

NEET-UG - 2013

1. In Young's double slit experiment, the slits are 2mm 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 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other ?

- (1) 3 mm (2) 8 mm (3) 6 mm (4) 4 mm

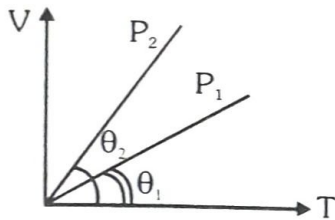
2. In a common emitter (CE) amplifier having a voltage gain G , the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 mho and current gain 20, the voltage gain will be :

- (1) $\frac{5}{4}G$ (2) $\frac{2}{3}G$ (3) 1.5 G (4) $\frac{1}{3}G$

3. 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 $1u = 931 \text{ MeV}$)

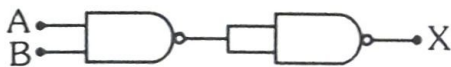
- (1) 13.35 MeV (2) 2.67 MeV
(3) 26.7 MeV (4) 6.675 MeV

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



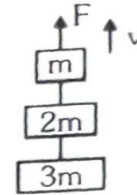
- (1) Cannot be predicted
(2) $P_2 = P_1$
(3) $P_2 > P_1$
(4) $P_2 < P_1$

5. The output (X) of the logic circuit shown in figure will be :



- (1) $X = \overline{A+B}$ (2) $X = \overline{\overline{A}\overline{B}}$
(3) $X = \overline{A\overline{B}}$ (4) $X = A.B$

6. 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) 6 mg (2) zero (3) 2 mg (4) 3 mg

7. In a n-type semiconductor, which of the following statement is true:

- (1) Holes are majority carriers and trivalent atoms are dopants.
(2) Electrons are majority carriers and trivalent atoms are dopants.
(3) Electron are minority carriers and pentavalent atoms are dopants
(4) Holes are minority carriers and pentavalent atoms are dopants.

8. 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) 100 years (2) 40 years
(3) 60 years (4) 80 years

9. 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) γR (2) $\frac{1+\gamma}{1-\gamma}$
(3) $\frac{R}{(\gamma-1)}$ (4) $\frac{(\gamma-1)}{R}$

10. The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by:

- (1) $\lambda_e \propto \frac{1}{\sqrt{\lambda}}$ (2) $\lambda_p \propto \lambda_e$
 (3) $\lambda_p \propto \lambda_e$ (4) $\lambda_p \propto \sqrt{\lambda_e}$

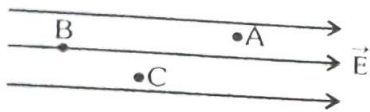
11. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is:-

- (1) $\frac{9}{31}$ (2) $\frac{5}{27}$ (3) $\frac{3}{23}$ (4) $\frac{7}{29}$

12. A current loop in a magnetic field :-

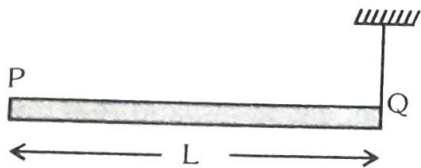
- (1) Can be in equilibrium in two orientations, one stable while the other is unstable.
 (2) Experiences a torque whether the field is uniform or non uniform in all orientations
 (3) Can be in equilibrium in one orientation
 (4) Can be in equilibrium in two orientations, both the equilibrium states are unstable

13. A, B and C are three points in a uniform electric field. The electric potential is :-



- (1) Same at all the three points A, B and C
 (2) Maximum at A
 (3) Maximum at B
 (4) Maximum at C

14. 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 :-

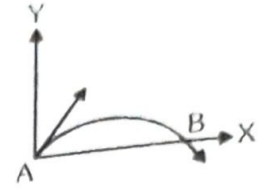


- (1) $\frac{2g}{3L}$ (2) $\frac{3g}{2L}$
 (3) g/L (4) $2g/L$

15. A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be :-

- (1) 16Ω (2) 2Ω
 (3) 4Ω (4) 8Ω

16. The velocity of a projectile at the initial point A is $(2\hat{i} + 3\hat{j})$ 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) $2\hat{i} - 3\hat{j}$

