प्रेरित होती है ?

(1) एल्डोलेज

(2) हेक्सोकाइनेज

(3) इनोलेज

(4) फास्फोफ्रक्टोकाइनेज

149. 'हेरोइन' नामक ड्रग कैसे संश्लेषित की जाती है ?

(1) मॉर्फिन के मिथाइलीकरण से

(2) मॉर्फिन के एसीटाइलीकरण से

(3) मॉर्फिन के ग्लाइकोसीकरण से

(4) मॉर्फिन के नाइट्रीकरण से

150. हार्मोन मोचक अंत:गर्भाशयी युक्तियों का चयन करो।

(1) वाल्टस, LNG-20

(2) मल्टीलोड 375, प्रोजेस्टासर्ट

(3) प्रोजेस्टासर्ट, LNG-20

(4) लिप्पेस लूप, मल्टीलोड 375

151. एक जीन लोकस पर दो अलील A, a हैं। यदि प्रभावी अलील A की बारंबारता 0.4 है तब समष्टि में समयुग्मजी प्रभावी, विषमयुग्मजी एवं समयुग्मजी अप्रभावी व्यक्तियों की बारंबारता क्या होगी ?

(1) 0.36 (AA); 0.48 (Aa); 0.16 (aa)

(2) 0.16 (AA); 0.24 (Aa); 0.36 (aa)

(3) 0.16 (AA); 0.48 (Aa); 0.36 (aa)

(4) 0.16 (AA); 0.36 (Aa); 0.48 (aa)

152. गोल्डन चावल के विषय में निम्नलिखित में से कौन सा कथन **सही** है ?

(1) यह डैफोडिल के जीन वाला, विटामिन-ए प्रचुरित है।

(2) यह *बैसीलस थुरिंजिएंसिस* के जीन वाला, पीड़क प्रतिरोधी है।

(3) *एग्रोबैक्टीरियम* वेक्टर का उपयोग कर विकसित किया गया है और यह शुष्कता सहनशील है।

(4) चावल की एक-आद्य किस्म से जीन निवेशन के कारण इसके दाने पीले हैं।

148. Conversion of glucose to glucose-6-phosphate, the first irreversible reaction of glycolysis, is catalyzed by :

(1) Aldolase

(2) Hexokinase

(3) Enolase

(4) Phosphofructokinase

149. Drug called 'Heroin' is synthesized by :

(1) methylation of morphine

(2) acetylation of morphine

(3) glycosylation of morphine

(4) nitration of morphine

150. Select the hormone-releasing Intra-Uterine Devices.

(1) Vaults, LNG-20

(2) Multiload 375, Progestasert

(3) Progestasert, LNG-20

(4) Lippes Loop, Multiload 375

151. A gene locus has two alleles A, a. If the frequency of dominant allele A is 0.4, then what will be the frequency of homozygous dominant, heterozygous and homozygous recessive individuals in the population ?

(1) 0.36 (AA); 0.48 (Aa); 0.16 (aa)

(2) 0.16 (AA); 0.24 (Aa); 0.36 (aa)

(3) 0.16 (AA); 0.48 (Aa); 0.36 (aa)

(4) 0.16 (AA); 0.36 (Aa); 0.48 (aa)

152. Which of the following is **true** for Golden rice ?

(1) It is Vitamin A enriched, with a gene from daffodil.

(2) It is pest resistant, with a gene from *Bacillus thuringiensis*.

(3) It is drought tolerant, developed using *Agrobacterium* vector.

(4) It has yellow grains, because of a gene introduced from a primitive variety of rice.

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153. पाइनस के बीज कवक के सहयोग के बिना अंकुरित और स्थापित **नहीं** हो सकते। यह किस कारण होता है?

(1) इसका भ्रूण अपरिपक्व होता है।

(2) इसका कवकमूल (माइकोराइजा) के साथ अनिवार्य सम्बन्ध है।

(3) इसका बीजावरण बहुत कठोर होता है।

(4) बीज में बाधक उपस्थित होते हैं जो अंकुरण को रोकते हैं।

154. निम्न में आनुवंशिक प्रकूट का कौन सा लक्षण जीवाणु को पुनर्योजन DNA तकनीक के द्वारा मानव इंसुलिन उत्पन्न करने देता है?

(1) आनुवंशिक प्रकूट असंदिग्ध होता है

(2) आनुवंशिक प्रकूट व्यर्थ होता है

(3) आनुवंशिक प्रकूट लगभग सार्वभौमिक होता है

(4) आनुवंशिक प्रकूट विशिष्ट होता है

155. निम्न में कौन सा यौन संचरित रोग पूर्णत: साध्य **नहीं** है?

(1) सुजाक

(2) लैंगिक मस्से

(3) जननिक परिसर्प

(4) क्लेमिडियता

156. निम्नलिखित में से कौन सा कथन **गलत** है?

(1) विरोइड में प्रोटीन आवरण का अभाव होता है।

(2) विषाणु अनिवार्य रूप से परजीवी होते हैं।

(3) विषाणुओं में संक्रामक संगठक प्रोटीन आवरण होता है।

(4) प्रियोनों में अनियमित मुड़ी हुई प्रोटीनें होती हैं।

157. निम्न जीवों का उनकी विशिष्टताओं के साथ मिलान करो :

(a)	*पाइला*	(i)	ज्वाला कोशिकाएँ
(b)	*बोमबिक्स*	(ii)	कंकत पट्टिकाएँ
(c)	*प्लूरोब्रेकिआ*	(iii)	रेतीजिह्वा
(d)	*टीनिआ*	(iv)	मैलपीगी नलिकाएँ

निम्नांकित विकल्पों में से **सही** उत्तर का चयन कीजिए :

	(a)	(b)	(c)	(d)
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iii)	(ii)	(iv)	(i)

153. Pinus seed **cannot** germinate and establish without fungal association. This is because :

(1) its embryo is immature.

(2) it has obligate association with mycorrhizae.

(3) it has very hard seed coat.

(4) its seeds contain inhibitors that prevent germination.

154. Which of the following features of genetic code does allow bacteria to produce human insulin by recombinant DNA technology?

(1) Genetic code is not ambiguous

(2) Genetic code is redundant

(3) Genetic code is nearly universal

(4) Genetic code is specific

155. Which of the following sexually transmitted diseases is **not** completely curable?

(1) Gonorrhoea

(2) Genital warts

(3) Genital herpes

(4) Chlamydiasis

156. Which of the following statements is **incorrect**?

(1) Viroids lack a protein coat.

(2) Viruses are obligate parasites.

(3) Infective constituent in viruses is the protein coat.

(4) Prions consist of abnormally folded proteins.

157. Match the following organisms with their respective characteristics :

(a)	*Pila*	(i)	Flame cells
(b)	*Bombyx*	(ii)	Comb plates
(c)	*Pleurobrachia*	(iii)	Radula
(d)	*Taenia*	(iv)	Malpighian tubules

Select the **correct** option from the following :

	(a)	(b)	(c)	(d)
(1)	(iii)	(ii)	(i)	(iv)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iii)	(ii)	(iv)	(i)

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158. व्यक्त अनुक्रम घुंडी (ई.एस.टी.) का क्या तात्पर्य है?

(1) आर.एन.ए. के रूप में जीनों का अभिव्यक्त होना

(2) पॉलिपेप्टाइड अभिव्यक्ति

(3) डी.एन.ए. बहुरूपता

(4) नूतन डी.एन.ए. अनुक्रम

159. निम्नलिखित में से कौन सा कथन **गलत** है?

(1) मॉरल और ट्रफल खाने योग्य होते हैं।

(2) *क्लेविसेप्स* बहुत से एल्केलॉइड और एल.एस.डी. का स्रोत है।

(3) कोनिडिया बहिर्जात रूप में उत्पन्न होते हैं और ऐस्कोबीजाणु अंतर्जातीय रूप में उत्पन्न होते हैं।

(4) यीस्ट की लम्बे धागेनुमा कवक तंतुवाली तन्तुमय काय होती है।

160. **कॉलम - I** को **कॉलम - II** से सुमेलित कीजिए :

	कॉलम - I		**कॉलम - II**
(a)	मृत जीवी	(i)	पादप जड़ों के साथ कवकों का सहजीवी सम्बन्ध
(b)	परजीवी	(ii)	मृत जैव पदार्थों का अपघटन
(c)	लाइकेन	(iii)	जीवित पादपों अथवा जन्तुओं पर रहने वाला
(d)	कवकमूल (माइकोराइजा)	(iv)	शैवालों और कवकों का सहजीवी सम्बन्ध

निम्नांकित विकल्पों में से **सही** उत्तर चुनिए :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(ii)	(iii)	(iv)	(i)

161. निम्न में कौन सा ग्लुकोस परिवाहक इंसुलिन-निर्भर है?

(1) GLUT I

(2) GLUT II

(3) GLUT III

(4) GLUT IV

162. निम्न में कौन सी प्रतिरक्षा अनुक्रिया वृक्क निरोप को नकारे जाने के लिए उत्तरदायी है?

(1) स्व-प्रतिरक्षा अनुक्रिया

(2) तरल प्रतिरक्षा अनुक्रिया

(3) इन्फ्लैमेटरी प्रतिरक्षा अनुक्रिया

(4) कोशिका मध्यित प्रतिरक्षा अनुक्रिया

158. Expressed Sequence Tags (ESTs) refers to :

(1) Genes expressed as RNA

(2) Polypeptide expression

(3) DNA polymorphism

(4) Novel DNA sequences

159. Which of the following statements is **incorrect**?

(1) Morels and truffles are edible delicacies.

(2) *Claviceps* is a source of many alkaloids and LSD.

(3) Conidia are produced exogenously and ascospores endogenously.

(4) Yeasts have filamentous bodies with long thread-like hyphae.

160. Match **Column - I** with **Column - II**.

	Column - I		**Column - II**
(a)	Saprophyte	(i)	Symbiotic association of fungi with plant roots
(b)	Parasite	(ii)	Decomposition of dead organic materials
(c)	Lichens	(iii)	Living on living plants or animals
(d)	Mycorrhiza	(iv)	Symbiotic association of algae and fungi

Choose the **correct** answer from the options given below :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(i)	(ii)	(iii)	(iv)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(ii)	(i)	(iii)	(iv)
(4)	(ii)	(iii)	(iv)	(i)

161. Which of the following glucose transporters is insulin-dependent?

(1) GLUT I

(2) GLUT II

(3) GLUT III

(4) GLUT IV

162. Which of the following immune responses is responsible for rejection of kidney graft?

(1) Auto-immune response

(2) Humoral immune response

(3) Inflammatory immune response

(4) Cell-mediated immune response

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163. हीमोडायलिसिस (रक्त अपोहन) के दौरान कृत्रिम वृक्क के उपयोग के परिणाम स्वरूप :

(a) नाइट्रोजनी अपशिष्ट शरीर में इकट्ठे हो जाते हैं।

(b) अतिरिक्त पोटैशियम आयनों का निष्कासन नहीं हो पाता।

(c) जठर-आंतीय पथ से कैल्सियम आयनों के अवशोषण में कमी आती है।

(d) RBC उत्पादन में कमी आती है।

निम्नलिखित में से कौन-सा विकल्प सर्वाधिक **उचित** है ?

(1) (a) एवं (b) उचित हैं

(2) (b) एवं (c) उचित हैं

(3) (c) एवं (d) उचित हैं

(4) (a) एवं (d) उचित हैं

164. निम्न में कौन सा कथन **सत्य** है ?

(1) कॉर्निया नेत्र गोलक का एक बाह्य, पारदर्शी एवं रक्षी प्रोटीनी आवरण है।

(2) कॉर्निया में इलास्टिन का सघन संयोजी ऊतक होता है जो अपनी मरम्मत कर सकता है।

(3) कॉर्निया उत्तल पारदर्शी परत है जो अत्याधिक संवहनित होता है।

(4) कॉर्निया में कोलाजन का सघन आधात्री होता है और यह नेत्र का सर्वाधिक संवेदनशील भाग है।

165. जीनों के बीच दूरी के मापन के रूप में एक ही गुणसूत्र पर जीन युग्मों के बीच पुनर्योगजन की आवृत्ति की व्याख्या किसके द्वारा की गयी थी ?

(1) टी.एच. मॉर्गन

(2) ग्रेगर जे. मेंडल

(3) अल्फ्रेड स्टर्टवैंट

(4) सटन बोवेरी

166. लैक ओपेरान के निम्न जीनों का उनके उत्पादों के साथ मिलान कीजिए।

(a)	i जीन	(i)	β-गैलेक्टोसाईडेज
(b)	z जीन	(ii)	परमीएज
(c)	a जीन	(iii)	दमनकारी
(d)	y जीन	(iv)	ट्रांसएसीटाईलेज

उचित विकल्प का चयन करो।

	(a)	(b)	(c)	(d)
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iii)	(i)	(ii)	(iv)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(iii)	(iv)	(i)	(ii)

163. Use of an artificial kidney during hemodialysis may result in :

(a) Nitrogenous waste build-up in the body

(b) Non-elimination of excess potassium ions

(c) Reduced absorption of calcium ions from gastro-intestinal tract

(d) Reduced RBC production

Which of the following options is the most **appropriate** ?

(1) (a) and (b) are correct

(2) (b) and (c) are correct

(3) (c) and (d) are correct

(4) (a) and (d) are correct

164. Which of the following statements is **correct** ?

(1) Cornea is an external, transparent and protective proteinacious covering of the eye-ball.

(2) Cornea consists of dense connective tissue of elastin and can repair itself.

(3) Cornea is convex, transparent layer which is highly vascularised.

(4) Cornea consists of dense matrix of collagen and is the most sensitive portion of the eye.

165. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by :

(1) T.H. Morgan

(2) Gregor J. Mendel

(3) Alfred Sturtevant

(4) Sutton Boveri

166. Match the following genes of the Lac operon with their respective products :

(a)	i gene	(i)	β-galactosidase
(b)	z gene	(ii)	Permease
(c)	a gene	(iii)	Repressor
(d)	y gene	(iv)	Transacetylase

Select the **correct** option.

	(a)	(b)	(c)	(d)
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iii)	(i)	(ii)	(iv)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(iii)	(iv)	(i)	(ii)

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167. अनन्नास के पौधे को पुष्प उत्पन्न करने में लम्बा समय लगता है। अनन्नास के उत्पादन को बढ़ाने के लिए, इसमें वर्ष भर कृत्रिम रूप में पुष्पन प्रेरित करने के लिए कौन सा हार्मोन डालना चाहिए ?

(1) ऑक्जीन और एथिलीन

(2) जिबरेलीन और साइटोकाइनीन

(3) जिबरेलीन और एब्सीसिक अम्ल

(4) साइटोकाइनीन और एब्सीसिक अम्ल

168. कोशिकाओं को पहचानिए जिनके स्राव जठर-आंत पथ के अस्तर को कई प्रकार के एंजाइमों से सुरक्षित करते हैं :

(1) मुख्य कोशिकाएँ

(2) गोब्लेट कोशिकाएँ

(3) ऑक्सिन्टिक कोशिकाएँ

(4) ग्रहणी कोशिकाएँ

169. निम्नलिखित में से किसे जैव नियंत्रण के एक कारक के रूप में, पादप रोग उपचार के लिए उपयोग किया जा सकता है ?

(1) *ट्राइकोडर्मा*

(2) *क्लोरेला*

(3) *एनाबीना*

(4) *लैक्टोबैसीलस*

170. अनावृतबीजीयों के फ्लोयम में किसका अभाव होता है ?

(1) एल्बुमिनीय कोशिकाओं और चालनी कोशिकाओं का

(2) केवल चालनी नलिकाओं का

(3) केवल सहचर कोशिकाओं का

(4) चालनी नलिका और सहचर कोशिकाओं दोनों का

171. अंडाणु केन्द्रक से द्वितीय ध्रुवीय पिण्ड कब बाहर निकलते हैं ?

(1) शुक्राणु के प्रवेश के बाद लेकिन निषेचन से पहले

(2) निषेचन के बाद

(3) शुक्राणु का अंडाणु में प्रवेश से पहले

(4) प्रथम विदलन के साथ-साथ

172. किस अवस्था में दिए गए निम्न mRNA के पढ़ने के प्राधार में कोई परिवर्तन **नहीं** होगा ?

5′ AACAGCGGUGCUAUU 3′

(1) 5 वीं स्थिति पर G के निवेशन से

(2) 5 वीं स्थिति पर G के विलोपन से

(3) 4 वीं एवं 5 वीं स्थिति पर क्रमश: A एवं G के निवेशन से

(4) 7 वीं, 8 वीं एवं 9 वीं स्थितियों पर GGU के विलोपन से

167. It takes very long time for pineapple plants to produce flowers. Which combination of hormones can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield ?

(1) Auxin and Ethylene

(2) Gibberellin and Cytokinin

(3) Gibberellin and Abscisic acid

(4) Cytokinin and Abscisic acid

168. Identify the cells whose secretion protects the lining of gastro-intestinal tract from various enzymes.

(1) Chief Cells

(2) Goblet Cells

(3) Oxyntic Cells

(4) Duodenal Cells

169. Which of the following can be used as a biocontrol agent in the treatment of plant disease ?

(1) *Trichoderma*

(2) *Chlorella*

(3) *Anabaena*

(4) *Lactobacillus*

170. Phloem in gymnosperms lacks :

(1) Albuminous cells and sieve cells

(2) Sieve tubes only

(3) Companion cells only

(4) Both sieve tubes and companion cells

171. Extrusion of second polar body from egg nucleus occurs :

(1) after entry of sperm but before fertilization

(2) after fertilization

(3) before entry of sperm into ovum

(4) simultaneously with first cleavage

172. Under which of the following conditions will there be no change in the reading frame of following mRNA ?

5′ AACAGCGGUGCUAUU 3′

(1) Insertion of G at 5^{th} position

(2) Deletion of G from 5^{th} position

(3) Insertion of A and G at 4^{th} and 5^{th} positions respectively

(4) Deletion of GGU from 7^{th}, 8^{th} and 9^{th} positions

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173. कोशिका विभाजन के संदर्भ में *'ओम्निस सेल्युला-इ सेल्युला'* की कल्पना सर्वप्रथम किसने प्रतिपादित की थी ?

(1) रुडोल्फ विर्चो

(2) थियोडोर श्वान

(3) स्लाइडेन

(4) एरिस्टोटल

174. गोलभ शलभ क्रिमि में *बैसिलस थुरिंजिएंसिस* के Bt आविष को सक्रिय करने के लिए प्रोटोक्सीन की सक्रियता किससे प्रेरित होती है ?

(1) शरीर का तापमान

(2) मध्यआंत की नमी वाली सतह

(3) आंत की क्षारीय pH

(4) आमाशय की अम्लीय pH

175. निम्नलिखित में से उस **सही** युग्म को चुनिए जो टाइफाइड ज्वर के कारक और टाइफाइड के पुष्टीपरीक्षण को निरूपित करता है ?

(1) *प्लैज्मोडियम वाइवैक्स* / यू.टी.आई. परीक्षण

(2) *स्ट्रेप्टोकोकस न्यूमोनी* / विडल परीक्षण

(3) *साल्मोनेला टाइफी* / एंथ्रोन परीक्षण

(4) *साल्मोनेला टाइफी* / विडल परीक्षण

176. वह आनुवंशिक विकार कौन है, जिसमें एक व्यक्ति में मुख्यत: पौरुष विकास होता है, मादा लक्षण होते हैं और बाँझ होता है ?

(1) टर्नर सिंड्रोम

(2) क्लाइनेफेल्टर सिंड्रोम

(3) एडवर्ड सिंड्रोम

(4) डाउन सिंड्रोम

177. पालीब्लैंड, पुनश्चक्रित रूपांतरित प्लास्टिक का महीन पाउडर है जो निम्नलिखित में से किसके लिए एक सुयोग्य पदार्थ के रूप में पुष्टिकृत हुई है ?

(1) प्लास्टिक की थैलियाँ बनाने में

(2) उर्वरक के रूप में

(3) सड़क के निर्माण में

(4) नलियाँ और पाइप बनाने में

173. The concept of *"Omnis cellula-e cellula"* regarding cell division was first proposed by :

(1) Rudolf Virchow

(2) Theodore Schwann

(3) Schleiden

(4) Aristotle

174. What triggers activation of protoxin to active Bt toxin of *Bacillus thuringiensis* in boll worm ?

(1) Body temperature

(2) Moist surface of midgut

(3) Alkaline pH of gut

(4) Acidic pH of stomach

175. Identify the **correct** pair representing the causative agent of typhoid fever and the confirmatory test for typhoid.

(1) *Plasmodium vivax* / UTI test

(2) *Streptococcus pneumoniae* / Widal test

(3) *Salmonella typhi* / Anthrone test

(4) *Salmonella typhi* / Widal test

176. What is the genetic disorder in which an individual has an overall masculine development, gynaecomastia, and is sterile ?

(1) Turner's syndrome

(2) Klinefelter's syndrome

(3) Edward syndrome

(4) Down's syndrome

177. Polyblend, a fine powder of recycled modified plastic, has proved to be a good material for :

(1) making plastic sacks

(2) use as a fertilizer

(3) construction of roads

(4) making tubes and pipes

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178. निम्न में कौन सी विधि नाभिकीय अपशिष्टों के निपटान के लिए सबसे अधिक उपयुक्त है?

(1) अपशिष्ट को अंतरिक्ष में दाग देना

(2) अपशिष्ट को अंटार्कटिका के हिम आच्छादन में दबा देना

(3) अपशिष्ट को गहरे महासागर के नीचे चट्टानों में डाल देना

(4) अपशिष्ट को पृथ्वी की सतह के नीचे गहरी चट्टानों में दबा देना

179. निम्न हार्मोनों का उनके रोग के साथ मिलान करो :

(a)	इंसुलिन	(i)	एडिसन रोग
(b)	थायरोक्सीन	(ii)	डायबिटीज इनसिपिडस
(c)	कोर्टिकॉइड	(iii)	एक्रोमिग्ली
(d)	वृद्धि हार्मोन	(iv)	गलगंड
		(v)	डायबिटीज मेलीटस

उचित विकल्प का चयन कीजिए।

	(a)	(b)	(c)	(d)
(1)	(v)	(i)	(ii)	(iii)
(2)	(ii)	(iv)	(iii)	(i)
(3)	(v)	(iv)	(i)	(iii)
(4)	(ii)	(iv)	(i)	(iii)

180. **उचित** विकल्प का चयन करो :

(1) 8 वीं, 9 वीं एवं 10 वीं पसलियों का युग्म उरोस्थि के साथ प्रत्यक्ष संधि बनाता है।

(2) 11 वीं एवं 12 वीं पसलियों का युग्म काचाभ उपास्थि की सहायता से उरोस्थि के साथ संयोजित होता है।

(3) प्रत्येक पसली एक पतली चपटी अस्थि है एवं सभी पसलियाँ पृष्ठभाग में वक्षीय कशेरुकों एवं अधर भाग में उरोस्थि के साथ जुड़ी होती हैं।

(4) सात युग्म वर्टिब्रोस्टरनल, तीन युग्म वर्टिब्रोकांड्रल एवं दो वर्टिब्रल पसलियाँ होती है।

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178. Which of these following methods is the most suitable for disposal of nuclear waste ?

(1) Shoot the waste into space

(2) Bury the waste under Antarctic ice-cover

(3) Dump the waste within rocks under deep ocean

(4) Bury the waste within rocks deep below the Earth's surface

179. Match the following hormones with the respective disease :

(a)	Insulin	(i)	Addison's disease
(b)	Thyroxin	(ii)	Diabetes insipidus
(c)	Corticoids	(iii)	Acromegaly
(d)	Growth Hormone	(iv)	Goitre
		(v)	Diabetes mellitus

Select the **correct** option.

	(a)	(b)	(c)	(d)
(1)	(v)	(i)	(ii)	(iii)
(2)	(ii)	(iv)	(iii)	(i)
(3)	(v)	(iv)	(i)	(iii)
(4)	(ii)	(iv)	(i)	(iii)

180. Select the **correct** option.

(1) 8^{th}, 9^{th} and 10^{th} pairs of ribs articulate directly with the sternum.

(2) 11^{th} and 12^{th} pairs of ribs are connected to the sternum with the help of hyaline cartilage.

(3) Each rib is a flat thin bone and all the ribs are connected dorsally to the thoracic vertebrae and ventrally to the sternum.

(4) There are seven pairs of vertebrosternal, three pairs of vertebrochondral and two pairs of vertebral ribs.

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रफ कार्य के लिए जगह / Space For Rough Work

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निम्नलिखित निर्देश ध्यान से पढ़ें :	*Read carefully the following instructions :*
1. पूछे जाने पर प्रत्येक परीक्षार्थी, निरीक्षक को अपना प्रवेश-पत्र दिखाएं।	1. Each candidate must show on demand his/her Admit Card to the Invigilator.
2. अधीक्षक या निरीक्षक की विशेष अनुमति के बिना कोई परीक्षार्थी अपना स्थान न छोड़ें।	2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
3. कार्यरत निरीक्षक को अपना उत्तर पत्र दिए बिना एवं उपस्थिति-पत्रक पर दुबारा हस्ताक्षर किए बिना कोई परीक्षार्थी परीक्षा हॉल नहीं छोड़ेंगे। **यदि किसी परीक्षार्थी ने दूसरी बार उपस्थिति-पत्रक पर हस्ताक्षर नहीं किए तो यह माना जाएगा कि उसने उत्तर पत्र नहीं लौटाया है और यह अनुचित साधन का मामला माना जाएगा।**	3. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
4. इलेक्ट्रानिक/हस्तचालित परिकलक का उपयोग वर्जित है।	4. Use of Electronic/Manual Calculator is prohibited.
5. परीक्षा-हॉल में आचरण के लिए परीक्षार्थी, परीक्षा के नियमों एवं विनियमों द्वारा नियमित हैं। अनुचित साधन के सभी मामलों का फैसला इस परीक्षा के नियमों एवं विनियमों के अनुसार होगा।	5. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
6. किसी भी हालत में परीक्षा पुस्तिका और उत्तर पत्र का कोई भाग अलग न करें।	6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
7. परीक्षा पुस्तिका / उत्तर पत्र में दिए गए परीक्षा पुस्तिका संकेत को परीक्षार्थी सही तरीके से उपस्थिति-पत्रक में लिखें।	7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/ Answer Sheet in the Attendance Sheet.

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Test Booklet Code

AA

*This Booklet contains **24** pages.*

Do not open this Test Booklet until you are asked to do so.

Read carefully the Instructions on the Back Cover of this Test Booklet.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **Side-1** and **Side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and this Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are 720.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **AA**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
8. Use of white fluid for correction is ***not*** permissible on the Answer Sheet.

Name of the Candidate (in Capitals) : _____

Roll Number : in figures _____

: in words _____

Centre of Examination (in Capitals) : _____

Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of
Centre Superintendent : _____

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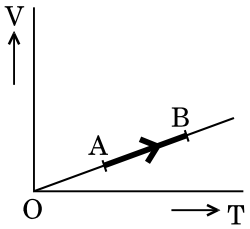
1. The volume (V) of a monatomic gas varies with its temperature (T), as shown in the graph. The ratio of work done by the gas, to the heat absorbed by it, when it undergoes a change from state A to state B, is



(1) $\frac{1}{3}$

(2) $\frac{2}{3}$

(3) $\frac{2}{5}$

(4) $\frac{2}{7}$

2. The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is

(1) 12·5 cm

(2) 8 cm

(3) 13·2 cm

(4) 16 cm

3. At what temperature will the rms speed of oxygen molecules become just sufficient for escaping from the Earth's atmosphere ?

(Given :

Mass of oxygen molecule (m) = $2{\cdot}76 \times 10^{-26}$ kg

Boltzmann's constant $k_B = 1{\cdot}38 \times 10^{-23}$ J K^{-1})

(1) $5{\cdot}016 \times 10^4$ K

(2) $8{\cdot}360 \times 10^4$ K

(3) $2{\cdot}508 \times 10^4$ K

(4) $1{\cdot}254 \times 10^4$ K

4. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is

(1) 6·25%

(2) 20%

(3) 26·8%

(4) 12·5%

5. A carbon resistor of $(47 \pm 4{\cdot}7)$ kΩ is to be marked with rings of different colours for its identification. The colour code sequence will be

(1) Yellow – Green – Violet – Gold

(2) Yellow – Violet – Orange – Silver

(3) Violet – Yellow – Orange – Silver

(4) Green – Orange – Violet – Gold

6. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is

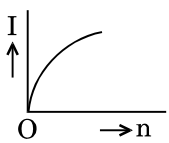
(1) 20

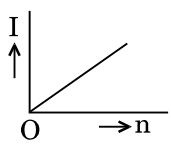
(2) 11

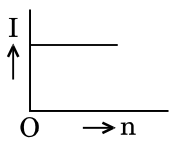
(3) 10

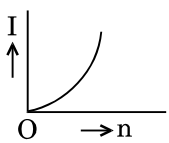
(4) 9

7. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n ?

(1) 

(2) 

(3) 

(4) 

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8. Unpolarised light is incident from air on a plane surface of a material of refractive index 'μ'. At a particular angle of incidence 'i', it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation ?

(1) $i = \sin^{-1}\left(\frac{1}{\mu}\right)$

(2) Reflected light is polarised with its electric vector perpendicular to the plane of incidence

(3) Reflected light is polarised with its electric vector parallel to the plane of incidence

(4) $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

9. In Young's double slit experiment the separation d between the slits is 2 mm, the wavelength λ of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0·20°. To increase the fringe angular width to 0·21° (with same λ and D) the separation between the slits needs to be changed to

(1) 2·1 mm

(2) 1·9 mm

(3) 1·8 mm

(4) 1·7 mm

10. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

(1) large focal length and large diameter

(2) large focal length and small diameter

(3) small focal length and large diameter

(4) small focal length and small diameter

11. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is

(1) 2 : – 1

(2) 1 : – 1

(3) 1 : 1

(4) 1 : – 2

12. An electron of mass m with an initial velocity $\vec{V} = V_0 \hat{i}$ ($V_0 > 0$) enters an electric field $\vec{E} = -E_0 \hat{i}$ (E_0 = constant > 0) at t = 0. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is

(1) $\lambda_0 t$

(2) $\lambda_0 \left(1 + \frac{eE_0}{mV_0} t\right)$

(3) $\frac{\lambda_0}{\left(1 + \frac{eE_0}{mV_0} t\right)}$

(4) λ_0

13. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is

(1) 30

(2) 10

(3) 20

(4) 15

14. When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1. When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2. The ratio of v_1 to v_2 is

(1) 4 : 1

(2) 1 : 4

(3) 1 : 2

(4) 2 : 1

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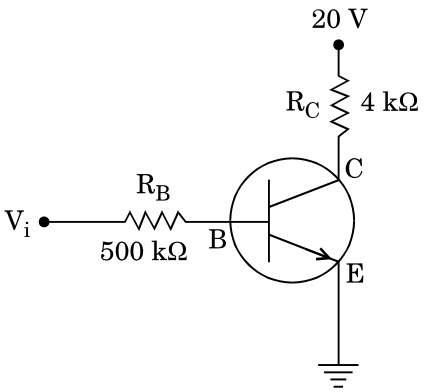
15. In the circuit shown in the figure, the input voltage V_i is 20 V, V_{BE} = 0 and V_{CE} = 0. The values of I_B, I_C and β are given by



(1) $I_B = 20\ \mu A,\ I_C = 5\ mA,\ \beta = 250$

(2) $I_B = 25\ \mu A,\ I_C = 5\ mA,\ \beta = 200$

(3) $I_B = 40\ \mu A,\ I_C = 10\ mA,\ \beta = 250$

(4) $I_B = 40\ \mu A,\ I_C = 5\ mA,\ \beta = 125$

16. In a p-n junction diode, change in temperature due to heating

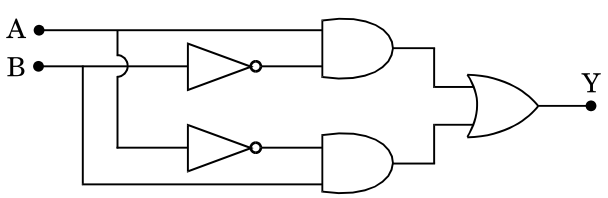
(1) does not affect resistance of p-n junction

(2) affects only forward resistance

(3) affects only reverse resistance

(4) affects the overall V – I characteristics of p-n junction

17. In the combination of the following gates the output Y can be written in terms of inputs A and B as



(1) $\overline{A \cdot B} + A \cdot B$

(2) $A \cdot \bar{B} + \bar{A} \cdot B$

(3) $\overline{A \cdot B}$

(4) $\overline{A + B}$

18. An em wave is propagating in a medium with a velocity $\vec{V} = V\hat{i}$. The instantaneous oscillating electric field of this em wave is along +y axis. Then the direction of oscillating magnetic field of the em wave will be along

(1) – y direction

(2) + z direction

(3) – z direction

(4) – x direction

19. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30°. One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is

(1) 30°

(2) 45°

(3) 60°

(4) zero

20. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be

(1) 30 cm towards the mirror

(2) 36 cm away from the mirror

(3) 30 cm away from the mirror

(4) 36 cm towards the mirror

21. The magnetic potential energy stored in a certain inductor is 25 mJ, when the current in the inductor is 60 mA. This inductor is of inductance

(1) 1·389 H

(2) 138·88 H

(3) 0·138 H

(4) 13·89 H

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22. An electron falls from rest through a vertical distance h in a uniform and vertically upward directed electric field E. The direction of electric field is now reversed, keeping its magnitude the same. A proton is allowed to fall from rest in it through the same vertical distance h. The time of fall of the electron, in comparison to the time of fall of the proton is

(1) 10 times greater

(2) 5 times greater

(3) smaller

(4) equal

23. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

(1) proportional to the square root of the distance between the plates.

(2) linearly proportional to the distance between the plates.

(3) independent of the distance between the plates.

(4) inversely proportional to the distance between the plates.

24. A tuning fork is used to produce resonance in a glass tube. The length of the air column in this tube can be adjusted by a variable piston. At room temperature of 27°C two successive resonances are produced at 20 cm and 73 cm of column length. If the frequency of the tuning fork is 320 Hz, the velocity of sound in air at 27°C is

(1) 350 m/s

(2) 339 m/s

(3) 330 m/s

(4) 300 m/s

25. A pendulum is hung from the roof of a sufficiently high building and is moving freely to and fro like a simple harmonic oscillator. The acceleration of the bob of the pendulum is 20 m/s^2 at a distance of 5 m from the mean position. The time period of oscillation is

(1) 2 s

(2) π s

(3) 2π s

(4) 1 s

26. A metallic rod of mass per unit length 0·5 kg m^{-1} is lying horizontally on a smooth inclined plane which makes an angle of 30° with the horizontal. The rod is not allowed to slide down by flowing a current through it when a magnetic field of induction 0·25 T is acting on it in the vertical direction. The current flowing in the rod to keep it stationary is

(1) 14·76 A

(2) 5·98 A

(3) 7·14 A

(4) 11·32 A

27. A thin diamagnetic rod is placed vertically between the poles of an electromagnet. When the current in the electromagnet is switched on, then the diamagnetic rod is pushed up, out of the horizontal magnetic field. Hence the rod gains gravitational potential energy. The work required to do this comes from

(1) the lattice structure of the material of the rod

(2) the magnetic field

(3) the current source

(4) the induced electric field due to the changing magnetic field

28. An inductor 20 mH, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, V = 10 sin 314 t. The power loss in the circuit is

(1) 2·74 W

(2) 0·43 W

(3) 0·79 W

(4) 1·13 W

29. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is

(1) 250 Ω

(2) 25 Ω

(3) 40 Ω

(4) 500 Ω

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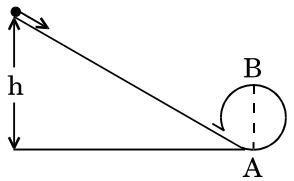
30. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter AB = D. The height h is equal to



(1) $\frac{7}{5}D$

(2) D

(3) $\frac{3}{2}D$

(4) $\frac{5}{4}D$

31. Three objects, A : (a solid sphere), B : (a thin circular disk) and C : (a circular ring), each have the same mass M and radius R. They all spin with the same angular speed ω about their own symmetry axes. The amounts of work (W) required to bring them to rest, would satisfy the relation

(1) $W_B > W_A > W_C$

(2) $W_A > W_B > W_C$

(3) $W_C > W_B > W_A$

(4) $W_A > W_C > W_B$

32. A moving block having mass m, collides with another stationary block having mass 4m. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v, then the value of coefficient of restitution (e) will be

(1) 0·8

(2) 0·25

(3) 0·5

(4) 0·4

33. Which one of the following statements is ***incorrect*** ?

(1) Frictional force opposes the relative motion.

(2) Limiting value of static friction is directly proportional to normal reaction.

(3) Rolling friction is smaller than sliding friction.

(4) Coefficient of sliding friction has dimensions of length.

34. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field $\vec{E}$. Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively

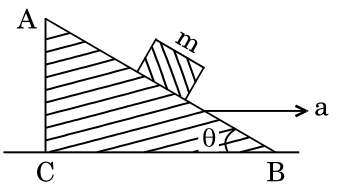
(1) 1 m/s, 3·5 m/s

(2) 1 m/s, 3 m/s

(3) 2 m/s, 4 m/s

(4) 1·5 m/s, 3 m/s

35. A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration 'a' towards the right. The relation between a and θ for the block to remain stationary on the wedge is



(1) $a = g \cos\theta$

(2) $a = \frac{g}{\sin\theta}$

(3) $a = \frac{g}{\text{cosec}\,\theta}$

(4) $a = g \tan\theta$

36. The moment of the force, $\vec{F} = 4\hat{i} + 5\hat{j} - 6\hat{k}$ at (2, 0, – 3), about the point (2, – 2, – 2), is given by

(1) $-7\hat{i} - 8\hat{j} - 4\hat{k}$

(2) $-4\hat{i} - \hat{j} - 8\hat{k}$

(3) $-8\hat{i} - 4\hat{j} - 7\hat{k}$

(4) $-7\hat{i} - 4\hat{j} - 8\hat{k}$

37. A student measured the diameter of a small steel ball using a screw gauge of least count 0·001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of – 0·004 cm, the correct diameter of the ball is

(1) 0·053 cm

(2) 0·525 cm

(3) 0·521 cm

(4) 0·529 cm

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38. A solid sphere is rotating freely about its symmetry axis in free space. The radius of the sphere is increased keeping its mass same. Which of the following physical quantities would remain constant for the sphere ?

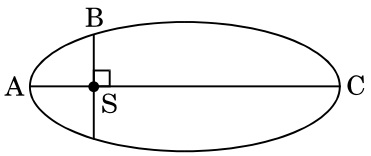
(1) Rotational kinetic energy

(2) Moment of inertia

(3) Angular velocity

(4) Angular momentum

39. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A, K_B and K_C, respectively. AC is the major axis and SB is perpendicular to AC at the position of the Sun S as shown in the figure. Then



(1) $K_B < K_A < K_C$

(2) $K_A > K_B > K_C$

(3) $K_A < K_B < K_C$

(4) $K_B > K_A > K_C$

40. If the mass of the Sun were ten times smaller and the universal gravitational constant were ten times larger in magnitude, which of the following is ***not*** correct ?

(1) Time period of a simple pendulum on the Earth would decrease.

(2) Walking on the ground would become more difficult.

(3) Raindrops will fall faster.

(4) 'g' on the Earth will not change.

