

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 announced post test submission.
10. The test will be auto-submitted once the timer ends.

Physics

Section A

- The condition under which a microwave oven heats up a food item containing water molecules most efficiently is
 - Microwaves are heat waves, so always produce heating
 - Infra -red waves produce heating in a microwave oven.
 - The frequency of the microwaves must match the resonant frequency of the water molecules
 - The frequency of the microwaves has no relation with natural frequency of water molecules

- A wire of resistance $4\ \Omega$ is stretched to twice its original length. The resistance of stretched wire would be

- $8\ \Omega$
- $16\ \Omega$
- $2\ \Omega$
- $4\ \Omega$

- 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



- $\frac{2g}{L}$
- $\frac{2g}{2L}$
- $\frac{3g}{2L}$
- $\frac{g}{L}$

- For photoelectric emission from certain metal the cutoff frequency is ν . If radiation

of frequency 2ν impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is the electron mass)

- $\sqrt{\frac{2h\nu}{m}}$
- $\sqrt{\frac{h\nu}{m}}$
- $\sqrt{\frac{h\nu}{(2m)}}$
- $\sqrt{\frac{h\nu}{1m}}$

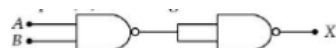
- In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows $P = \frac{a^3 b^2}{cd}$ % error in P is

- 7%
- 4%
- 14%
- 10%

- The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of $10\ \Omega$ is

- $0.8\ \Omega$
- $1.0\ \Omega$
- $0.2\ \Omega$
- $0.5\ \Omega$

- The output (X) of the logic circuit shown in figure will be



- $X = A \cdot B$
- $X = \overline{A + B}$
- $X = \overline{\overline{A} \cdot \overline{B}}$
- $X = \overline{A \cdot B}$

- When a proton is released from rest in a room, it starts with an initial acceleration a_0

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. $\frac{ma_0}{e} \text{ east}, \frac{3ma_0}{ev_0} \text{ up}$
2. $\frac{ma_0}{e} \text{ east}, \frac{3ma_0}{ev_0} \text{ down}$
3. $\frac{ma_0}{e} \text{ west}, \frac{2ma_0}{ev_0} \text{ up}$
4. $\frac{ma_0}{e} \text{ west}, \frac{2ma_0}{ev_0} \text{ down}$

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 h_1 , h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1 , h_2 and h_3 is

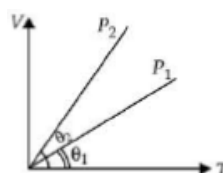
1. $h_2 = 3h_1 \text{ and } h_3 = 3h_2$
2. $h_1 = h_2 = h_3$
3. $h_1 = 2h_2 = 3h_3$
4. $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

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 mho 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. $1.5 G$

12. In the given (V - T) diagram, what is the relation between pressures P_1 and P_2 ?



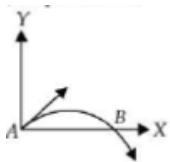
1. $P_1 > P_2$
 2. Cannot be predicted
 3. $P_2 = P_1$
 4. $P_2 > P_1$
13. The amount of heat energy required to raise the temperature of 1 g of Helium at constant volume from $T_1 \text{ K}$ to $T_2 \text{ K}$ is
1. $\frac{3}{4} N_a k_B (T_2 - T_1)$
 2. $\frac{3}{4} N_a k_B \left(\frac{T_2}{T_1} \right)$
 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 $(3\hat{i} + \hat{j})$ newton acts on a particle of mass 2 kg . Hence the particle is displaced from position $(2\hat{i} + \hat{k})$ meter to position $(4\hat{i} + 3\hat{j} - \hat{k})$ meter. The work done by the force on the particle is

1. 13 J
2. 15 J
3. 9 J
4. 6 J

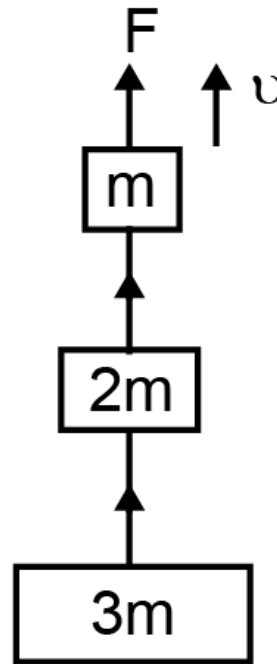
15. The upper half of an inclined plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by

1. $\mu = 2 \tan \theta$
2. $\mu = \tan \theta$
3. $\mu = \frac{1}{\tan \theta}$
4. $\mu = \frac{2}{\tan \theta}$

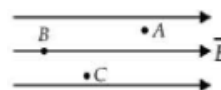
16. The velocity of a projectile at the initial point A is $(2\hat{i} + 3\hat{j}) \text{ m/s}$. Its velocity (in m/s) at point B is