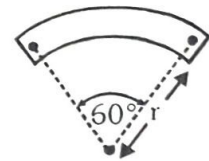
17. A body of mass 'm' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be :-

- (1) $\frac{1}{3} mgR$ (2) $mg2R$
 (3) $\frac{2}{3} mgR$ (4) $3 mgR$

18. A stone falls freely under gravity. It covers distance 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) $h_1 = h_2 = h_3$
 (2) $h_1 = 2h_2 = 3h_3$
 (3) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$
 (4) $h_2 = 3h_1$ and $h_3 = 3h_2$

19. 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) $\frac{M}{2}$ (2) M
 (3) $\frac{3}{\pi} M$ (4) $\frac{2}{\pi} M$

20. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is

- (1) 1.0Ω (2) 0.2Ω
 (3) 0.5Ω (4) 0.8Ω

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) :-

- (1) $2\sqrt{h\nu/m}$ (2) $\sqrt{h\nu/(2m)}$
 (3) $\sqrt{h\nu/m}$ (4) $\sqrt{2h\nu/m}$

22. 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) $\frac{3}{2}$ (2) $\frac{4}{3}$
 (3) 2 (4) $\frac{5}{3}$

23. 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 = 300cm, diameter = 3mm
 (2) length = 50 cm, diameter = 0.5 mm
 (3) length = 100 cm, diameter = 1mm
 (4) length = 200 cm, diameter = 2mm

24. 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) 2.0 A (2) 1.0 A
 (3) 0.2 A (4) 0.1 A

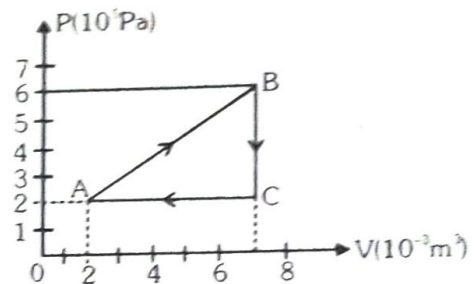
25. The amount of heat energy required to raise the temperature of 1 g of Helium at constant volume, from T_1 K to T_2 K is :-

- (1) $\frac{3}{4} N_a k_B \left(\frac{T_2}{T_1} \right)$
 (2) $\frac{3}{8} N_a k_B (T_2 - T_1)$
 (3) $\frac{3}{2} N_a k_B (T_2 - T_1)$
 (4) $\frac{3}{4} N_a k_B (T_2 - T_1)$

26. 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) Newton's Law of cooling
 (2) Stefan's Law
 (3) Wien's displacement Law
 (4) Kirchoff's Law

27. 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) -2000 J (2) 2000 J
 (3) 1000 J (4) Zero

28. The condition under which a microwave oven heats up a food item containing water molecules most efficiently is :-

- (1) Infra-red waves produce heating in a microwave oven
 (2) The frequency of the microwaves must match the resonant frequency of the water molecules
 (3) The frequency of the microwaves has no relation with natural frequency of water molecules
 (4) Microwaves are heat waves, so always produce heating

29. 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) 17 kg (2) 3 kg
 (3) 5 kg (4) 7 kg

30. 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 :-

- (1) 4% (2) 14%
 (3) 10% (4) 7%

31. 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) Disc
 (2) Ring
 (3) Solid sphere
 (4) Hollow sphere

32. 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 combination is

- (1) $\frac{2R}{(\mu_2 - \mu_1)}$ (2) $\frac{R}{2(\mu_1 + \mu_2)}$
 (3) $\frac{R}{2(\mu_1 - \mu_2)}$ (4) $\frac{R}{(\mu_1 - \mu_2)}$

33. 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 central maximum will be unaffected.
 (2) Diffraction pattern is not observed on the screen in the case of electrons.
 (3) The angular width of the central maximum of the diffraction pattern will increase.
 (4) The angular width of the central maximum will decrease.