41. A solid sphere is in rolling motion. In rolling motion a body possesses translational kinetic energy (K_t) as well as rotational kinetic energy (K_r) simultaneously. The ratio $K_t : (K_t + K_r)$ for the sphere is

(1) 10 : 7

(2) 5 : 7

(3) 7 : 10

(4) 2 : 5

42. A small sphere of radius 'r' falls from rest in a viscous liquid. As a result, heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity, is proportional to

(1) r^5

(2) r^2

(3) r^3

(4) r^4

43. The power radiated by a black body is P and it radiates maximum energy at wavelength, λ_0. If the temperature of the black body is now changed so that it radiates maximum energy at wavelength $\frac{3}{4}\lambda_0$, the power radiated by it becomes nP. The value of n is

(1) $\frac{256}{81}$

(2) $\frac{4}{3}$

(3) $\frac{3}{4}$

(4) $\frac{81}{256}$

44. Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area 3A. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second wire by the same amount ?

(1) 4 F

(2) 6 F

(3) 9 F

(4) F

45. A sample of 0·1 g of water at 100°C and normal pressure ($1{\cdot}013 \times 10^5$ Nm^{-2}) requires 54 cal of heat energy to convert to steam at 100°C. If the volume of the steam produced is 167·1 cc, the change in internal energy of the sample, is

(1) 42·2 J

(2) 208·7 J

(3) 104·3 J

(4) 84·5 J

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46. The correct order of N-compounds in its decreasing order of oxidation states is

(1) HNO_3, NH_4Cl, NO, N_2

(2) HNO_3, NO, NH_4Cl, N_2

(3) HNO_3, NO, N_2, NH_4Cl

(4) NH_4Cl, N_2, NO, HNO_3

47. Which one of the following elements is unable to form MF_6^{3-} ion ?

(1) B

(2) Al

(3) Ga

(4) In

48. Considering Ellingham diagram, which of the following metals can be used to reduce alumina ?

(1) Mg

(2) Zn

(3) Fe

(4) Cu

49. The correct order of atomic radii in group 13 elements is

(1) B < Ga < Al < Tl < In

(2) B < Al < Ga < In < Tl

(3) B < Al < In < Ga < Tl

(4) B < Ga < Al < In < Tl

50. Which of the following statements is ***not*** true for halogens ?

(1) All but fluorine show positive oxidation states.

(2) All are oxidizing agents.

(3) All form monobasic oxyacids.

(4) Chlorine has the highest electron-gain enthalpy.

51. In the structure of ClF_3, the number of lone pairs of electrons on central atom 'Cl' is

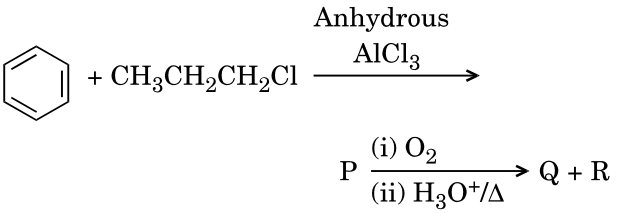
(1) four

(2) two

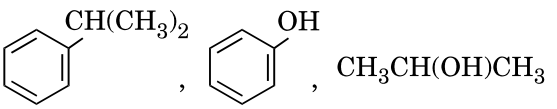
(3) one

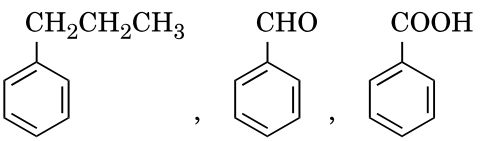
(4) three

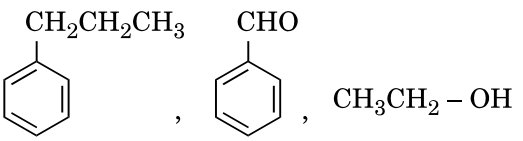
52. Identify the major products P, Q and R in the following sequence of reactions :

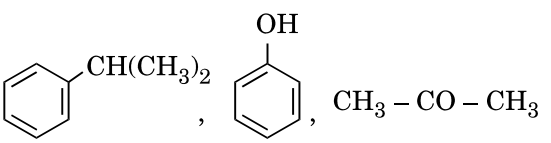


P Q R

(1) 

(2) 

(3) 

(4) 

53. Which of the following compounds can form a zwitterion ?

(1) Benzoic acid

(2) Acetanilide

(3) Aniline

(4) Glycine

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54. Regarding cross-linked or network polymers, which of the following statements is ***incorrect*** ?

(1) Examples are bakelite and melamine.

(2) They are formed from bi- and tri-functional monomers.

(3) They contain covalent bonds between various linear polymer chains.

(4) They contain strong covalent bonds in their polymer chains.

55. Nitration of aniline in strong acidic medium also gives m-nitroaniline because

(1) In absence of substituents nitro group always goes to m-position.

(2) In electrophilic substitution reactions amino group is meta directive.

(3) In spite of substituents nitro group always goes to only m-position.

(4) In acidic (strong) medium aniline is present as anilinium ion.

56. The difference between amylose and amylopectin is

(1) Amylopectin have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ β-linkage

(2) Amylose have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ β-linkage

(3) Amylopectin have $1 \rightarrow 4$ α-linkage and $1 \rightarrow 6$ α-linkage

(4) Amylose is made up of glucose and galactose

57. A mixture of 2·3 g formic acid and 4·5 g oxalic acid is treated with conc. H_2SO_4. The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be

(1) 2·8

(2) 3·0

(3) 1·4

(4) 4·4

58. Which of the following oxides is most acidic in nature ?

(1) BaO

(2) BeO

(3) MgO

(4) CaO

59. Which oxide of nitrogen is ***not*** a common pollutant introduced into the atmosphere both due to natural and human activity ?

(1) N_2O

(2) NO_2

(3) N_2O_5

(4) NO

60. The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order

(1) C_2H_5Cl, C_2H_6, C_2H_5OH

(2) C_2H_5OH, C_2H_5Cl, C_2H_5ONa

(3) C_2H_5OH, C_2H_6, C_2H_5Cl

(4) C_2H_5OH, C_2H_5ONa, C_2H_5Cl

61. The compound C_7H_8 undergoes the following reactions :

$$C_7H_8 \xrightarrow{3\ Cl_2\ /\ \Delta} A \xrightarrow{Br_2\ /\ Fe} B \xrightarrow{Zn\ /\ HCl} C$$

The product 'C' is

(1) 3-bromo-2,4,6-trichlorotoluene

(2) *o*-bromotoluene

(3) *m*-bromotoluene

(4) *p*-bromotoluene

62. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is

(1) $CH_3 - CH_3$

(2) $CH_2 = CH_2$

(3) $CH \equiv CH$

(4) CH_4

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63. Which of the following molecules represents the order of hybridisation sp^2, sp^2, sp, sp from left to right atoms ?

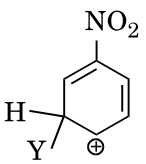
(1) $CH_2 = CH - CH = CH_2$

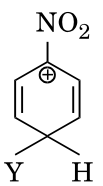
(2) $CH_2 = CH - C \equiv CH$

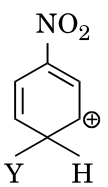
(3) $HC \equiv C - C \equiv CH$

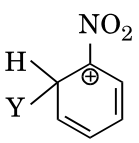
(4) $CH_3 - CH = CH - CH_3$

64. Which of the following carbocations is expected to be most stable ?

(1) 

(2) 

(3) 

(4) 

65. Which of the following is correct with respect to – I effect of the substituents ? (R = alkyl)

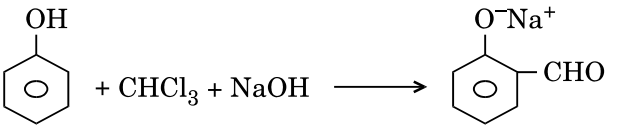
(1) $-NH_2 > -OR > -F$

(2) $-NR_2 < -OR < -F$

(3) $-NH_2 < -OR < -F$

(4) $-NR_2 > -OR > -F$

66. In the reaction



the electrophile involved is

(1) dichloromethyl anion ($\overset{\ominus}{C}HCl_2$)

(2) formyl cation ($\overset{\oplus}{C}HO$)

(3) dichloromethyl cation ($\overset{\oplus}{C}HCl_2$)

(4) dichlorocarbene ($:CCl_2$)

67. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

(1) more extensive association of carboxylic acid via van der Waals force of attraction

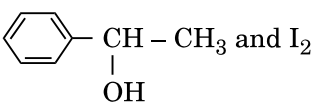
(2) formation of carboxylate ion

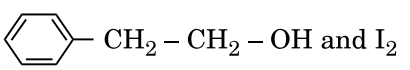
(3) formation of intramolecular H-bonding

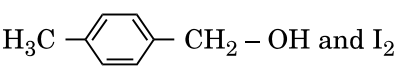
(4) formation of intermolecular H-bonding

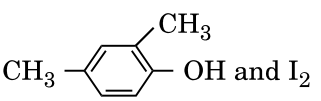
68. Compound A, $C_8H_{10}O$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell.

A and Y are respectively

(1) 

(2) 

(3) 

(4) 

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69. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the ***correct*** code :

	Column I		*Column II*
a.	Co^{3+}	i.	$\sqrt{8}$ B.M.
b.	Cr^{3+}	ii.	$\sqrt{35}$ B.M.
c.	Fe^{3+}	iii.	$\sqrt{3}$ B.M.
d.	Ni^{2+}	iv.	$\sqrt{24}$ B.M.
		v.	$\sqrt{15}$ B.M.

	a	**b**	**c**	**d**
(1)	iv	i	ii	iii
(2)	i	ii	iii	iv
(3)	iv	v	ii	i
(4)	iii	v	i	ii

70. Which one of the following ions exhibits d-d transition and paramagnetism as well ?

(1) MnO_4^-

(2) $Cr_2O_7^{2-}$

(3) CrO_4^{2-}

(4) MnO_4^{2-}

71. Iron carbonyl, $Fe(CO)_5$ is

(1) trinuclear

(2) mononuclear

(3) tetranuclear

(4) dinuclear

72. The type of isomerism shown by the complex $[CoCl_2(en)_2]$ is

(1) Ionization isomerism

(2) Coordination isomerism

(3) Geometrical isomerism

(4) Linkage isomerism

73. The geometry and magnetic behaviour of the complex $[Ni(CO)_4]$ are

(1) square planar geometry and paramagnetic

(2) tetrahedral geometry and diamagnetic

(3) square planar geometry and diamagnetic

(4) tetrahedral geometry and paramagnetic

74. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations :

a. 60 mL $\frac{M}{10}$ HCl + 40 mL $\frac{M}{10}$ NaOH

b. 55 mL $\frac{M}{10}$ HCl + 45 mL $\frac{M}{10}$ NaOH

c. 75 mL $\frac{M}{5}$ HCl + 25 mL $\frac{M}{5}$ NaOH

d. 100 mL $\frac{M}{10}$ HCl + 100 mL $\frac{M}{10}$ NaOH

pH of which one of them will be equal to 1 ?

(1) d

(2) a

(3) b

(4) c

75. On which of the following properties does the coagulating power of an ion depend ?

(1) Both magnitude and sign of the charge on the ion

(2) Size of the ion alone

(3) The magnitude of the charge on the ion alone

(4) The sign of charge on the ion alone

76. Given van der Waals constant for NH_3, H_2, O_2 and CO_2 are respectively 4·17, 0·244, 1·36 and 3·59, which one of the following gases is most easily liquefied ?

(1) O_2

(2) H_2

(3) NH_3

(4) CO_2

77. The solubility of $BaSO_4$ in water is $2{\cdot}42 \times 10^{-3}$ gL^{-1} at 298 K. The value of its solubility product (K_{sp}) will be

(Given molar mass of $BaSO_4$ = 233 g mol^{-1})

(1) $1{\cdot}08 \times 10^{-14}$ mol^2 L^{-2}

(2) $1{\cdot}08 \times 10^{-12}$ mol^2 L^{-2}

(3) $1{\cdot}08 \times 10^{-10}$ mol^2 L^{-2}

(4) $1{\cdot}08 \times 10^{-8}$ mol^2 L^{-2}

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78. In which case is the number of molecules of water maximum ?

(1) 0·00224 L of water vapours at 1 atm and 273 K

(2) 0·18 g of water

(3) 18 mL of water

(4) 10^{-3} mol of water

79. The correct difference between first- and second-order reactions is that

(1) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed

(2) the half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$

(3) the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations

(4) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations

80. Among CaH_2, BeH_2, BaH_2, the order of ionic character is

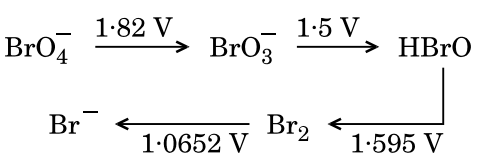
(1) $BeH_2 < BaH_2 < CaH_2$

(2) $CaH_2 < BeH_2 < BaH_2$

(3) $BeH_2 < CaH_2 < BaH_2$

(4) $BaH_2 < BeH_2 < CaH_2$

81. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below :



Then the species undergoing disproportionation is

(1) Br_2

(2) BrO_4^-

(3) BrO_3^-

(4) HBrO

82. For the redox reaction

$$MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow Mn^{2+} + CO_2 + H_2O$$

the correct coefficients of the reactants for the balanced equation are

	MnO_4^-	$C_2O_4^{2-}$	H^+
(1)	2	16	5
(2)	2	5	16
(3)	16	5	2
(4)	5	16	2

83. Which one of the following conditions will favour maximum formation of the product in the reaction,

$A_2(g) + B_2(g) \rightleftharpoons X_2(g) \quad \Delta_r H = -X$ kJ ?

(1) High temperature and high pressure

(2) Low temperature and low pressure

(3) Low temperature and high pressure

(4) High temperature and low pressure

84. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

(1) is tripled

(2) is doubled

(3) is halved

(4) remains unchanged

85. The bond dissociation energies of X_2, Y_2 and XY are in the ratio of 1 : 0·5 : 1. ΔH for the formation of XY is – 200 kJ mol^{-1}. The bond dissociation energy of X_2 will be

(1) 800 kJ mol^{-1}

(2) 100 kJ mol^{-1}

(3) 200 kJ mol^{-1}

(4) 400 kJ mol^{-1}

86. The correction factor 'a' to the ideal gas equation corresponds to

(1) electric field present between the gas molecules

(2) volume of the gas molecules

(3) density of the gas molecules

(4) forces of attraction between the gas molecules

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87. Consider the following species :

CN^+, CN^-, NO and CN

Which one of these will have the highest bond order ?

(1) CN^+

(2) CN^-

(3) NO

(4) CN

88. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2\ 2s^2\ 2p^3$, the simplest formula for this compound is

(1) Mg_2X

(2) MgX_2

(3) Mg_2X_3

(4) Mg_3X_2

89. Iron exhibits bcc structure at room temperature. Above 900°C, it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900°C (assuming molar mass and atomic radii of iron remains constant with temperature) is

(1) $\frac{3\sqrt{3}}{4\sqrt{2}}$

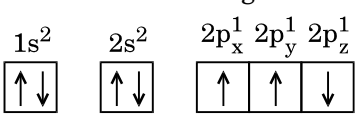
(2) $\frac{4\sqrt{3}}{3\sqrt{2}}$

(3) $\frac{\sqrt{3}}{\sqrt{2}}$

(4) $\frac{1}{2}$

90. Which one is a ***wrong*** statement ?

(1) The electronic configuration of N atom is



(2) An orbital is designated by three quantum numbers while an electron in an atom is designated by four quantum numbers.

(3) Total orbital angular momentum of electron in 's' orbital is equal to zero.

(4) The value of m for d_{z^2} is zero.

91. Oxygen is ***not*** produced during photosynthesis by

(1) *Cycas*

(2) *Nostoc*

(3) Green sulphur bacteria

(4) *Chara*

92. Double fertilization is

(1) Fusion of two male gametes with one egg

(2) Fusion of one male gamete with two polar nuclei

(3) Fusion of two male gametes of a pollen tube with two different eggs

(4) Syngamy and triple fusion

93. Which one of the following plants shows a very close relationship with a species of moth, where none of the two can complete its life cycle without the other ?

(1) Banana

(2) *Yucca*

(3) *Hydrilla*

(4) *Viola*

94. Pollen grains can be stored for several years in liquid nitrogen having a temperature of

(1) – 196°C

(2) – 80°C

(3) – 120°C

(4) – 160°C

95. Which of the following elements is responsible for maintaining turgor in cells ?

(1) Potassium

(2) Sodium

(3) Magnesium

(4) Calcium

96. What is the role of NAD^+ in cellular respiration ?

(1) It is a nucleotide source for ATP synthesis.

(2) It functions as an electron carrier.

(3) It functions as an enzyme.

(4) It is the final electron acceptor for anaerobic respiration.

97. In which of the following forms is iron absorbed by plants ?

(1) Free element

(2) Ferrous

(3) Ferric

(4) Both ferric and ferrous

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98. Which of the following is commonly used as a vector for introducing a DNA fragment in human lymphocytes ?

(1) λ phage

(2) Ti plasmid

(3) Retrovirus

(4) pBR 322

99. Use of bioresources by multinational companies and organisations without authorisation from the concerned country and its people is called

(1) Biodegradation

(2) Biopiracy

(3) Bio-infringement

(4) Bioexploitation

100. In India, the organisation responsible for assessing the safety of introducing genetically modified organisms for public use is

(1) Research Committee on Genetic Manipulation (RCGM)

(2) Council for Scientific and Industrial Research (CSIR)

(3) Indian Council of Medical Research (ICMR)

(4) Genetic Engineering Appraisal Committee (GEAC)

101. The correct order of steps in Polymerase Chain Reaction (PCR) is

(1) Denaturation, Extension, Annealing

(2) Annealing, Extension, Denaturation

(3) Extension, Denaturation, Annealing

(4) Denaturation, Annealing, Extension

102. Select the ***correct*** match :

(1) T.H. Morgan – Transduction

(2) $F_2 \times$ Recessive parent – Dihybrid cross

(3) Ribozyme – Nucleic acid

(4) G. Mendel – Transformation

103. A 'new' variety of rice was patented by a foreign company, though such varieties have been present in India for a long time. This is related to

(1) Lerma Rojo

(2) Sharbati Sonora

(3) Co-667

(4) Basmati

104. Which of the following pairs is ***wrongly*** matched ?

(1) XO type sex determination : Grasshopper

(2) ABO blood grouping : Co-dominance

(3) Starch synthesis in pea : Multiple alleles

(4) T.H. Morgan : Linkage

105. Select the ***correct*** statement :

(1) Spliceosomes take part in translation.

(2) Punnett square was developed by a British scientist.

(3) Franklin Stahl coined the term "linkage".

(4) Transduction was discovered by S. Altman.

106. The experimental proof for semiconservative replication of DNA was first shown in a

(1) Plant

(2) Bacterium

(3) Fungus

(4) Virus

107. Which of the following flowers only once in its life-time ?

(1) Mango

(2) Jackfruit

(3) Bamboo species

(4) Papaya

108. Offsets are produced by

(1) Parthenocarpy

(2) Mitotic divisions

(3) Meiotic divisions

(4) Parthenogenesis

109. Select the ***correct*** match :

(1) Matthew Meselson and F. Stahl – *Pisum sativum*

(2) Alfred Hershey and Martha Chase – TMV

(3) Alec Jeffreys – *Streptococcus pneumoniae*

(4) Francois Jacob and Jacques Monod – *Lac* operon

110. Which of the following has proved helpful in preserving pollen as fossils ?

(1) Oil content

(2) Cellulosic intine

(3) Pollenkitt

(4) Sporopollenin

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111. Natality refers to
(1) Number of individuals leaving the habitat
(2) Birth rate
(3) Death rate
(4) Number of individuals entering a habitat

112. World Ozone Day is celebrated on
(1) 16^{th} September
(2) 21^{st} April
(3) 5^{th} June
(4) 22^{nd} April

113. Which of the following is a secondary pollutant ?
(1) SO_2
(2) CO_2
(3) CO
(4) O_3

114. Niche is
(1) the range of temperature that the organism needs to live
(2) the physical space where an organism lives
(3) all the biological factors in the organism's environment
(4) the functional role played by the organism where it lives

115. What type of ecological pyramid would be obtained with the following data ?
Secondary consumer : 120 g
Primary consumer : 60 g
Primary producer : 10 g
(1) Upright pyramid of numbers
(2) Pyramid of energy
(3) Inverted pyramid of biomass
(4) Upright pyramid of biomass

116. In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen ?
(1) Fe
(2) Cl
(3) Carbon
(4) Oxygen

117. The two functional groups characteristic of sugars are
(1) carbonyl and phosphate
(2) carbonyl and methyl
(3) hydroxyl and methyl
(4) carbonyl and hydroxyl

118. Which among the following is ***not*** a prokaryote ?
(1) *Nostoc*
(2) *Mycobacterium*
(3) *Saccharomyces*
(4) *Oscillatoria*

119. The Golgi complex participates in
(1) Respiration in bacteria
(2) Formation of secretory vesicles
(3) Fatty acid breakdown
(4) Activation of amino acid

120. Which of the following is ***not*** a product of light reaction of photosynthesis ?
(1) NADPH
(2) NADH
(3) ATP
(4) Oxygen

121. Which of the following is true for nucleolus ?
(1) It takes part in spindle formation.
(2) It is a membrane-bound structure.
(3) Larger nucleoli are present in dividing cells.
(4) It is a site for active ribosomal RNA synthesis.

122. Stomatal movement is ***not*** affected by
(1) O_2 concentration
(2) Light
(3) Temperature
(4) CO_2 concentration

123. The stage during which separation of the paired homologous chromosomes begins is
(1) Diakinesis
(2) Diplotene
(3) Pachytene
(4) Zygotene

124. Stomata in grass leaf are
(1) Rectangular
(2) Kidney shaped
(3) Dumb-bell shaped
(4) Barrel shaped

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125. Secondary xylem and phloem in dicot stem are produced by
(1) Phellogen
(2) Vascular cambium
(3) Apical meristems
(4) Axillary meristems

126. Pneumatophores occur in
(1) Carnivorous plants
(2) Free-floating hydrophytes
(3) Halophytes
(4) Submerged hydrophytes

127. Casparian strips occur in
(1) Cortex
(2) Pericycle
(3) Epidermis
(4) Endodermis

128. Plants having little or no secondary growth are
(1) Conifers
(2) Deciduous angiosperms
(3) Grasses
(4) Cycads

129. Sweet potato is a modified
(1) Tap root
(2) Adventitious root
(3) Stem
(4) Rhizome

130. Which of the following statements is ***correct*** ?
(1) Horsetails are gymnosperms.
(2) *Selaginella* is heterosporous, while *Salvinia* is homosporous.
(3) Ovules are not enclosed by ovary wall in gymnosperms.
(4) Stems are usually unbranched in both *Cycas* and *Cedrus*.

131. Select the ***wrong*** statement :
(1) Pseudopodia are locomotory and feeding structures in Sporozoans.
(2) Mushrooms belong to Basidiomycetes.
(3) Cell wall is present in members of Fungi and Plantae.
(4) Mitochondria are the powerhouse of the cell in all kingdoms except Monera.

132. After karyogamy followed by meiosis, spores are produced exogenously in
(1) *Agaricus*
(2) *Alternaria*
(3) *Neurospora*
(4) *Saccharomyces*

133. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I		*Column II*
a.	Herbarium	i.	It is a place having a collection of preserved plants and animals.
b.	Key	ii.	A list that enumerates methodically all the species found in an area with brief description aiding identification.
c.	Museum	iii.	Is a place where dried and pressed plant specimens mounted on sheets are kept.
d.	Catalogue	iv.	A booklet containing a list of characters and their alternates which are helpful in identification of various taxa.

	a	**b**	**c**	**d**
(1)	ii	iv	iii	i
(2)	iii	ii	i	iv
(3)	i	iv	iii	ii
(4)	iii	iv	i	ii

134. Winged pollen grains are present in
(1) Mango
(2) *Cycas*
(3) Mustard
(4) *Pinus*

135. Which one is ***wrongly*** matched ?
(1) Gemma cups – *Marchantia*
(2) Biflagellate zoospores – Brown algae
(3) Uniflagellate gametes – *Polysiphonia*
(4) Unicellular organism – *Chlorella*

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136. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively ?

(1) Increased respiratory surface; Inflammation of bronchioles

(2) Increased number of bronchioles; Increased respiratory surface

(3) Inflammation of bronchioles; Decreased respiratory surface

(4) Decreased respiratory surface; Inflammation of bronchioles

137. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I		*Column II*
a.	Tricuspid valve	i.	Between left atrium and left ventricle
b.	Bicuspid valve	ii.	Between right ventricle and pulmonary artery
c.	Semilunar valve	iii.	Between right atrium and right ventricle

	a	**b**	**c**
(1)	i	ii	iii
(2)	i	iii	ii
(3)	iii	i	ii
(4)	ii	i	iii

138. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I		*Column II*
a.	Tidal volume	i.	2500 – 3000 mL
b.	Inspiratory Reserve volume	ii.	1100 – 1200 mL
c.	Expiratory Reserve volume	iii.	500 – 550 mL
d.	Residual volume	iv.	1000 – 1100 mL

	a	**b**	**c**	**d**
(1)	i	iv	ii	iii
(2)	iii	i	iv	ii
(3)	iii	ii	i	iv
(4)	iv	iii	ii	i

139. The transparent lens in the human eye is held in its place by

(1) smooth muscles attached to the iris

(2) ligaments attached to the iris

(3) ligaments attached to the ciliary body

(4) smooth muscles attached to the ciliary body

140. Which of the following is an amino acid derived hormone ?

(1) Estradiol

(2) Ecdysone

(3) Epinephrine

(4) Estriol

141. Which of the following hormones can play a significant role in osteoporosis ?

(1) Estrogen and Parathyroid hormone

(2) Progesterone and Aldosterone

(3) Aldosterone and Prolactin

(4) Parathyroid hormone and Prolactin

142. Which of the following structures or regions is ***incorrectly*** paired with its function ?

(1) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst.

(2) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement.

(3) Medulla oblongata : controls respiration and cardiovascular reflexes.

(4) Corpus callosum : band of fibers connecting left and right cerebral hemispheres.

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143. The amnion of mammalian embryo is derived from

(1) mesoderm and trophoblast

(2) endoderm and mesoderm

(3) ectoderm and mesoderm

(4) ectoderm and endoderm

144. Hormones secreted by the placenta to maintain pregnancy are

(1) hCG, hPL, progestogens, estrogens

(2) hCG, hPL, estrogens, relaxin, oxytocin

(3) hCG, hPL, progestogens, prolactin

(4) hCG, progestogens, estrogens, glucocorticoids

145. The difference between spermiogenesis and spermiation is

(1) In spermiogenesis spermatozoa from sertoli cells are released into the cavity of seminiferous tubules, while in spermiation spermatozoa are formed.

(2) In spermiogenesis spermatozoa are formed, while in spermiation spermatids are formed.

(3) In spermiogenesis spermatids are formed, while in spermiation spermatozoa are formed.

(4) In spermiogenesis spermatozoa are formed, while in spermiation spermatozoa are released from sertoli cells into the cavity of seminiferous tubules.

146. The contraceptive 'SAHELI'

(1) is an IUD.

(2) increases the concentration of estrogen and prevents ovulation in females.

(3) blocks estrogen receptors in the uterus, preventing eggs from getting implanted.

(4) is a post-coital contraceptive.

147. Ciliates differ from all other protozoans in

(1) using pseudopodia for capturing prey

(2) having a contractile vacuole for removing excess water

(3) using flagella for locomotion

(4) having two types of nuclei

148. Identify the vertebrate group of animals characterized by crop and gizzard in its digestive system.

(1) Aves

(2) Reptilia

(3) Amphibia

(4) Osteichthyes

149. Which of the following features is used to identify a male cockroach from a female cockroach ?

(1) Forewings with darker tegmina

(2) Presence of caudal styles

(3) Presence of a boat shaped sternum on the 9^{th} abdominal segment

(4) Presence of anal cerci

150. Which one of these animals is ***not*** a homeotherm ?

(1) *Camelus*

(2) *Chelone*

(3) *Macropus*

(4) *Psittacula*

151. Which of the following animals does ***not*** undergo metamorphosis ?

(1) Moth

(2) Tunicate

(3) Earthworm

(4) Starfish

152. Which of the following organisms are known as chief producers in the oceans ?

(1) Cyanobacteria

(2) Diatoms

(3) Dinoflagellates

(4) Euglenoids

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153. Which one of the following population interactions is widely used in medical science for the production of antibiotics ?

(1) Parasitism
(2) Mutualism
(3) Commensalism
(4) Amensalism

154. All of the following are included in 'Ex-situ conservation' *except*

(1) Botanical gardens
(2) Sacred groves
(3) Wildlife safari parks
(4) Seed banks

155. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I		*Column II*
a.	Eutrophication	i.	UV-B radiation
b.	Sanitary landfill	ii.	Deforestation
c.	Snow blindness	iii.	Nutrient enrichment
d.	Jhum cultivation	iv.	Waste disposal

	a	**b**	**c**	**d**
(1)	iii	iv	i	ii
(2)	i	iii	iv	ii
(3)	ii	i	iii	iv
(4)	i	ii	iv	iii

156. In a growing population of a country,

(1) reproductive and pre-reproductive individuals are equal in number.
(2) reproductive individuals are less than the post-reproductive individuals.
(3) pre-reproductive individuals are more than the reproductive individuals.
(4) pre-reproductive individuals are less than the reproductive individuals.

157. Which part of poppy plant is used to obtain the drug "Smack" ?

(1) Roots
(2) Latex
(3) Flowers
(4) Leaves

158. All of the following are part of an operon *except*

(1) an enhancer
(2) structural genes
(3) an operator
(4) a promoter

159. A woman has an X-linked condition on one of her X chromosomes. This chromosome can be inherited by

(1) Only grandchildren
(2) Only sons
(3) Only daughters
(4) Both sons and daughters

160. According to Hugo de Vries, the mechanism of evolution is

(1) Phenotypic variations
(2) Saltation
(3) Multiple step mutations
(4) Minor mutations

161. AGGTATCGCAT is a sequence from the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA ?

(1) ACCUAUGCGAU
(2) UGGTUTCGCAT
(3) AGGUAUCGCAU
(4) UCCAUAGCGUA

162. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I		*Column II*
a.	Proliferative Phase	i.	Breakdown of endometrial lining
b.	Secretory Phase	ii.	Follicular Phase
c.	Menstruation	iii.	Luteal Phase

	a	**b**	**c**
(1)	ii	iii	i
(2)	i	iii	ii
(3)	iii	ii	i
(4)	iii	i	ii

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163. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I		*Column II*
a.	Glycosuria	i.	Accumulation of uric acid in joints
b.	Gout	ii.	Mass of crystallised salts within the kidney
c.	Renal calculi	iii.	Inflammation in glomeruli
d.	Glomerular nephritis	iv.	Presence of glucose in urine

	a	**b**	**c**	**d**
(1)	ii	iii	i	iv
(2)	i	ii	iii	iv
(3)	iii	ii	iv	i
(4)	iv	i	ii	iii

164. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I (Function)		*Column II (Part of Excretory System)*
a.	Ultrafiltration	i.	Henle's loop
b.	Concentration of urine	ii.	Ureter
c.	Transport of urine	iii.	Urinary bladder
d.	Storage of urine	iv.	Malpighian corpuscle
		v.	Proximal convoluted tubule

	a	**b**	**c**	**d**
(1)	v	iv	i	ii
(2)	iv	i	ii	iii
(3)	iv	v	ii	iii
(4)	v	iv	i	iii

165. Which of the following gastric cells indirectly help in erythropoiesis ?

(1) Goblet cells

(2) Mucous cells

(3) Chief cells

(4) Parietal cells

166. Match the items given in Column I with those in Column II and select the ***correct*** option given below :

	Column I		*Column II*
a.	Fibrinogen	i.	Osmotic balance
b.	Globulin	ii.	Blood clotting
c.	Albumin	iii.	Defence mechanism

	a	**b**	**c**
(1)	i	iii	ii
(2)	i	ii	iii
(3)	iii	ii	i
(4)	ii	iii	i

167. Which of the following is an occupational respiratory disorder ?

(1) Botulism

(2) Silicosis

(3) Anthracis

(4) Emphysema

168. Calcium is important in skeletal muscle contraction because it

(1) detaches the myosin head from the actin filament.

(2) activates the myosin ATPase by binding to it.

(3) binds to troponin to remove the masking of active sites on actin for myosin.

(4) prevents the formation of bonds between the myosin cross bridges and the actin filament.

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169. Nissl bodies are mainly composed of

(1) Nucleic acids and SER

(2) DNA and RNA

(3) Proteins and lipids

(4) Free ribosomes and RER

170. Which of these statements is ***incorrect*** ?

(1) Glycolysis operates as long as it is supplied with NAD that can pick up hydrogen atoms.

(2) Glycolysis occurs in cytosol.

(3) Enzymes of TCA cycle are present in mitochondrial matrix.

(4) Oxidative phosphorylation takes place in outer mitochondrial membrane.

171. Select the ***incorrect*** match :

(1) Submetacentric chromosomes – L-shaped chromososmes

(2) Allosomes – Sex chromosomes

(3) Lampbrush chromosomes – Diplotene bivalents

(4) Polytene chromosomes – Oocytes of amphibians

172. Which of the following terms describe human dentition ?

(1) Pleurodont, Monophyodont, Homodont

(2) Thecodont, Diphyodont, Heterodont

(3) Thecodont, Diphyodont, Homodont

(4) Pleurodont, Diphyodont, Heterodont

173. Which of the following events does ***not*** occur in rough endoplasmic reticulum ?

(1) Cleavage of signal peptide

(2) Protein glycosylation

(3) Protein folding

(4) Phospholipid synthesis

174. Many ribosomes may associate with a single mRNA to form multiple copies of a polypeptide simultaneously. Such strings of ribosomes are termed as

(1) Plastidome

(2) Polyhedral bodies

(3) Polysome

(4) Nucleosome

175. In which disease does mosquito transmitted pathogen cause chronic inflammation of lymphatic vessels ?

(1) Ringworm disease

(2) Ascariasis

(3) Elephantiasis

(4) Amoebiasis

176. Which of the following is ***not*** an autoimmune disease ?

(1) Alzheimer's disease

(2) Rheumatoid arthritis

(3) Psoriasis

(4) Vitiligo

177. Among the following sets of examples for divergent evolution, select the ***incorrect*** option :

(1) Brain of bat, man and cheetah

(2) Heart of bat, man and cheetah

(3) Forelimbs of man, bat and cheetah

(4) Eye of octopus, bat and man

178. Conversion of milk to curd improves its nutritional value by increasing the amount of

(1) Vitamin B_{12}

(2) Vitamin A

(3) Vitamin D

(4) Vitamin E

179. The similarity of bone structure in the forelimbs of many vertebrates is an example of

(1) Convergent evolution

(2) Analogy

(3) Homology

(4) Adaptive radiation

180. Which of the following characteristics represent 'Inheritance of blood groups' in humans ?

a. Dominance

b. Co-dominance

c. Multiple allele

d. Incomplete dominance

e. Polygenic inheritance

(1) b, d and e

(2) a, b and c

(3) b, c and e

(4) a, c and e

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1	3	46	2	91	3	136	3
2	2	47	3	92	2	137	1
3	3	48	1	93	1	138	2
4	3	49	4	94	2	139	3
5	3	50	4	95	4	140	1
6	2	51	4	96	4	141	3
7	3	52	4	97	2	142	1
8	1	53	3	98	3	143	2
9	4	54	3	99	2	144	4
10	4	55	1	100	3	145	3
11	3	56	2	101	1	146	4
12	2	57	4	102	4	147	1
13	2	58	2	103	1	148	3
14	4	59	3	104	2	149	1
15	2	60	4	105	4	150	2
16	4	61	3	106	3	151	4
17	4	62	3	107	1	152	2
18	2	63	2	108	3	153	1
19	2	64	3	109	4	154	3
20	2	65	2	110	2	155	2
21	1	66	1	111	2	156	1
22	2	67	4	112	2	157	3
23	2	68	1	113	2	158	3
24	3	69	1	114	4	159	4
25	3	70	2	115	4	160	3
26	2	71	3	116	2	161	3
27	2	72	1	117	3	162	2
28	4	73	4	118	3	163	2
29	4	74	2	119	4	164	4
30	2	75	3	120	1	165	2
31	4	76	1	121	3	166	3
32	4	77	4	122	4	167	4
33	4	78	4	123	2	168	4
34	4	79	1	124	3	169	4
35	3	80	3	125	2	170	3
36	2	81	2	126	3	171	2
37	4	82	2	127	1	172	4
38	3	83	4	128	4	173	4
39	2	84	3	129	3	174	4
40	1	85	4	130	4	175	2
41	1	86	1	131	3	176	2
42	3	87	3	132	4	177	1

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43	3	88	3	133	3	178	4
44	2	89	4	134	4	179	2
45	3	90	4	135	2	180	3

2017

Test Booklet Code

B

This Booklet contains 24 pages.

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2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks **are 720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
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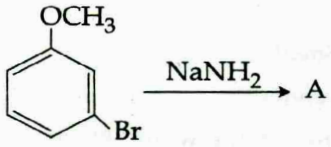
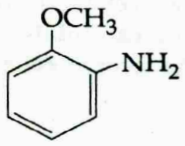
1. Which of the following is a sink for CO ?
   (1) Micro organisms present in the soil
   (2) Oceans
   (3) Plants
   (4) Haemoglobin

2. The element Z = 114 has been discovered recently. It will belong to which of the following family/group and electronic configuration ?
   (1) Carbon family, [Rn] $5f^{14}\ 6d^{10}\ 7s^2\ 7p^2$
   (2) Oxygen family, [Rn] $5f^{14}\ 6d^{10}\ 7s^2\ 7p^4$
   (3) Nitrogen family, [Rn] $5f^{14}\ 6d^{10}\ 7s^2\ 7p^6$
   (4) Halogen family, [Rn] $5f^{14}\ 6d^{10}\ 7s^2\ 7p^5$

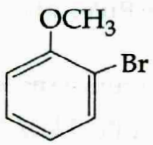
3. For a given reaction, $\Delta H = 35.5\ kJ\ mol^{-1}$ and $\Delta S = 83.6\ JK^{-1}\ mol^{-1}$. The reaction is spontaneous at : (Assume that ΔH and ΔS do not vary with temperature)
   (1) T > 425 K
   (2) all temperatures
   (3) T > 298 K
   (4) T < 425 K

4. Identify A and predict the type of reaction

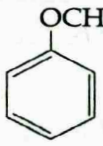


   (1) 

and elimination addition reaction

   (2) 

and cine substitution reaction

   (3) 

and cine substitution reaction

   (4)

and substitution reaction

5. Which of the following is dependent on temperature ?
   (1) Molarity
   (2) Mole fraction
   (3) Weight percentage
   (4) Molality

6. With respect to the conformers of ethane, which of the following statements is **true** ?
   (1) Bond angle changes but bond length remains same
   (2) Both bond angle and bond length change
   (3) Both bond angles and bond length remains same
   (4) Bond angle remains same but bond length changes

7. Name the gas that can readily decolourise acidified $KMnO_4$ solution :
   (1) SO_2
   (2) NO_2
   (3) P_2O_5
   (4) CO_2

8. It is because of inability of ns^2 electrons of the valence shell to participate in bonding that :
   (1) Sn^{2+} is oxidising while Pb^{4+} is reducing
   (2) Sn^{2+} and Pb^{2+} are both oxidising and reducing
   (3) Sn^{4+} is reducing while Pb^{4+} is oxidising
   (4) Sn^{2+} is reducing while Pb^{4+} is oxidising

9. Mechanism of a hypothetical reaction $X_2 + Y_2 \rightarrow 2\ XY$ is given below :
   (i) $X_2 \rightarrow X + X$ (fast)
   (ii) $X + Y_2 \rightleftharpoons XY + Y$ (slow)
   (iii) $X + Y \rightarrow XY$ (fast)
   The overall order of the reaction will be :
   (1) 2
   (2) 0
   (3) 1.5
   (4) 1

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10. The equilibrium constants of the following are :

$N_2 + 3\,H_2 \rightleftharpoons 2\,NH_3$ K_1

$N_2 + O_2 \rightleftharpoons 2\,NO$ K_2

$H_2 + \frac{1}{2} O_2 \rightarrow H_2O$ K_3

The equilibrium constant (K) of the reaction :

$2\,NH_3 + \frac{5}{2} O_2 \overset{K}{\rightleftharpoons} 2\,NO + 3\,H_2O$, will be :

(1) $K_2 K_3^3 / K_1$

(2) $K_2 K_3 / K_1$

(3) $K_2^3 K_3 / K_1$

(4) $K_1 K_3^3 / K_2$

11. Which one is the **wrong** statement ?

(1) The uncertainty principle is $\Delta E \times \Delta t \geq h/4\pi$.