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

4. maximum at B

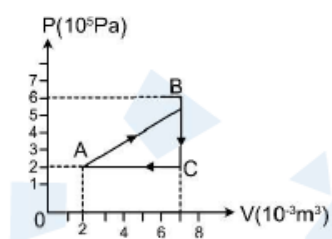
20. A coil of self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when

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

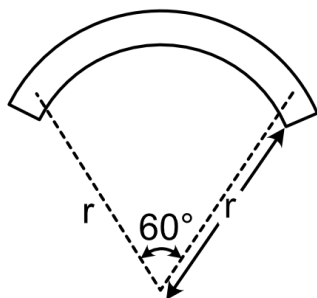
25. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using

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 $\lambda_1 = 12000 \text{ \AA}$ and $\lambda_2 = 10000 \text{ \AA}$. 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

orientations

4. can be in equilibrium in one orientation

34. The wavelength λ_e of an electron and λ_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, R and 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 7 volt 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 plano convex lens fits exactly into a plano 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. $3mgR$

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

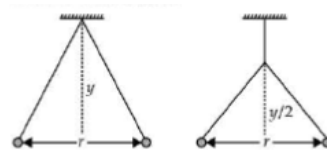
2. 1.5 cm

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. $\left(\frac{2r}{3}\right)$

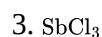
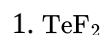
3. $\left(\frac{1}{\sqrt{2}}\right)^2$

4. $\left(\frac{r}{\sqrt[3]{2}}\right)$

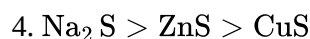
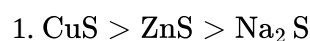
Chemistry

Section A

46. XeF_2 is isostructural with



47. Identify the correct order of solubility in aqueous medium.



48. Which of these is not a monomer for a high molecular mass silicone polymer?



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

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

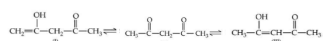
50. Which of the following does not give oxygen on heating?

1. KClO_3
2. $\text{Zn}(\text{ClO}_3)_2$
3. $\text{K}_2\text{Cr}_2\text{O}_7$
4. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$

51. Which is the strongest acid in the following?

1. H_2SO_4
2. HClO_3
3. HClO_4
4. H_2SO_3

52. The order of stability of the following tautomeric compounds is

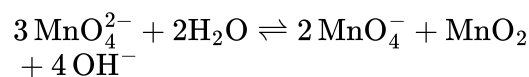


1. $\text{I} > \text{II} > \text{III}$
2. $\text{III} > \text{II} > \text{I}$
3. $\text{II} > \text{I} > \text{III}$
4. $\text{II} > \text{III} > \text{I}$

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_2MnO_4 as per the reaction



The reaction can go to completion by removing OH^- ions by adding

1. HCl
2. KOH
3. CO_2
4. SO_2

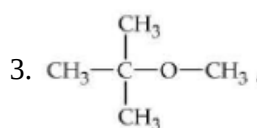
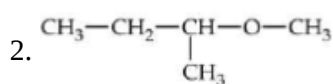
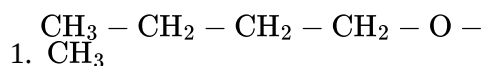
55. Which of the following lanthanoid ions is diamagnetic? (At. nos. Ce = 58, Sm = 62, Eu = 63, Yb = 70)

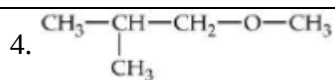
1. Ce^{2+}
2. Sm^{2+}
3. Eu^{2+}
4. Yb^{2+}

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?





58. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO_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 = $6.02 \times 10^{23} \text{ mol}^{-1}$)

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 $9.54 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ and at infinite dilution its molar conductance is $238 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$. 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 ?

($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)

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?

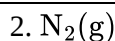
1. BF_3
2. SF_4
3. SiF_4
4. XeF_4

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

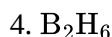
1. $\text{H}_2(\text{g})$



67. Which of these is least likely to act as a Lewis base?



68. Which of the following structure is similar to graphite?



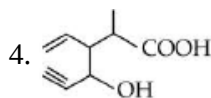
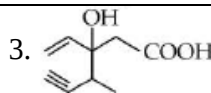
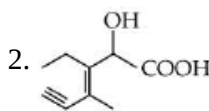
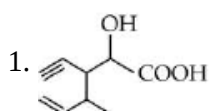
69. Which of the following is electron-deficient?