(2) Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement.

(3) The energy of 2s orbital is less than the energy of 2p orbital in case of Hydrogen like atoms.

(4) de-Broglie's wavelength is given by $\lambda = \frac{h}{mv}$, where m = mass of the particle, v = group velocity of the particle.

12. Which one of the following statements is **not** correct ?

(1) The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium.

(2) Enzymes catalyse mainly bio-chemical reactions.

(3) Coenzymes increase the catalytic activity of enzyme.

(4) Catalyst does not initiate any reaction.

13. $HgCl_2$ and I_2 both when dissolved in water containing I^- ions the pair of species formed is :

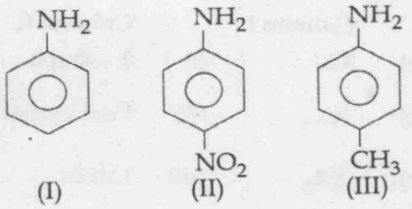
(1) HgI_2, I^-

(2) HgI_4^{2-}, I_3^-

(3) Hg_2I_2, I^-

(4) HgI_2, I_3^-

14. The **correct** increasing order of basic strength for the following compounds is :



(I) (II) (III)

(1) III < I < II

(2) III < II < I

(3) II < I < III

(4) II < III < I

15. An example of a sigma bonded organometallic compound is :

(1) Grignard's reagent

(2) Ferrocene

(3) Cobaltocene

(4) Ruthenocene

16. A 20 litre container at 400 K contains $CO_2(g)$ at pressure 0.4 atm and an excess of SrO (neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO_2 attains its maximum value, will be :

(Given that : $SrCO_3(s) \rightleftharpoons SrO(s) + CO_2(g)$, $Kp = 1.6$ atm)

(1) 10 litre

(2) 4 litre

(3) 2 litre

(4) 5 litre

17. Mixture of chloroxylenol and terpineol acts as :

(1) antiseptic

(2) antipyretic

(3) antibiotic

(4) analgesic

18. Pick out the correct statement with respect to $[Mn(CN)_6]^{3-}$:

(1) It is sp^3d^2 hybridised and tetrahedral

(2) It is d^2sp^3 hybridised and octahedral

(3) It is dsp^2 hybridised and square planar

(4) It is sp^3d^2 hybridised and octahedral

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19. Match the interhalogen compounds of **column I** with the geometry in **column II** and assign the correct code.

	Column I		Column II
(a)	XX'	(i)	T - shape
(b)	XX'_3	(ii)	Pentagonal bipyramidal
(c)	XX'_5	(iii)	Linear
(d)	XX'_7	(iv)	Square - pyramidal
		(v)	Tetrahedral

Code :

	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(iv)	(ii)
(2)	(v)	(iv)	(iii)	(ii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iii)	(iv)	(i)	(ii)

20. The species, having bond angles of 120° is :

(1) ClF_3

(2) NCl_3

(3) BCl_3

(4) PH_3

21. Predict the correct intermediate and product in the following reaction :

$$H_3C-C\equiv CH \xrightarrow[HgSO_4]{H_2O,\ H_2SO_4} \underset{(A)}{\text{intermediate}} \longrightarrow \underset{(B)}{\text{product}}$$

(1) A : $H_3C-\underset{\underset{OH}{|}}{C}=CH_2$ B : $H_3C-\underset{\underset{SO_4}{|}}{C}=CH_2$

(2) A : $H_3C-\underset{\underset{O}{||}}{C}-CH_3$ B : $H_3C-C\equiv CH$

(3) A : $H_3C-\underset{\underset{OH}{|}}{C}=CH_2$ B : $H_3C-\underset{\underset{O}{||}}{C}-CH_3$

(4) A : $H_3C-\underset{\underset{SO_4}{|}}{C}=CH_2$ B : $H_3C-\underset{\underset{O}{||}}{C}-CH_3$

22. If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be :

(1) halved

(2) tripled

(3) unchanged

(4) doubled

23. The heating of phenyl-methyl ethers with HI produces.

(1) iodobenzene

(2) phenol

(3) benzene

(4) ethyl chlorides

24. In the electrochemical cell :

$Zn|ZnSO_4$ (0.01 M)|| $CuSO_4$ (1.0 M)|Cu, the emf of this Daniel cell is E_1. When the concentration of $ZnSO_4$ is changed to 1.0 M and that of $CuSO_4$ changed to 0.01 M, the emf changes to E_2. From the followings, which one is the relationship between E_1 and E_2 ? (Given, $\frac{RT}{F}=0.059$)

(1) $E_1 < E_2$

(2) $E_1 > E_2$

(3) $E_2 = 0 \neq E_1$

(4) $E_1 = E_2$

25. A first order reaction has a specific reaction rate of $10^{-2}\,sec^{-1}$. How much time will it take for 20 g of the reactant to reduce to 5 g ?

(1) 138.6 sec

(2) 346.5 sec

(3) 693.0 sec

(4) 238.6 sec

26. Which one of the following pairs of species have the same bond order ?

(1) O_2, NO^+

(2) CN^-, CO

(3) N_2, O_2^-

(4) CO, NO

27. In which pair of ions both the species contain S – S bond ?

(1) $S_4O_6^{2-}, S_2O_3^{2-}$

(2) $S_2O_7^{2-}, S_2O_8^{2-}$

(3) $S_4O_6^{2-}, S_2O_7^{2-}$

(4) $S_2O_7^{2-}, S_2O_3^{2-}$

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28. Concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is 2.2×10^{-4} mol L^{-1}. Solubility product of $Ag_2C_2O_4$ is :

(1) 2.66×10^{-12}

(2) 4.5×10^{-11}

(3) 5.3×10^{-12}

(4) 2.42×10^{-8}

29. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solution of their salts are put under an electric field ?

(1) K

(2) Rb

(3) Li

(4) Na

30. A gas is allowed to expand in a well insulated container against a constant external pressure of 2.5 atm from an initial volume of 2.50 L to a final volume of 4.50 L. The change in internal energy ΔU of the gas in joules will be :

(1) -500 J

(2) -505 J

(3) $+505$ J

(4) 1136.25 J

31. The reason for greater range of oxidation states in actinoids is attributed to :

(1) actinoid contraction

(2) 5f, 6d and 7s levels having comparable energies

(3) 4f and 5d levels being close in energies

(4) the radioactive nature of actinoids

32. The most suitable method of separation of 1 : 1 mixture of ortho and para - nitrophenols is :

(1) Chromatography

(2) Crystallisation

(3) Steam distillation

(4) Sublimation

33. The correct order of the stoichiometries of AgCl formed when $AgNO_3$ in excess is treated with the complexes : $CoCl_3.6\,NH_3$, $CoCl_3.5\,NH_3$, $CoCl_3.4\,NH_3$ respectively is :

(1) 3 AgCl, 1 AgCl, 2 AgCl

(2) 3 AgCl, 2 AgCl, 1 AgCl

(3) 2 AgCl, 3 AgCl, 1 AgCl

(4) 1 AgCl, 3 AgCl, 2 AgCl

34. Correct increasing order for the wavelengths of absorption in the visible region for the complexes of Co^{3+} is :

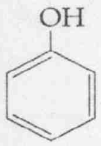
(1) $[Co(H_2O)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(NH_3)_6]^{3+}$

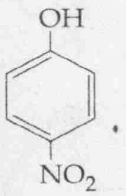
(2) $[Co(H_2O)_6]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$

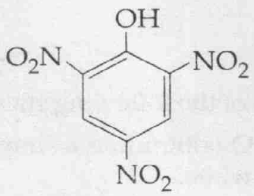
(3) $[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(H_2O)_6]^{3+}$

(4) $[Co(en)_3]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(H_2O)_6]^{3+}$

35. Which one is the most acidic compound ?

(1) 

(2) 

(3) 

(4)

36. Which of the following pairs of compounds is isoelectronic and isostructural ?

(1) TeI_2, XeF_2

(2) IBr_2^-, XeF_2

(3) IF_3, XeF_2

(4) $BeCl_2$, XeF_2

37. Which of the following reactions is appropriate for converting acetamide to methanamine ?

(1) Hoffmann hypobromamide reaction

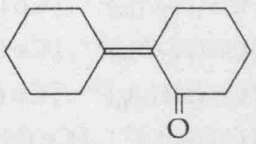
(2) Stephens reaction

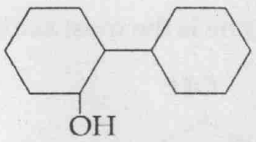
(3) Gabriels phthalimide synthesis

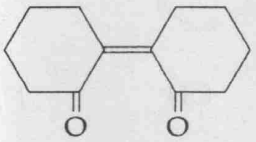
(4) Carbylamine reaction

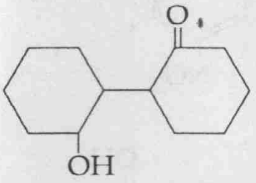
https://neucademy.com/

38. Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating ?

(1) 

(2) 

(3) 

(4) 

39. Which of the following statements is **not** correct ?

(1) Ovalbumin is a simple food reserve in egg - white.

(2) Blood proteins thrombin and fibrinogen are involved in blood clotting.

(3) Denaturation makes the proteins more active.

(4) Insulin maintains sugar level in the blood of a human body.

40. Which one is the **correct** order of acidity ?

(1) $CH \equiv CH > CH_3 - C \equiv CH > CH_2 = CH_2 > CH_3 - CH_3$

(2) $CH \equiv CH > CH_2 = CH_2 > CH_3 - C \equiv CH > CH_3 - CH_3$

(3) $CH_3 - CH_3 > CH_2 = CH_2 > CH_3 - C \equiv CH > CH \equiv CH$

(4) $CH_2 = CH_2 > CH_3 - CH = CH_2 > CH_3 - C \equiv CH > CH \equiv CH$

41. Extraction of gold and silver involves leaching with CN^- ion. Silver is later recovered by :

(1) distillation

(2) zone refining

(3) displacement with Zn

(4) liquation

42. The **correct** statement regarding electrophile is :

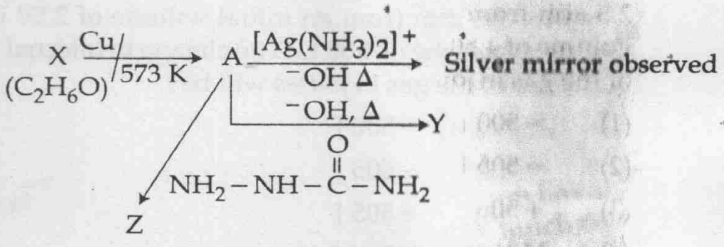
(1) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from another electrophile

(2) Electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile

(3) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile

(4) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile

43. Consider the reactions :



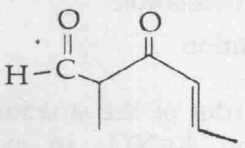
Identify A, X, Y and Z

(1) A-Methoxymethane, X-Ethanol, Y-Ethanoic acid, Z-Semicarbazide.

(2) A-Ethanal, X-Ethanol, Y-But-2-enal, Z-Semicarbazone.

(3) A-Ethanol, X-Acetaldehyde, Y-Butanone, Z-Hydrazone.

(4) A-Methoxymethane, X-Ethanoic acid, Y-Acetate ion, Z-hydrazine.

44. The IUPAC name of the compound  is _____.

(1) 5-formylhex-2-en-3-one

(2) 5-methyl-4-oxohex-2-en-5-al

(3) 3-keto-2-methylhex-5-enal

(4) 3-keto-2-methylhex-4-enal

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45. Which is the **incorrect** statement ?

(1) Density decreases in case of crystals with Schottky's defect.

(2) NaCl(s) is insulator, silicon is semiconductor, silver is conductor, quartz is piezo electric crystal.

(3) Frenkel defect is favoured in those ionic compounds in which sizes of cation and anions are almost equal.

(4) $FeO_{0.98}$ has non stoichiometric metal deficiency defect.

46. A decrease in blood pressure/volume will not cause the release of :

(1) Atrial Natriuretic Factor

(2) Aldosterone

(3) ADH

(4) Renin

47. Which of the following are **not** polymeric ?

(1) Proteins

(2) Polysaccharides

(3) Lipids

(4) Nucleic acids

48. A baby boy aged two years is admitted to play school and passes through a dental check - up. The dentist observed that the boy had twenty teeth. Which teeth were absent ?

(1) Canines

(2) Pre-molars

(3) Molars

(4) Incisors

49. Which of the following statements is **correct** ?

(1) The descending limb of loop of Henle is impermeable to water.

(2) The ascending limb of loop of Henle is permeable to water.

(3) The descending limb of loop of Henle is permeable to electrolytes.

(4) The ascending limb of loop of Henle is impermeable to water.

50. Adult human RBCs are enucleate. Which of the following statement(s) is/are **most appropriate** explanation for this feature ?

(a) They do not need to reproduce

(b) They are somatic cells

(c) They do not metabolize

(d) All their internal space is available for oxygen transport

Options :

(1) Only (a)

(2) (a), (c) and (d)

(3) (b) and (c)

(4) Only (d)

51. An important characteristic that Hemichordates share with Chordates is :

(1) ventral tubular nerve cord

(2) pharynx with gill slits

(3) pharynx without gill slits

(4) absence of notochord

52. Alexander Von Humbolt described for the first time :

(1) Laws of limiting factor

(2) Species area relationships

(3) Population Growth equation

(4) Ecological Biodiversity

53. Identify the **wrong** statement in context of heartwood :

(1) It is highly durable

(2) It conducts water and minerals efficiently

(3) It comprises dead elements with highly lignified walls

(4) Organic compounds are deposited in it

54. Which one of the following statements is **correct**, with reference to enzymes ?

(1) Holoenzyme = Apoenzyme + Coenzyme

(2) Coenzyme = Apoenzyme + Holoenzyme

(3) Holoenzyme = Coenzyme + Co-factor

(4) Apoenzyme = Holoenzyme + Coenzyme

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55. Root hairs develop from the region of :

(1) Elongation

(2) Root cap

(3) Meristematic activity

(4) Maturation

56. Among the following characters, which one was **not** considered by Mendel in his experiments on pea ?

(1) Trichomes - Glandular or non-glandular

(2) Seed - Green or Yellow

(3) Pod - Inflated or Constricted

(4) Stem - Tall or Dwarf

57. Which of the following facilitates opening of stomatal aperture ?

(1) Decrease in turgidity of guard cells

(2) Radial orientation of cellulose microfibrils in the cell wall of guard cells

(3) Longitudinal orientation of cellulose microfibrils in the cell wall of guard cells

(4) Contraction of outer wall of guard cells

58. The association of histone H1 with a nucleosome indicates :

(1) DNA replication is occurring.

(2) The DNA is condensed into a Chromatin Fibre.

(3) The DNA double helix is exposed.

(4) Transcription is occurring.

59. DNA fragments are :

(1) Negatively charged

(2) Neutral

(3) Either positively or negatively charged depending on their size

(4) Positively charged

60. The process of separation and purification of expressed protein before marketing is called :

(1) Downstream processing

(2) Bioprocessing

(3) Postproduction processing

(4) Upstream processing

61. An example of colonial alga is :

(1) *Volvox*

(2) *Ulothrix*

(3) *Spirogyra*

(4) *Chlorella*

62. Capacitation occurs in :

(1) Epididymis

(2) Vas deferens

(3) Female Reproductive tract

(4) Rete testis

63. Select the mismatch :

(1) *Rhodospirillum* - Mycorrhiza

(2) *Anabaena* - Nitrogen fixer

(3) *Rhizobium* - Alfalfa

(4) *Frankia* - *Alnus*

64. Homozygous purelines in cattle can be obtained by :

(1) mating of unrelated individuals of same breed.

(2) mating of individuals of different breed.

(3) mating of individuals of different species.

(4) mating of related individuals of same breed.

65. The DNA fragments separated on an agarose gel can be visualised after staining with :

(1) Acetocarmine

(2) Aniline blue

(3) Ethidium bromide

(4) Bromophenol blue

66. Double fertilization is exhibited by :

(1) Algae

(2) Fungi

(3) Angiosperms

(4) Gymnosperms

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67. The water potential of pure water is :
(1) Less than zero
(2) More than zero but less than one
(3) More than one
(4) Zero

68. Out of 'X' pairs of ribs in humans only 'Y' pairs are true ribs. Select the option that correctly represents values of X and Y and provides their explanation :
(1) X = 12, Y = 5 True ribs are attached dorsally to vertebral column and sternum on the two ends.
(2) X = 24, Y = 7 True ribs are dorsally attached to vertebral column but are free on ventral side.
(3) X = 24, Y = 12 True ribs are dorsally attached to vertebral column but are free on ventral side.
(4) X = 12, Y = 7 True ribs are attached dorsally to vertebral column and ventrally to the sternum.

69. DNA replication in bacteria occurs :
(1) Within nucleolus
(2) Prior to fission
(3) Just before transcription
(4) During S phase

70. Which cells of 'Crypts of Lieberkuhn' secrete antibacterial lysozyme ?
(1) Paneth cells
(2) Zymogen cells
(3) Kupffer cells
(4) Argentaffin cells

71. The hepatic portal vein drains blood to liver from :
(1) Stomach
(2) Kidneys
(3) Intestine
(4) Heart

72. In case of a couple where the male is having a very low sperm count, which technique will be suitable for fertilisation ?
(1) Gamete intracytoplasmic fallopian transfer
(2) Artificial Insemination
(3) Intracytoplasmic sperm injection
(4) Intrauterine transfer

73. What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis ?
(1) The smaller the fragment size, the farther it moves
(2) Positively charged fragments move to farther end
(3) Negatively charged fragments do not move
(4) The larger the fragment size, the farther it moves

74. The function of copper ions in copper releasing IUD's is :
(1) They inhibit gametogenesis.
(2) They make uterus unsuitable for implantation.
(3) They inhibit ovulation.
(4) They suppress sperm motility and fertilising capacity of sperms.

75. Spliceosomes are **not** found in cells of :
(1) Fungi
(2) Animals
(3) Bacteria
(4) Plants

76. Which of the following cell organelles is responsible for extracting energy from carbohydrates to form ATP ?
(1) Ribosome
(2) Chloroplast
(3) Mitochondrion
(4) Lysosome

77. The pivot joint between atlas and axis is a type of :
(1) cartilaginous joint
(2) synovial joint
(3) saddle joint
(4) fibrous joint

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78. GnRH, a hypothalamic hormone, needed in reproduction, acts on :

(1) anterior pituitary gland and stimulates secretion of LH and FSH.

(2) posterior pituitary gland and stimulates secretion of oxytocin and FSH.

(3) posterior pituitary gland and stimulates secretion of LH and relaxin.

(4) anterior pituitary gland and stimulates secretion of LH and oxytocin.

79. Which of the following represents order of 'Horse' ?

(1) Perissodactyla

(2) Caballus

(3) Ferus

(4) Equidae

80. Phosphoenol pyruvate (PEP) is the primary CO_2 acceptor in :

(1) C_4 plants

(2) C_2 plants

(3) C_3 and C_4 plants

(4) C_3 plants

81. Which ecosystem has the maximum biomass ?

(1) Grassland ecosystem

(2) Pond ecosystem

(3) Lake ecosystem

(4) Forest ecosystem

82. A disease caused by an autosomal primary non-disjunction is :

(1) Klinefelter's Syndrome

(2) Turner's Syndrome

(3) Sickle Cell Anemia

(4) Down's Syndrome

83. The vascular cambium normally gives rise to :

(1) Primary phloem

(2) Secondary xylem

(3) Periderm

(4) Phelloderm

84. Which of the following is correctly matched for the product produced by them ?

(1) *Methanobacterium* : Lactic acid

(2) *Penicillium notatum* : Acetic acid

(3) *Sacchromyces cerevisiae* : Ethanol

(4) *Acetobacter aceti* : Antibiotics

85. Thalassemia and sickle cell anemia are caused du to a problem in globin molecule synthesis. Sele the correct statement.

(1) Both are due to a quantitative defect in glob chain synthesis.

(2) Thalassemia is due to less synthesis of glob molecules.

(3) Sickle cell anemia is due to a quantitati problem of globin molecules.

(4) Both are due to a qualitative defect in glob chain synthesis.

86. Flowers which have single ovule in the ovary a are packed into inflorescence are usually pollinat by :

(1) Bee

(2) Wind

(3) Bat

(4) Water

87. Receptor sites for neurotransmitters are present

(1) pre-synaptic membrane

(2) tips of axons

(3) post-synaptic membrane

(4) membranes of synaptic vesicles

88. During DNA replication, Okazaki fragments used to elongate :

(1) The lagging strand towards replication f

(2) The leading strand away from replica fork.

(3) The lagging strand away from the replica fork.

(4) The leading strand towards replication

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89. Which of the following options best represents the enzyme composition of pancreatic juice ?

(1) amylase, pepsin, trypsinogen, maltase

(2) peptidase, amylase, pepsin, rennin

(3) lipase, amylase, trypsinogen, procarboxypeptidase

(4) amylase, peptidase, trypsinogen, rennin

90. Anaphase Promoting Complex (APC) is a protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in a human cell, which of the following is expected to occur ?

(1) Chromosomes will be fragmented

(2) Chromosomes will not segregate

(3) Recombination of chromosome arms will occur

(4) Chromosomes will not condense

91. The genotypes of a Husband and Wife are I^AI^B and I^Ai.

Among the blood types of their children, how many different genotypes and phenotypes are possible ?

(1) 3 genotypes ; 4 phenotypes

(2) 4 genotypes ; 3 phenotypes

(3) 4 genotypes ; 4 phenotypes

(4) 3 genotypes ; 3 phenotypes

92. Viroids differ from viruses in having :

(1) DNA molecules without protein coat

(2) RNA molecules with protein coat

(3) RNA molecules without protein coat

(4) DNA molecules with protein coat

93. Mycorrhizae are the example of :

(1) Amensalism

(2) Antibiosis

(3) Mutualism

(4) Fungistasis

94. The morphological nature of the edible part of coconut is :

(1) Cotyledon

(2) Endosperm

(3) Pericarp

(4) Perisperm

95. Myelin sheath is produced by :

(1) Astrocytes and Schwann Cells

(2) Oligodendrocytes and Osteoclasts

(3) Osteoclasts and Astrocytes

(4) Schwann Cells and Oligodendrocytes

96. Match the following sexually transmitted diseases **(Column - I)** with their causative agent **(Column - II)** and select the **correct** option.

	Column - I		**Column - II**
(a)	Gonorrhea	(i)	HIV
(b)	Syphilis	(ii)	*Neisseria*
(c)	Genital Warts	(iii)	*Treponema*
(d)	AIDS	(iv)	Human Papilloma - Virus

Options :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iv)	(ii)	(iii)	(i)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(ii)	(iii)	(iv)	(i)

97. Which among these is the **correct** combination of aquatic mammals ?

(1) Dolphins, Seals, *Trygon*

(2) Whales, Dolphins, Seals

(3) *Trygon*, Whales, Seals

(4) Seals, Dolphins, Sharks

98. Coconut fruit is a :

(1) Berry

(2) Nut

(3) Capsule

(4) Drupe

99. A dioecious flowering plant prevents both :

(1) Autogamy and geitonogamy

(2) Geitonogamy and xenogamy

(3) Cleistogamy and xenogamy

(4) Autogamy and xenogamy

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100. Which of the following are found in extreme saline conditions ?

(1) Eubacteria

(2) Cyanobacteria

(3) Mycobacteria

(4) Archaebacteria

101. Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen ?

(1) *Pseudomonas*

(2) Mycoplasma

(3) *Nostoc*

(4) *Bacillus*

102. With reference to factors affecting the rate of photosynthesis, which of the following statements is **not** correct ?

(1) Increasing atmospheric CO_2 concentration up to 0.05% can enhance CO_2 fixation rate

(2) C_3 plants respond to higher temperatures with enhanced photosynthesis while C_4 plants have much lower temperature optimum

(3) Tomato is a greenhouse crop which can be grown in CO_2 - enriched atmosphere for higher yield

(4) Light saturation for CO_2 fixation occurs at 10% of full sunlight

103. Life cycle of *Ectocarpus* and *Fucus* respectively are :

(1) Diplontic, Haplodiplontic

(2) Haplodiplontic, Diplontic

(3) Haplodiplontic, Haplontic

(4) Haplontic, Diplontic

104. The region of Biosphere Reserve which is legally protected and where no human activity is allowed is known as :

(1) Buffer zone

(2) Transition zone

(3) Restoration zone

(4) Core zone

105. A gene whose expression helps to identify transformed cell is known as :

(1) Vector

(2) Plasmid

(3) Structural gene

(4) Selectable marker

106. Which of the following components provides sticky character to the bacterial cell ?

(1) Nuclear membrane

(2) Plasma membrane

(3) Glycocalyx

(4) Cell wall

107. The final proof for DNA as the genetic material came from the experiments of :

(1) Hershey and Chase

(2) Avery, Mcleod and McCarty

(3) Hargobind Khorana

(4) Griffith

108. Fruit and leaf drop at early stages can be prevented by the application of :

(1) Ethylene

(2) Auxins

(3) Gibberellic acid

(4) Cytokinins

109. Which one of the following statements is **not** valid for aerosols ?

(1) They alter rainfall and monsoon patterns

(2) They cause increased agricultural productivity

(3) They have negative impact on agricultural land

(4) They are harmful to human health

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110. Which of the following options gives the **correct** sequence of events during mitosis ?

(1) condensation → nuclear membrane disassembly → arrangement at equator → centromere division → segregation → telophase

(2) condensation → crossing over → nuclear membrane disassembly → segregation → telophase

(3) condensation → arrangement at equator → centromere division → segregation → telophase

(4) condensation → nuclear membrane disassembly → crossing over → segregation → telophase

111. In Bougainvillea thorns are the modifications of :

(1) Adventitious root

(2) Stem

(3) Leaf

(4) Stipules

112. If there are 999 bases in an RNA that codes for a protein with 333 amino acids, and the base at position 901 is deleted such that the length of the RNA becomes 998 bases, how many codons will be altered ?

(1) 11

(2) 33

(3) 333

(4) 1

113. Transplantation of tissues/organs fails often due to non-acceptance by the patient's body. Which type of immune-response is responsible for such rejections ?

(1) Cell - mediated immune response

(2) Hormonal immune response

(3) Physiological immune response

(4) Autoimmune response

114. Select the **correct** route for the passage of sperms in male frogs :

(1) Testes → Vasa efferentia → Kidney → Seminal Vesicle → Urinogenital duct → Cloaca

(2) Testes → Vasa efferentia → Bidder's canal → Ureter → Cloaca

(3) Testes → Vasa efferentia → Kidney → Bidder's canal → Urinogenital duct → Cloaca

(4) Testes → Bidder's canal → Kidney → Vasa efferentia → Urinogenital duct → Cloaca

115. A temporary endocrine gland in the human body is :

(1) Corpus cardiacum

(2) Corpus luteum

(3) Corpus allatum

(4) Pineal gland

116. Attractants and rewards are required for :

(1) Entomophily

(2) Hydrophily

(3) Cleistogamy

(4) Anemophily

117. Functional megaspore in an angiosperm develops into :

(1) Endosperm

(2) Embryo sac

(3) Embryo

(4) Ovule

118. Which of the following in sewage treatment removes suspended solids ?

(1) Secondary treatment

(2) Primary treatment

(3) Sludge treatment

(4) Tertiary treatment

119. Presence of plants arranged into well defined vertical layers depending on their height can be seen best in :

(1) Tropical Rain Forest

(2) Grassland

(3) Temperate Forest

(4) Tropical Savannah

https://neucademy.com/

120. Which of the following is made up of dead cells ?

(1) Collenchyma

(2) Phellem

(3) Phloem

(4) Xylem parenchyma

121. Zygotic meiosis is characteristic of :

(1) *Fucus*

(2) *Funaria*

(3) *Chlamydomonas*

(4) *Marchantia*

122. MALT constitutes about _____ percent of the lymphoid tissue in human body.

(1) 20%

(2) 70%

(3) 10%

(4) 50%

123. Lungs are made up of air-filled sacs, the alveoli. They do not collapse even after forceful expiration, because of :

(1) Inspiratory Reserve Volume

(2) Tidal Volume

(3) Expiratory Reserve Volume

(4) Residual Volume

124. In case of poriferans, the spongocoel is lined with flagellated cells called :

(1) oscula

(2) choanocytes

(3) mesenchymal cells

(4) ostia

125. Which one of the following is related to Ex-situ conservation of threatened animals and plants ?

(1) Biodiversity hot spots

(2) Amazon rainforest

(3) Himalayan region

(4) Wildlife Safari parks

126. Which of the following RNAs should be most abundant in animal cell ?

(1) t-RNA

(2) m-RNA

(3) mi-RNA

(4) r-RNA

127. Which statement is **wrong** for Krebs' cycle ?

(1) There is one point in the cycle where FAD^+ is reduced to $FADH_2$

(2) During conversion of succinyl CoA to succinic acid, a molecule of GTP is synthesised

(3) The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid

(4) There are three points in the cycle where NAD^+ is reduced to $NADH + H^+$

128. Hypersecretion of Growth Hormone in adults does not cause further increase in height, because :

(1) Epiphyseal plates close after adolescence.

(2) Bones loose their sensitivity to Growth Hormone in adults.

(3) Muscle fibres do not grow in size after birth.

(4) Growth Hormone becomes inactive in adults.

129. Plants which produce characteristic pneumatophores and show vivipary belong to :

(1) Halophytes

(2) Psammophytes

(3) Hydrophytes

(4) Mesophytes

130. Asymptote in a logistic growth curve is obtained when :

(1) $K = N$

(2) $K > N$

(3) $K < N$

(4) The value of 'r' approaches zero

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131. Good vision depends on adequate intake of carotene-rich food.

Select the best option from the following statements.

(a) Vitamin A derivatives are formed from carotene.

(b) The photopigments are embedded in the membrane discs of the inner segment.

(c) Retinal is a derivative of Vitamin A.

(d) Retinal is a light absorbing part of all the visual photopigments.

Options:

(1) (a), (c) and (d)

(2) (a) and (c)

(3) (b), (c) and (d)

(4) (a) and (b).

132. Artificial selection to obtain cows yielding higher milk output represents :

(1) directional as it pushes the mean of the character in one direction.

(2) disruptive as it splits the population into two, one yielding higher output and the other lower output.

(3) stabilizing followed by disruptive as it stabilizes the population to produce higher yielding cows.

(4) stabilizing selection as it stabilizes this character in the population.

133. Frog's heart when taken out of the body continues to beat for sometime.

Select the best option from the following statements.

(a) Frog is a poikilotherm.

(b) Frog does not have any coronary circulation.

(c) Heart is "myogenic" in nature.

(d) Heart is autoexcitable.

Options:

(1) Only (d)

(2) (a) and (b)

(3) (c) and (d)

(4) Only (c)

134. Select the mismatch :

(1) *Cycas* - Dioecious

(2) *Salvinia* - Heterosporous

(3) *Equisetum* - Homosporous

(4) *Pinus* - Dioecious

135. Which one from those given below is the period for Mendel's hybridization experiments ?

(1) 1840 - 1850

(2) 1857 - 1869

(3) 1870 - 1877

(4) 1856 - 1863

136. Two astronauts are floating in gravitational free space after having lost contact with their spaceship. The two will :

(1) move towards each other.

(2) move away from each other.

(3) will become stationary.

(4) keep floating at the same distance between them.

137. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8^{th} bright fringe in the medium lies where 5^{th} dark fringe lies in air. The refractive index of the medium is nearly :

(1) 1.59

(2) 1.69

(3) 1.78

(4) 1.25

138. In a common emitter transistor amplifier the audio signal voltage across the collector is 3 V. The resistance of collector is 3 kΩ. If current gain is 100 and the base resistance is 2 kΩ, the voltage and power gain of the amplifier is :

(1) 15 and 200

(2) 150 and 15000

(3) 20 and 2000

(4) 200 and 1000

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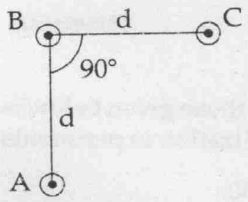
139. An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current 'I' along the same direction is shown in Fig. Magnitude of force per unit length on the middle wire 'B' is given by :



(1) $\frac{2\mu_o i^2}{\pi d}$

(2) $\frac{\sqrt{2}\mu_o i^2}{\pi d}$

(3) $\frac{\mu_o i^2}{\sqrt{2}\pi d}$

(4) $\frac{\mu_o i^2}{2\pi d}$

140. The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature T (Kelvin) and mass m, is :

(1) $\frac{h}{\sqrt{3mkT}}$

(2) $\frac{2h}{\sqrt{3mkT}}$

(3) $\frac{2h}{\sqrt{mkT}}$

(4) $\frac{h}{\sqrt{mkT}}$

141. Radioactive material 'A' has decay constant '8 λ' and material 'B' has decay constant 'λ'. Initially they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be $\frac{1}{e}$?

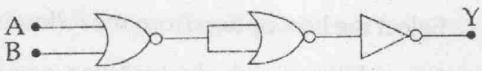
(1) $\frac{1}{7\lambda}$

(2) $\frac{1}{8\lambda}$

(3) $\frac{1}{9\lambda}$

(4) $\frac{1}{\lambda}$

142. The given electrical network is equivalent to :



(1) OR gate

(2) NOR gate

(3) NOT gate

(4) AND gate

143. The resistance of a wire is 'R' ohm. If it is melted and stretched to 'n' times its original length, its new resistance will be :

(1) $\frac{R}{n}$

(2) n^2R

(3) $\frac{R}{n^2}$

(4) nR

144. Two cars moving in opposite directions approach each other with speed of 22 m/s and 16.5 m/s respectively. The driver of the first car blows a horn having a frequency 400 Hz . The frequency heard by the driver of the second car is [velocity of sound 340 m/s] :

(1) 361 Hz

(2) 411 Hz

(3) 448 Hz

(4) 350 Hz

145. In an electromagnetic wave in free space the root mean square value of the electric field is $E_{rms} = 6V/m$. The peak value of the magnetic field is :

(1) 2.83×10^{-8} T

(2) 0.70×10^{-8} T

(3) 4.23×10^{-8} T

(4) 1.41×10^{-8} T

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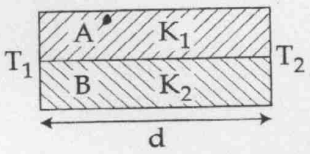
146. Two rods A and B of different materials are welded together as shown in figure. Their thermal conductivities are K_1 and K_2. The thermal conductivity of the composite rod will be :



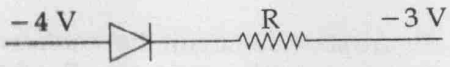
(1) $\frac{3(K_1+K_2)}{2}$

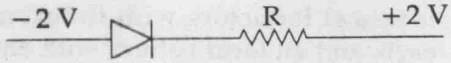
(2) K_1+K_2

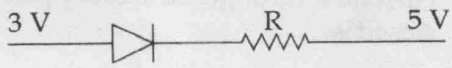
(3) $2(K_1+K_2)$

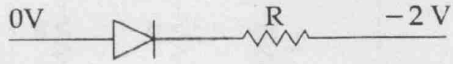
(4) $\frac{K_1+K_2}{2}$

147. Which one of the following represents forward bias diode ?

(1) 

(2) 

(3) 

(4) 

148. A 250 - Turn rectangular coil of length 2.1 cm and width 1.25 cm carries a current of 85 μA and subjected to a magnetic field of strength 0.85 T. Work done for rotating the coil by 180° against the torque is :

(1) 4.55 μ J

(2) 2.3 μ J

(3) 1.15 μ J

(4) 9.1 μ J

149. If θ_1 and θ_2 be the apparent angles of dip observed in two vertical planes at right angles to each other, then the true angle of dip θ is given by :

(1) $\tan^2\theta = \tan^2\theta_1 + \tan^2\theta_2$

(2) $\cot^2\theta = \cot^2\theta_1 - \cot^2\theta_2$

(3) $\tan^2\theta = \tan^2\theta_1 - \tan^2\theta_2$

(4) $\cot^2\theta = \cot^2\theta_1 + \cot^2\theta_2$

150. A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F. because the method involves :

(1) potential gradients

(2) a condition of no current flow through the galvanometer

(3) a combination of cells, galvanometer and resistances

(4) cells

151. The ratio of resolving powers of an optical microscope for two wavelengths $\lambda_1 = 4000$ Å and $\lambda_2 = 6000$ Å is :

(1) 9 : 4

(2) 3 : 2

(3) 16 : 81

(4) 8 : 27

152. A thin prism having refracting angle 10° is made of glass of refractive index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be :

(1) 6°

(2) 8°

(3) 10°

(4) 4°

153. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system :

(1) decreases by a factor of 2

(2) remains the same

(3) increases by a factor of 2

(4) increases by a factor of 4

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154. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be :

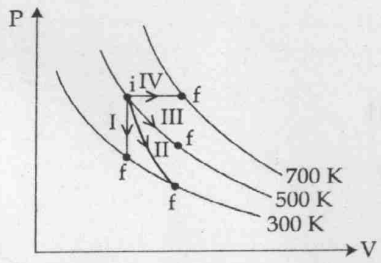
(1) $\frac{t_1 t_2}{t_2 - t_1}$

(2) $\frac{t_1 t_2}{t_2 + t_1}$

(3) $t_1 - t_2$

(4) $\frac{t_1 + t_2}{2}$

155. Thermodynamic processes are indicated in the following diagram.



Match the following :

	Column-1		Column-2
P.	Process I	a.	Adiabatic
Q.	Process II	b.	Isobaric
R.	Process III	c.	Isochoric
S.	Process IV	d.	Isothermal

(1) P → c, Q → a, R → d, S → b

(2) P → c, Q → d, R → b, S → a

(3) P → d, Q → b, R → a, S → c

(4) P → a, Q → c, R → d, S → b

156. One end of string of length l is connected to a particle of mass 'm' and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed 'v', the net force on the particle (directed towards center) will be (T represents the tension in the string)

(1) $T + \frac{m v^2}{l}$

(2) $T - \frac{m v^2}{l}$

(3) Zero

(4) T

157. The two nearest harmonics of a tube closed at one end and open at other end are 220 Hz and 260 Hz. What is the fundamental frequency of the system ?

(1) 20 Hz

(2) 30 Hz

(3) 40 Hz

(4) 10 Hz

158. The photoelectric threshold wavelength of silver is 3250×10^{-10} m. The velocity of the electron ejected from a silver surface by ultraviolet light of wavelength 2536×10^{-10} m is :

(Given $h = 4.14 \times 10^{-15}$ eVs and $c = 3 \times 10^8$ ms^{-1})

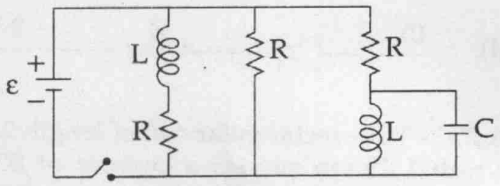
(1) $\approx 0.6 \times 10^6$ ms^{-1}

(2) $\approx 61 \times 10^3$ ms^{-1}

(3) $\approx 0.3 \times 10^6$ ms^{-1}

(4) $\approx 6 \times 10^5$ ms^{-1}

159. Figure shows a circuit that contains three identical resistors with resistance R = 9.0 Ω each, two identical inductors with inductance L = 2.0 mH each, and an ideal battery with emf ε = 18 V. The current 'i' through the battery just after the switch closed is,.....



(1) 0.2 A

(2) 2 A

(3) 0 ampere

(4) 2 mA

160. A spherical black body with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be :

(1) 450

(2) 1000

(3) 1800

(4) 225

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161. A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N ?

(1) $0.25\ rad/s^2$

(2) $25\ rad/s^2$

(3) $5\ m/s^2$

(4) $25\ m/s^2$

162. Two discs of same moment of inertia rotating about their regular axis passing through centre and perpendicular to the plane of disc with angular velocities ω_1 and ω_2. They are brought into contact face to face coinciding the axis of rotation. The expression for loss of energy during this process is :

(1) $\frac{1}{4} I(\omega_1 - \omega_2)^2$

(2) $I(\omega_1 - \omega_2)^2$

(3) $\frac{I}{8}(\omega_1 - \omega_2)^2$

(4) $\frac{1}{2} I(\omega_1 + \omega_2)^2$

163. A gas mixture consists of 2 moles of O_2 and 4 moles of Ar at temperature T. Neglecting all vibrational modes, the total internal energy of the system is :

(1) 15 RT

(2) 9 RT

(3) 11 RT

(4) 4 RT

164. The bulk modulus of a spherical object is 'B'. If it is subjected to uniform pressure 'p', the fractional decrease in radius is :

(1) $\frac{B}{3p}$

(2) $\frac{3p}{B}$

(3) $\frac{p}{3B}$

(4) $\frac{p}{B}$

165. Which of the following statements are correct ?

(a) Centre of mass of a body always coincides with the centre of gravity of the body.

(b) Centre of mass of a body is the point at which the total gravitational torque on the body is zero.

(c) A couple on a body produce both translational and rotational motion in a body.

(d) Mechanical advantage greater than one means that small effort can be used to lift a large load.

(1) (a) and (b)

(2) (b) and (c)

(3) (c) and (d)

(4) (b) and (d)

166. The acceleration due to gravity at a height 1 km above the earth is the same as at a depth d below the surface of earth. Then :

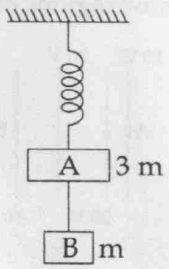
(1) $d = 1\ km$

(2) $d = \frac{3}{2} km$

(3) $d = 2\ km$

(4) $d = \frac{1}{2} km$

167. Two blocks A and B of masses 3m and m respectively are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively :



(1) $\frac{g}{3}, g$

(2) g, g

(3) $\frac{g}{3}, \frac{g}{3}$

(4) $g, \frac{g}{3}$

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168. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is :

(1) 1

(2) 4

(3) 0.5

(4) 2

169. A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source L. When the mirror is rotated through a small angle θ, the spot of the light is found to move through a distance y on the scale. The angle θ is given by :

(1) $\frac{y}{x}$

(2) $\frac{x}{2y}$

(3) $\frac{x}{y}$

(4) $\frac{y}{2x}$

170. A spring of force constant k is cut into lengths of ratio 1 : 2 : 3. They are connected in series and the new force constant is k'. Then they are connected in parallel and force constant is k". Then k' : k" is :

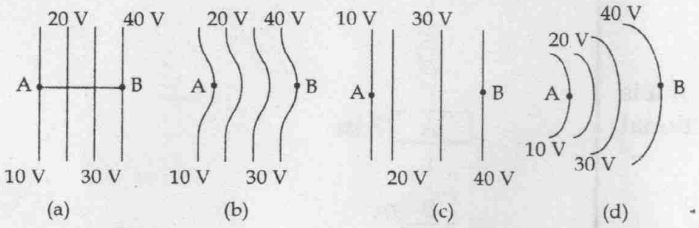
(1) 1 : 9

(2) 1 : 11

(3) 1 : 14

(4) 1 : 6

171. The diagrams below show regions of equipotentials.



A positive charge is moved from A to B in each diagram.

(1) In all the four cases the work done is the same.

(2) Minimum work is required to move q in figure (a).

(3) Maximum work is required to move q in figure (b).

(4) Maximum work is required to move q in figure (c).

172. Suppose the charge of a proton and an electron differ slightly. One of them is $-e$, the other is $(e + \Delta e)$. If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero, then Δe is of the order of [Given mass of hydrogen $m_h = 1.67 \times 10^{-27}$ kg]

(1) 10^{-23} C

(2) 10^{-37} C

(3) 10^{-47} C

(4) 10^{-20} C

173. A physical quantity of the dimensions of length that can be formed out of c, G and $\frac{e^2}{4\pi\epsilon_0}$ is [c is velocity of light, G is universal constant of gravitation and e is charge]:

(1) $c^2\left[G\frac{e^2}{4\pi\epsilon_0}\right]^{1/2}$

(2) $\frac{1}{c^2}\left[\frac{e^2}{G\,4\pi\epsilon_0}\right]^{1/2}$

(3) $\frac{1}{c}G\frac{e^2}{4\pi\epsilon_0}$

(4) $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\epsilon_0}\right]^{1/2}$

174. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1. The intensity of transmitted light through P_2 is :

(1) $\frac{I_0}{4}$

(2) $\frac{I_0}{8}$

(3) $\frac{I_0}{16}$

(4) $\frac{I_0}{2}$

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175. A particle executes linear simple harmonic motion with an amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is :

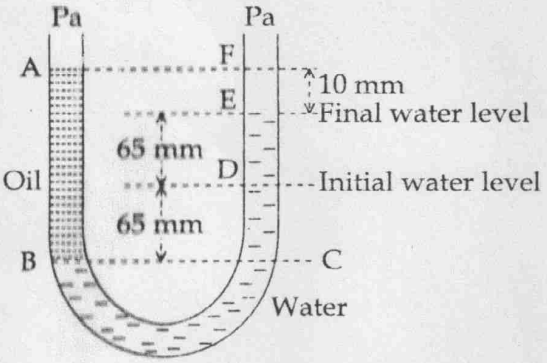
(1) $\frac{\sqrt{5}}{2\pi}$

(2) $\frac{4\pi}{\sqrt{5}}$

(3) $\frac{2\pi}{\sqrt{3}}$

(4) $\frac{\sqrt{5}}{\pi}$

176. A U tube with both ends open to the atmosphere, is partially filled with water. Oil, which is immiscible with water, is poured into one side until it stands at a distance of 10 mm above the water level on the other side. Meanwhile the water rises by 65 mm from its original level (see diagram). The density of the oil is :



(1) 425 kg m^{-3}

(2) 800 kg m^{-3}

(3) 928 kg m^{-3}

(4) 650 kg m^{-3}

177. Consider a drop of rain water having mass 1g falling from a height of 1 km. It hits the ground with a speed of 50 m/s. Take 'g' constant with a value 10 m/s^2. The work done by the (i) gravitational force and the (ii) resistive force of air is :

(1) (i) 1.25 J (ii) −8.25 J

(2) (i) 100 J (ii) 8.75 J

(3) (i) 10 J (ii) −8.75 J

(4) (i) −10 J (ii) −8.25 J

178. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at t = 2s is :

(1) 5 m/s^2

(2) −4 m/s^2

(3) −8 m/s^2

(4) 0

179. A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At the centre of the solenoid, a coil of 100 turns and radius 0.01 m is placed with its axis coinciding with the solenoid axis. The current in the solenoid reduces at a constant rate to 0A from 4 A in 0.05 s. If the resistance of the coil is $10\pi^2\ \Omega$, the total charge flowing through the coil during this time is :

(1) 16 μ C

(2) 32 μ C

(3) 16 π μC

(4) 32 π μC

180. A carnot engine having an efficiency of $\frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is :

(1) 90 J

(2) 99 J

(3) 100 J

(4) 1 J

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NEET 2016-II

Test Instructions

1. Total duration of this test is **180** minutes.
2. This test has 4 subjects consisting of
   180 questions in total.
3. There are **4** total sections in the test.
4. Sections Info :
   Physics
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Chemistry
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Botany
      a. **Section A** has **42** questions, compulsory questions **42**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Zoology
      a. **Section A** has **48** questions, compulsory questions **48**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
5. Total marks for this test is **720** marks.
6. No marks will be deducted for unattempted questions.
7. This test can be submitted only once.
8. Once the test has been submitted, you cannot edit the responses.
9. Results will be anounced post test submission.
10. The test will be auto-submitted once the timer ends.

Physics

Section A

1. Planck's constant h speed of light in vacuum c and Newton's gravitational constant G are three fundamental constants. Which of the following combinations of these has the dimension of length?

   1. $\frac{\sqrt{hG}}{c^{3/2}}$
   2. $\frac{\sqrt{hG}}{c^{5/2}}$
   3. $\sqrt{\frac{hc}{G}}$
   4. $\sqrt{\frac{Gc}{h^{3/2}}}$

2. A particle moves from a point $\left(-2\hat{i}+5\hat{j}\right)$ to $\left(4\hat{j}+3\hat{k}\right)$ when a force of $\left(4\hat{i}+3\hat{j}\right)$ N is applied. How much work has been done by the force?

   1. 8 J
   2. 5 J
   3. 11 J
   4. 2 J

3. Two identical balls “A” and “B” having velocities of $0.5\ \text{ms}^{-1}$ and $-0.3\ \text{ms}^{-1}$ respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be:

   1. $0.3\ \text{m/s}$ and $0.5\ \text{m/s}$
   2. $-0.5\ \text{m/s}$ and $0.3\ \text{m/s}$
   3. $0.5\ \text{m/s}$ and $-0.3\ \text{m/s}$
   4. $-0.3\ \text{m/s}$ and $0.5\ \text{m/s}$

4. A bullet of mass $10g$ moving horizontally with a velocity of $400\ ms^{-1}$ strikes a wood block of mass $2\ kg$ which is suspended by light inextensible string of length $5m$. As a result, the centre of gravity of the block found to rise a vertical distance of $10\ cm$. The speed of the bullet after it emerges out horizontally from the block will be

   1. $100\ ms^{-1}$
   2. $80\ ms^{-1}$
   3. $120\ ms^{-1}$
   4. $160\ ms^{-1}$

5. Two rotating bodies A and B of masses $m, 2m$ with moments of inertia l_A andI_B ($I_B > I_A$) have equal kinetic energy of rotation. If L_A and L_B be their angular momenta respectively, then

   1. $L_A = \frac{L_B}{2}$
   2. $L_A = 2L_B$
   3. $L_B > L_A$
   4. $L_A > L_B$

6. Three liquids of densities $\rho_1, \rho_2\ and\ \rho_3$ (with $\rho_1, \rho_2\ >\ \rho_3$), having the same value of surface tension T, rise to the same height in

three identical capillaries. The angles of contact$\theta_1, \theta_2 \; and \; \theta_3$ obey

1. $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$
2. $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$
3. $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$
4. $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$

7. A given sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas?

1. $P\,/(k\,T)$
2. $P\,m\,/(k\,T)$
3. $P\,/(k\,T\,V)$
4. mkT

8. Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at 100^0C while the other one is at 0^0C. If the two bodies are brought into contact, then, assuming no heat loss, the final common temperature is

1. $50^\circ \mathrm{C}$
2. more than $50^\circ \mathrm{C}$
3. less than $50^\circ \mathrm{C}$ but greater than $0^\circ \mathrm{C}$
4. $0^\circ \mathrm{C}$

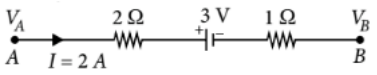
9. A body cools from a temperature 3T to 2T in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be

1. $\frac{7}{4}T$
2. $\frac{3}{2}T$
3. $\frac{4}{3}T$
4. T

10. One mole of an ideal monoatomic gas undergoes a process described by the equation $\mathrm{pv}^3 = \text{constant}$ constant. The heat capacity of the gas during this process is

1. $\frac{3}{2}R$
2. $\frac{5}{2}R$
3. 2R
4. R

11. The potential difference $(V_A - V_B)$ between the points A and B in the given figure is



1. $-3V$
2. $+3V$
3. $+6V$
4. $+9V$

12. An electron is moving in a circular path under the influence of a transverse magnetic field of

3.57×10^{-2} T. If the value of e/m is $1.76 \times 10^{11}\ C\ kg^{-1}$, the frequency of revolution of the electron is

1. 1 GHz
2. 100 MHz
3. 62.8 MHz
4. 6.28 MHz

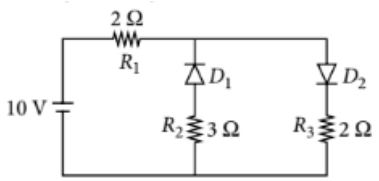
13. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60^0 is W. Now the torque required to keep the magnet in this new position is

1. $\frac{W}{\sqrt{3}}$
2. $\sqrt{3}W$
3. $\frac{\sqrt{3}W}{2}$
4. $\frac{2W}{\sqrt{3}}$

14. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is

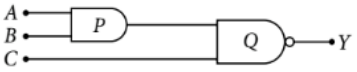
1. 8
2. 10
3. 12
4. 16

15. The given circuit has two ideal diodes connected as shown in the figure. The current flowing through the resistance R_1 will be



1. 2.5 A
2. 10.0 A
3. 1.43 A
4. 3.13 A

16. What is the output Y in the following circuit, when all the three inputs A, B, C are first 0 and then 1 ?



1. 0,0
2. 0,1
3. 1,0
4. 1,1

17. A 100Ω resistance and a capacitor of 100Ω reactance are connected in series across a 220 V source. When the capacitor is 50 % charged, the peak value of the displacement current is

1. 2.2 A

2. 11 A

3. 4.4 A

4. $11\sqrt{2}$ A

18. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = (at + bt^2)$ and $x_Q(t) = (ft - t^2)$. At what time do the cars have the same velocity?

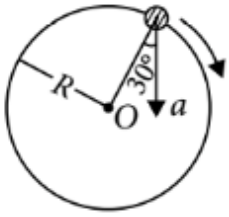
1. $\frac{a-f}{1+b}$

2. $\frac{a+f}{2(b-1)}$

3. $\frac{a+f}{2(1+b)}$

4. $\frac{f-a}{2(1+b)}$

19. In the given figure, a $= 15\ \text{ms}^{-2}$ represents the total acceleration of a particle moving in the clockwise direction in a circle of radius R = 2.5 m at a given instant of time. The speed of the particle is



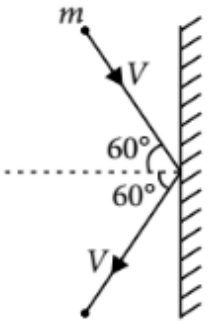
1. $4.5\ \text{m s}^{-1}$

2. $5\ \text{m s}^{-1}$

3. $5.7\ \text{m s}^{-1}$

4. $6.2\ \text{m s}^{-1}$

20. A rigid ball of mass m strikes a rigid wall at 60^0 and gets reflected without loss of speed as shown in the figure. The value of impulse imparted by the wall on the ball will be



1. mv

2. 2mv

3. $\frac{mv}{2}$

4. $\frac{mv}{3}$

21. A light rod of length l has two masses $m_1$and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

1. $\frac{m_1 m_2}{m_1+m_2} l^2$

2. $\frac{m_1+m_2}{m_1 m_2}\Big|^2$

3. $(m_1 + m_2)l^2$

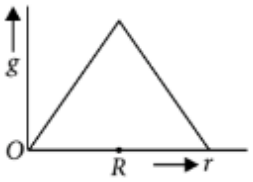
4. $\sqrt{m_1 m_2} l^2$

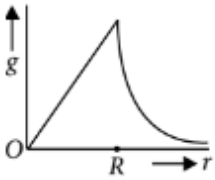
22. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its

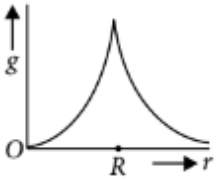
geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation $(E_{\text{sphere}}/E_{\text{cylinder}})$ will be

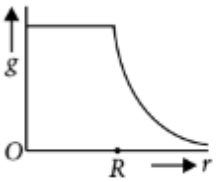
1. 2:3
2. 1:5
3. 1:4
4. 3:1

23. Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by

1. 

2. 

3. 

4. 

24. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0, the value of acceleration due to gravity at the earth's surface, is

1. $\frac{mg_0R^2}{2(R+h)}$
2. $-\frac{mg_0R^2}{2(R+h)}$
3. $\frac{2mg_0R^2}{R+h}$
4. $-\frac{2mg_0R^2}{R+h}$

25. A rectangular film of liquid is extended from $(4\ cm \times 2\ cm)$ to $(5\ cm \times 4\ cm)$. If the work done is $3 \times 10^{-4}\ J$ the value of the surface tension of the liquid is

1. $0.250\ \text{N m}^{-1}$
2. $0.125\ \text{N m}^{-1}$
3. $0.2\ \text{N m}^{-1}$
4. $8\ \text{N m}^{-1}$

26. The temperature inside a refrigerator is ${t_2}^0C$ and the room temperature is ${t_1}^0C$. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be

1. $\frac{t_1}{t_1-t_2}$
2. $\frac{t_1+273}{t_1-t_2}$
3. $\frac{t_2+273}{t_1-t_2}$
4. $\frac{t_1+t_2}{t_1+273}$

27.

A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of $3s$. When the mass m is increased by $1\ kg$, the time period of oscillations becomes $5\ s$. The value of m in kg is

1. $\frac{3}{4}$
2. $\frac{4}{3}$
3. $\frac{16}{9}$
4. $\frac{9}{16}$

28. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be

1. L
2. 2L
3. $\frac{L}{2}$
4. 4L

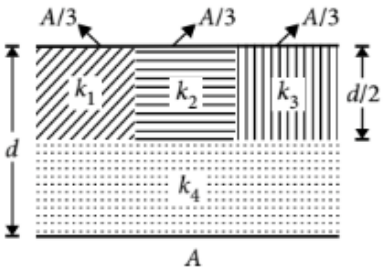
29. Three sound waves of equal amplitudes have frequencies (n-1), n, (n+1) . They superimpose to give beats. The number of beats produced per second will be

1. 1
2. 4
3. 3
4. 2

30. An electric dipole is placed at an angle of $30^0$with an electric field intensity $2 \times 10^5\ NC^{-1}$. It experiences a torque equal to $4\ Nm$. The charge on the dipole, if the dipole length is $2cm$

1. 8 mC
2. 2 mC
3. 5 mC
4. $7\mu C$

31. A parallel-plate capacitor of area A, plate separation d and capacitance C is filled with four dielectric materials having dielectric constants $K_1, K_2, K_3\ and\ K_4$ as shown in the figure.



If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant k is given by

1. $k = k_1 + k_2 + k_3 + 3k_4$
2. $k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$
3. $\frac{2}{k} = \frac{3}{k_1+k_2+k_3} + \frac{1}{k_4}$
4. $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$

32.

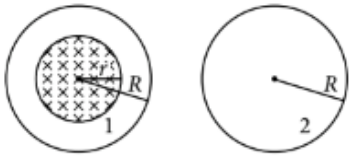
A filament bulb $500W$, $100V$ is to be used in a $230V$ main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes $500W$. The value of R is

1. $230\ \Omega$
2. $46\ \Omega$
3. $26\ \Omega$
4. $13\ \Omega$

33. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be

1. nB
2. n^2B
3. 2nB
4. $2n^2B$

34. A uniform magnetic field is restricted within a region of radius "r". The magnetic field changes with time at a rate $\frac{d\vec{B}}{dt}$. Loop 1 of radius R > r encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure. Then the e.m.f. generated is



1. zero in loop 1 and zero in loop 2
2. $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 1 and $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 2
3. $-\frac{d\vec{B}}{dt}\pi R^2$ in loop 1 and zero in loop 2
4. $-\frac{d\vec{B}}{dt}\pi r^2$ in loop 1 and zero in loop 2

35. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication?

1. $R = 20\Omega, L = 1.5\text{H}, C = 35\mu\text{F}$
2. $R = 25\Omega, L = 2.5\text{H}, C = 45\mu\text{F}$
3. $R = 15\Omega, L = 3.5\text{H}, C = 30\mu\text{F}$
4. $R = 25\Omega, L = 1.5\text{H}, C = 45\mu\text{F}$

36. The potential differences across the resistance, capacitance and inductance are80 V, 40 V and 100 V respectively in an L-C-R series circuit. The power factor of this circuit is

1. 0.4
2. 0.5
3. 0.8
4. 1.0

37. Two identical glass $\left(\mu_g = \frac{3}{2}\right)$ equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with

water $\left(\mu_w = \frac{4}{3}\right)$. The focal length of the combination is

1. $\frac{f}{3}$
2. f
3. $\frac{4f}{3}$
4. $\frac{3f}{4}$

38. A person can see clearly objects only when they lie between 50 cm and 400 cm from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, the person has to use, will be

1. convex, $+2.25$ diopter
2. concave, -0.25 diopter
3. concave, -0.2 diopter
4. convex, $+0.15$ diopter

39. A linear aperture whose width is $0.02\ cm$is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength $5 \times 10^{-5}\ cm$. The distance of the first dark band of the diffraction pattern from the centre of the screen is

1. 0.10 cm
2. 0.25 cm
3. 0.20 cm
4. 0.15 cm

40. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio $\frac{I_{\max}-I_{\min}}{I_{\max}+I_{\min}}$will be

1. $\frac{\sqrt{n}}{n+1}$
2. $\frac{2\sqrt{n}}{n+1}$
3. $\frac{\sqrt{n}}{(n+1)^2}$
4. $\frac{2\sqrt{n}}{(n+1)^2}$

41. Photons with energy 5 eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV. When photons of energy 6 eV are incident on C, no photoelectrons will reach the anode A, if the stopping potential of A relative to C is

1. +3 V
2. +4 V
3. -1 V
4. -3 V

42. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X -ray tube. The cutoff wavelength (λ_0) of the emitted X -ray is

1. $\lambda_0 = \frac{2mc\lambda^2}{h}$
2. $\lambda_0 = \frac{2h}{mc}$
3. $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$
4. $\lambda_0 = \lambda$

43. If an electron in a hydrogen atom jumps from the 3^{rd} orbit to the 2^{rd} orbit, it emits a photon of wavelength λ. When it jumps from the 4^{rd} orbit to the 3^{rd} orbit, the corresponding wavelength of the photon will be

    1. $\frac{16}{25}\lambda$
    2. $\frac{9}{16}\lambda$
    3. $\frac{20}{7}\lambda$
    4. $\frac{20}{13}\lambda$

44. The half-life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is

    1. 15
    2. 30
    3. 45
    4. 60

45. For CE transistor amplifier, the audio signal voltage across the collector resistance of 2 $k\Omega$ is 4V. If the current amplification factor of the transistor is 100 and the base resistance is1 $K\Omega$, then the input signal voltage is

    1. 10 mV
    2. 20 mV
    3. 30 mV
    4. 15 mV

Chemistry

Section A

46. The percentage of pyridine $\left(\mathrm{C_5H_5\ N}\right)$ that forms pyridinium ion $\left(\mathrm{C_5H_5\ N^+H}\right)$ in a $0.10\mathrm{M}$ aqueous pyridine solution $\left(\mathrm{K_b}\right.$ for $\left.\mathrm{C_5H_5\ N} = 1.7 \times 10^{-9}\right)$ is

    1. 0.0060 %
    2. 0.013 %
    3. 0.77 %
    4. 1.6 %

47. The solubility of $\mathrm{AgCl_{(s)}}$ with solubility product 1.6×10^{-10} in $0.1\mathrm{M}$ of NaCl solution would be

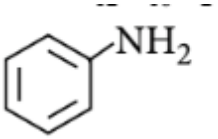
    1. $1.26 \times 10^{-5}\mathrm{M}$
    2. $1.6 \times 10^{-9}\mathrm{M}$
    3. $1.6 \times 10^{-11}\mathrm{M}$
    4. Zero

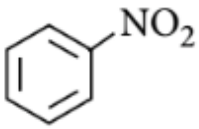
48. Jahn-Teller effect is not observed in high spin complexes of

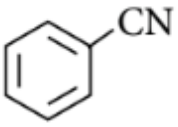
    1. $\mathrm{d^7}$
    2. $\mathrm{d^8}$
    3. $\mathrm{d^4}$
    4. $\mathrm{d^9}$

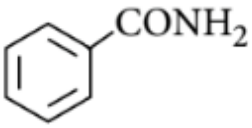
49. A given nitrogen containing aromatic compound A reacts with Sn / HCl, followed byHNO_2 to give an unstable compound 'B'. ' B ', on treatment with phenol, forms a beautiful coloured compound 'C

with the molecular formula $C_{12}H_{10}N_2O$. The structure of compound ' A is

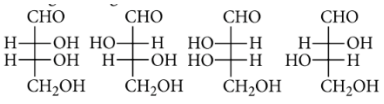
1. 

2. 

3. 

4. 

50. The correct corresponding order of names of four aldoses with configuration given below



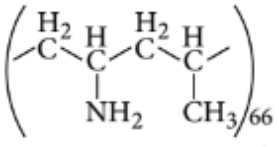
respectively,is

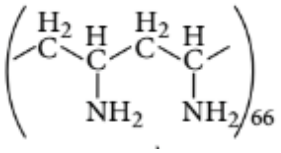
1. L -erythrose, L -threose, L -erythrose, D -threose
2. D -threose, D -erythrose, L -threose, L -erythrose
3. L -erythrose, L -threose, D -erythrose, D -threose
4. D -erythrose, D -threose, L -erythrose, L -threose.

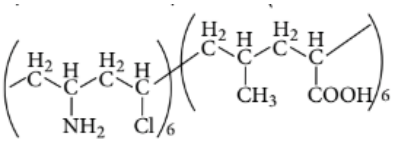
51. The central dogma of molecular genetics states that the genetic information flows from

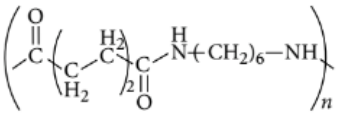
1. Amino acids $\rightarrow$ Proteins $\rightarrow$ DNA
2. DNA $\rightarrow$ Carbohydrates $\rightarrow$ Proteins
3. DNA $\rightarrow$ RNA $\rightarrow$ Proteins
4. DNA $\rightarrow$ RNA $\rightarrow$ Carbohydrates

52. Which one of the following structures represents nylon 6,6 polymer?

1. 

2. 

3. 

4. 

53. The hybridizations of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are

1. sp, sp^3 and sp^2

2. sp^2, sp^3 and sp

3. sp, sp^2 and sp^3

4. sp^2, sp and sp^3

54. In the context of beryllium, which one of the following statements is incorrect?

1. It is rendered passive by nitric acid.

2. It forms Be_2C

3. Its salts rarely hydrolyse

4. Its hydride is electron-deficient and polymeric.

55. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of

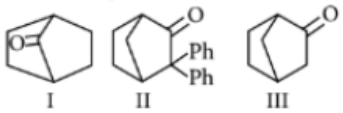
1. $K_3[AlF_3H_3]$

2. $K_3[AlF_6]$

3. AlF_3

4. $K[AlF_3]$

56. Which among the given molecules can exhibit tautomerism?



I II III

1. III only

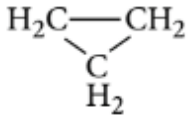
2. Both I and III

3. Both I and II

4. Both II and III

57. Which of the following compounds shall not produce propene by reaction with HBr followed by elimination or direct only elimination reaction?

1.



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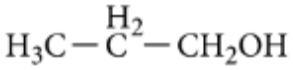

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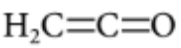

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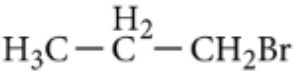


58. The compound that will react most readily with gaseous bromine has the formula

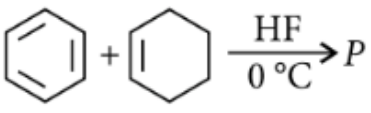
1. C_3H_6

2. C_2H_2

3. C_4H_{10}

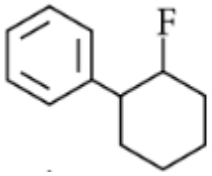
4. C_2H_4

59. In the given reaction,

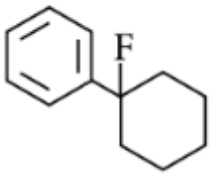


the product P is

1.



2.



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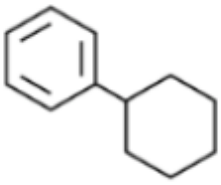

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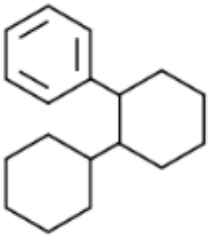
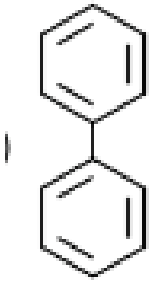
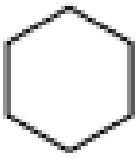


60. In which of the following molecules, all atoms are coplanar?

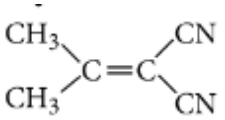
1.



2.



3.



4.

61. Which one of the following is incorrect for ideal solution?

1. $\Delta H_{mix} = 0$
2. $\Delta U_{mix} = 0$
3. $\Delta P = P_{obs} - P_{\text{calculated by Raoult's law}} = 0$
4. $\Delta G_{mix} = 0$

62. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is ?

(charge on electron = $1.60 \times 10^{-19} C$)

1. 6×10^{23}
2. 6×10^{20}
3. 3.75×10^{20}
4. 7.48×10^{23}

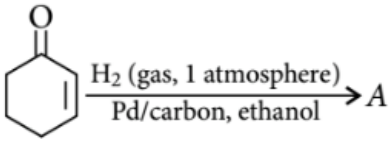
63. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because

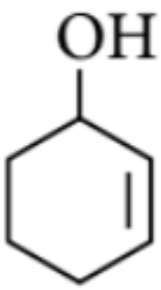
1. zinc is lighter than iron
2. zinc has lower melting point than iron
3. zinc has lower negative electrode potential than iron
4. zinc has higher negative electrode potential than iron

64. If the E_{cell}° for a given reaction has a negative value, which of the following gives the correct relationships for the values of ΔG° and K_{eq} ?

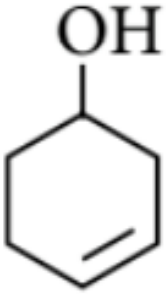
1. $\Delta G^{\circ} > 0; K_{eq} < 1$
2. $\Delta G^{\circ} > 0; K_{eq} > 1$
3. $\Delta G^{\circ} < 0; K_{eq} > 1$
4. $\Delta G^{\circ} < 0; K_{eq} < 1$

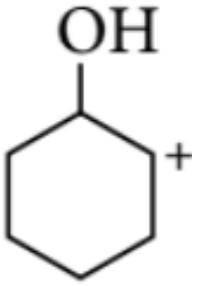
65. The correct structure of the product 'A' formed in the reaction is



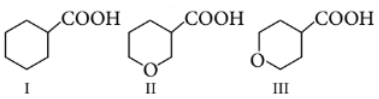
1. 

2.

3. 

4. 

66. The correct order of strengths of the carboxylic acids



is

1. I > II > III
2. II > III > I
3. III > II > I
4. II > I > III

67. Among the following, which one is a wrong statement?

1. PH_5 and $BiCl_5$ do not exist.
2. $p\pi - d\pi$ bonds are present in SO_2

3. SeF_4 and CH_4 have same shape.

4. I_3^+ has bent geometry.

68. Which one of the following compounds shows the presence of intramolecular hydrogen bond?

1. H_2O_2
2. HCN
3. Cellulose
4. Concentrated acetic acid

69. For a sample of perfect gas when its pressure is changed isothermally from p_i to p_f, the entropy change is given by

1. $\Delta S = nR\ln\left(\frac{p_f}{p_i}\right)$
2. $\Delta S = nR\ln\left(\frac{p_i}{p_f}\right)$
3. $\Delta S = nRT\ln\left(\frac{p_f}{p_i}\right)$
4. $\Delta S = RT\ln\left(\frac{p_i}{p_f}\right)$

70. The suspension of slaked lime in water is known as

1. lime water
2. quick lime
3. milk of lime
4. aqueous solution of slaked lime

71. Boric acid is an acid because its molecule

1. contains replaceable H^+ ion
2. gives up a proton
3. accepts OH^- from water releasing proton
4. combines with proton from water molecule.

72. The decomposition of phosphine PH_3 on tungsten at low pressure is a first-order reaction. It is because the

1. rate is proportional to the surface coverage
2. rate is inversely proportional to the surface coverage
3. rate is independent of the surface coverage
4. rate of decomposition is very slow.

73. Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reactions does not show oxidizing behaviour?

1. $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$
2. $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$
3. $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
4. $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

74. Which of the following can be used as the halide component for Friedel-Crafts reaction?

1. Chlorobenzene
2. Bromobenzene

3. Chloroethene

4. Isopropyl chloride

75. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion Ca^{2+} and fluoride ion F^- are

1. 4 and 2

2. 6 and 6

3. 8 and 4

4. 4 and 8

76. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

1. 0

2. 1

3. 2

4. 3

77. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below:

I. $(NaCl) = 52$

II. $(BaCl_2) = 0.69$,

III. $(MgSO_4) = 0.22$

The correct order of their coagulating power is

1. $I > II > III$

2. $II > I > III$

3. $III > II > I$

4. $III > I > II$

78. Which of the following fluoro compounds is most likely to behave as a Lewis base?

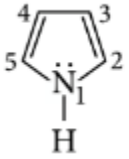
1. BF_3

2. PF_3

3. CF_4

4. SiF_4

79. In pyrrole



the electron density is maximum on

1. 2 and 3

2. 3 and 4

3. 2 and 4

4. 2 and 5

80. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 Amperes.

1. 55 minutes

2. 110 minutes

3. 220 minutes

4. 330 minutes

81. The correct increasing order of trans-effect of the following species is

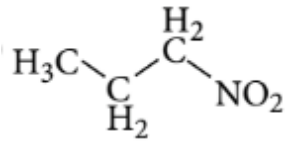
1. $NH_3 > CN^- > Br^- > C_6H_5^-$

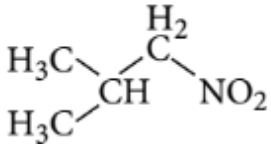
2. $CN^- > C_6H_5^- > Br^- > NH_3$

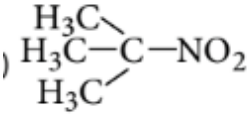
3. $Br^- > CN^- > NH_3 > C_6H_5^-$

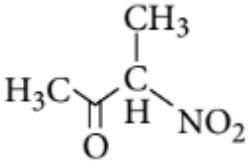
4. $CN^- > Br^- > C_6H_5^- > NH_3$

82. Which one of the following nitro compounds does not react with nitrous acid?

1. 

2. 

3. 

4. 

83. Suppose the elements $x$and y combine to form two compounds $xy_2$and x_3y_2. When 0.1 mole of xy_2 weighs 10 g and 0.05 mole of x_3y_2 weighs 9 g, the atomic weights of X and Y are

1. 40,30

2. 60,40

3. 20,30

4. 30,20

84. Which of the following pairs of d - orbitals will have electron density along the axes?

1. d_{z^2}, d_{xz}

2. d_{xz}, d_{yz}

3. $d_{z^2}, d_{x^2-y^2}$

4. $d_{xy}, d_{x^2-y^2}$

85. How many electrons can fit in the orbital for which n=3 and I=1

1. 2

2. 6

3. 10

4. 14

86. Which of the following pairs of ions are isoelectronic and isostructural?

1. CO_3^{2-}, NO_3^-

2. ClO_3^-, CO_3^{2-}

3. NO_3^-, SO_3^{2-}

4. ClO_3^-, SO_3^{2-}

87. The correct geometry and hybridization for XeF_4 are

1. octahedral, sp^3d^2

2. trigonal bipyramidal, sp^3d

3. planar triangle, sp^3d^3

4. square planar, sp^3d^2

88. The molar conductivity of a $0.5\ \text{mol}/\text{dm}^3$ solution $AgNO_3$ with electrolytic conductivity of $5.76 \times 10^{-3}\ \text{S cm}^{-1}$ at 298 K is

1. $2.88\ \text{S cm}^2/\text{mol}$

2. $11.52\ \text{S cm}^2/\text{mol}$

3. $0.086\ \text{S cm}^2/\text{mol}$

4. $28.8\ \text{S cm}^2/\text{mol}$

89. Which one of the following statements related to lanthanons is incorrect?

1. Europium shows $+2$ oxidation state.

2. The basicity decreases as the ionic radius decreases from Pr to Lu.

3. All the lanthanons are much more reactive than aluminium.

4. $Ce(+4)$ solutions are widely used as oxidizing agent in volumetric analysis.

90. Consider the reaction,

$$CH_3CH_2CH_2Br + NaCN \rightarrow CH_3CH_2CH_2CN + NaBr$$

This reaction will be the fastest in

1. ethanol water.

2. methanol

3. N, N' -dimethylformamide (DMF)

4. water

Botany

Section A

91. A few drops of sap were collected by cutting across a plant stem by a suitable method. The sap was tested chemically. Which one of the following test results indicates that it is phloem sap?

1. Acidic

2. Alkaline

3. Low refractive index

4. Absence of sugar

92. Oxidative phosphorylation is

1. formation of ATP by transfer of phosphate group from a substrate to ATP

2. oxidation of phosphate group in ATP

3. addition of phosphate group in ATP

4. formation of ATP by energy released from electrons removed during substrate oxidation

93. Radial symmetry is found in the flowers of

1. *Brassica*

2. *Trifolium*

3. *Pisum*

4. *Cassia*

94. Free central placentation is found in

1. *Dianthus*
2. *Argemone*
3. *Brassica*
4. *Citrus*

95. Which of the biomolecules is common to respiratory mediated breakdown of fats, carbohydrates and proteins?

1. Glucose 6 phosphate
2. Fructose 1,6 bisphosphate
3. Pyruvic acid
4. Acetyl CoA

96. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?

1. G_1/S
2. G_2/M
3. M
4. Both G_2/M and M

97. Which one of the following statements is wrong?

1. Algae increase the level of dissolved oxygen in the immediate environment.
2. Algin is obtained from red algae, and carrageenan from brown algae.
3. Agar-agar is obtained from *Gelidium* and *Gracilaria*.
4. *Laminaria* and *Sargassum* are used as food.

98. Which is essential for the growth of root tip?

1. Zn
2. Fe
3. Ca
4. Mn

99. The mechanism that causes a gene to move from one linkage group to another is called

1. inversion
2. duplication
3. translocation
4. crossing-over

100. Phytochrome is a

1. flavoprotein
2. glycoprotein
3. lipoprotein
4. chromoprotein

101. How many plants among *Indigofera*, *Sesbania*, *Salvia*, *Allium*, *Aloe*, mustard, groundnut, radish, gram and turnip have stamens with different lengths in their flowers?