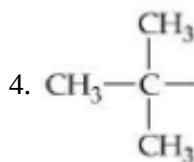
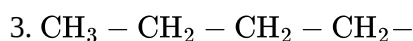
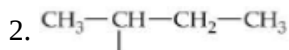
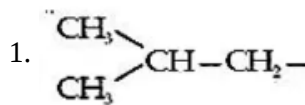
70. The basic structural unit of silicates is



71. Structure of the compound whose IUPAC name is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is



72. The structure of isobutyl group in an organic compound is



73. The radical, is aromatic because it has

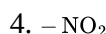
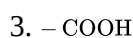
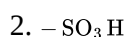
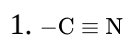
1. 6 p-orbitals and 6 unpaired electrons

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?



75. Which of the following compounds will not undergo Friedel-Craft's reaction easily

1. Cumene
2. Xylene
3. Nitrobenzene
4. Toluene

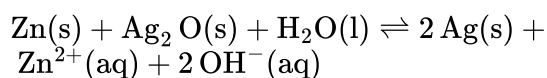
76. Nitrobenzene on reaction with conc. $\text{HNO}_3/\text{H}_2\text{SO}_4$ at $80 - 100^\circ\text{C}$ forms which one of the following products?

1. 1, 2-Dinitrobenzene
2. 1, 3-Dinitrobenzene
3. 1, 4-Dinitrobenzene
4. 1, 2, 4-Trinitrobenzene

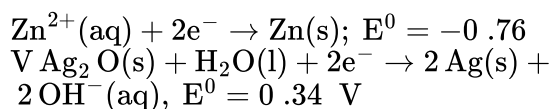
77. The number of carbon atoms per unit cell of diamond unit cell is

1. 4
2. 8
3. 6
4. 1

78. A button cell used in watches function as following.



If half cell potentials are



The cell potential will be

1. 1.10 V
2. 0.42 V
3. 0.84 V
4. 1.34 V

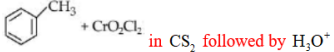
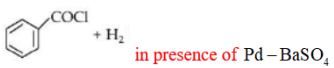
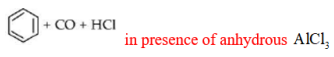
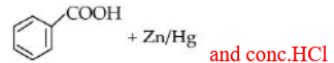
79. A reaction having equal energies of activation for forward and reverse reactions has:

1. $\Delta S = 0$
2. $\Delta G = 0$
3. $\Delta H = 0$
4. $\Delta H = \Delta G = \Delta S = 0$

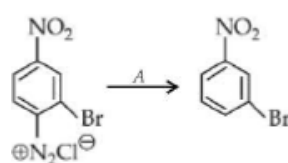
80. A magnetic moment at 1.73 BM will be shown by one among of the following

1. TiCl_4
2. $[\text{Ni}(\text{CN})_4]^{2-}$
3. $[\text{Cu}(\text{NH}_3)_4]^{2+}$
4. $[\text{CoCl}_6]^{4-}$

81. Reaction by which benzaldehyde cannot be prepared

1.  1. $\text{C}_6\text{H}_5\text{CH}_3 + \text{CrO}_2\text{Cl}_2 \xrightarrow{\text{in CS}_2} \text{C}_6\text{H}_5\text{CHO} \xrightarrow{\text{H}_3\text{O}^+}$
2.  2. $\text{C}_6\text{H}_5\text{COCl} + \text{H}_2 \xrightarrow{\text{in presence of Pd-BaSO}_4}$
3.  3. $\text{C}_6\text{H}_6 + \text{CO} + \text{HCl} \xrightarrow{\text{in presence of anhydrous AlCl}_3}$
4.  4. $\text{C}_6\text{H}_5\text{COOH} + \text{Zn/Hg} \xrightarrow{\text{and conc. HCl}}$

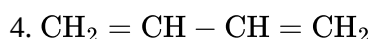
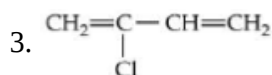
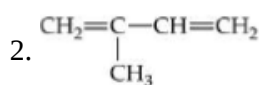
82. In the reaction:



A is:

1. $\text{HgSO}_4/\text{H}_2\text{SO}_4$
2. Cu_2Cl_2
3. H_3PO_2 and H_2O
4. $\text{H}^+/\text{H}_2\text{O}$

83. Which is the monomer of Neoprene in the following?



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 $3 \times 10^{17} \text{ nms}^{-1}$. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of $6 \times 10^{15} \text{ s}^{-1}$?

1. 10
2. 25
3. 50
4. 75

87. Based on equation $E = -2.178 \times 10^{-18} \left(\frac{Z^2}{n^2} \right) \text{ J}$, 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 microorganisms. 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?

$$n = 3, l = 1 \text{ and } m = -1$$

1. 10
2. 6

3. 4

4. 2

Botany

Section A

91. During seed germination its stored food is mobilized by

1. ABA
2. Gibberlin
3. Ethylene
4. Cytokinin

92. Lenticels are involved in

1. food transport
2. photosynthesis
3. transpiration
4. gaseous exchange

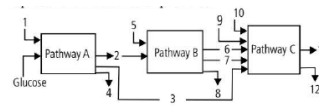
93. Interfascicular cambium develops from the cells of

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.