1. Three

2. Four

3. Five

4. Six

102. Which of the following restriction enzymes produces blunt ends?

1. *Sal*I

2. *Eco*RV

3. *Xho*I

4. *Hin*dIII

103. You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots?

1. IAA and gibberellin

2. Auxin and cytokinin

3. Auxin and abscisic acid

4. Gibberellin and abscisic acid

104. Match column I with column II and select the correct option using the codes given below.

	Column-I		**Column-II**
A.	Citric Acid	(i)	*Trichoderma*
B.	Cyclosporin A	(ii)	*Clostridium*
C.	Statins	(iii)	*Aspergillus*
D.	Butyric acid	(iv)	*Monascus*

	A	**B**	**C**	**D**
1.	iii	i	ii	iv
2.	iii	i	iv	ii
3.	i	iv	ii	iii
4.	iii	iv	i	ii

1. 1

2. 2

3. 3

4. 4

105. Match column-I with column-II for housefly classification and select the correct option.

	Column-I		**Column-II**
(A)	Family	(I)	Diptera
(B)	Order	(II)	Arthropoda
(C)	Class	(III)	Muscidae
(D)	Phylum	(IV)	Insecta

	A	**B**	**C**	**D**
1.	III	I	IV	II
2.	III	II	IV	I
3.	IV	III	II	I
4.	IV	II	I	III

1. 1

2. 2

3. 3

4. 4

106. Match column I with column II and select the correct option using the codes given below.

	Column-I		**Column-II**
A.	Pistils fused together	(i)	Gametogenesis
B.	Formation of gametes	(ii)	Pistillate

C.	Hyphae of higher Ascomycetes	(iii)	Syncarpous
D.	Unisexual female flower	(iv)	Dikaryotic

	A	B	C	D
1.	iv	iii	i	ii
2.	ii	i	iv	iii
3.	i	ii	iv	iii
4.	iii	i	iv	ii

1. 1
2. 2
3. 3
4. 4

107. Match the stages of meiosis in column I to their characteristic features in column II and select the correct option using the codes given below.

	Column-I		Column-II
A.	Pachytene	(i)	Pairing of homologous chromosomes
B.	Metaphase I	(ii)	Terminalisation of chiasmata
C.	Diakinesis	(iii)	Crossing-over takes place
D.	Zygotene	(iv)	Chromosomes align at equatorial plate

	A	B	C	D
1.	iii	iv	ii	i
2.	i	iv	ii	iii
3.	ii	iv	iii	i
4.	iv	iii	ii	i

1. 1
2. 2
3. 3
4. 4

108. During cell growth, DNA synthesis takes place

1. S-phase
2. G_1 phase
3. G_2 phase
4. M phase

109. A true breeding plant is

1. one that is able to breed on its own
2. produced due to cross-pollination among unrelated plants
3. near homozygous and produces offspring of its own kind
4. always homozygous recessive in its genetic constitution

110. Taylor conducted the experiments to prove semi-conservative mode of chromosome replication on

1. *Vinca rosea*
2. *Vicia faba*
3. *Drosophila melanogaster*
4. *E. coli*.

111.

A molecule that can act as a genetic material must fulfill the traits given below, except

1. it should be able to express itself in the form of 'Mendelian characters'
2. it should be able to generate its replica.
3. it should be structurally and chemically unstable.
4. it should provide the scope for slow changes that are required for evolution.

112. Select the wrong statement.

1. Bacterial cell wall is made up of peptidoglycan.
2. Pili and fimbriae are mainly involved in motility of bacterial cells.
3. Cyanobacteria lack flagellated cells.
4. Mycoplasma is a wall-less microorganism.

113. Methanogens belong to

1. Eubacteria
2. Archaebacteria
3. Dinoflagellates
4. Slime moulds.

114. Cortex is the region found between

1. epidermis and stele
2. pericycle and endodermis
3. endodermis and pith
4. endodermis and vascular bundle.

115. Which one of the following statements is not correct?

1. Offspring produced by the asexual reproduction are called clone.
2. Microscopic, motile, asexual reproductive structures are called zoospores.
3. In potato, banana and ginger, the plantlets arise from, the internodes present in the modified stem.
4. Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.

116. The equivalent of a structural gene is

1. muton
2. cistron
3. operon
4. recon

117. Study the four statements (A-D) given below and select the two correct ones out of them.
A. Definition of biological species was given by Ernst Mayr.

B. Photoperiod does not affect reproduction in plants.
C. Binomial nomenclature system was given by R.H. Whittaker.
D. In unicellular organisms, reproduction is synonymous with growth.
The two correct statements are

1. B and C
2. C and D
3. A and D
4. A and B

118. Select the **mismatch**.

1. Gas vacuoles - Green bacteria
2. Large central vacuoles - Animal cells
3. Protists - Eukaryotes
4. Methanogens - Prokaryotes

119. DNA-dependent RNA polymerase catalyses transcription on one strand of the DNA which is called the

1. template strand
2. coding strand
3. alpha strand
4. antistrand

120. Select the wrong statement.

1. The walls of diatoms are easily destructible.
2. 'Diatomaceous earth' is formed by the cell walls of diatoms.
3. Diatoms are chief producers in the oceans.
4. Diatoms are microscopic and float passively in water.

121. A cell organelle containing hydrolytic enzymes is

1. lysosome
2. microsome
3. ribosome
4. mesosome.

122. The term 'polyadelphous' is related to

1. gynoecium
2. androecium
3. corolla
4. calyx.

123. Which one of the following generates new genetic combinations leading to variation?

1. Vegetative reproduction
2. Parthenogenesis
3. Sexual reproduction
4. Nucellar polyembryony

124. In majority of angiosperms

1. egg has a filiform apparatus

2. there are numerous antipodal cells
3. reduction division occurs in the megaspore mother cells
4. a small central cell is present in that embryo sac

125. The ovule of an angiosperm is technically equivalent to

1. megasporangium
2. megasporophyll
3. megaspore mother cell
4. megaspore.

126. Pollination in water hyacinth and water lily is brought about by the agency of

1. water
2. insects or wind
3. birds
4. bats

127. Which of the following rRNAs acts as structural RNA as well as ribozyme in bacteria?

1. 5S rRNA
2. 18S rRNA
3. 23S rRNA
4. 5.8S rRNA

128. Which one of the following is **wrong** for fungi?

1. They are eukaryotic
2. All fungi possess a purely cellulosic cell wall.
3. They are heterotrophic.
4. They are both unicellular and multicellular.

129. Conifers are adapted to tolerate extreme environmental conditions because of

1. broad, hard leaves
2. superficial stomata
3. thick cuticle
4. presence of vessels.

130. The label of a herbarium sheet does not carry information on

1. date of collection
2. name of collector
3. local names
4. height of the plant.

131. The balloon-shaped structures called tyloses

1. originate in the lumen of vessels
2. characterise the sapwood
3. are extensions of xylem parenchyma cells into vessels
4. are linked to the ascent of sap through xylem vessels.

132. The process which makes major difference between C_3 and C_4 plants is

1. glycolysis
2. Calvin cycle
3. photorespiration
4. respiration

Zoology

Section A

133. Which of the following is correctly matched?

1. Aerenchyma - *Opuntia*
2. Age pyramid - Biome
3. *Parthenium hysterophorus* - Threat to biodiversity
4. Stratification - Population

134. Choose the correct statement.

1. Nociceptors respond to changes in pressure
2. Meissner's corpuscles are thermoreceptors.
3. Photoreceptors in the human eye are depolarised during darkness and become hyperpolarised in response to the light stimulus.
4. Receptors do not produce graded potentials

135. Match column I with column II and select the correct option using the codes given below.

Column-I		Column-II
A. Mons pubis	(i)	Embryo formation
B Antrum	(ii)	Sperm
C. Trophectoderm	(iii)	Female external genitalia
D. Nebenkern	(iv)	Graafian follicle

	A	B	C	D
1	iii	iv	ii	i
2	iii	iv	i	ii
3	iii	i	iv	ii
4	i	iv	iii	ii

1. 1
2. 2
3. 3
4. 4

136. If'+' sign is assigned to beneficial interaction, '- ' sign to detrimental and 'O' sign to neutral interaction, then the population interaction represented by'+"-' refers to

1. mutualism
2. amensalism
3. commensalism
4. parasitism

137. Which of the following depicts the correct pathway of transport of sperms?

1. Rete testis ➔ Efferent ductules ➔ Epididymis ➔ Vas deferens
2. Rete testis ➔ Epididymis ➔ Efferent ductules ➔ Vas deferens
3. Rete testis ➔ Vas deferens ➔ Efferent ductules ➔ Epididymis
4. Efferent ductules ➔ Rete testis ➔ Vas deferens ➔ Epididymis

138. Serum differs from blood in

1. lacking globulins
2. lacking albumins
3. lacking clotting factors
4. lacking antibodies

139. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because

1. there is a negative pressure in the lungs
2. there is a negative intrapleural pressure pulling at the lung walls
3. there is a positive intrapleural pressure
4. pressure in the lungs is higher than the atmospheric pressure

140. Smooth muscles are

1. involuntary, fusiform, non-striated
2. voluntary, multinucleate, cylindrical
3. involuntary, cylindrical, striated
4. voluntary, spindle-shaped, uninucleate

141. The partial pressure of oxygen in the alveoli of the lungs is

1. equal to that in the blood
2. more than that in the blood
3. less than that in the blood
4. less than that of carbon dioxide

142. Which of the following is hormone-releasing IUD?

1. LNG 20
2. Multiload 375
3. Lippes loop
4. Cu 7

143. Which of the following is **incorrect** regarding vasectomy?

1. No sperm occurs in seminal fluid
2. No sperm occurs in epididymis
3. Vasa deferentia is cut and tied
4. Irreversible sterility

144. Biochemical Oxygen Demand (BOD) may not be a good index for

pollution for water bodies receiving effluents from

1. domestic sewage
2. dairy industry
3. petroleum industry
4. sugar industry

145. A lake which is rich in organic waste may result in

1. increased population of aquatic organisms due to minerals
2. drying of the lake due to algal bloom
3. increased population of fish due to lots of nutrients
4. mortality of fish due to lack of oxygen

146. The highest DDT concentration in aquatic food chain shall occur in

1. phytoplankton
2. seagull
3. crab
4. eel

147. If a colour-blind man marries a woman who is homozygous for normal colour vision, the probability of their son being colour-blind is

1. 0
2. 0.5
3. 0.75
4. 1

148. Several hormones like hCG, hPL, estrogen, progesterone are produced by

1. ovary
2. placenta
3. fallopian tube
4. pituitary

149. Which of the following National Parks is home to the famous musk deer or hangul?

1. Keibul Lamjao National Park, Manipur
2. Bandhavgarh National Park, Madhya Pradesh
3. Eaglenest Wildlife Sanctuary, Arunachal Pradesh
4. Dachigam National Park, Jammu and Kashmir

150. Embryo with more than 16 blastomeres, formed due to *in vitro* fertilisation is transferred into

1. uterus
2. fallopian tube
3. fimbriae
4. cervix

151. The principle of competitive exclusion was stated by

1. C. Darwin
2. G.F. Gause
3. Mac Arthur
4. Verhulst and Pearl.

152. Which of the following is the correct sequence of events in the origin of life?
I. Formation of protobionts
II. Synthesis of organic monomers
III. Synthesis of organic polymers
IV. Formation of DNA-based genetic systems

1. I, II, III, IV
2. I, III, II, IV
3. II, III, I, IV
4. II, III, IV, I

153. Name the ion responsible for unmasking of active sites for myosin for cross-bridge activity during muscle contraction.

1. Calcium
2. Magnesium
3. Sodium
4. Potassium

154. Graves' disease is caused due to

1. hyposecretion of thyroid gland
2. hypersecretion of thyroid gland
3. hyposecretion of adrenal gland
4. hypersecretion of adrenal gland

155. The posterior pituitary gland is **not** a ' true' endocrine gland because

1. it is provided with a duct
2. it only stores and releases hormones
3. it is under the regulation of hypothalamus
4. it secretes enzymes

156. Name the blood cells, whose reduction in number can cause clotting disorder, leading to excessive loss of blood from the body.

1. Erythrocytes
2. Leucocytes
3. Neutrophils
4. Thrombocytes

157. Which of the following sets of diseases is caused by bacteria?

1. Cholera and tetanus
2. Typhoid and smallpox
3. Tetanus and mumps
4. Herpes and influenza

158. Red list contains data or information on

1. all economically important plants

2. plants whose products are in international trade

3. threatened species

4. marine vertebrates only

159. The part of nephron involved in active reabsorption of sodium is

1. distal convoluted tubule

2. proximal convoluted tubule

3. Bowman's capsule

4. descending limb of Henle's loop.

160. The primary producers of the deep-sea hydrothermal vent ecosystem are

1. green algae

2. chemosynthetic bacteria

3. blue-green algae

4. coral reefs

161. Which of the following is correct for r-selected species?

1. Large number of progeny with small size

2. Large number of progeny with large size

3. Small number of progeny with small size

4. Small number of progenywith large size

162. Name a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilisation.

1. Insulin

2. Glucagon

3. Secretin

4. Gastrin

163. Genetic drift operates in

1. small isolated population

2. large isolated population

3. non-reproductive population

4. slow reproductive population

164. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by

1. p^2

2. 2pq

3. pq

4. q^2

165. Choose the correct statement.

1. All mammals are viviparous.

2. All cyclostomes do not possess jaws and paired fins.

3. All reptiles have a three-chambered heart.

4. All pisces have gills covered by an operculum.

166.

In male cockroaches, sperm is stored in which part of the reproductive system?

1. Seminal vesicles
2. Mushroom glands
3. Testis
4. Vas deferens

167. Which hormones do stimulate the production of pancreatic juice and bicarbonate?

1. Angiotensin and epinephrine
2. Gastrin and insulin
3. Cholecystokinin and secretin
4. Insulin and glucagon

168. Which of the following is correct regarding AIDS causative agent HIV?

1. HIV is enveloped virus containing one molecule of single-stranded RNA and one molecule of reverse transcriptase.
2. HIV is enveloped virus that contains two identical molecules of single-stranded RNA and two molecules of reverse transcriptase.
3. HIV is unenveloped retrovirus.
4. HIV does not escape but attacks the acquired immune response.

169. Interspecific hybridisation is the mating of

1. animals within same breed without having common ancestors
2. two different related species
3. superior males and females of different breeds
4. more closely related individuals within same breed for 4-6 generations

170. Which kind of therapy was given in 1990 to a four-year-old girl with adenosine deaminase (ADA) deficiency?

1. Gene therapy
2. Chemotherapy
3. Immunotherapy
4. Radiation therapy

171. How many hotspots of biodiversity in the world have been identified till date by Norman Myers?

1. 17
2. 25
3. 34
4. 43

172. Osteoporosis, an age-related disease of skeletal system, may occur due to

1. immune disorder affecting neuromuscular junction leading to fatigue
2. high concentration of Ca^{++} and Na^{+}
3. decreased level of estrogen
4. accumulation of uric acid leading to inflammation of joints

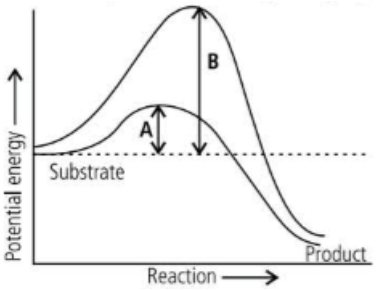
173. The chronological order of human evolution from early to the recent is

1. *Australopithecus* → *Ramapithecus* →*Homo habilis* →*Homo erectus*
2. *Ramapithecus* → *Australopithecus* →*Homo habilis* →*Homo erectus*
3. *Ramapithecus* →*Homo habilis* →*Australopithecus* →*Homo erectus*
4. *Australopithecus* →*Homo habilis* →*Ramapithecus* →*Homo erectus*

174. Among the following edible fishes, which one is a marine fish having rich source of omega-3 fatty acids?

1. *Mystus*
2. Mangur
3. Mrigala
4. Mackerel

175. Which of the following describes the given graph correctly?



1. Endothermic reaction with energy A in presence of enzyme and B in absence of enzyme
2. Exothermic reaction with energy A in presence of enzyme and B in absence of enzyme.
3. Endothermic reaction with energy A in absence of enzyme and B in presence of enzyme.
4. Exothermic reaction with energy A in absence of enzyme and B in presence of enzyme.

176. Which of the following is the least likely to be involved in stabilising the three-dimensional folding of most proteins?

1. Hydrogen bonds
2. Electrostatic interaction
3. Hydrophobic interaction
4. Ester bonds

177. A non-proteinaceous enzyme is

1. lysozyme
2. ribozyme

3. ligase

4. deoxyribonuclease.

178. Stirred-tank bioreactors have been designed for

1. purification of product

2. addition of preservatives to the product

3. availability of oxygen throughout the process

4. ensuring anaerobic conditions in the culture vessel

179. Which of the following is **not** a component of downstream processing?

1. Separation

2. Purification

3. Preservation

4. Expression

180. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using

1. *Eco*RI

2. *Taq* polymerase

3. polymerase III

4. ligase

NEET 2016-I

Test Instructions

1. Total duration of this test is **180** minutes.
2. This test has 4 subjects consisting of
   180 questions in total.
3. There are **4** total sections in the test.
4. Sections Info :
   Physics
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Chemistry
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Botany
      a. **Section A** has **42** questions, compulsory questions **42**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Zoology
      a. **Section A** has **48** questions, compulsory questions **48**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
5. Total marks for this test is **720** marks.
6. No marks will be deducted for unattempted questions.
7. This test can be submitted only once.
8. Once the test has been submitted, you cannot edit the responses.
9. Results will be anounced post test submission.
10. The test will be auto-submitted once the timer ends.

Physics

Section A

1. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is

   1. 45^0
   2. 180^0
   3. 0^0
   4. 90^0

2. What is the minimum velocity with which a body of mass m must enter at the bottom of a vertical loop of radius R so that it can complete the loop?

   1. $\sqrt{3gR}$
   2. $\sqrt{5gR}$
   3. $\sqrt{gR}$
   4. $\sqrt{2gR}$

3. From a disc of radius R and mass M a circular hole of diameter R whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?

   1. $11MR^2/32$
   2. $9MR^2/32$
   3. $15MR^2/32$
   4. $13MR^2/32$

4. A uniform circular disc of radius $50cm$ at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of $2.0\,\text{rads}^{-2}$. Its net acceleration in ms^{-2} at the end of $2s$ is approximately

   1. 6.0
   2. 3.0
   3. 8.0
   4. 7.0

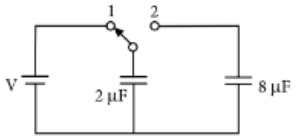
5. Coefficient of linear expansion of brass and steel rods are α_1 and α_2 Lengths of brass and steel rods are $_1$ and $_2$ respectively. If $(_2 - _1)$ is maintained same at all temperatures, which one of the following relations holds good?

   1. $\alpha_1^2 {}_2 = \alpha_2^2 {}_1$
   2. $\alpha_1 {}_1 = \alpha_2 {}_2$
   3. $\alpha_1 {}_2 = \alpha_2 {}_1$
   4. $\alpha_1 \frac{2}{2} = \alpha_2 \frac{2}{1}$

6. A piece of ice falls from a height h so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of h is [latent heat of ice is $3.4 \times 10^5 \text{J/kg}$ and $\text{g} = 10\ \text{N/kg}$]

   1. 136 km
   2. 68 km
   3. 34 km
   4. 544 km

7. A capacitor of $2\mu F$ is charged as shown in the diagram. When the switch S is turned to position 2 , the percentage of its stored energy dissipated is



   1. 75%
   2. 80%
   3. 0%
   4. 20%

8. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$ where a and b are positive constants. The total heat produced in R is

   1. $\frac{a^3R}{2b}$
   2. $\frac{a^3R}{b}$

3. $\frac{a^3R}{6b}$

4. $\frac{a^3R}{3b}$

9. A long straight wire of radius a carries a steady current I The current is uniformly distributed over its cross-section. The ratio of the magnetic fields B and B', at radial distances $\frac{a}{2}$ and $2a$ respectively, from the axis of the wire is

1. 1
2. 4
3. $\frac{1}{4}$
4. $\frac{1}{2}$

10. A small signal voltage $V(t) = V_0 \sin \omega t$ is applied across an ideal capacitor C

1. Current $I(t)$ is in phase with voltage $V(t)$
2. Current $I(t)$ leads voltage $V(t)$ by 180°.
3. Current $I(t)$, lags voltage $V(t)$ by 90°
4. Over a full cycle the capacitor C does not consume any energy from the voltage source.

11. An inductor 20 mH,a capacitor 50μF and a resistor 40Ω are connected in series across a source of emf $V = 10 \sin 340t$.The power loss in A.C. circuit is

1. 0.76 W
2. 0.89 W
3. 0.51 W
4. 0.67 W

12. Out of the following options which one can be used to produce a propagating electromagnetic wave?

1. A chargeless particle
2. An accelerating charge
3. A charge moving at constant velocity
4. A stationary charge

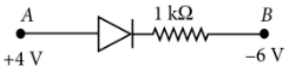
13. The intensity at the maximum in a Young's double slit experiment is I_0. Distance between two slits is $d = 5\lambda$, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10d$?

1. $\frac{3}{4}I_0$
2. $\frac{I_0}{2}$
3. I_0
4. $\frac{I_0}{4}$

14. In a diffraction pattern due to a single slit of width a, the first minimum is observed at an angle 30^0 when light of wavelength 5000Å is incident on the slit. The first secondary maximum is observed at an angle of:

1. $\sin^{-1}\left(\frac{1}{2}\right)$
2. $\sin^{-1}\left(\frac{3}{4}\right)$
3. $\sin^{-1}\left(\frac{1}{4}\right)$
4. $\sin^{-1}\left(\frac{2}{3}\right)$

15. Consider the junction diode as ideal. The value of current flowing through AB is



1. 10^{-1} A
2. 10^{-3} A
3. 0 A
4. 10^{-2} A

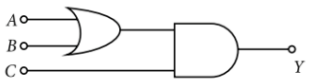
16. A npn transistor is connected in common emitter configuration in a given amplifier. A load resistance of 800Ω is connected in the collector circuit and the voltage drop across it is $0.8V$. If the current amplification factor is 0.96 and the input resistance of the circuit is 192Ω,the voltage gain and the power gain of the amplifier will respectively be

1. 4, 4
2. 4, 3.69

3. 4, 3.84

4. 3.69, 3.84

17. To get output 1 for the following circuit, the correct choice for the input is



1. $A = 1, B = 1, C = 0$
2. $A = 1, B = 0, C = 1$
3. $A = 0, B = 1, C = 0$
4. $A = 1, B = 0, C = 0$

18. A particle moves so that its position vector is given by $\vec{r} = \cos\omega t\ \hat{x} + \sin\omega t\ \hat{y}$, where ω is a constant.

Which of the following is true?

1. Velocity is perpendicular to $\vec{r}$ and acceleration is directed towards the origin.
2. Velocity is perpendicular to $\vec{r}$ and acceleration is directed away from the origin
3. Velocity and acceleration both are perpendicular to $\vec{r}$
4. Velocity and acceleration both are parallel to $\vec{r}$

19. A refrigerator works between 4^0C and 30^0C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is (Take 1 cal = 4.2 Joules)

1. 236.5 W
2. 2365 W
3. 2.365 W
4. 23.65 W

20. If the velocity of a particle is $v = At + Bt^2$, where $A\ and\ B$ are constants, then the distance travelled by it between $1s\ and\ 2s$ is

1. $\frac{3}{2}A + \frac{7}{3}B$
2. $\frac{A}{2} + \frac{B}{3}$
3. $\frac{3}{2}A + 4B$
4. $3\ A + 7\ B$

21. A car is negotiating a curved road of radius R. The road is banked at an angle θ. The coefficient of friction between the tyres of the car and the road is μ_s. The maximum safe velocity on this road is

1. $\sqrt{\frac{g}{R}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$
2. $\sqrt{\frac{g}{R^2}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$
3. $\sqrt{gR^2\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$
4. $\sqrt{gR\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

22. A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion?

1. $0.18\ m/s^2$
2. $0.2\ m/s^2$
3. $0.1\ m/s^2$
4. $0.15\ m/s^2$

23. A body of mass $1kg$ begins to move under the action of a time dependent force $\vec{\mathrm{F}} = \left(2\mathrm{t}\ \hat{\mathrm{i}} + 3\mathrm{t}^2\ \hat{\mathrm{j}}\right)$ N, where $\hat{i}\ and\ \hat{j}$ are unit vectors along $x-$axis and $y-$axis respectively. What power will be developed by the force at the time t?

1. $\left(2t^3 + 3t^4\right)$ W
2. $\left(2t^3 + 3t^5\right)$ W
3. $\left(2t^2 + 3t^3\right)$ W
4. $\left(2t^2 + 4t^4\right)$ W

24. A disk and a sphere of same radius but different masses roll off on two inclined planes of the same altitude and length. Which one of

the two objects gets to the bottom of the plane first?

1. Both reach at the same time
2. Depends on their masses
3. Disk
4. Sphere

25. At what height from the surface of earth the gravitation potential and the value of g are $-5.4 \times 10^7\ J\ kg^{-1}$ and $6.0\ m\ s^{-2}$ respectively? Take the radius of earth as $6400\ km$

1. $1400\ km$
2. $2000\ km$
3. $2600\ km$
4. $1600\ km$

26. The ratio of escape velocity at earth (v_e) to the escape velocity at a planet (v_p) whose radius and mean density are twice as that of earth is:

1. $1:\ 4$
2. $1:\sqrt{2}$
3. $1:\ 2$
4. $1:2\sqrt{2}$

27. Two non-mixing liquids of densities ρ and $n\rho\ (n>1)$ are put in a container. The height of each liquid is h. A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length $pL\ (\ p<1\ )$ in the denser liquid. The density d is equal to

1. $\{2+(n-1)p\}\rho$
2. $\{1+(n-1)p\}\rho$
3. $\{1+(n+1)p\}\rho$
4. $\{2+(n+1)p\}\rho$

28. A black body is at a temperature of $5760\ \mathrm{K}$. The energy of radiation emitted by the body at wavelength $250\ nm$ is U_1 , at wavelength $500\ \mathrm{nm}$ is U_2 and that at $1000\ \mathrm{nm}$ is U_3. Wien's constant, $\mathrm{b}=2.88\times10^6\ \mathrm{nmK}$. Which of the following is correct?

1. $U_1>U_2$
2. $\mathrm{U}_3<\mathrm{U}_2>\mathrm{U}_1$
3. $\mathrm{U}_1=0$
4. $U_3=0$

29. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process until its volume is again reduced to half. Then

1. Compressing the gas isothermally or adiabatically will require the same amount of work.
2. Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.
3. Compressing the gas isothermally will require more work to be done.
4. Compressing the gas through adiabatic process will require more work to be done.

30. The molecules of a given mass of a gas have r.m.s. velocity of $200\ \mathrm{m\ s^{-1}}$ at $27^{\circ}\mathrm{C}$ and $1.0\times10^5\ \mathrm{N\ m^{-2}}$ pressure. When the temperature and pressure of the gas are respectively, $127^{\circ}\mathrm{C}$ and $0.05\times10^5\ \mathrm{N\ m^{-2}}$ the r.m.s. velocity of its molecules in ms^{-1}

1. $\frac{100\sqrt{2}}{3}ms^{-1}$
2. $\frac{100}{3}ms^{-1}$
3. $100\sqrt{2}ms^{-1}$
4. $\frac{400}{\sqrt{3}}ms^{-1}$

31. A uniform rope of length L and mass m_1 hangs vertically from a rigid support. A block of mass m_2 is attached to the free end of the rope. A transverse pulse of wavelength λ_1 is produced at the lower end of the rope. The wavelength of the pulse when it reaches the top of the rope is λ_2. The ratio $\frac{\lambda_2}{\lambda_1}$ is

1. $\sqrt{\frac{m_2}{m_1}}$
2. $\sqrt{\frac{m_1+m_2}{m_1}}$

3. $\sqrt{\frac{m_1}{m_2}}$

4. $\sqrt{\frac{m_1+m_2}{m_2}}$

32. An air column, closed at one end and open at the other, resonates with a tuning fork when the smallest length of the column is 50cm. The next larger length of the column resonating with the same tuning fork is

1. 150cm
2. 200cm
3. 66.7cm
4. 100cm

33. A siren emitting a sound of frequency 800 Hz moves away from an observer towards a cliff at a speed of$15\ \text{m s}^{-1}$. Then, the frequency of sound that the observer hears in the echo reflected from the cliff is? (The Velocity of Sound in air$= 330\ \text{m s}^{-1}$)

1. 838 Hz
2. 885 Hz
3. 765 Hz
4. 800 Hz

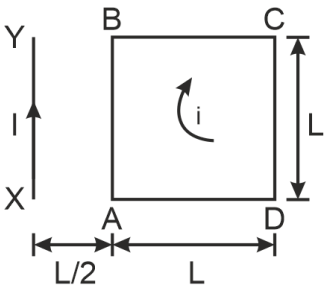
34. Two identical charged spheres suspended from a common point by two massless strings of lengths l, are initially at a distance d(d<<l) apart because of their mutual repulsion. The charges begin to leak from both the spheres at a constant rate. As a result, the spheres approach each other with a velocity V. Then V varies as a function of the distance x between the spheres, as

1. $v \propto x^{-1/2}$
2. $v \propto x^{-1}$
3. $y \propto x^{1/2}$
4. $v \propto x$

35. A potentiometer wire is $100cm$ long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at $50cm$ and $10cm$ from the positive end of the wire in the two cases. The ratio of emf's is

1. 3 : 4
2. 3 : 2
3. 5 : 1
4. 5 : 4

36. A square loop ABCD carrying a current i, is placed near and coplanar with a long straight conductor XY carrying a current I, the net force on the loop will be



1. $\frac{2\mu_0 IiL}{3\pi}$
2. $\frac{\mu_0 IiL}{2\pi}$
3. $\frac{2\mu_0 Ii}{3\pi}$
4. $\frac{\mu_0 Ii}{2\pi}$

37. The magnetic susceptibility is negative for

1. ferromagnetic material only
2. paramagnetic and ferromagnetic materials
3. diamagnetic material only
4. paramagnetic material only

38. A long solenoid has 1000 turns. When a current of 4 A flows through it, the magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self-inductance of the solenoid is

1. 2H
2. 1H
3. 4H
4. 3H

39. Match the corresponding entries of column 1 with column 2.[Where m is the magnification

produced by the mirror]

Column-I	Column-II
(A) m = - 2	(p) Convex mirror
(B) $m = -\frac{1}{2}$	(q) Concave mirror
(C) m = 2	(r) Real image
(D) $m = +\frac{1}{2}$	(s) Virtual image

	(A)	(B)	(C)	(D)
(1)	p,s	q,r	q,s	q,r
(2)	r,s	q,s	q,r	p,s
(3)	q,r	q,r	q,s	p,s
(4)	p,r	p,s	p,q	r,s

1. 1
2. 2
3. 3
4. 4

40. The angle of incidence for a ray of light at a refracting surface of a prism is 45^0. The angle of prism is 60^0. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are

1. $45^\circ; \sqrt{2}$
2. $30^\circ; \frac{1}{\sqrt{2}}$
3. $45^\circ; \frac{1}{\sqrt{2}}$
4. $30^\circ; \sqrt{2}$

41. An astronomical telescope has objective and eyepiece of focal lengths $40cm$ and $4cm$ respectively. To view an object $200cm$ away from the objective, the lenses must be separated by a distance

1. 50 cm
2. 54 cm
3. 37.3 cm
4. 46 cm

42. An electron of mass m and a photon have same energy E. The ratio of de-Broglie wavelengths associated with them is

1. $c(2mE)^{\frac{1}{2}}$
2. $\frac{1}{c}\left(\frac{2m}{E}\right)^{\frac{1}{2}}$
3. $\frac{1}{c}\left(\frac{E}{2m}\right)^{\frac{1}{2}}$
4. $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

(c being velocity of light)

43. When a metallic surface is illuminated with radiation of wavelength λ the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ the stopping potential is $\frac{V}{4}$, The threshold wavelength for the metallic surface is

1. $\frac{5}{2}\lambda$
2. 3λ
3. 4λ
4. 5λ

44. When an α -particle of mass m moving with velocity v bombards on a heavy nucleus of charge Ze, its distance of closest approach from the nucleus depends on m as

1. $\frac{1}{m^2}$
2. m
3. $\frac{1}{m}$
4. $\frac{1}{\sqrt{m}}$

45. Given the value of Rydberg constant is $10^7 m^{-1}$, the wave number of the last line of the Balmer series in hydrogen spectrum will be

1. $0.25 \times 10^7\ \mathrm{m}^{-1}$
2. $2.5 \times 10^7\ \mathrm{m}^{-1}$
3. $0.025 \times 10^4\ \mathrm{m}^{-1}$
4. $0.5 \times 10^7\ \mathrm{m}^{-1}$

Chemistry

Section A

46. Match the compounds given in column I with the hybridisation and shape given in column II and mark the correct option.

Column I	Column II
A XeF_6	i distorted octahedral
B XeO_3	ii square planar
C $XeOF_4$	iii pyramidal
D XeF_4	iv square pyramidal

1. **A B C D**
(iv) (iii) (i) (ii)

2. **A B C D**
(iv) (*i*) (ii) (*iii*)

3. **A B C D**
(*i*) (iii) (iv) (ii)

4. **A B C D**
(*i*) (ii) (iv) (*iii*)

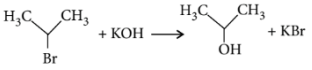
47. Equal moles of hydrogen and oxygen gases are placed in a container with a pin-hole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?

1. $\frac{3}{8}$
2. $\frac{1}{2}$
3. $\frac{1}{8}$
4. $\frac{1}{4}$

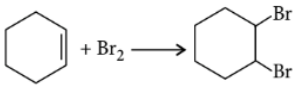
48. For the following reactions:

(A)
$CH_3\,CH_2\,CH_2\,Br + KOH \longrightarrow CH_3\,CH = CH_2 + KBr + H_2O$

(B)



(C)



Which of the following statement is correct?

1. (A) is elimination, (B)and (C) are substitution reactions.
2. (A) is substitution, (B) and (C) are addition reactions.
3. (A) and (B) are elimination reactions and (C) is addition reaction.
4. (A) is elimination, (B) is substitution and (C) is addition reaction.

49. The ionic radii of $A^+$and B^- ions are 0.98×10^{-10}m and 1.81×10^{-10}m. The coordination number of each ion in AB is

1. 8
2. 2
3. 6
4. 4

50. Lithium has a b c c structure. Its density is $530\ kg\ m^{-3}$ and its atomic mass is $6.94\ g\ mol^{-1}$. Calculate the edge length of a unit cell of lithium metal.
$\left(N_A = 6.02 \times 10^{23}\ mol^{-1}\right)$

1. 527 pm
2. 264 pm
3. 154 pm
4. 352 pm

51. Which of the following statements about the composition of the vapour over an ideal 1: 1 molar mixture of benzene and toluene is correct? Assume that the temperature is constant at 25^0C. (Given, vapour pressure data at 25^0C, benzene =12.8kPa, toluene =3.85 kPa

1. The vapour will contain equal amounts of benzene and toluene.
2. Not enough information is given to make a prediction.
3. The vapour will contain a higher percentage of benzene.
4. The vapour will contain a higher percentage of toluene.

52. Which one of the following statements is correct when SO_2 is passed through acidified $K_2\,Cr_2\,O_7$solution?

1. SO_2 is reduced .
2. Green $Cr_2(SO_4)_3$ is formed.
3. The solution turns blue.
4. The solution is decolourised .

53. The correct statement regarding the basicity of arylamines is

1. arylamines are generally more basic than alkylamines because of aryl group
2. arylamines are generally more basic than alkylamines, because the nitrogen atom in arylamines is sp-hybridised
3. arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons are delocalised by interaction with the aromatic ring π-electron system
4. arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons are not delocalised by interaction with the aromatic ring π -electron system.

54. In which of the following options the order of arrangement does not agree with the variation of property indicated against it?

1. $I < Br < Cl < F$ (increasing electron gain enthalpy)
2. $Li < Na < K < Rb$ (increasing metallic radius)
3. $Al^{3+} < Mg^{2+} < Na^{+} < F^{-}$ (increasing ionic size)
4. $B < C < N < O$ (increasing first ionisation enthalpy)

55. MY and NY_3, two nearly insoluble salts, have the same K_{sp} values of 6.2×10^{-13} at room temperature. Which statement would be true in regard to MY and NY_3 ?

1. The salts MY and NY_3 are more soluble in 0.5M KY than in pure water.
2. The addition of the salt of KY to solution of MYand NY_3 will have no effect on their solubilities.
3. The molar solubilities of MY and NY_3 in water are identical.
4. The molar solubility of MY in water is less than that of NY_3

56. Which of the following statements about hydrogen is incorrect?

1. Hydronium ion, H_3O^{+}exists freely in solution.
2. Dihydrogen does not act as a reducing agent.
3. Hydrogen has three isotopes of which tritium is the least common.
4. Hydrogen never acts as cation in ionic salts.(generally)

57. Which of the following statements is false?

1. Ca^{2+} ions are not important in maintaining the regular beating of the heart.
2. Mg^{2+} ions are important in the green parts of the plants.
3. Mg^{2+} ions form a complex with ATP.
4. Ca^{2+} ions are important in blood clotting.

58. Which is the correct statement for the given acids?

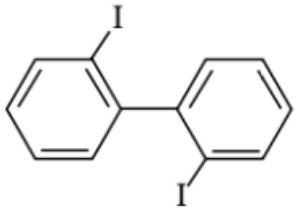
1. Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid.
2. Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid.
3. Both are diprotic acids.
4. Both are triprotic acids.

59. Which one of the following order is correct for the bond dissociation enthalpy of halogen molecules?

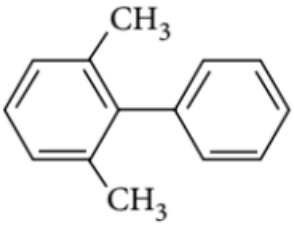
1. $Br_2 > I_2 > F_2 > Cl_2$
2. $F_2 > ClI_2 > Br_2 > I_2$
3. $I_2 > Br_2 > Cl_2 > F_2$
4. $CI_2 > Br_2 > F_2 > I_2$

60. Which of the following biphenyls is optically active?

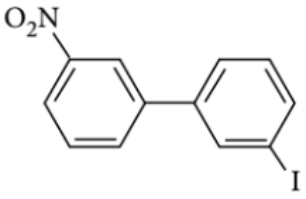
1.



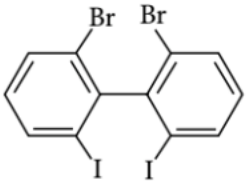
2.



3.



4.



61. The correct statement regarding the comparison of staggered and eclipsed conformations of ethane, is

1. the eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain
2. the staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain
3. the staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain
4. the eclipsed conformation of ethane is more stable than staggered conformation, because eclipsed conformation has no torsional strain.

62. In the reaction,

$$H-C\equiv C-H \xrightarrow[ii)\ CH_3CH_2Br]{i)\ NaNH_2} X \xrightarrow[ii)\ CH_3CH_2Br]{i)\ NaNH_2} Y.$$

X and Y are

1. $X = 2$ -butyne , $Y = 2$ - hexyne
2. $X = 1$ - butyne , $Y = 2$ - hexyne
3. $X = 1$ -butyne , $Y = 3$ - hexyne
4. $X = 2$ -butyne , $Y = 3$ - hexyne

63. Consider the nitration of benzene using mixture of conc.H_2SO_4 and HNO_3. If a large amount of $KHSO_4$ is added to the mixture, the rate of nitration will be

1. Unchanged
2. Doubled
3. Faster
4. Slower

64. Which of the following reagents would distinguish cis-cyclopenta-1,2-diol from the trans − isomer?

1. MnO_2
2. Aluminium isopropoxide
3. Acetone
4. Ozone

65. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon, is

1. a carbonyl compound with a hydrogen atom on its alphacarbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation

2. a carbonyl compound with a hydrogen atom on its alphacarbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism

3. a carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol

4. a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration.

66. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is

1. $\Delta H < 0$ and $\Delta S > 0$
2. $\Delta H < 0$ and $\Delta S < 0$
3. $\Delta H < 0$ and $\Delta S = 0$
4. $\Delta H > 0$ and $\Delta S < 0$

67. The product obtained as a result of a reaction of nitrogen with CaC_2 is

1. $CaCN_2$
2. $CaCN_3$
3. $Ca_2\,CN$
4. $Ca\,(CN)_2$

68. When copper is heated with conc.HNO_3 it produces

1. $Cu\,(NO_3)_2, NO$ and NO_2
2. $Cu\,(NO_3)_2$, N_2O
3. $Cu\,(NO_3)_2$, NO_2
4. $Cu\,(NO_3)_2, NO$

69. Among the following, the correct order of acidity is

1. $HClO_2 < HClO < HClO_3 < HClO_4$
2. $HClO_4 < HClO_2 < HClO < HClO_3$
3. $HClO_3 < HClO_4 < HClO_2 < HClO$
4. $HClO < HClO_2 < HClO_3 < HClO_4$

70. Consider the following liquid-vapour equilibrium.

$$\text{Liquid} \rightleftharpoons \text{Vapour}$$

Which of the following relation is correct?

1. $\frac{dlnP}{dT^2} = \frac{-\Delta H_v}{T^2}$
2. $\frac{dlnP}{dT} = \frac{\Delta H_v}{RT^2}$
3. $\frac{dlnG}{dT^2} = \frac{\Delta H_v}{RT^2}$
4. $\frac{dlnP}{dT} = \frac{-\Delta H_v}{RT}$

71. The addition of a catalyst during a chemical reaction alters which of the following quantities?

1. Enthalpy
2. Activation energy
3. Entropy
4. Internal energy

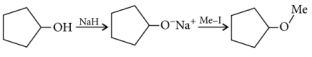
72. Fog is a colloidal solution of

1. Solid in gas
2. Gas in gas
3. Liquid in gas
4. Gas in liquid

73. Which one of the following characteristics is associated with adsorption?

1. ΔG and ΔH are negative but ΔS is positive.
2. ΔG and ΔS are negative but ΔH is positive .
3. ΔG is negative but ΔH and ΔS is positive .
4. ΔG, ΔH and ΔS all are negative

74. The reaction



can be classified as

1. dehydration reaction.
2. Williamson alcohol synthesis reaction.

3. Williamson ether synthesis reaction.

4. alcohol formation reaction.

75. The product formed by the reaction of an aldehyde with a primary amine is

1. carboxylic acid
2. aromatic acid
3. Schiff's base
4. Ketone

76. Which one given below is a non-reducing sugar?

1. Glucose
2. sucrose
3. Maltose
4. Lactose

77. In a protein molecule various amino acids are linked together by

1. peptide bond
2. dative bond
3. α -glycosidic bond
4. β -glycosidic bond

78. The correct statement regarding RNA and DNA, respectively is

1. the sugar component in RNA is arabinose and the sugar component in DNA is ribose
2. the sugar component in RNA is 2-deoxyribose and the sugar component in DNA is arabinose
3. the sugar component in RNA is arabinose and the sugar component in DNA is 2-deoxyribose
4. the sugar component in RNA is ribose and the sugar component in DNA is 2 -deoxyribose.

79. Natural rubber has

1. alternate cis- and trans-configuration
2. random cis- and trans-configuration
3. all cis-configuration
4. all trans-configuration

80. The pair of electrons in the given carbanion, $CH_3\,C \equiv C^-$, is present in which of the following orbitals?

1. sp^2
2. sp
3. 2p
4. sp^3

81. The pressure of H_2 required to make the potential of H_2 electrode zero in pure water at 298 K

1. 10^{-10} atm
2. 10^{-4} atm
3. 10^{-14} atm
4. 10^{-12} atm

82. The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are

1. $[Xe]4f^6 5d^1 6s^2$, $[Xe]4f^7 5d^1 6s^2$ and $[Xe]4f^8 5d^1 6s^2$
2. $[Xe]4f^7 6s^2$, $[Xe]4f^7 5d^1 6s^2$ and $[Xe]4f^9 6s^2$
3. $[Xe]4f^7 6s^2$, $[Xe]4f^8 6s^2$ and $[Xe]4f^8 5d^1 6s^2$
4. $[Xe]4f^6 5d^1 6s^2$, $[Xe]4f^7 5d^1 6s^2$ and $[Xe]4f^9 6s^2$

83. Which of the following has longest $C-O$ bond length? (Free $C-O$ bond length in CO is $1.128\ A^{\circ}$)

1. $[Fe(CO)_4]^{2-}$
2. $[Mn(CO)_6]^{+}$
3. $Ni(CO)_4$
4. $[Co(CO)_4]^{-}$

84.

Two electrons occupying the same orbital are distinguished by

1. azimuthal quantum number
2. spin quantum number
3. principal quantum number
4. magnetic quantum number.

85. Predict the correct order among the following ?

1. bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
2. lone pair - bond pair >bond pair - bond pair > lone pair - lone pair
3. lone pair - lone pair > lone pair - bond pair > bond pair - bond pair
4. lone pair - lone pair > bond pair - bond pair > lone pair - bond pair

86. Consider the molecules CH_4, NH_3 and H_2O. Which of the given statements is false?

1. The $H-O-H$ bond angle in H_2O is smaller than the $H-N-H$ bond angle in NH_3
2. The $H-C-H$ bond angle in CH_4 is larger than the $H-N-H$ bond angle in NH_3
3. The $H-C-H$ bond angle in CH_4,The $H-N-H$ bond angle in NH_3 ,and the $H-O-H$ bond angle in H_2O are all greater than 90^0
4. The $H-O-H$ bond angle in H_2O is larger than the $H-C-H$ bond angle in CH_4

87. At 100^0C, the vapour pressure of a solution of $6.5g$ of a solute in $100g$ water is $732\,mm$. If $k_b = 0.52$, the boiling point of this solution will be

1. 102^0C
2. 103^0C
3. 101^0C
4. 100^0C

88. The rate of first-order reaction is $0.04\ mol\ L^{-1}S^{-1}$ at 10 seconds and $0.03\ molL^{-1}S^{-1}$ at 20 seconds after initiation of the reaction. The half-life period of the reaction is

1. 44.1s
2. 54.1s
3. 24.1s
4. 34.1s

89. Match items of Column I with the items of Column II and assign the correct code :

Column I		Column II	
(A)	Cyanide process	(i)	Ultrapure Ge
(B)	Froth flotatiion process	(ii)	Dressing of ZnS
(C)	Electrolytic reduction	(iii)	Extraction of Al
(D)	Zone refining	(iv)	Extraction of Au
		(v)	Purification of Ni

	A	B	C	D
1	i	ii	iii	iv
2	iii	iv	v	i
3	iv	ii	iii	i
4	ii	iii	i	v

1. 1
2. 2
3. 3
4. 4

90. Which of the following is an analgesic?

1. Streptomycin
2. Chloromycetin
3. Novalgin
4. Penicillin

Botany

Section A

91. Which of the following statements is not correct?

1. Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.
2. Some reptiles have also been reported as pollinators in some plant species.
3. Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.
4. Insects that consume pollen or nectar without bringing about pollination are called pollen/ nectar robbers.

92. Which one of the following statements is not true?

1. Pollen grains of many species cause severe allergies.
2. Stored pollen in liquid nitrogen can be used in the crop breeding programmes.
3. Tapetum helps in the dehiscence of anther.
4. Exine of pollen grains is made up of sporopollenin

93. The primitive prokaryotes responsible for the production of biogas from the dung of ruminant animals, include the

1. methanogens
2. eubacteria
3. halophiles
4. thermoacidophiles

94. The *Avena* curvature is used for bioassay of

1. IAA
2. ethylene
3. ABA
4. GA_3

95. Specialised epidermal cells surrounding the guard cells are called

1. bulliform cells
2. lenticels
3. complementary cells
4. subsidiary cells

96. Tricarpellary, syncarpous gynoecium is found in flowers of

1. Fabaceae
2. Poaceae
3. Liliaceae
4. Solanaceae

97. Emerson's enhancement effect and red drop have been instrumental in the discovery of

1. photophosphorylation and cyclic electron transport
2. oxidative phosphorylation
3. photophosphorylation and non-cyclic electron transport
4. two photosystems operating simultaneously.

98. In a chloroplast the highest number of protons during ETS are found in

1. intermembrane space
2. antennae complex
3. stroma
4. lumen of thylakoids

99. A system of rotating crops with legume or grass pasture to improve soil structure and fertility is called

1. strip farming
2. shifting agriculture
3. ley farming
4. contour farming

100. In a test cross involving F_1 dihybrid flies, more parental type offspring were produced than the recombinant-type offspring. This indicates

1. the two genes are linked and present on the same chromosome
2. both of the characters are controlled by more than one gene
3. the two genes are located on two different chromosomes
4. chromosomes failed to separate during meiosis.

101. Nomenclature is governed by certain universal rules. Which one of the following is contrary to the rules of nomenclature?

1. The names are written in Latin and are italicised.
2. When written by hand, the names are to be underlined.
3. Biological names can be written in any language.
4. The first word of biological name represents the genus name, and the second is a specific epithet.

102. Stems modified into flat green organs performing the functions of leaves are known as

1. phylloclades
2. scales
3. cladodes
4. phyllodes

103. The standard petal of a papilionaceous corolla is also called

1. vexillum
2. corona
3. carina
4. pappus

104. Chrysophytes, Euglenoids, Dinoflagellates and Slime moulds are included in the kingdom

1. Fungi
2. Animalia
3. Monera
4. Protista

105. One of the major components of cell wall of most fungi is

1. cellulose
2. chitin
3. hemicellulose
4. peptidoglycan

106. Which of the following statements is wrong for viroids?

1. They cause infections.
2. Their RNA is of high molecular weight
3. They lack a protein coat.
4. They are smaller than viruses.

107. Which one of the following statements is wrong?

1. Eubacteria are also called false bacteria.
2. Phycomycetes are also called algal fungi.
3. Cyanobacteria are also called blue-green algae
4. Golden algae are also called desmids.

108. Water soluble pigments found in plant cell vacuoles are

1. carotenoids
2. anthocyanins
3. xanthophylls
4. chlorophylls

109. Match the terms in column I with their description in column II and choose the correct

option.

Column I		Column II
A. Dominance	(i)	Many genes govern a single character
B. Codominance	(ii)	In a heterozygous organism only one allele expresses itself
C. Pleiotropy	(iii)	In a heterozygous organism both alleles express themselves fully
D. Polygenic inheritance	(iv)	A single gene influences many characters

	A	B	C	D
1	iv	i	ii	iii
2	iv	iii	i	ii
3	ii	i	iv	iii
4	ii	iii	iv	i

1. 1
2. 2
3. 3
4. 4

110. Which of the following is not a stem modification?

1. Tendrils of cucumber
2. Flattened structures of *Opuntia*
3. Pitcher of *Nepenthes*
4. Thorns of *Citrus*

111. Which of the following would appear as the pioneer organisms on bare rocks?

1. Mosses
2. Green algae
3. Lichens
4. Liverworts

112. A complex of ribosomes attached to a single strand of RNA is known as

1. polypeptide
2. Okazaki fragment
3. polysome
4. polymer

113. Spindle fibres attach to

1. centromere of the chromosome
2. kinetosome of the chromosome
3. telomere of the chromosome
4. kinetochore of the chromosome

114. In which of the following all three are macronutrients?

1. Molybdenum, Magnesium, Manganese
2. Nitrogen, Potassium, Phosphorus
3. Boron, Zinc, Manganese
4. Iron, Copper, Molybdenum

115. Which of the following is **not** a characteristic feature during mitosis in somatic cells?

1. Chromosome movement
2. Synapsis
3. Spindle fibres
4. Disappearance of nucleolus

116. A cell at telophase stage is observed by a student in a plant brought from the field. He tells his teacher that this cell is not like other cells at telophase stage.There is no formation of cell plate and thus the cell is containing more number of chromosomes as compared to other dividing cells. This would result in

1. somaclonal variation
2. polyteny
3. aneuploidy
4. polyploidy

117. A tall true breeding garden pea plant is crossed with a dw true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of

1. 3: 1 : : Tall: Dwarf
2. 3 : 1 : : Dwarf: Tall
3. 1: 2: 1: : Tall homozygous: Tall heterozygous: Dwarf

4. 1 : 2 : 1 : : Tall heterozygous : Tall homozygous : Dwarf

118. Which of the following is wrongly matched in the given table?

	Microbe	Product	Application
1.	*Streptococcus*	Streptokinase	Removal of clot from blood vessel
2.	*Clostridium butylicum*	Lipase	Removal of oil stains
3.	*Trichoderma polysporum*	Cyclosporin A	Immuno-suppressive drug
4.	*Monascus purpureus*	Statins	Lowering of blood cholesterol

1. 1
2. 2
3. 3
4. 4

119. Water vapour comes out from the plant leaf through the stomatal opening. Through the same stomatal opening carbon dioxide diffuses into the plant during photosynthesis. Reason out the above statements using one of following options.

1. The above processes happen only during night time.
2. One process occurs during day time and the other at night.
3. Both processes can not happen simultaneously.
4. Both processes can happen together because the diffusion of water and CO_2 is different

120. In bryophytes and pteridophytes, transport of male gametes requires

1. birds
2. water
3. wind
4. insects

121. Which one of the following cell organelles is enclosed by a single membrane?

1. Lysosomes
2. Nuclei
3. Mitochondria
4. Chloroplasts

122. Which one of the following is the starter codon?

1. UAA
2. UAG
3. AUG
4. UGA

123. Mitochondria and chloroplast are

(A) semi-autonomous organelles

(B) formed by division of pre-existing organelles and they contain DNA but lack protein synthesising machinery.

Which one of the following options is correct?

1. (A) is true but (B) is false.
2. Both (A) and (B) are false.
3. Both (A) and (B) are correct.
4. (B) is true but (A) is false.

124. A plant in your garden avoids photorespiratory losses, has improved water use efficiency, shows high rates of photosynthesis at high temperatures and has improved efficiency of nitrogen utilisation. In which of the following physiological groups would you assign this plant?

1. CAM
2. Nitrogen fixer
3. C_3
4. C_4

125.

Proximal end of the filament of stamen is attached to the

1. placenta
2. thalamus or petal
3. anther
4. connective

126. The coconut water from tender coconut represents

1. free nuclear proembryo
2. free nuclear endosperm
3. endocarp
4. fleshy mesocarp.

127. Seed formation without fertilisation in flowering plants involves the process of

1. somatic hybridisation
2. apomixis
3. sporulation
4. budding

128. Select the correct statement.

1. *Sequoia* is one of the tallest tree species.
2. The leaves of gymnosperms are not well adapted to extremes of climate.
3. Gymnosperms are both homosporous and heterosporous.
4. *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms.

129. Cotyledon of maize grain is called

1. coleoptile
2. scutellum
3. plumule
4. coleorhiza

130. Microtubules are the constituents of

1. centrioles, spindle fibres and chromatin
2. centrosome, nucleosome and centrioles
3. cilia, flagella and peroxisomes
4. spindle fibres, centrioles and cilia

131. Which of the following is required as inducer (s) for the expression of Lac operon?

1. Lactose
2. Fructose
3. Glucose
4. Galactose

132. In meiosis crossing over is initiated at

1. zygotene
2. diplotene
3. pachytene
4. leptotene

Zoology

Section A

133. Following are the two statements regarding the origin of life.

(A) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.

(B) The first autotrophic organisms were the chemoautotrophs that never released oxygen.

Of the above statements which one of the following options is correct?

1. Both (A) and (B) are correct.
2. Both (A) and (B) are false.
3. (A) is correct but (B) is false.
4. (B) is correct but (A) is false.

134. Which one of the following is a characteristic feature of cropland ecosystem?

1. Absence of weeds

2. Ecological succession

3. Absence of soil organisms

4. Least genetic diversity

135. Lack of relaxation between successive stimuli in sustained muscle contraction is known as

1. tetanus

2. tonus

3. spasm

4. fatigue

136. It is much easier for a small animal to run uphill than for a large animal, because

1. small animals have a lower O_2 requirement

2. the efficiency of muscles in large animals is less than in the small animals

3. it is easier to carry a small body weight

4. smaller animals have a higher metabolic rate

137. Which of the following guards the opening of hepatopancreatic duct into the duodenum?

1. Pyloric sphincter

2. Sphincter of Oddi

3. Semilunar valve

4. Ileocaecal valve

138. Which is the National Aquatic Animal of lndia?

1. Blue whale

2. Sea-horse

3. Gangetic shark

4. River dolphin

139. Which of the following is the most important cause of animals and plants being driven to extinction?

1. Habitat loss and fragmentation

2. Co-extinctions

3. Over-exploitation

4. Alien species invasion

140. Changes in GnRH pulse frequency in females is controlled by circulating levels of

1. progesterone only

2. progesterone and inhibin

3. estrogen and progesterone

4. estrogen and inhibin

141. Identify the correct statement on 'inhibin'.

1. Is produced by granulosa cells in ovary and inhibits the secretion of LH

2. Is produced by nurse cells in testes and inhibits the secretion of LH

3. Inhibits the secretion of LH, FSH and prolactin

4. Is produced by granulosa cells in ovary and inhibits the secretion of FSH

142. When does the growth rate of a population following the logistic model equal zero? The logistic model is given as

$dN / dt = rN (1 - N / K)$

1. when N / K equals zero

2. when death rate is greater than birth rate

3. when N / K is exactly one

4. when N nears the carrying capacity of the habitat

143. Antivenom injection contains preformed antibodies while polio drops that are administered into the body contain

1. gamma globulin

2. attenuated pathogens

3. activated pathogens

4. harvested antibodies

144. In mammals, which blood vessel would normally carry largest amount of urea?

1. Hepatic vein
2. Hepatic portal vein
3. Renal vein
4. Dorsal aorta

145. Which of the following features is **not** present in *Periplaneta americana*?

1. Exoskeleton composed of N-acetylglucosamine
2. Metamerically segmented body
3. Schizocoelom as body cavity
4. Indeterminate and radial cleavage during embryonic development

146. Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers?

1. Ammonia
2. Methane
3. Nitrous oxide
4. Ozone

147. Joint Forest Management Concept was introduced in India during

1. 1980s
2. 1990s
3. 1960s
4. 1970s

148. Which of the following structures is homologous to the wing of a bird?

1. Hindlimb of rabbit
2. Flipper of whale
3. Dorsal fin of a shark
4. Wing of a moth

149. Analogous structures are a result of

1. shared ancestry
2. stabilising selection
3. divergent evolution
4. convergent evolution

150. The term ecosystem was coined by

1. E. Haeckel
2. E.Warming
3. E.P. Odum
4. A.G. Tansley

151. In context of amniocentesis, which of the following statements is **incorrect**?

1. It can be used for detection of Down's syndrome.
2. It can be used for detection of cleft palate.
3. It is usually done when a woman is between 14-16 weeks pregnant.
4. It is used for prenatal sex determination.

152. Which type of tissue correctly matches with its location?

	Tissue	Location
1	Transitional epithelium	Tip of nose
2	Cuboidal epithelium	Lining of stomach
3	Smooth muscle	Wall of intestine
4	Areolar tissue	Tendons

1. 1
2. 2
3. 3
4. 4

153. Which of the following features is **not** present in the Phylum Arthropoda?

1. Parapodia
2. Jointed appendages
3. Chitinous exoskeleton

4. Metameric segmentation

154. Reduction in pH of blood will

1. decrease the affinity of hemoglobin with oxygen
2. release bicarbonate ions by the liver
3. reduce the rate of heart beat
4. reduce the blood supply to the brain

155. In the stomach, gastric acid is secreted by the

1. peptic cells
2. acidic cells
3. gastrin secreting cells
4. parietal cells

156. Which of the following approaches does **not** give the defined action of contraceptive?

1. Hormonal contraceptives - Prevent/retard entry of sperms, prevent ovulation and fertilisation
2. Vasectomy - Prevents spermatogenesis
3. Barrier methods - Prevent fertilisation
4. Intra uterine devices - Increase phagocytosis of sperms, suppress sperm motility and fertilising capacity of sperms

157. Select the **incorrect** statement.

1. LH and FSH decrease gradually during the follicular phase.
2. LH triggers secretion of androgens from the Leydig cells.
3. FSH stimulates the Sertoli cells which help in spermiogenesis.
4. LH triggers ovulation in ovary.

158. A river with an inflow of domestic sewage rich in organic waste may result in

1. an increased production of fish due to biodegradable nutrients
2. death of fish due to lack of oxygen
3. drying of the river very soon due to algal bloom
4. increased population of aquatic food web organisms.

159. In higher vertebrates, the immune system can distinguish self-cells and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to

1. autoimmune disease
2. active immunity
3. allergic response
4. graft rejection

160. Fertilisation in humans is practically feasible only if

1. the ovum and sperms are transported simultaneously to ampullary- isthmic junction of the cervix
2. the sperms are transported into cervix within 48 hrs of release of ovum in uterus
3. the sperms are transported into vagina just after the release of ovum in fallopian tube
4. the ovum and sperms are transported simultaneously to ampullary- isthmic junction of the fallopian tube

161. Which of the following most appropriately describes haemophilia?

1. Chromosomal disorder
2. Dominant gene disorder
3. Recessive gene disorder
4. X-linked recessive gene disorder

162. Which of the following is **not** required for any of the techniques of DNA fingerprinting available at present?

1. Restriction enzymes
2. DNA-DNA hybridisation

3. Polymerase chain reaction

4. Zinc finger analysis

163. Asthma may be attributed to

1. inflammation of the trachea

2. accumulation of fluid in the lungs

3. bacterial infection of the lungs

4. allergic reaction of the mast cells in the lungs

164. Which one of the following characteristics is **not** shared by birds and mammals?

1. Viviparity

2. Homeothermy

3. Internal fertilisation

4. Double circulation

165. Which of the following characteristic features always holds true for the corresponding group of animals?

1. Possess a mouth with an upper and a lower jaw - Chordata

2. 3-chambered heart with one incompletely divided ventricle -Reptilia

3. Cartilaginous endoskeleton - Chondrichthyes

4. Viviparous - Mammalia

166. Blood pressure in the pulmonary artery is

1. more than that in the pulmonary vein

2. less than that in the venae cavae

3. same as that in the aorta

4. more than that in the carotid

167. Photosensitive compound in human eye is made up of

1. opsin and retinol

2. transducin and retinene

3. guanosine and retinal

4. opsin and retinal

168. Which of the following pairs of hormones are **not** antagonistic (having opposite effects) to each other?

1. Aldosterone - Atrial Natriuretic Factor

2. Relaxin - Inhibin

3. Parathormone - Calcitonin

4. Insulin - Glucagon

169. Which of the following statements is **not** true for cancer cells in relation to mutations?

1. Mutations inactivate the cell control.

2. Mutations inhibit production of telomerase.

3. Mutations in proto-oncogenes accelerate the cell cycle.

4. Mutations destroy telomerase inhibitor.

170. The two polypeptides of human insulin are linked together by

1. covalent bonds

2. disulphide bridges

3. hydrogen bonds

4. phosphodiester bonds

171. Name the chronic respiratory disorder caused mainly by cigarette smoking.

1. Respiratory acidosis

2. Respiratory alkalosis

3. Emphysema

4. Asthma

172. Gause's principle of competitive exclusion states that

1. no two species can occupy the same niche indefinitely for the same limiting resources

2. always larger organisms exclude smaller ones through competition

3. always more abundant species will exclude the less abundant species through competition

4. competition exclude species having different food preferences.

173. Pick out the correct statements.

(A) Haemophilia is a sex-linked recessive disease.

(B) Down's syndrome is due to aneuploidy.

(C) Phenylketonuria is an autosomal recessive gene disorder.

(D) Sickle cell anaemia is an X-linked recessive gene disorder.

1. (A), (C) and (D) are correct.

2. (A), (B) and (C) are correct.

3. (A) and (D) are correct.

4. (B) and (D) are correct.

174. The amino acid tryptophan is the precursor for the synthesis of

1. ostrogen and progesterone

2. cortisol and cortisone

3. melatonin and serotonin

4. thyroxine and triiodothyronine

175. Which of the following is a restriction endonuclease?

1. DNase I

2. RNase

3. Hind II

4. Protease

176. A typical fat molecule is made up of

1. one glycerol and one fatty acid molecule

2. three glycerol and three fatty acid molecules

3. three glycerol molecules and one fatty acid molecule

4. one glycerol and three fatty acid molecules

177. Which one of the following statements is wrong?

1. Uracil is a pyrimidine.

2. Glycine is a sulphur containing amino acid.

3. Sucrose is a disaccharide.

4. Cellulose is a polysaccharide.

178. Which of the following is **not** a feature of the plasmids?

1. Transferable

2. Single-stranded

3. Independent replication

4. Circular structure

179. The *Taq* polymerase enzyme is obtained from

1. *Bacillus subtilis*

2. *Pseudomonas putida*

3. *Thermus aquaticus*

4. *Thiobacillus ferroxidans*

180. Which part of the tobacco plant is infected by *Meloidegyne incognita*?

1. Stem

2. Root

3. Flower

4. Leaf

AIPMT 2014

Test Instructions

1. Total duration of this test is **180** minutes.
2. This test has 4 subjects consisting of
   180 questions in total.
3. There are **4** total sections in the test.
4. Sections Info :
   Physics
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Chemistry
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Botany
      a. **Section A** has **49** questions, compulsory questions **49**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Zoology
      a. **Section A** has **41** questions, compulsory questions **41**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
5. Total marks for this test is **720** marks.
6. No marks will be deducted for unattempted questions.
7. This test can be submitted only once.
8. Once the test has been submitted, you cannot edit the responses.
9. Results will be anounced post test submission.
10. The test will be auto-submitted once the timer ends.

Physics

Section A

1. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are

   1. $[FVT^{-1}]$
   2. $[FVT^{-2}]$
   3. $[FV^{-1}T^{-1}]$
   4. $[FV^{-1}T]$

2. A body of mass(4m) is lying in x–y plane at rest. It suddenly explodes into three pieces. Two pieces, each of mass (m) move perpendicular to each other with equal speeds (ν). The total kinetic energy generated due to explosion is

   1. mv^2
   2. $\frac{3}{2}mv^2$
   3. $2mv^2$
   4. $4mv^2$

3. Certain quantity of water cools from 70°C to 60°C in the first 5 minutes and to 54°C in the next 5 minutes. The temperature of the surroundings is

   1. 45°C
   2. 20°C
   3. 42°C
   4. 10°C

4. A monoatomic gas at a pressure P having a volume V expands isothermally to a volume 2V and then adiabatically to a volume 16 V. The final pressure of the gas is (Take γ = 5/3)

   1. 64 P
   2. 32 P
   3. P / 64
   4. 16 P

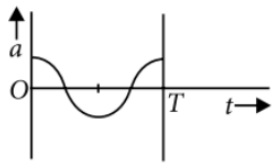
5. The oscillation of a body on a smooth horizontal surface is represented by the equation,

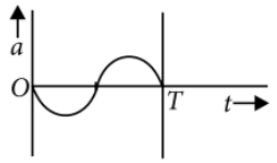
   $X = A\cos(\omega t)$

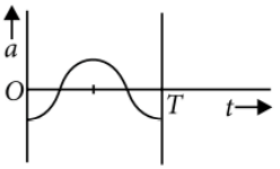
   where x = displacement at time t

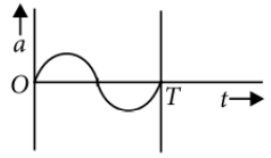
   ω=frequency of oscillation

   Which one of the following graphs shows correctly the variation a with t?

   1. 

   2. 

   3. 

   4. 

6. A conducting sphere of radius R is given a charge Q. The electric potential and the electric field at the centre of the sphere respectively are

   1. zero and $\frac{Q}{4\pi\varepsilon_0 R^2}$
   2. $\frac{Q}{4\pi\varepsilon_0 R}$ and zero
   3. $\frac{Q}{4\pi\varepsilon_0 R}$ and $\frac{Q}{4\pi\varepsilon_0 R^2}$
   4. Both are zero

7. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is 0.5 Ω. The power loss in the wire is

   1. 19.2 W
   2. 19.2 kW
   3. 19.2 J
   4. 12.2 kW

8. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The

potentiometer wire itself is 4 m long. When the resistance R, connected across the given cell, has values of
(i) infinity (ii) 9.5 Ω the balancing lengths on the potentiometer wire are found to be 3 m and 2.85 m, respectively. The value of internal resistance of the cell is

1. 0.25 Ω
2. 0.95 Ω
3. 0.5 Ω
4. 0.75 Ω

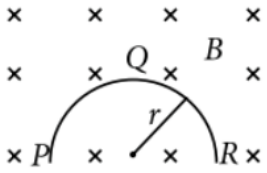
9. Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 0 is their common point for the two. The wires carry I_1 and I_2 currents, respectively. Point P is lying at distance d from 0 along a direction perpendicular to the plane containing the wires. The magnetic field at the point P will be

1. $\frac{\mu_0}{2\pi d}\left(\frac{I_1}{I_2}\right)$
2. $\frac{\mu_0}{2\pi d}(I_1+I_2)$
3. $\frac{\mu_0}{2\pi d}\left(I_1^2-I_2^2\right)$
4. $\frac{\mu_0}{2\pi d}\left(I_1^2+I_2^2\right)^{1/2}$

10. In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be

1. $\frac{1}{499}G$
2. $\frac{499}{500}G$
3. $\frac{1}{500}G$
4. $\frac{500}{499}G$

11. A thin semicircular conducting ring (PQR) of radius r is falling with its plane vertical in a horizontal magnetic field B, as shown in the figure.



The potential difference developed across the ring when its speed ν, is

1. zero
2. $\frac{Bv\pi r^2}{2}$ and P is at higher potential
3. $\pi rB\nu$ and R is a higher potential
4. 2rBv and R is at higher potential

12. A transformer having efficiency of 90% is working on 200 V and 3 kW power supply. If the current in the secondary coil is 6 A, the voltage across the secondary coil and the current in the primary coil respectively are

1. 300 V, 15 A
2. 450 V, 15 A
3. 450 V, 13.5 A
4. 600 V, 15 A

13. In the Young's double slit experiment, the intensity of light at a point on the screen (where the path difference is λ) is K, (λ - the wavelength of light used). The intensity at a point where the path difference is $\lambda/4$ will be

1. K
2. K/4
3. K/2
4. zero

14. Hydrogen atom in ground state is excited by a monochromatic radiation of λ= 975 $\overset{o}{A}$. Number of spectral lines in the resulting spectrum emitted will be

1. 3
2. 2
3. 6
4. 10

15. The binding energy per nucleon of ^7_3Li and ^4_2He Nuclei are 5.60 MeV and 7.06 MeV respectively. In the nuclear reaction

$^7_3\text{Li}+{}^1_1\text{H}\rightarrow{}^4_2\text{He}+{}^4_2\text{He}+Q$

the value of energy Q released is

1. 19.6 MeV
2. -2.4 MeV

3. 8.4 MeV

4. 17.3 MeV

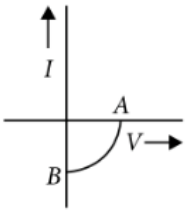
16. The barrier potential of a p-n junction depends on

1. type of semiconductor material
2. amount of doping
3. temperature

Which one of the following is correct?

1. (1) and (2) only
2. (2) only
3. (2) and (3) only
4. (1), (2) and (3)

17. The given graph presents V-I characteristic for a semiconductor device.



Which of the following statement is correct?

1. It is V-I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current.
2. It is for a solar cell and points A and B represent open circuit voltage and current, respectively.
3. It is for a photodiode and points A and B represent open circuit voltage and current, respectively.
4. It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively.

18. Copper of fixed volume V is drawn into wire of length l. When this wire is subjected to a constant force F, the extension produced in the wire is Δl. Which of the following graphs is a straight line?

1. Δl versus $1/l$
2. Δl versus l^2
3. Δl versus $1/l^2$
4. Δl versus l

19. Light with an energy flux of $25 \text{x} 10^4 \text{W m}^{-2}$ falls on a perfectly reflecting surface at normal incidence. If the surface area is $15\,\text{cm}^2$, the average force exerted on the surface is

1. 1.25×10^{-6} N
2. 2.50×10^{-6} N
3. 1.20×10^{-6} N
4. 3.0×10^{-6} N

20. A particle is moving such that its position coordinates (x,y) are (2m, 3m) at time t = 0, (6 m, 7 m) at time t = 2s and (13 m, 14m) at time t = 5s. Average velocity vector $\left(\vec{v}_{\text{av}}\right)$ from t = 0 to t = 5 s is

1. $\frac{1}{5}\left(13\hat{i}+14\hat{j}\right)$
2. $\frac{7}{3}\left(\hat{i}+\hat{j}\right)$
3. $2\left(\hat{i}+\hat{j}\right)$
4. $\frac{11}{5}\left(\hat{i}+\hat{j}\right)$

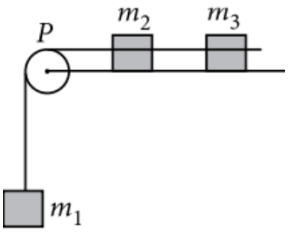
21. A projectile is fired from the surface of the earth with a velocity of 5 $ms^{-1}$and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 ms^{-1} at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is $\left(ms^{-2}\right)$ is (Given g =9.8 ms^{-2})

1. 3.5
2. 5.9
3. 16.3
4. 110.8

22. A system consists of three masses $m_1,\ m_2\ and\ m_3$ connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction= μ)

The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is

$(\text{Assume } m_1 = m_2 = m_3 = m)$

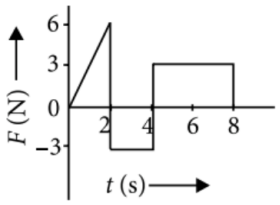


1. $\frac{g(1-g\mu)}{9}$
2. $\frac{2g\mu}{3}$

3. $\frac{g(1-2\mu)}{3}$

4. $\frac{g(1-2\mu)}{2}$

23. The force F acting on a particle of mass m is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8s is



1. 24 N s

2. 20 N s

3. 12 N s

4. 6 N s

24. A balloon with mass m is descending down with an acceleration a (where a < g). How much mass should be removed from it so that it starts moving up with an acceleration a ?

1. $\frac{2ma}{g+a}$

2. $\frac{2ma}{g-a}$

3. $\frac{ma}{g+a}$

4. $\frac{ma}{g-a}$

25. A solid cylinder of mass 50 kg and radius 0.5 m is free to rotate about the horizontal axis. A massless string is wound round the cylinder with one end attached to it and other hanging freely. Tension in the string required to produce an angular acceleration of 2 revolutions $s^{-2}$is

1. 25 N

2. 50 N

3. 78.5 N

4. 157 N

26. The ratio of the accelerations for a solid sphere (mass m and radius R) rolling down an incline of angle θ without slipping and slipping down the incline without rolling is

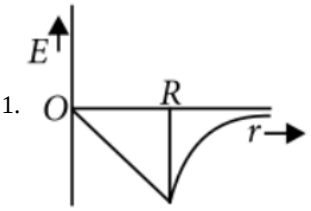
1. 5 : 7

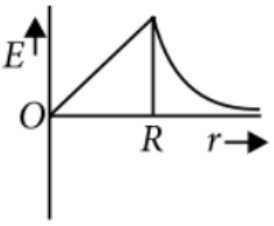
2. 2 : 3

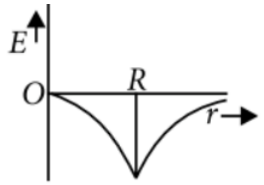
3. 2 : 5

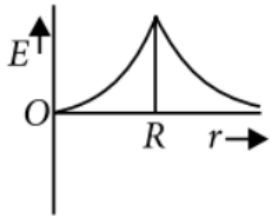
4. 7 : 5

27. Dependence of intensity of gravitational field (E) of earth with distance (r) from centre of earth is correctly represented by

1. 

2. 

3. 

4. 

28. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass = 5.98 x 10^{24} kg) have to be compressed to be a black hole?

1. $10^{-9}m$

2. $10^{-6}m$

3. $10^{-2}m$

4. 100 m

29. A certain number of spherical drops of a liquid of radius r coalesce to form a single drop of radius R and volume V. If T is the surface tension of the liquid, then

1. energy $= 4VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released.
2. energy $= 3VT\left(\frac{1}{r} + \frac{1}{R}\right)$ is absorbed.
3. energy $= 3VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released.
4. energy is neither released nor absorbed

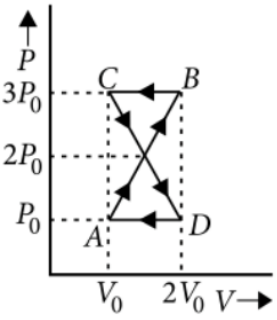
30. Steam at 100°C is passed into 20 g of water at 10°C. When water acquires a temperature of 80°C, the mass of water present will be [Take specific heat of water = 1 cal $g^{-1o}C$ and latent heat of steam = 540 cal g^{-1}]

1. 24 g
2. 31.5 g
3. 42.5 g
4. 22.5 g

31. The mean free path of molecules of a gas, (radius r) is inversely proportional to

1. r^3
2. r^2
3. r
4. $\sqrt{r}$

32. A thermodynamic system undergoes cyclic process ABCDA as shown in figure. The work done by the system in the cycle is



1. P_0V_0
2. $2P_0V_0$
3. $\frac{P_0V_0}{2}$
4. Zero

33. The number of possible natural oscillations of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are (Velocity of sound = 340 m s^{-1})

1. 4
2. 5
3. 7
4. 6

34. If $n_1,\ n_2\ and\ n_3$ are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency n of the string is given by

1. $\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$
2. $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$
3. $\sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$
4. $n = n_1 + n_2 + n_3$

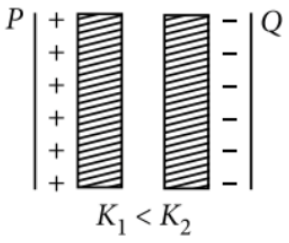
35. A speeding motorcyclist sees traffic jam ahead him. He slows down to 36 km hour^{-1}. He finds that traffic has eased and a car moving ahead of him at 18 km hour^{-1} is honking at a frequency of 1392 Hz. If the speed of sound is 343 ms^{-1}, the frequency of the honk as heard by him will be

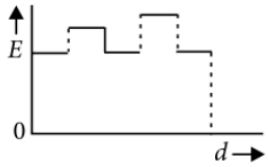
1. 1332 Hz
2. 1372 Hz
3. 1412 Hz
4. 1454 Hz

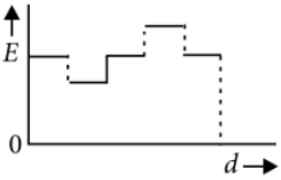
36. In a region, the potential is represented by V(x, y, z) = 6x - 8xy - 8y + 6yz, where V is in volts and x, y, z are in metres. The electric force experienced by a charge of 2 coulomb situated at point (1, 1, 1) is

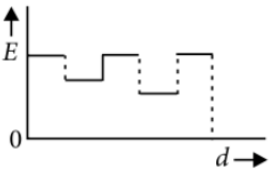
1. $6\sqrt{5}$ N
2. 30 N
3. 24 N
4. $4\sqrt{35}$ N

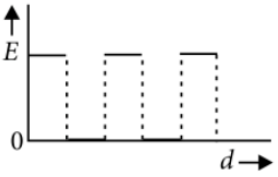
37. Two thin dielectric slabs of dielectric constants $K_1\ and\ K_2\ (K_2 < K_2)$ are inserted between plates of a parallel plate capacitor, as shown in the figure. The variation of electric field E between the plates with distance d as measured from plate P is correctly shown by



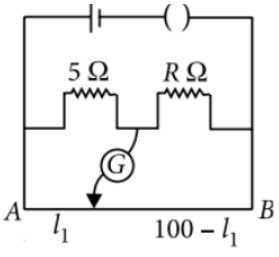
1. 

2. 

3. 

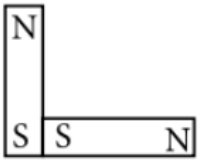
4. 