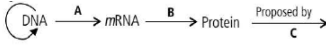
(D) The sporophyte in liverworts is more elaborate than that in mosses.

(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?

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. <i>Spirogyra</i> 2. <i>Volvox</i> 3. <i>Chlamydomonas</i> 4. <i>Fucus</i> 100. Which of the following are likely to be present in deep sea water? 1. Blue-green algae 2. Saprophytic fungi 3. Archaeobacteria 4. Eubacteria 101. Select the wrong statement. 1. In oomycetes, female gamete is smaller and motile, while male gamete is larger and non-motile. 2. <i>Chlamydomonas</i> exhibits both isogamy and anisogamy and <i>Fucus</i> 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
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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.



	Cell plate
1. Cytokinesis	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 inactivation 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 is 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.

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

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

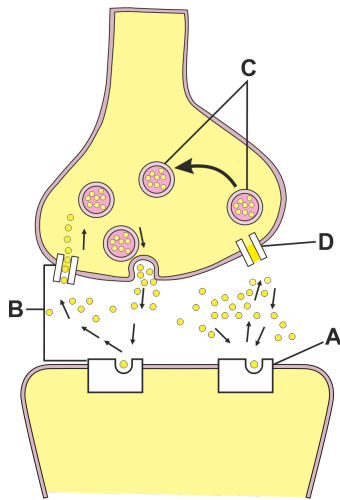
Section A

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.

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

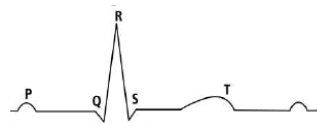
4. Posterior pituitary Growth Hormone(GH) Over secretion stimulates abnormal growth

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

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

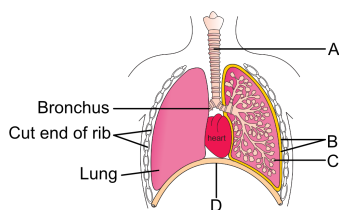
1. 1

2. 2

3. 3

4. 4

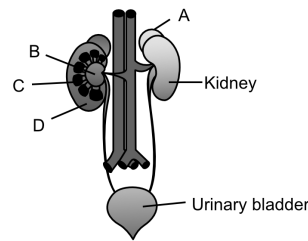
146. The figure shows a diagrammatic view of human respiratory system with labels A, B, C and D. Select the option which gives correct identification and main function and / or characteristic.



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

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.

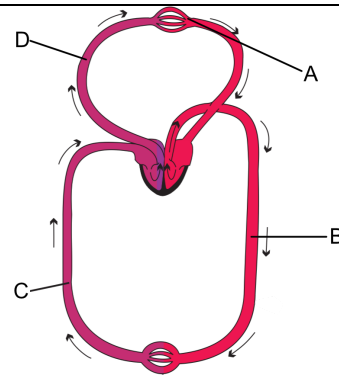
151. Kyoto protocol was endorsed at

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, $p\text{CO}_2 = 45 \text{ mm Hg}$
2. D - Dorsal aorta - takes blood from heart to body parts, $p\text{O}_2 = 95 \text{ mm Hg}$
3. A - Pulmonary vein - takes impure blood from body parts, $p\text{O}_2 = 60 \text{ mm Hg}$
4. B - Pulmonary artery - takes blood from heart to lungs, $p\text{O}_2 = 90 \text{ mm Hg}$.

154. What external changes are visible after the last moult of a cockroach nymph?

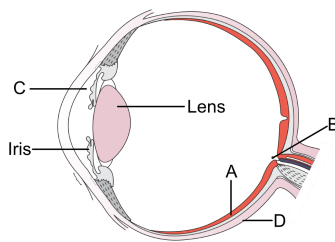
1. Both forewings and hindwings develop
2. Labium develops
3. Mandibles become harder
4. Anal cerci develop

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

1 <i>Limulus</i>	Body covered by chitinous exoskeleton
2 <i>Adamsia</i>	Radially symmetrical
3 <i>Petromyzon</i>	Ectoparasite
4 <i>Ichthyophis</i>	Terrestrial

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 myofibrils 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

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
Fluid filled synovial 1 cavity between two bones	Joint between atlas and axis bones
Lymph filled 2 between two bones, limited movement	Gliding joint between carpals
Fluid cartilage 3 between two bones, limited movement	Knee joint
Fluid filled between 4 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, <i>Locusta</i> 2. Sponge, sea anemone, starfish 3. Malarial parasite, <i>Amoeba</i>, 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 <i>ex situ</i> 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
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3. ectoparasitism	4. mutualism