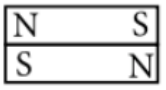
38. The resistances in the two arms of the meter bridge are 5 Ω and R Ω respectively. When the resistance R is shunted with an equal resistance, the new balance point is at 1.6 $_1$.The resistance R is

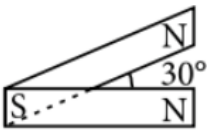


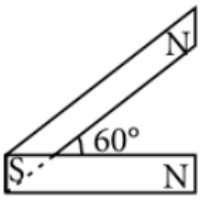
1. 10 Ω
2. 15 Ω
3. 20 Ω
4. 25 Ω

39. Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment $\vec{m}$. Which configuration has highest net magnetic dipole moment?

1. 

2. 

3. 

4. 

40. The angle of a prism is A. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence 2A on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index μ, of the prism is

1. 2sinA
2. 2cosA
3. $\frac{1}{2}\cos A$
4. tanA

41. If the focal length of objective lens is increased then magnifying power of

1. microscope will increase but that of telescope decrease.
2. microscope and telescope both will increase.
3. microscope and telescope both will decrease.
4. microscope will decrease but that of telescope will increase.

42. A beam of light of $\lambda = 600\,\text{nm}$ from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away.

The distance between first dark fringes on either side of the central bright fringe is

1. 1.2 cm
2. 1.2 mm
3. 2.4 cm
4. 2.4 mm

43. When the energy of the incident radiation is increased by 20%, the kinetic energy of the photoelectrons emitted from a metal surface increased from 0.5 eV to 0.8 eV. The work function of the metal is

1. 0.65 eV
2. 1.0 eV
3. 1.3 eV
4. 1.5 eV

44. If the kinetic energy of the particle is increased to16 times its previous value, the percentage change in the de Broglie wavelength of the particle is

1. 25
2. 75
3. 60
4. 50

45. A radioisotope X with a half life 1.4×10^9 years decays to Y which is stable. A sample of the rock from a cave was found to contain X and Y in the ratio 1: 7 . The age of the rock is

1. 1.96×10^9 years
2. 3.92×10^9 years
3. 4.2×10^9 years.
4. 8.40×10^9 years

Chemistry

Section A

46. Which of the following molecules has the maximum dipole moment?

1. CO_2
2. CH_4
3. NH_3
4. NF_3

47. Which of the following organic compounds has same hybridization as its combustion product (CO_2) ?

1. Ethane
2. Ethyne
3. Ethene
4. Ethanol

48. For the reversible reaction

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2\,NH_{3(g)} + \text{heat}$$

The equilibrium shifts in forward direction

1. By increasing the concentration of $NH_{3(g)}$
2. by decreasing the pressure
3. By decreasing the concentrations of $N_{2(g)}$ and $H_{2(g)}$
4. by increasing pressure and decreasing temperature.

49. The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic conditions gives

1. Mn^{4+} and O_2
2. Mn^{2+} and O_2
3. Mn^{2+} and O_3
4. Mn^{4+} and MnO_2

50. (I) $H_2O_2 + O_3 \longrightarrow H_2O + 2O_2$

(II) $H_2O_2 + Ag_2O \longrightarrow 2Ag + H_2O + O_2$

Role of hydrogen peroxide in the above reactions is respectively

1. Oxidizing in (I) and reducing in (II)
2. reducing in (I) and Oxidizing in (II)
3. reducing in (I) and (II)
4. Oxidizing in (I) and (II)

51. Acidity of diprotic acids in aqueous solutions increases in the order

1. $H_2S < H_2Se < H_2Te$
2. $H_2Se < H_2S < H_2Te$
3. $H_2Te < H_2S < H_2Se$
4. $H_2Se < H_2Te < H_2S$

52. Identify Z in the sequence of reactions:

$$CH_3CH_2CH = CH_2 \xrightarrow{HBr/H_2O_2} Y \xrightarrow{C_2H_5ONa} Z$$

1. $CH_3 - (CH_2)_3 - O - CH_2CH_3$

2. $(CH_3)_2CH-O-CH_2CH_3$
3. $CH_3(CH_2)_4-O-CH_3$
4. $CH_3CH_2-CH(CH_3)-O-CH_2CH_3$

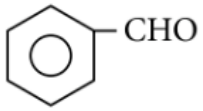
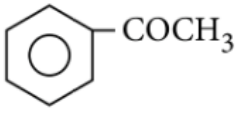
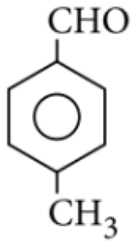
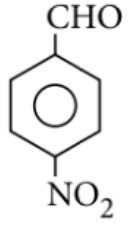
53. The weight of silver (at. wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be

1. 5.4 g
2. 10.8 g
3. 54.0 g
4. 108.0 g

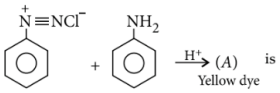
54. Which of the following statements is correct for the spontaneous adsorption of a gas?

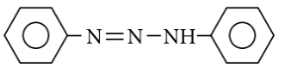
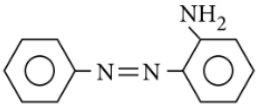
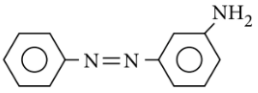
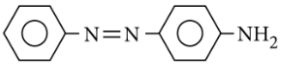
1. ΔS is negative and, therefore ΔH should be highly positive.
2. ΔS is negative and therefore, ΔH should be highly negative.
3. ΔS is positive and therefore, ΔH should be negative.
4. ΔS is positive and therefore, ΔH should also be highly positive.

55. Which one is most reactive towards nucleophilic addition reaction?

1. 
2. 
3. 
4. 

56. In the following reaction, the product (A)



1. 
2. 
3. 
4. 

57. For the reaction, $X_2O_{4(l)} \longrightarrow 2\,XO_{2(g)}$

$\Delta U = 2.1$ kcal, $\Delta S = 20$ cal K^{-1} at 300 K

Hence, ΔG is

1. 2.7 kcal
2. -2.7 kcal
3. 9.3 kcal
4. -9.3 kcal

58. For a given exothermic reaction, K_p and K_p' are the equilibrium constants at temperatures T_1 and T_2, respectively. Assuming that heat of reaction is constant in temperature range between T_1 *and* T_2, correct relation is $(T_1 < T_2)$

1. $K_p > K_p'$
2. $K_p < K_p'$
3. $K_p = K_p'$
4. $K_p = \frac{1}{K_p'}$

59. In acidic medium, H_2O_2 changes $Cr_2O_7^{2-}$ to CrO_5 which has two $(-O-O-)$ bonds. Oxidation state of

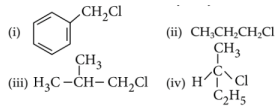
Cr in CrO_5 is:

1. +5
2. +3
3. +6
4. -10

60. When 0.1 mol MnO_4^{2-} is oxidized, the quantity of electricity required to completely oxidize MnO_4^{2-} to MnO_4^- is

1. 96500 C
2. 2 × 96500 C
3. 9650 C
4. 96.50 C

61. Which of the following compounds will not undergo racemisation when solution of KOH hydrolyses?



1. (i) and (ii)
2. (iv)
3. (iii) and (iv)
4. (i) and (iv)

62. Using the Gibb's energy change, $\Delta G^\circ = +63.3$ kJ, for the following reaction,

$Ag_2CO_{3(s)} \rightleftharpoons 2Ag^+_{(aq)} + CO^{2-}_{3(aq)}$

the K_{sp} of $Ag_2CO_{3(s)}$ in water at 25°C is

$(R = 8.314\ J\ K^{-1}\ mol^{-1})$

1. 3.2×10^{-26}
2. 8.0×10^{-12}
3. 2.9×10^{-3}
4. 7.9×10^{-2}

63. Which of the following orders of ionic radii is correctly represented?

1. $H^- > H^+ > H$
2. $Na^+ > F^- > O^{2-}$
3. $F^- > O^{2-} > Na^+$
4. $Al^{3+} > Mg^{2+} > N^{3-}$

64. Which one of the following species has plane triangular shape?

1. N_3
2. NO_3^-
3. NO_2^-
4. CO_2

65. The pair of compounds that can exist together is

1. $FeCl_3, SnCl_2$
2. $HgCl_2, SnCl_2$
3. $FeCl_2, SnCl_2$
4. $FeCl_3, KI$

66. Which one of the following is not a common component of Photochemical smog?

1. Ozone
2. Acrolein
3. Peroxyacetyl nitrate
4. Chlorofluorocarbons

67. Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression?

1. KCl
2. $C_6H_{12}O_6$
3. $Al_2(SO_4)_3$
4. K_2SO_4

68. Which property of colloids is not dependent on the charge on colloidal particles?

1. Coagulation
2. Electrophoresis
3. Electro-osmosis
4. Tyndall effect

69. Magnetic moment 2.83 BM is given by which of the following ions?

(At.nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28)

1. Ti^{3+}
2. Ni^{2+}
3. Cr^{3+}
4. Mn^{2+}

70. Reason of lanthanide contraction is

1. negligible screening effect of 'f' - orbitals
2. increasing nuclear charge
3. decreasing nuclear charge

4. decreasing screening effect

71. Among the following complexes the one which shows zero crystal field stabilization energy (CFSE) is

1. $[Mn(H_2O)_6]^{3+}$
2. $[Fe(H_2O)_6]^{3+}$
3. $[Co(H_2O)_6]^{2+}$
4. $[Co(H_2O)_6]^{3+}$

72. Which of the following complexes is used to be as an anticancer agent?

1. mer $-[Co(NH_3)_3Cl_3]$
2. cis-$[PtCl_2(NH_3)_2]$
3. cis $-K_2[PtCl_2Br_2]$
4. Na_2CoCl_4

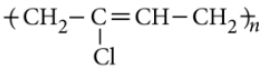
73. Among the following sets of reactants which one produces anisole?

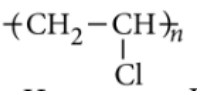
1. $CH_3CHO; RMgX$
2. $C_6H_5OH; NaOH; CH_3I$
3. C_6H_5OH ; neutral $FeCl_3$
4. $C_6H_5CH_3; CH_3COCl; AlCl_3$

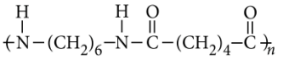
74. Which of the following will be most stable diazonium salt $RN_2^+X^-$?

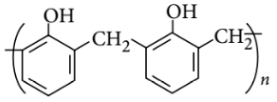
1. $CH_3\ N_2^+X^-$
2. $C_6H_5\ N_2^+X^-$
3. $CH_3CH_2\ N_2^+X^-$
4. $C_6H_5CH_2\ N_2^+X^-$

75. Which one of the following is an example of thermosetting polymer?

1. 

2. 

3. 

4. 

76. Which of the following organic compounds polymerizes to form the polyester Dacron?

1. Propylene and para HO – (C_6H_4) – OH
2. Benzoic acid and ethanol
3. Terephthalic acid and ethylene glycol
4. Benzoic acid and para HO – (C_6H_4) – OH

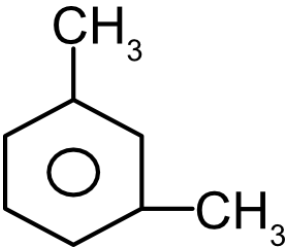
77. Which of the following salts will give highest pH in water?

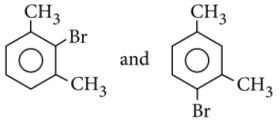
1. KCl
2. NaCl
3. Na_2CO_3
4. $CuSO_4$

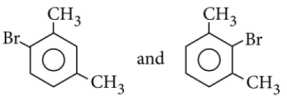
78. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4. The percentage of nitrogen in the soil is

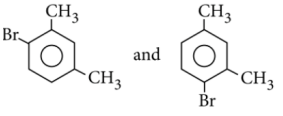
1. 37.33
2. 45.33
3. 35.33
4. 43.33

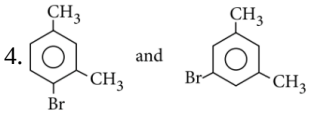
79. What products are formed when the following compound is treated with Br_2 in the presence of $FeBr_3$?



1. 

2. 

3. 

4.  and

80. Which of the following will not be soluble in sodium hydrogen carbonate?

1. 2,4,6 - Trinitrophenol
2. Benzoic acid
3. O - Nitrophenol
4. Benzenesulphonic acid

81. Equal masses of H_2, O_2 and methane have been taken in a container of volume V at temperature 27°C in identical conditions. The ratio of the volumes of gases H_2:O_2: methane would be

1. 8 : 16 : 1
2. 16 : 8 : 1
3. 16 : 1 : 2
4. 8 : 1 : 2

82. 1.0 g of magnesium is burnt with 0.56 g O_2 in a closed vessel. Which reactant is left in excess and how much?

(At. wt. Mg = 24,O = 16)

1. Mg, 0.16 g
2. O_2, 0.16 g
3. Mg, 0.44 g
4. O_2, 0.28 g

83. When 22.4 litres of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, each at S.T.P, the moles of HCl(g) formed is equal to

1. $1\ mol\ of\ HCl_{(g)}$
2. $2\ mol\ of\ HCl_{(g)}$
3. $0.5\ mol\ of\ HCl_{(g)}$
4. 1.5 mol of $HCl_{(g)}$

84. Calculate the energy in joule corresponding to light of wavelength 45 nm. (Planck's constant, h = 6.63 × 10^{-34} Js , speed of light, c = 3 ×10^8 ms^{-1})

1. 6.67×10^{15}
2. 6.67×10^{11}
3. 4.42×10^{-15}
4. 4.42×10^{-18}

85. Which of the following hormones is produced under the conditions of stress which stimulate glycogenolysis in the liver of human beings?

1. Thyroxin
2. Insulin
3. Adrenaline
4. Estradiol

86. Be^{2+} is isoelectronic with which of the following ions?

1. H^+
2. Li^+
3. Na^+
4. Mg^{2+}

87. What is the maximum number of orbitals that can be identified with the following quantum numbers?

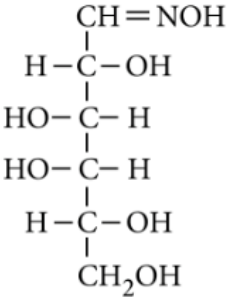
n = 3, l = 1, $m_l = 0$

1. 1
2. 2
3. 3
4. 4

88. If a is the length of the side of a cube, the distance between the body centered atom and one corner atom in the cube will be

1. $\frac{2}{\sqrt{3}}a$
2. $\frac{4}{\sqrt{3}}a$
3. $\frac{\sqrt{3}}{4}a$
4. $\frac{\sqrt{3}}{2}a$

89. D(+) -glucose reacts with hydroxyl amine and yields an oxime. The structure of the oxime would be

1. 

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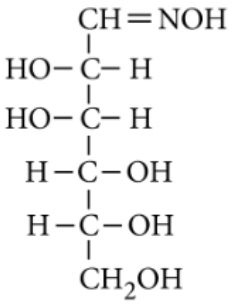

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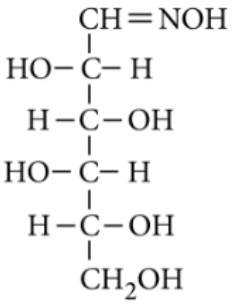

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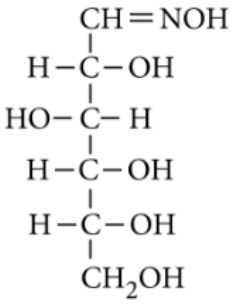


90. Artificial sweetner which is stable under cold conditions only is

1. Saccharine
2. Sucralose
3. aspartame
4. alitame

Botany

Section A

91. An analysis of chromosomal DNA using the Southern hybridization technique does not use

1. electrophoresis
2. blotting
3. autoradiography
4. PCR

92. A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them?

1. Mutated
2. Embolised
3. Etiolated
4. Defoliated

93. *In vitro* clonal propagation in plants is characterised by

1. PCR and RAPD
2. Northern blotting
3. electrophoresis and HPLC
4. microscopy

94. Anoxygenic photosynthesis is characteristic of

1. *Rhodospirillum*
2. *Spirogyra*
3. *Chlamydomonas*
4. *Ulva*

95. Tracheids differ from other tracheary elements in

1. having casparian strips
2. being imperforate
3. lacking nucleus
4. being lignified

96. The osmotic expansion of a cell kept in water is chiefly regulated by

1. mitochondria
2. vacuoles
3. plastids
4. ribosomes

97. Which one of the following is a non - reducing carbohydrate?

1. Maltose
2. Sucrose
3. Lactose
4. Ribose 5 - phosphate

98. Archaebacteria differ from eubacteria in

1. cell membrane structure

2. mode of nutrition
3. cell shape
4. mode of reproduction

99. Which vector can clone only a small fragment of DNA?
1. Bacterial artificial chromosome
2. Yeast artificial chromosome
3. Plasmid
4. Cosmid

100. Dr. F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. Of what significance is this experiment?
1. It made possible the isolation and exact identification of auxin
2. It is the basis for quantitative determination of sm all amounts of growth-promoting substances
3. It supports the hypothesis that IAA is auxin
4. It demonstrated polar movement of auxins

101. An aggregate fruit is one which develops from
1. multicarpellary syncarpous gynoecium
2. multicarpellary apocarpus gynoecium
3. complete inflorescence
4. multicarpellary superior ovary

102. The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as
1. microtubules
2. microfilaments
3. intermediate filaments
4. lamins

103. Select the option which is **not** correct with respect to enzyme action.
1. Substrate binds with enzyme at its active site.
2. Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.
3. A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrat e.
4. Malonate is a competitive inhibitor of succinic dehydrogenase.

104. Which one of the following is **wrongly** matched?
1. Transcription - Writing information from DNA to *t*-RNA
2. Translation - Using information in m-RNA to make protein
3. Repressor protein - Binds to operator to stop enzyme synthesis
4. Operon - Structural genes, operator and promoter

105. Male gametophyte with least number of cells is present in
1. *Pteris*
2. *Funaria*
3. *Lilium*
4. *Pinus*

106. Fruit colour in squash is an example of
1. Recessive epistasis
2. Dominant epistasis
3. Complementary genes
4. Inhibitory genes

107. Which one of the following fungi contains hallucinogens?
1. *Morchella esculenta*
2. *Amanita muscaria*
3. *Neurospora* sp.
4. *Ustilago* sp.

108. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as
1. Vexillary
2. Imbricate
3. Twisted
4. Valvate

109. Which one of the following living organisms completely lacks a cell wall?
1. Cyanobacteria

2. Sea - fan *(Gorgonia)*

3. *Saccharomyces*

4. Blue - green algae

110. Match the following and select the correct answer.

(A)	Centriole	(i)	lnfoldings in mitochondria
(B)	Chlorophyll	(ii)	Thylakoids
(C)	Cristae	(iii)	Nucleic acids
(D)	Ribozymes	(iv)	Basal body of cilia or flagella

	A	B	C	D
1.	iv	ii	i	iii
2.	i	ii	iv	iii
3.	i	iii	ii	iv
4.	iv	iii	i	ii

1. 1

2. 2

3. 3

4. 4

111. In which one of the following processes CO_2 is **not** released?

1. Aerobic respiration in plants

2. Aerobic respiration in animals

3. Alcoholic fermentation

4. Lactate fermentation

112. Five kingdom system of classification suggested by R.H. Whittaker is **not** based on

1. presence or absence of a well-defined nucleus

2. mode of reproduction

3. mode of nutrition

4. complexity of body organisation

113. During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C?

1. G_0 and G_1

2. G_1 and S

3. Only G_2

4. G_2 and M

114. In 'S' phase of the cell cycle

1. amount of DNA doubles in each cell

2. amount of DNA remains same in each cell

3. chromosome number is increased

4. amount of DNA is reduced to half in each cell

115. Transformation was discovered by

1. Meselson and Stahl

2. Hershey and Chase

3. Griffith

4. Watson and Crick

116. Which one of the following shows isogamy with non-flagellated gametes?

1. *Sargassum*

2. *Ectocarpus*

3. *Ulothrix*

4. *Spirogyra*

117. An alga which can be employed as food for human beings is

1. *Ulothrix*

2. *Chlorella*

3. *Spirogyra*

4. *Polysiphonia*

118. An example of edible underground stem is

1. carrot

2. groundnut

3. sweet potato

4. potato

119. Which structure performs the function of mitochondria in bacter

1. Nucleoid

2. Ribosomes

3. Cell wall

4. Mesosomes

120. The motile bacteria are able to move by

1. fimbriae

2. flagella

3. cilia

4. pili

121. Which of the following is responsible for peat formation?

1. *Marchantia*

2. *Riccia*

3. *Funaria*

4. *Sphagnum*

122. You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two?

1. Secondary xylem

2. Secondary phloem

3. Protoxylem

4. Cortical cells

123. Deficiency symptoms of nitrogen and potassium are visible first in

1. senescent leaves

2. young leaves

3. roots

4. buds

124. Select the correct option with respect to transcription.

	Direction of RNA synthesis	Direction of reading of the template DNA strand
1	5' → 3'	3' → 5'
2	3' → 5'	5' → 3'
3	5' → 3'	5' → 3'
4	3' → 5'	3' → 5'

1. 1

2. 2

3. 3

4. 4

125. What gases are produced in anaerobic sludge digesters?

1. Methane and CO_2 only

2. Methane, hydrogen sulphide and CO_2

3. Methane, hydrogen sulphide and O_2

4. Hydrogen sulphide and CO_2 only

126. Which one of the following growth regulators is known as 'stress hormone'?

1. Abscisic acid

2. Ethylene

3. GA_3

4. Indole acetic acid

127. Which one of the following is **wrong** about *Chara?*

1. Upper oogonium and lower round antheridium

2. Globule and nucule present on the same plant

3. Upper antheridium and lower oogonium

4. Globule is male reproductive structure

128. Placenta and pericarp are both edible portions in

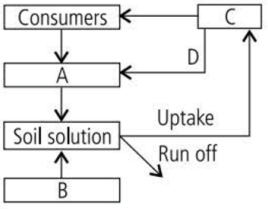
1. apple

2. banana

3. tomato

4. potato

129. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks.



	A	B	C	D
1.	Rock minerals	Detritus	Litter fall	Producers
2.	Litter fall	Producers	Rock minerals	Detritus
3.	Detritus	Rock minerals	Producers	Litter fall
4.	Producers	Litter fall	Rock minerals	Detritus

1. 1

2. 2

3. 3

4. 4

130. Which of the following shows coiled RNA strand and capsomer

1. Polio virus

2. Tobacco mosaic virus

3. Measles virus

4. Retrovirus

131. To obtain virus- free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken?

1. Apical meristem only

2. Palisade parenchyma

3. Both apical and axillary meristems

4. Epidermis only

132. Which one of the following statements is correct?

1. The seed in grasses is not endospermic.

2. Mango is a parthenocarpic fruit.

3. A proteinaceous aleurone layer is present in maize grain.

4. A sterile pistil is called as staminode

133. Viruses have

1. DNA enclosed in a protein coat

2. prokaryotic nucleus

3. single chromosome

4. both DNA and RNA

134. A location with luxuriant growth of lichens on the trees indicates that the

1. trees are very healthy

2. trees are heavily infested

3. location is highly polluted

4. location is not polluted

135. The enzyme recombinase is required at which stage of meiosis?

1. Pachytene

2. Zygotene

3. Diplotene

4. Diakinesis

136. Function of filiform apparatus is to

1. recognize the suitable pollen at stigma

2. stimulate division of generative cell

3. produce nectar

4. guide the entry of pollen tube

137. Geitonogamy involves

1. fertilisation of a flower by the pollen from another flower of the same plant

2. fertilisation of a flower by the pollen from the same flower

3. fertilisation of a flower by the pollen from a flower of another plant in the same population

4. fertilisation of a flower by the pollen from a flower of another plant belonging to a distant population

138. Pollen tablets are available in the market for

1. *in vitro* fertilization

2. breeding programmes

3. supplementing food

4. *ex situ* conservation

139. Non-albuminous seed is produced in

1. maize

2. castor

3. wheat

4. pea

Zoology

Section A

140. A scrubber in the exhaust of a chemical industrial plant removes

1. gases like sulphur dioxide

2. particulate matter of the size 5 micrometer or above

3. gases like ozone and methane

4. particulate matterof the size 2.5 micrometer or less.

141. Person with blood group AB is considered as universal recipient because he has

1. both A and B antigens on RBC but no antibodies in the plasma

2. both A and B antibodies in the plasma

3. no antigen on RBC and no antibody in the plasma

4. both A and B antigens in the plasma but no antibodies

142. Which of the following causes an increase in sodium reabsorption in the distal convoluted tubul

1. Increase in aldosterone levels.

2. Increase in antidiuretic hormone levels.

3. Decrease in aldosterone levels.

4. Decrease in antidiuretic hormone levels.

143. Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of

1. analogous organs
2. adaptive radiation
3. homologous organs
4. convergent evolution

144. Choose the correctly matched pair.

1. Tendon - Specialised connective tissue
2. Adipose tissue - Dense connective tissue
3. Areolar tissue - Loose connective tissue
4. Cartilage - Loose connective tissue

145. Choose the correctly matched pair.

1. Inner lining of salivary ducts - Ciliated epithelium
2. Moist surface of buccal cavity - Glandular epitheli um
3. Tubular parts of nephrons - Cuboidal epithelium
4. Inner surface of bronchioles - Squamous epitheliu m

146. Tubectomy is a method of sterilisation in which

1. small part of the fallopian tube is removed or tied up
2. ovaries are removed surgically
3. small part of vas deferens is removed or tied up
4. uterus is removed surgically

147. Which of the following is a hormone releasing Intra Uterine Device (IUD)?

1. Multiload 375
2. Cervical cap
3. LNG - 20
4. Vault

148. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind?

1. 25%
2. 0%
3. 50%
4. 75%

149. If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain?

plant → mice → snake → peacock

1. 0.02 J
2. 0.002 J
3. 0.2 J
4. 0.0002 J

150. Which of the following is a marine cartilaginous fish that can produce electric current?

1. *Pristis*
2. *Torpedo*
3. *Trygon*
4. *Scoliodon*

151. The zone of atmosphere in which the ozone layer is present is called

1. ionosphere
2. mesosphere
3. stratosphere
4. troposphere

152. Which one of the following statements is **not** correct?

1. Retinal is the light absorbing portion of visual photo pigments.
2. In retina the rods have the photopigment rhodopsi n while cones have three different photopigments.
3. Retinal is a derivative of vitamin C.
4. Rhodopsin is the purplish red protein present in ro ds only.

153. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown here?

1. Hallucinogen
2. Depressant
3. Stimulant
4. Pain - killer

154. Match the following and select the correct option.

(A) Earthworm	(i) Pioneer species
(B) Succession	(ii) Detritivore
(C) Ecosystem service	(iii) Natality
(D) Population growth	(iv) Pollination

	A	B	C	D
1	i	ii	iii	iv
2	iv	i	iii	ii
3	iii	ii	iv	i
4	ii	i	iv	iii

1. 1
2. 2
3. 3
4. 4

155. The shared terminal duct of the reproductive and urinary system in the human male is

1. urethra
2. ureter
3. vas deferens
4. vasa efferentia

156. Stimulation of a muscle fiber by a motor neuron occurs at

1. the neuromuscular junction
2. the transverse tubules
3. the myofibril
4. the sacroplasmic reticulum

157. Identify the hormone with its correct matching of source and function.

1. Oxytocin - posterior pituitary, growth and maintenance of mammary glands
2. Melatonin - pineal gland, regulates the normal rhythm of sleep-wake cycle
3. Progesterone - corpus luteum, stimulation of growth and activities of female secondary sex organs.
4. Atrial natriuretic factor - ventricular wall, increase s the blood pressure.

158. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to

1. Western Ghat
2. Meghalaya
3. Corbett National Park
4. Keolado National Park

159. Injury localised to the hypothalamus would most likely disrupt

1. short - term memory
2. co-ordination during locomotion
3. executive functions, such as decision making
4. regulation of body temperature

160. A species facing extremely high risk of extinction in the immediate future is called

1. vulnerable
2. endemic
3. critically endangered
4. extinct

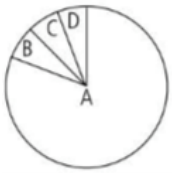
161. The organization which publishes the Red list of species is

1. ICFRE
2. IUCN
3. UNEP
4. WWF

162. Which one of the following are analogous structures?

1. Wings of bat and wings of pigeon
2. Gills of prawn and lungs of man
3. Thorns of *Bougainvillea* and tendrils of *Cucurbita*
4. Flippers of dolphin and legs of horse

163. Given here is a pie chart representation of the extent of global diversity of invertebrates. What groups the four portions (A-D)represent respectively?



	A	B	C	D
1	Insects	Crustaceans	Other animal groups	Molluscs
2	Crustaceans	Insects	Molluscs	Other animal groups
3	Molluscs	Other animal groups	Crustaceans	Insects
4	Insects	Molluscs	Crustaceans	Other animal groups

1. 1
2. 2
3. 3
4. 4

164. Approximately seventy percent of carbon dioxide absorbed by the blood will be transported to the lungs

1. as bicarbonate ions
2. in the form of dissolved gas molecules
3. by binding to RBC
4. as carbamino-haemoglobin

165. Fight-or-flight reactions cause activation of

1. the parathyroid glands, leading to increased metabolic rate
2. the kidney, leading to suppression of renin-angiotensin aldosterone pathway
3. the adrenal medulla, leading to increased secretion of epinephrine and n orepinephrine
4. the pancreas leading to a reduction in the blood sugar levels

166. The initial step in the digestion of milk in humans is carried out by

1. lipase
2. trypsin
3. rennin
4. pepsin

167. Select the correct matching of the type of the joint with the example in human skeletal system.

	Type of joint	Example
1.	Cartilaginous joint	Between frontal and parietal
2.	Pivot joint	Between third and fourth cervical vertebrae
3.	Hinge joint	Between humerus and pectoral girdle
4.	Gliding joint	Between carpals

1. 1
2. 2
3. 3
4. 4

168. Select the taxon mentioned that represents both marine and fresh water species.

1. Echinoderms
2. Ctenophora
3. Cephalochordata
4. Cnidaria

169. *Planaria* possesses high capacity of

1. metamorphosis
2. regeneration
3. metagenesis
4. bioluminescence

170. The main function of mammalian corpus luteum is to produce

1. oestrogen only
2. progesterone
3. human chorionic gonadotropin
4. relaxin only

171. In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is

1. 0.4
2. 0.5
3. 0.6

4. 0.7

172. Fructose is absorbed into the blood through mucosa cells of intestine by the process called

1. active transport
2. facilitated transport
3. simple diffusion
4. co-transport mechanism

173. Select the correct option describing gonadotropin activity in a normal pregnant female.

1. High level of FSH and LH stimulates the thickening of endometrium.
2. High level of FSH and LH facilitates implantation of the embryo.
3. High level of hCG stimulates the synthesis of estrogen and progesterone.
4. High level of hCG stimulates the thickening of endometrium.

174. At which stage of HIV infection does one usually show symptoms of AIDS?

1. Within 15 days of sexual contact with an infected person
2. When the infected retrovirus enters host cells
3. When HIV damages large number of helper T - Lymphocytes
4. When the viral DNA is produced by reverse transcriptase

175. Commonly used vectors for human genome sequencing are

1. T - DNA
2. BAC and YAC
3. expression vectors
4. T/A cloning vectors

176. An example of *ex situ* conservation is

1. national park
2. seed bank
3. wildlife sanctuary
4. sacred grove

177. The first human hormone produced by recombinant DNA technology is

1. insulin
2. oestrogen
3. thyroxin
4. progesterone

178. Assisted reproductive technology, IVF involves transfer of

1. ovum into the fallopian tube
2. zygote into the fallopian tube
3. zygote into the uterus
4. embryo with 16 blastomeres into the fallopian tube

179. How do parasympathetic neural signals affect the working of the heart?

1. They Reduce both heart rate and cardiac output.
2. Heart rate is increased without affecting the cardiac output.
3. Both heart rate and cardiac output increase.
4. Heart rate decreases but cardiac output increases.

180. A human female with Turner's syndrome

1. has 45 chromosomes with XO
2. has one additional X chromosome
3. exhibits male characters
4. is able to produce children with normal husband

NEET 2013

Test Instructions

1. Total duration of this test is **180** minutes.
2. This test has 4 subjects consisting of
   180 questions in total.
3. There are **4** total sections in the test.
4. Sections Info :
   Physics
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Chemistry
      a. **Section A** has **45** questions, compulsory questions **45**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Botany
      a. **Section A** has **47** questions, compulsory questions **47**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
   Zoology
      a. **Section A** has **43** questions, compulsory questions **43**. **4** marks will be given for correct attempt and incorrect attempt **-1** .
5. Total marks for this test is **720** marks.
6. No marks will be deducted for unattempted questions.
7. This test can be submitted only once.
8. Once the test has been submitted, you cannot edit the responses.
9. Results will be anounced post test submission.
10. The test will be auto-submitted once the timer ends.

Physics

Section A

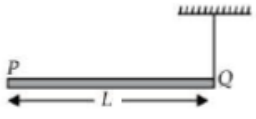
1. The condition under which a microwave oven heats up a food item containing water molecules most efficiently is

    1. Microwaves are heat waves, so always produce heating
    2. Infra -red waves produce heating in a microwave oven.
    3. The frequency of the microwaves must match the resonant frequency of the water molecules
    4. The frequency of the microwaves has no relation with natural frequency of water molecules

2. A wire of resistance $4\,\Omega$ is stretched to twice its original length. The resistance of stretched wire would be

    1. $8\,\Omega$
    2. $16\,\Omega$
    3. $2\,\Omega$
    4. $4\,\Omega$

3. A rod PQ of mass M and length L is hinged at end P. The rod is kept horizontal by a massless string tied to point Q as shown in figure. When string is cut, the initial angular acceleration of the rod is



    1. $\frac{2g}{L}$
    2. $\frac{2g}{2L}$
    3. $\frac{3g}{2L}$
    4. $\frac{g}{L}$

4. For photoelectric emission from certain metal the cutoff frequency is υ . If radiation of frequency 2υ impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is the electron mass)

    1. $\sqrt{\frac{2h\upsilon}{m}}$
    2. $\sqrt{\frac{h\upsilon}{m}}$
    3. $\sqrt{\frac{h\upsilon}{(2m)}}$
    4. $\sqrt{\frac{h\upsilon}{1m}}$

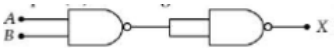
5. In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as fol1ows $P=\frac{a^3b^2}{cd}$% error in P is

    1. 7%
    2. 4%
    3. 14%
    4. 10%

6. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is

    1. 0.8Ω
    2. 1.0Ω
    3. 0.2Ω
    4. 0.5Ω

7. The output (X) of the logic circuit shown in figure will be



    1. $X=A.B$
    2. $X=\overline{A+B}$
    3. $X=\overline{\overline{A}}.\overline{\overline{B}}$
    4. $X=\overline{A.B}$

8. When a proton is released from rest in a room, it starts with an initial acceleration a_0

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towards west. When it is projected towards north with a speed v_0

it moves with an initial acceleration $3a_0$ toward west. The electric and magnetic fields in the room are

1. $\frac{ma_0}{e}east, \frac{3ma_0}{ev_0}up$
2. $\frac{ma_0}{e}east, \frac{3ma_0}{ev_0}down$
3. $\frac{ma_0}{e}west, \frac{2ma_0}{ev_0}up$
4. $\frac{ma_0}{e}west, \frac{2ma_0}{ev_0}down$

9. A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct?

   1. The angular width of the central maximum will decrease.
   2. The angular width of the central maximum will be unaffected.
   3. Diffraction pattern is not observed on the screen in the case of electrons.
   4. The angular width of the central maximum of the diffraction pattern will increase.

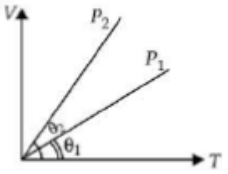
10. A stone falls freely under gravity. It covers distances $\mathrm{h_1, h_2}$ and $\mathrm{h_3}$in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between $\mathrm{h_1, h_2}$ and $\mathrm{h_3}$ is

    1. $h_2 = 3h_1 and h_3 = 3h_2$
    2. $h_1 = h_2 = h_3$
    3. $h_1 = 2h_2 = 3h_3$
    4. $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

11. In a common emitter (CE) amplifier having a voltage gain G, the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 rnho and current gain 20, the voltage gain will be

    1. $\frac{1}{3}G$
    2. $\frac{5}{4}G$
    3. $\frac{2}{3}G$
    4. $1.5G$

12. In the given (V - T) diagram, what is the relation between pressures $P_1 and P_2$?



    1. $P_1 > P_2$
    2. Cannot be predicted
    3. $P_2 = P_1$
    4. $P_2 > P_1$

13. The amount of heat energy required to raise the temperature of 1 g of Helium at constant volume from $\mathrm{T_1 K}$ to $\mathrm{T_2 K}$ is

    1. $\frac{3}{4}N_a k_B(T_2 - T_1)$
    2. $\frac{3}{4}N_a k_B\left(\frac{T_2}{T_1}\right)$
    3. $\frac{3}{8}N_a k_B(T_2 - T_1)$
    4. $\frac{3}{2}N_a k_B(T_2 - T_1)$

14. A uniform force of $\left(3\hat{i} + \hat{j}\right)$ newton acts on a particle of mass 2 kg. Hence the particle is displaced from position $\left(2\hat{i} + \hat{k}\right)$ meter to position $\left(4\hat{i} + 3\hat{j} - \hat{k}\right)$ meter. The work done by the force on the particle is

    1. 13J
    2. 15J
    3. 9J
    4. 6J

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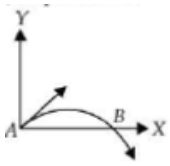
15. The upper half of an inclined plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by

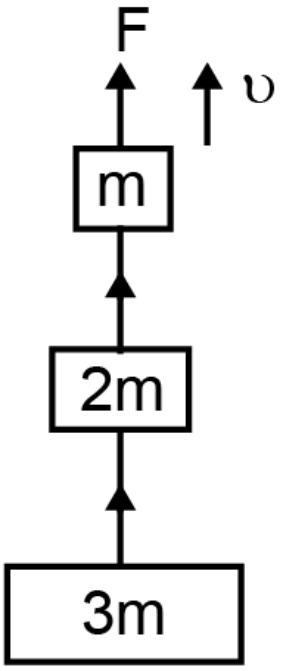
    1. $\mu = 2\tan\theta$
    2. $\mu = \tan\theta$
    3. $\mu = \frac{1}{\tan\theta}$
    4. $\mu = \frac{2}{\tan\theta}$

16. The velocity of a projectile at the initial point A is $\left(2\hat{i} + 3\hat{j}\right) m/s$. It's velocity (in m/s) at point B is



    1. $2\hat{i} - 3\hat{j}$
    2. $2\hat{i} + 3\hat{j}$
    3. $-2\hat{i} - 3\hat{j}$
    4. $-2\hat{i} + 3\hat{j}$

17. Three blocks with masses m, 2m and 3m are connected by strings, as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass 2m? (g is the acceleration due to gravity)

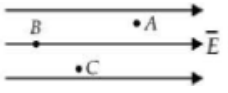


    1. 3 mg
    2. 6 mg
    3. Zero
    4. 2 mg

18. An explosion breaks a rock into three parts in a horizontal plane. Two of them go off at right angles to each other. The first part of mass 1 kg moves with a speed of 12 ms^{-1} and the second part of mass 2 kg moves with 8 ms^{-1} speed. If the third part flies off with 4 ms^{-1} speed, then its mass is

    1. 7 kg
    2. 17 kg
    3. 3 kg
    4. 5 kg

19. A, B and C are three points in a uniform electric field. The electric potential is



    1. maximum at C
    2. same at all the three points A, B and C
    3. maximum at A

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4. maximum at B

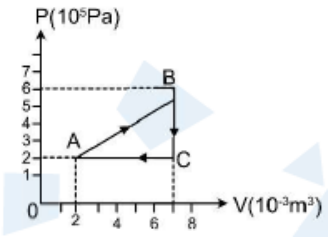
20. A coil of self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when

1. a capacitance of reactance $X_C = X_L$ is included in the same circuit.
2. an iron rod is inserted in the coil
3. frequency of the AC source is decreased
4. number of turns in the coil is reduced

21. The wettability of a surface by a liquid depends primarily on

1. density
2. angle of contact between the surface and the liquid
3. viscosity
4. surface tension

22. A gas is taken through the cycle $A \rightarrow B \rightarrow C \rightarrow A$, as shown. What is the net work done by the gas?



1. Zero
2. -2000 J
3. 2000 J
4. 1000 J

23. A wire loop is rotated in a magnetic field. The frequency of change of direction of the induced e.m.f. is

1. four times per revolution
2. six times per revolution
3. once per revolution
4. twice per revolution

24. The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied?

1. length= 200 cm, diameter= 2 mm
2. length= 300 cm, diameter= 3 mm
3. length= 50 cm, diameter= 0.5 mm
4. length= 100 cm, diameter= 1 mm

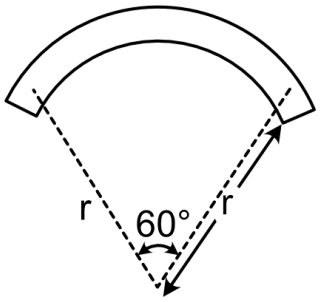
25. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using

1. Kirchhoff's Law
2. Newton's Law of cooling
3. Stefan's Law
4. Wien's displacement Law

26. A small object of uniform density rolls up a curved surface with an initial velocity 'v'. It reaches upto a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is

1. hollow sphere
2. disc
3. ring
4. solid sphere

27. A bar magnet of length 'l' and magnetic dipole moment 'M' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be



1. $\frac{2}{\pi}M$
2. $\frac{M}{2}$
3. M
4. $\frac{3}{\pi}M$

28. In a n-type semiconductor, which of the following statement is true ?

    1. Holes are minority carriers and pentavalent atoms are dopants.
    2. Holes are majority carriers and trivalent atoms are dopants.
    3. Electrons are majority carriers and trivalent atoms are dopants.
    4. Electrons are minority carriers and pentavalent atoms are dopants.

29. In Young's double slit experiment, the slits are 2 mm apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000\,\overset{0}{A}$ and $\lambda_2 = 10000\,\overset{0}{A}$. At what minimum distance from the common central bright fringe on the screen 2 m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?

    1. 4 mm
    2. 3 mm
    3. 8 mm
    4. 6 mm

30. A certain mass of Hydrogen is changed to Helium by the process of fusion. The mass defect in fusion reaction is 0.02866 u. The energy liberated per u is (given 1 u = 931 MeV)

    1. 6.675 MeV
    2. 13.35 MeV
    3. 2.67 MeV
    4. 26.7 MeV

31. If we study the vibration of a pipe open at both ends, then the following statement is not true.

    1. All harmonics of the fundamental frequency will be generated.
    2. Pressure change will be maximum at both ends.
    3. Open end will be displacement antinode.
    4. Odd harmonics of the fundamental frequency will be generated.

32. A source of unknown frequency gives 4 beats/s when sounded with a source of known frequency 250 Hz. The second harmonic of the source of unknown frequency gives five beats per second, when sounded with a source of frequency 513 Hz. The unknown frequency is

    1. 240 Hz
    2. 260 Hz
    3. 254 Hz
    4. 246 Hz

33. A current loop in a magnetic field

    1. can be in equilibrium in two orientations, both the equilibrium states are unstable
    2. can be in equilibrium in two orientations, one stable while the other is unstable
    3. experiences a torque whether the field is uniform or non uniform in non

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orientations

4. can be in equilibrium in one orientation

34. The wavelength $\lambda_e$of an electron and $\lambda_p$of a photon of same energy E are related by

1. $\lambda_p \propto \sqrt{\lambda_e}$
2. $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$
3. $\lambda_p \propto \lambda_e^2$
4. $\lambda_p \propto \lambda_e$

35. The half life of a radioactive isotope 'X' is 20 years. It decays to another element *'Y'* which is stable. The two elements 'X' and *'Y'* were found to be in the ratio 1 : 7 in a sample of a given rock. The age of the rock is estimated to be

1. 80 years
2. 100 years
3. 40 years
4. 60 years

36. The resistances of the four arms P, Q, Rand S in a Wheatstone's bridge are 10 ohm, 30 ohm, 30 ohm and 90 ohm, respectively. The e.m.f. and internal resistance of the cell are 7volt and 5 ohm respectively. If the galvanometer resistance is 50 ohm, the current drawn from the cell will be

1. 0.1 A
2. 2.0 A
3. 1.0 A
4. 0.2 A

37. The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_P and C_V respectively. If $\gamma = \frac{C_P}{C_V}$ and R is the universal gas constant, then C_V is equal to

1. $\frac{(\gamma-1)}{R}$
2. γR
3. $\frac{1+\gamma}{1-\gamma}$
4. $\frac{R}{(\gamma-1)}$

38. A piano convex lens fits exactly into a piano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then the focal length of the combination is

1. $\frac{R}{(\mu_1-\mu_2)}$
2. $\frac{2R}{(\mu_2-\mu_1)}$
3. $\frac{R}{2(\mu_1+\mu_2)}$
4. $\frac{R}{2(\mu_1-\mu_2)}$

39. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is

1. $\frac{5}{3}$
2. $\frac{3}{2}$
3. $\frac{4}{3}$
4. 2

40. A wave travelling in the +ve x-direction having displacement along y-direction as 1 m, wavelength $2\pi m$ and frequency of $\frac{1}{\pi}Hz$ is represented by

1. $y = \sin(10\pi x - 20\pi t)$
2. $y = \sin(2\pi x + 2\pi t)$
3. $y = \sin(x - 2t)$
4. $y = \sin(2\pi x - 2\pi t)$

41. A body of mass 'm' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be

1. 3mgR

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2. $\frac{1}{3}mgR$

3. mg2R

4. $\frac{2}{3}mgR$

42. Ratio of longest wave lengths corresponding to Lyman and Balmer series in hydrogen spectrum is

1. $\frac{7}{29}$

2. $\frac{9}{31}$

3. $\frac{5}{27}$

4. $\frac{3}{23}$

43. Infinite number of bodies, each of mass 2 kg are situated on x-axis at distances 1 m, 2 m, 4 m, 8 m, ..., respectively, from the origin. The resulting gravitational potential due to this system at the origin will be

1. $\frac{-4}{3}G$

2. $-4G$

3. $-G$

4. $\frac{-8}{3}G$

44. For a normal eye, the cornea of eye provides a converging power of 40 D and the least converging power of the eye lens behind the cornea is 20 D. Using this information, the distance between the retina and the cornea-eye lens can be estimated to be

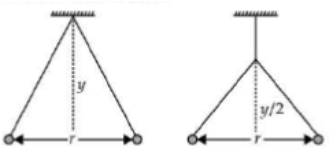
1. 1.67 cm

2. 1.5 cm

3. 5 cm

4. 2.5 cm

45. Two pith balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r. Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become:



1. $\left(\frac{2r}{\sqrt{3}}\right)$

2. $\left(\frac{2r}{3}\right)$

3. $\left(\frac{1}{\sqrt{2}}\right)^2$

4. $\left(\frac{r}{\sqrt[3]{2}}\right)$

Chemistry

Section A

46. XeF_2 is isostructural with

1. TeF_2

2. ICl_2^-

3. $SbCl_3$

4. $BaCl_2$

47. Identify the correct order of solubility in aqueous medium.

1. $CuS > ZnS > Na_2S$

2. $ZnS > Na_2S > CuS$

3. $Na_2S > CuS > ZnS$

4. $Na_2S > ZnS > CuS$

48. Which of these is not a monomer for a high molecular mass silicone polymer?

1. Me_3SiCl

2. $PhSiCl_3$

3. $MeSiCl_3$

4. Me_2SiCl_2

49. Roasting of sulphides gives the gas *X* as a byproduct. This is a colourless gas with choking smell of burnt sulphur and causes great damage to respiratory organs as a

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result of acid rain. Its aqueous solution is acidic, acts as a reducing agent and its acid has never been isolated. The gas X is

1. H_2S
2. SO_2
3. CO_2
4. SO_3

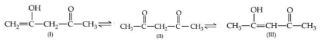
50. Which of the following does not give oxygen on heating?

1. $KClO_3$
2. $Zn\,(ClO_3)_2$
3. $K_2\,Cr_2\,O_7$
4. $(NH_4)_2\,Cr_2\,O_7$

51. Which is the strongest acid in the following?

1. $H_2\,SO_4$
2. $HClO_3$
3. $HClO_4$
4. $H_2\,SO_3$

52. The order of stability of the following tautomeric compounds is



1. I > II > III
2. III > II> I
3. II>I>III
4. II>III>I

53. Which of the following statements about the interstitial compounds is incorrect?

1. They retain metallic conductivity
2. They are chemically reactive
3. They are much harder than the pure metal
4. They have higher melting points than the pure metal

54. $KMnO_4$ can be prepared from $K_2\,MnO_4$ as per the reaction

$$3\,MnO_4^{2-} + 2H_2O \rightleftharpoons 2\,MnO_4^- + MnO_2 + 4\,OH^-$$

The reaction can go to completion by removing OH^- ions by adding

1. HCl
2. KOH
3. CO_2
4. SO_2

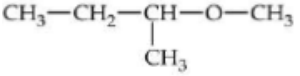
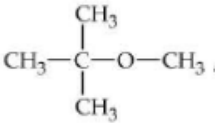
55. Which of the following lanthanoid ions is diamagnetic? (At. nos. Ce = 58, Sm = 62, Eu = 63, Yb = 70)

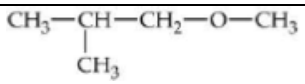
1. Ce^{2+}
2. Sm^{2+}
3. Eu^{2+}
4. Yb^{2+}

56. An excess of $AgNO_3$ is added to 100 mL of a 0.01 **M** solution of dichlorotetraaquachromium (III) chloride. The number of moles of $AgCl$ precipitated would be

1. 0.003
2. 0.01
3. 0.001
4. 0.002

57. Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HI?

1. $CH_3 - CH_2 - CH_2 - CH_2 - O - CH_3$
2. 
3. 

4. 

58. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 MHNO_3? The concentrated acid is 70% HNO_3

1. 45 .0 g conc. HNO_3
2. 90 .0 g conc. HNO_3
3. 70 .0 g conc. HNO_3
4. 54 .0 g conc. HNO_3

59. A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is $2.72\,g\ cm^{-3}$. The molar mass of the metal is :

(N_A Avogadro's constant $= 6.02 \times 10^{23}\,mol^{-1}$)

1. $40\,g\ mol^{-1}$
2. $30\,g\ mol^{-1}$
3. $27\,g\ mol^{-1}$
4. $20\,g\,mol^{-1}$

60. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of electrode would be?

1. 0.059 V
2. 0.59 V
3. 0.118 V
4. 1.18 V

61. At 25°C molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is $9.54\ ohm^{-1}\,cm^2\,mol^{-1}$ and at infinite dilution its molar conductance is $238\ ohm^{-1}\,cm^2\,mol^{-1}$ The degree of ionisation of ammonium hydroxide at the same concentration and temperature is

1. 2.080%
2. 20.800%
3. 4.008%
4. 40.800%

62. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 20°C to 35°C?

$(R = 8.314\ Jmol^{-1}\,K^{-1})$

1. $342\ kJ\ mol^{-1}$
2. $269\ kJ\ mol^{-1}$
3. $34.7\ kJ\ mol^{-1}$
4. $15.1\ kJ\ mol^{-1}$

63. Which one of the following molecules contains no π bond?

1. CO_2
2. H_2O
3. SO_2
4. NO_2

64. Which of the following is a polar molecule?

1. BF_3
2. SF_4
3. SiF_4
4. XeF_4

65. Dipole-induced dipole interactions are present in which of the following pairs

1. H_2O and alcohol
2. Cl_2 and CCl_4
3. HCl and He atoms
4. $SiF_4$and He atoms

66. Maximum deviation from ideal gas is expected from

1. $H_2(g)$

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2. $N_2(g)$

3. $CH_4(g)$

4. $NH_3(g)$

67. Which of these is least likely to act as a Lewis base?

1. CO

2. F^-

3. BF_3

4. PF_3

68. Which of the following structure is similar to graphite?

1. BN

2. B

3. B_4C

4. B_2H_6

69. Which of the following is electron-deficient?

1. $(CH_3)_2$

2. $(SiH_3)_2$

3. $(BH_3)_2$

4. PH_3

70. The basic structural unit of silicates is

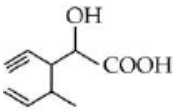
1. SiO^-

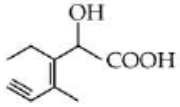
2. SiO_4^{4-}

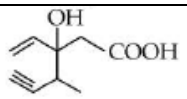
3. SiO_3^{2-}

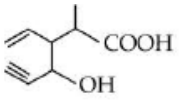
4. SiO_4^{2-}

71. Structure of the compound whose IUPAC name is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is

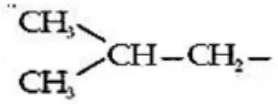
1. 

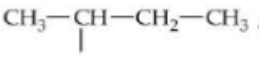
2. 

3. 

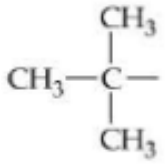
4. 

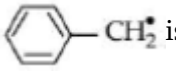
72. The structure of isobutyl group in an organic compound is

1. 

2. 

3. $CH_3 - CH_2 - CH_2 - CH_2-$

4. 

73. The radical,  is aromatic because it has

1. 6 p-orbitals and 6 unpaired electrons

2. 7 p-orbitals and 6 unpaired electrons

3. 7 p-orbitals and 7 unpaired electrons

4. 6 p-orbitals and 7 unpaired electrons

74. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?

1. $-C \equiv N$

2. $-SO_3H$

3. $-COOH$

4. $-NO_2$

75. Which of the following compounds will not undergo Friedal-Craft's reaction easily

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1. Cumene
2. Xylene
3. Nitrobenzene
4. Toluene

76. Nitrobenzene on reaction with conc. HNO_3/H_2SO_4 at $80-100^0C$ forms which one of the following products?

1. 1, 2-Dinitrobenzene
2. 1, 3-Dinitrobenzene
3. 1, 4-Dinitrobenzene
4. 1, 2, 4-Trinitrobenzene

77. The number of carbon atoms per unit cell of diamond unit cell is

1. 4
2. 8
3. 6
4. 1

78. A button cell used in watches function as following.

$Zn(s) + Ag_2O(s) + H_2O(l) \rightleftharpoons 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$

If half cell potentials are

$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s);\ E^0 = -0.76\ V$
$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq),\ E^0 = 0.34\ V$

The cell potential will be

1. 1.10 V
2. 0.42 V
3. 0.84 V
4. 1.34 V

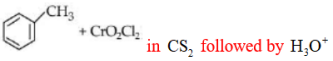
79. A reaction having equal energies of activation for forward and reverse reactions has:

1. $\Delta S = 0$
2. $\Delta G = 0$
3. $\Delta H = 0$
4. $\Delta H = \Delta G = \Delta S = 0$

80. A magnetic moment at 1.73 BM will be shown by one among of the following

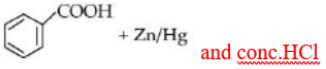
1. $TiCl_4$
2. $[Ni(CN)_4]^{2-}$
3. $[Cu(NH_3)_4]^{2+}$
4. $[CoCl_6]^{4-}$

81. Reaction by which benzaldehyde cannot be prepared

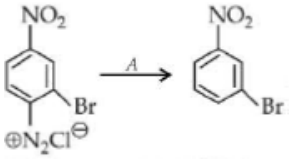
1. 

2.

3.

4. 

82. In the reaction:



A is:

1. $HgSO_4/H_2SO_4$
2. Cu_2Cl_2
3. H_3PO_2 and H_2O
4. H^+/H_2O

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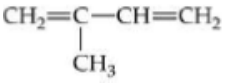
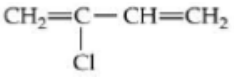
83. Which is the monomer of Neoprene in the following?

1. $CH_2 = CH - C \equiv CH$
2. 
3. 
4. $CH_2 = CH - CH = CH_2$

84. Nylon is an example of

1. Polyester
2. Polysaccharide
3. Polyamide
4. Polythene

85. 6.02×10^{20}molecules of urea are present in 100 mL of its solution. The concentration of solution is

1. 0.001 M
2. 0.1 M
3. 0.02 M
4. 0.01 M

86. The value of Planck's constant is 6.63×10^{-34} Js. The speed of light is 3×10^{17} nms^{-1}. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of 6×10^{15}s^{-1}?

1. 10
2. 25
3. 50
4. 75

87. Based on equation $E = -2.178 \times 10^{-18}\left(\frac{Z^2}{n^2}\right)$J , certain conclusions are written. Which of them is not correct?

1. The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus
2. Larger the value of n, the larger is the orbit radius
3. Equation can be used to calculate the change in energy when the electron changes orbit
4. For n = 1, the electron has a more negative energy than it does for n = 6 which means that the electron is more loosely bound in the smallest allowed orbit.

88. Which of the following is paramagnetic?

1. CO
2. O_2^-
3. CN^-
4. NO^+

89. Antiseptics and disinfectants either kill or prevent growth of microrganisms. Identify which of the following statements is not true.

1. A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant
2. Chlorine and iodine are used as strong disinfectants
3. Dilute solutions of boric acid and hydrogen peroxide are strong antiseptics
4. Disinfectants harm the living tissues

90. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers?

n = 3, l = 1 and m = -1

1. 10
2. 6

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3. 4

4. 2

Botany

Section A

91. During seed germination its stored food is mobilized by

1. ABA
2. Gibberllin
3. Ethylene
4. Cytokinin

92. Lenticels are involved in

1. food transport
2. photosynthesis
3. transpiration
4. gaseous exchange

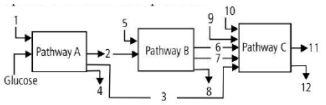
93. Interfascicular cambium develops from the cells of

1. endodermis
2. pericycle
3. medullary rays
4. xylem parenchyma

94. Among bitter gourd, mustard, brinjal, pumpkin, china rose, lupin, cucumber, sunnhemp, gram, guava, bean, chilli, plum, *Petunia*, tomato, rose, *Withania*, potato, onion, *Aloe* and tulip how many plants have hypogynous flower?

1. Fifteen
2. Eighteen
3. Six
4. Ten

95. The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products.



Arrows numbered 4, 8 and 12 can all be

1. H_2O
2. FAD^+ or $FADH_2$
3. NADH
4. ATP

96. Read the following statements (A - E) and answer the question which follows them.

(A) In liverworts, mosses, ferns and gametophytes are free living .

(B) Gymnosperms and some ferns are heterosporous.

(C) Sexual reproduction in *Fucus*, *Volvox* and *Albugo* is oogamous.

(D) The sporophyte in liverworts is more elaborate than that in mosses.

(E) Both *Pinus* and *Marchantia* are dioecious.

How many of the above statements are correct?

1. Three
2. Four
3. One
4. Two

97. Which of the following statements is not true of two genes that show 50% recombination frequency?

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1. The gene show independent assortment.
2. If the genes are present on the same chromosome, they undergo more than one crossovers in every meiosis
3. The genes may be on different chromosomes
4. The genes are tightly linked.

98. Which enzyme will be produced in a cell if there is a non-sense mutation in the lac Y gene?
1. Transacetylase
2. Lactose permease and transacetylase
3. β-galactosidase
4. Lactose permease

99. Isogamous condition with non-flagellated gametes is found in
1. *Spirogyra*
2. *Volvox*
3. *Chlamydomonas*
4. *Fucus*

100. Which of the following are likely to be present in deep sea water?
1. Blue-green algae
2. Saprophytic fungi
3. Archaebacteria
4. Eubacteria

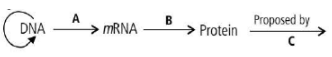
101. Select the **wrong** statement.
1. In oomyctes, female gamete is smaller and motile, while male gamete is larger and non-motile.
2. *Chlamydomonas* exhibits both isogamy and anisogamy and *Fucus* shows oogamy.
3. Isogametes are similar in structure, function and behaviour.
4. Anisogametes differ either in structure, function or behaviour.

102. Meiosis takes place in
1. gemmule
2. megaspore
3. meiocyte
4. conidia

103. Seed coat is not thin, membranous in
1. groundnut
2. gram
3. maize
4. coconut

104. Which of the following criteria is not pertained to facilitated transport ?
1. Transport saturation
2. Uphill transport
3. Requirement of special membrane proteins
4. High selectivity.

105. The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C.



1. A - Transcription, B -Translation, C - Francis Crick
2. A - Translation, B - Extension , C - Rosalind Franklin
3. A - Transcription, B - Replication, C - Jame S Watson
4. A - Translation, B - Transcription, C - Ervin Chargaff

106. A phosphoglyceride is always made up of

1. a saturated or unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached.
2. a saturated or unsaturated fatty acid esterified to a phosphate group which is also attached to a glycerol molecule.
3. only a saturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached.
4. only an unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached.

107. DNA fragments generated by the restriction endonucleases in a chemical reaction can be separated by

1. electrophoresis
2. restriction mapping
3. centrifugation
4. polymerase chain reaction

108. Pigment containing membranous extensions in some cyanobacteria are

1. pneumatophores
2. chromatophores
3. heterocysts
4. basal bodies

109. Macromolecule chitin is

1. sulphur containing polysaccharide
2. simple polysaccharide
3. nitrogen containing polysaccharide
4. phosphorous containing polysaccharide.

110. A stage in cell division is shown in the figure. Select the answer which gives correct identification of the stage with its characteristics.

1.	Cytokinesis	Cell plate formed, mitochondria distributed between two daughter cells.
2.	Telophase	Endoplasmic reticulum and nucleolus not reformed yet.
3.	Telophase	Nuclear envelope reforms, Golgi complex reforms.
4.	Late anaphase	Chromosomes move away from equatorial plate, Golgi complex not present.

1. 1
2. 2
3. 3
4. 4

111. A good producer of citric acid is

1. *Clostridium*
2. *Saccharomyces*
3. *Aspergillus*
4. *Pseudomonas*

112. The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of

1. insertional in activation of alpha galactosidase in recombinant bacteria.
2. inactivation of glycosidase enzyme in recombinant bacteria
3. non-recombinant bacteria containing beta galactosidase

4. insertional inactivation of alpha galactosidase in non-recombinant bacteria.

113. Which of the following Bt crops is being grown in India by the farmers?

1. Brinjal
2. Soybean
3. Maize
4. Cotton

114. If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group: 'AB' blood group : 'B' blood group in 1 : 2 : 1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This in an example of

1. partial dominance
2. complete dominance
3. codominance
4. incomplete dominance.

115. In plant breeding programmes, the entire collection (of plants/seeds) having all the diverse alleles for all genes in a given crop is called

1. evaluation and selection of parents.
2. germplasm collection.
3. selection of superior recombinants.
4. cross-hybridisation among the selected parents.

116. Which idea is depicted by a cross in which the F_1 generation resembles both the parents?

1. Inheritance of one gene
2. Codominance
3. Incomplete dominance
4. Complete dominance

117. The Golgi complex plays a major role

1. as energy transferring organelles
2. in post translational modification of proteins and glycosylation of lipids
3. in trapping the light and transforming it into chemical energy
4. in digesting proteins and carbohydrates.

118. During sewage treatment, biogas is produced which includes

1. hydrogen sulphide, methane, sulphur dioxide
2. hydrogen sulphide, nitrogen, methane
3. methane, hydrogen sulphide, carbon dioxide
4. methane, oxygen, hydrogen sulphide.

119. Which one of the following organelle in the figure correctly matches with its function?

1. Golgi apparatus, formation of glycolipids
2. Rough endoplasmic reticulum, protein synthesis
3. Rough endoplasmic reticulum, formation of glycoproteins
4. Golgi apparatus, protein synthesis.

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120. A major site for synthesis of lipids is

1. symplast
2. nucleoplasm
3. RER
4. SER

121. In China rose the flowers are

1. zygomorphic, hypogynous with imbricate aestivation
2. zygomorphic, epigynous with twisted aestivation
3. actinomorphic, hypogynous with twisted aestivation
4. actinomorphic, epigynous with valvate aestivation

122. Advantage of cleistogamy is

1. no dependence on pollinators
2. vivipary
3. higher genetic variability
4. more vigorous offspring .

123. Megasporangium is equivalent to

1. nucellus
2. ovule
3. embryo sac
4. fruit

124. Which one of the following statements is correct?

1. Endothecium produces the microspores
2. Tapetum nourishes the developing pollen
3. Hard outer layer of pollen is called intine
4. Sporogenous tissue is haploid

125. Perisperm differs from endosperm in

1. being a diploid tissue
2. its formation by fusion of secondary nucleus with several sperms
3. being a haploid tissue
4. having no reserve food

126. Product of sexual reproduction generally generates

1. new genetic combination leading to variation
2. large biomass
3. longer viability of seeds
4. prolonged dormancy.

127. Which one of the following is **not** a correct statement?

1. A museum has collection of photographs of plants and animals.
2. Key is a taxonomic aid for identification of specimens.
3. Herbarium houses dried, pressed and preserved plant specimens.
4. Botanical gardens have collection of living plants for reference.

128. Transition state structure of the substrate formed during a enzymatic reaction is

1. transient and unstable
2. permanent and stable
3. transient but stable
4. permanent but unstable

129. Natural reservoir of phosphorus is

1. rock
2. fossils
3. sea water

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4. animal bones.

130. Besides paddy fields, cyanobacteria are also found inside vegetative part of

1. *Equisetum*
2. *Psilotum*
3. *Pinus*
4. *Cycas*

131. Age of a tree can be estimated by

1. number of annual rings
2. diameter of its heart wood
3. its height and girth
4. biomass

132. The essential chemical components of many coenzymes are

1. carbohydrates
2. vitamins
3. proteins
4. nucleic acids

133. Monoecious plant of *Chara* shows occurrence of

1. upper antheridium and lower oogonium on the same plant.
2. upper oogonium and lower antheridium on the same plant.
3. antheridiophore and archegoniophore on the same plant.
4. stamen and carpel on the same plant.

134. Homologous chromosomes paired together in zygotene is referred as

1. bivalent
2. axoneme
3. equatorial plate
4. kinetochore

135. Which of the following is **not** correctly matched for the organism and its cell wall degrading enzyme?

1. Algae - Methylase
2. Fungi- Chitinase
3. Bacteria- Lysozyme
4. Plant cells - Cellulase

136. Which of the metabolites is common to respiration-mediated aerobic breakdown of fats, carbohydrates and proteins?

1. Pyruvic acid
2. Acetyl Co A
3. Glucose - 5 - phosphate
4. Fructose 1, 6 - bisphosphate

137. The first stable product of fixation of atmospheric nitrogen in leguminous plants is

1. NO_3^-
2. glutamate
3. NO_2^-
4. ammonia

Zoology

Section A

138. Which of the following statements is correct in relation to the endocrine system?

1. Non-nutrient chemicals produced by the body in trace amounts that act as intercellular messenger are known as hormones.
2. Releasing and inhibitory hormones are produced by the pituitary gland.
3. Adenohypophysis is under direct neural regulation of the hypothalamus.

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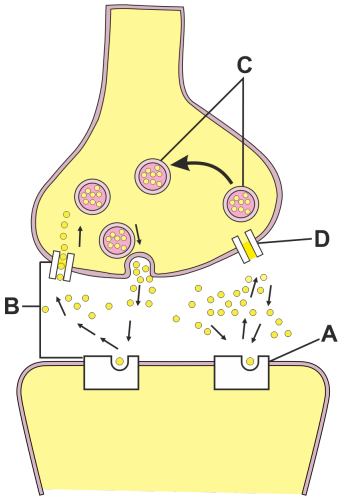
4. Organs in the body like gastrointestinal tract, heart, kidney and liver do not produce any hormones.

139. A diagram showing axon terminal and synapse is given. Identify correctly at least two of A - D.



1. A - Neurotransmitter, B - Synaptic cleft
2. C - Neurotransmitter, D - Ca^{++}
3. A - Receptor, C - Synaptic vesicles
4. B - Synaptic connection, D-K^{+}

140. A pregnant female delivers a baby who suffers from stunted growth, mental retardation, low intelligence quotient and abnormal skin. This is the result of

1. cancer of the thyroid gland
2. over secretion of pars distalis
3. deficiency of iodine in diet
4. low secretion of growth hormone

141. Select the answer which correctly matches the endocrine gland with the hormone it secretes and its function/deficiency symptom.

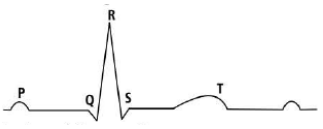
	Endocrine gland	**Hormone**	**Function/ Deficiency symptom**
1	Thyroid gland	Thyroxine	Lack of iodine in diet results in goitre
2	Corpus luteum	Testosterone	Stimulates spermatogenesis
3	Anterior pituitary	Oxytocin	Stimulates uterus contraction during child birth
4	Posterior pituitary	Growth Hormone(GH)	Over secretion stimulates abnormal growth

1. 1
2. 2
3. 3
4. 4

142. Infection of *Ascaris* usually occurs by

1. Tse-tse fly
2. mosquito bite
3. drinking water containing eggs of *Ascaris*
4. eating imperfectly cooked pork

143. The diagram given here is the standard ECG of a normal person. The P-wave represents the



1. beginning of the systole
2. end of systole
3. contraction of both the atria
4. initiation of the ventricular contraction .

144. If both parents are carriers for thalassaemia, which is an autosomal recessive disorder, what are the chances of pregnancy resulting in an affected child?

1. 25%
2. 100%
3. No chance
4. 50 %

145. Select the correct match of the digested products in humans given in column I with

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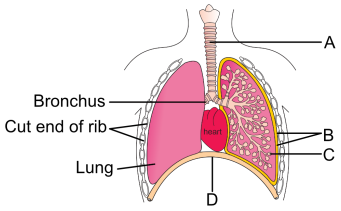
their absorption site and mechanism in column II.

	Column I	Column II
1	Glycerol, fatty acids	Duodenum, move as chylomicrons
2	Cholesterol, maltose	Large intestine, active absorption
3	Glycine, glucose	Small intestine, active absorption
4	Fructose, Na^+	Small intestine, passive absorption

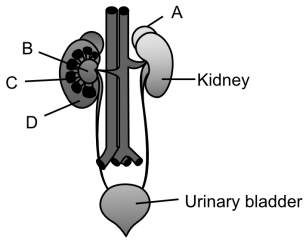
1. 1
2. 2
3. 3
4. 4

146. The figure shows a diagrammatic view of human respiratory system with labels A, B, C and D. Select the option which gives correct identification and main function and / or characteristic.



1. C - Alveoli - Thin walled vascular bag like structures for exchange of gases.
2. D - Lower end of lungs - Diaphragm pulls it down during inspiration.
3. A - Trachea - Long tube supported by complete cartilaginous rings for conducting inspired air.
4. B - Pleural membrane - Surround ribs on both sides to provide cushion against rubbing.

147. Figure shows human urinary system with structures labelled A to D. Select option which correctly identifies them and gives their characteristic and/ or functions.



1. C - Medulla - inner zone of kidney and contains complete nephrons.
2. D - Cortex - outer part of kidney and do not contain any part of nephrons.
3. A - Adrenal gland - located at the anterior part of kidney. Secrete catecholamines which stimulate glycogen break down.
4. B - Pelvis - broad funnel shaped space inner to hilum, directly connected to loops of Henle.

148. Which one of the following processes during decomposition is correctly described?

1. Catabolism - Last step in the decomposition under fully anaerobic condition
2. Leaching - Water soluble inorganic nutrients rise to the top layers of soil
3. Fragmentation - Carried out by organisms such as earthworm
4. Humification - Leads to the accumulation of a dark coloured substance humus which undergoes microbial action at a very fast rate.

149. What is the correct sequence of sperm formation?

1. Spermatogonia, spermatozoa, spermatocytes, spermatids
2. Spermatogonia, spermatocytes, spermatids, spermatozoa

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3. Spermatids, spermatocytes, spermatogonia, spermatozoa

4. Spermatogonia, spermatocytes, spermatozoa, spermatids.

150. Global warming can be controlled by

1. increasing deforestation, slowing down the growth of human population.

2. increasing deforestation, reducing efficiency of energy usage.

3. reducing deforestation, cutting down use of fossil fuel.

4. reducing reforestation, increasing the use of fossil fuel.

151. Kyoto protocol was endorsed at

1. CoP - 6

2. CoP - 4

3. CoP - 3

4. CoP - 5

152. Which one of the following is **not** the function of placenta?

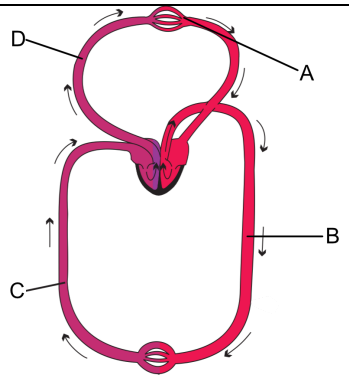
1. Facilitates removal of carbon dioxide and waste material from embryo

2. Secretes oxytocin during parturition

3. Facilitates supply of oxygen and nutrients to embryo

4. Secretes oestrogen

153. The given figure shows schematic plan of blood circulation in humans with labels A to D. Identify the label and give its functions?



1. C - Vena cava - takes blood from body parts to right auricle, pCO_2 = 45 mm Hg

2. D - Dorsal aorta - takes blood from heart to body parts, pO_2 = 95 mm Hg

3. A - Pulmonary vein - takes impure blood from body parts, pO_2 = 60 mm Hg

4. B - Pulmonary artery - takes blood from heart to lungs, pO_2 = 90 mm H g.

154. What external changes are visible after the last moult of a cockroach nymph?

1. Both forewings and hindwings develop

2. Labium develops

3. Mandibles become harder

4. Anal cerci develop

155. Select the correct statement with respect to locomotion in humans.

1. The vertebral column has 10 thoracic vertebrae

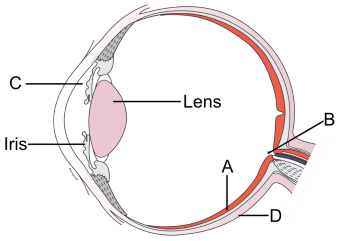
2. The joint between adjacent vertebrae is a fibrous joint.

3. A decreased level of progesterone causes osteoporosis in old people.

4. Accumulation of uric acid crystals in joints causes their inflammation.

156. Parts A, B, C and D of the human eye are shown in the diagram. Select the option

which gives correct identification along with its functions/characteristics.



1. C - Aqueous chamber - Reflects the light which does not pass through the lens.
2. D - Choroid - Its anterior part forms ciliary body.
3. A - Retina - Contains photoreceptors, i.e., rods and cones.
4. B - Blind spot - Has only a few rods and cones.

157. According to Darwin, the organic evolution is due to

1. competition within closely related species
2. reduced feeding efficiency in one species due to the presence of interfering species
3. intraspecific competition
4. interspecific competition

158. A biologist studied the population of rats in a barn . He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is

1. 05
2. zero
3. 10
4. 15

159. Match the name of the animal (column I), with one characteristic (column II), and the phylum / class (column III) to which it belongs and choose the correct option.

Column-I	Column-II	C
1 *Limulus*	Body covered by chitinous exoskeleton	I
2 *Adamsia*	Radially symmetrical	I
3 *Petromyzon*	Ectoparasite	C
4 *Ichthyophis*	Terrestrial	I

1. 1
2. 2
3. 3
4. 4

160. Which of the following **cannot** be detected in a developing foetus by amniocentesis?

1. Down's syndrome
2. Jaundice
3. Klinefelter's syndrome
4. Sex of foetus

161. The most abundant intracellular cation is

1. H^+
2. K^+
3. Na^+
4. Ca^{++}

162. The H-zone in the skeletal muscle fibre is due to

1. the central gap between actin filaments extending through myosin filaments in the A-band.
2. extension of myosin filaments in the central portion of the A-band.
3. the absence of myfibrils in the central portion of A-band.
4. the central gap between myosin filaments in the A-band.

163. Secondary productivity is rate of formation of new organic matter by

1. consumers
2. decomposers

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3. producers

4. parasites

164. The Air Prevention and Control of Pollution Act came into force in

1. 1985

2. 1990

3. 1975

4. 1981

165. The process by which organisms with different evolutionary history evolve similar phenotypic adaptations in response to a common environmental challenge, is called

1. non-random evolution

2. adaptive radiation

3. natural selection

4. convergent evolution

166. Which of the following represent maximum number of species among global biodiversity?

1. Fungi

2. Mosses and Ferns

3. Algae

4. Lichens

167. The eye of octopus and eye of cat show different patterns of structure, yet they perform similar function. This is an example of

1. analogous organs that have evolved due to convergent evolution

2. analogous organs that have evolved due to divergent evolution

3. homologous organs that have evolved due to convergent evolution

4. homologous organs that have evolved due to divergent evolution

168. The characteristic and an example of a synovial joint in humans is

	Characteristics	Example
1	Fluid filled synovial cavity between two bones	Joint between atlas and axis bones
2	Lymph filled between two bones, limited movement	Gliding joint between carpals
3	Fluid cartilage between two bones, limited movement	Knee joint
4	Fluid filled between two joints, provides cushion	Skull bones

1. 1

2. 2

3. 3

4. 4

169. One of the legal methods of birth control is

1. by having coitus at the time of day break

2. by a premature ejaculation during coitus

3. abortion by taking an appropriate medicine

4. by abstaining from coitus from day 10 to 17 of the menstrual cycle.

170. Which of the following are correctly matched with respect to their taxonomic classification?

1. House fly, butterfly, tse-tse fly, silverfish - Insecta

2. Spiny anteater, sea urchin, sea cucumber - Echinodermata

3. Flying fish, cuttlefish, silverfish - Pisces

4. Centipede, millipede, spider, scorpion - Insecta

171. Which group of animals belong to the same phylum?

1. Prawn, scorpion, *Locusta*
2. Sponge, sea anemone, starfish
3. Malarial parasite, *Amoeba*, mosquito
4. Earthworm, pinworm, tapeworm

172. One of the representatives of Phylum Arthropoda is

1. puffer fish
2. flying fish
3. cuttle fish
4. silver fish

173. Menstrual flow occurs due to lack of

1. oxytocin
2. vasopressin
3. progesterone
4. FSH

174. The tendency of population to remain in genetic equilibrium may be disturbed by

1. lack of mutations
2. lack of random mating
3. random mating
4. lack of migration

175. Select the **incorrect** statement with regard to haemophilia.

1. It is a dominant disease.
2. A single protein involved in the clotting of blood is affected.
3. It is a sex-linked disease.
4. It is a recessive disease.

176. Variation in gene frequencies within populations can occur by chance rather than by natural selection. This is referred to as

1. random mating
2. genetic load
3. genetic flow
4. genetic drift

177. Cell-mediated immunity in human beings is provided by

1. thrombocytes
2. erythrocytes
3. T-lymphocytes
4. B-lymphocytes

178. Which one of the following is not used for *ex situ* plant conservation?

1. Shifting cultivation
2. Botanical gardens
3. Field gene banks
4. Seed banks

179. Artificial insemination means

1. artificial introduction of sperms of a healthy donor into the vagina
2. introduction of sperms of a healthy donor directly into the ovary
3. transfer of sperms of a healthy donor to a test tube containing ova
4. transfer of sperms of husband to a test tube containing ova

180. A sedentary sea anemone gets attached to the shell lining of hermit crab. The association is

1. commensalism
2. amensalism

3. ectoparasitism	4. mutualism