34. 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) 1.5 cm (2) 5 cm
 (3) 2.5 cm (4) 1.67 cm

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

36. A wave travelling in the +ve x-direction having displacement along y-direction as 1m, wavelength 2π m and frequency of $\frac{1}{\pi}$ Hz is represented by

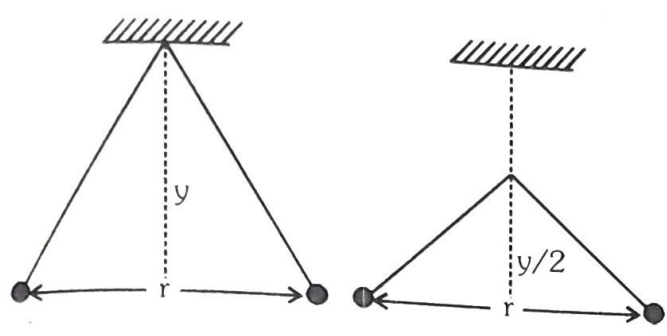
- (1) $y = \sin (2\pi x + 2\pi t)$
 (2) $y = \sin (x - 2t)$
 (3) $y = \sin (2\pi x - 2\pi t)$
 (4) $y = \sin (10\pi x - 20\pi t)$

37. A source of unknown frequency gives 4 beats, 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) 260 Hz (2) 254 Hz
 (3) 246 Hz (4) 240 Hz

38. 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) an iron rod is inserted in the coil.
 - (2) frequency of the AC source is decreased.
 - (3) number of turns in the coil is reduced.
 - (4) A capacitance of reactance $X_C = X_L$ is included in the same circuit.

39. 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) $\left(\frac{2r}{3}\right)$
- (2) $\left(\frac{1}{\sqrt{2}}\right)^2$
- (3) $\left(\frac{r}{\sqrt{2}}\right)$
- (4) $\left(\frac{2r}{\sqrt{3}}\right)$

40. If we study the vibration of a pipe open at both ends, then the following statement is not true :
- (1) Pressure change will be maximum at both ends
 - (2) Open end will be antinode
 - (3) Odd harmonics of the fundamental frequency will be generated
 - (4) All harmonics of the fundamental frequency will be generated

41. 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 $3a_0$ towards west. The electric and magnetic fields in the room are:

- (1) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ down
- (2) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ up
- (3) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ down
- (4) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ up

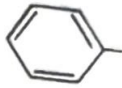
42. A wire loop is rotated in magnetic field. The frequency of change of direction of the induced e.m.f. is :
- (1) Six times per revolution
 - (2) Once per revolution
 - (3) twice per revolution
 - (4) four times per revolution

43. A uniform force of $(3\hat{i} + \hat{j})$ newton acts on a particle of mass 2kg. 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) 15 J (2) 9 J (3) 6 J (4) 13 J

44. The wettability of a surface by a liquid depends primarily on :-
- (1) angle of contact between the surface and the liquid
 - (2) viscosity
 - (3) surface tension
 - (4) density

45. Infinite number of bodies, each of mass 2 kg are situated on x-axis at distance 1m, 2m, 4m, 8m, respectively, from the origin. The resulting gravitational potential due to this system at the origin will be :
- (1) $-4G$ (2) $-G$
 - (3) $-\frac{8}{3}G$ (4) $-\frac{4}{3}G$

46. The value of Planck's constant is 6.63×10^{-34} Js. The speed of light is 3×10^{17} nm s⁻¹. Which value is closest to the wavelength in nanometer of a quantum of light with frequency of 6×10^{15} s⁻¹ ?
 (1) 75 (2) 10
 (3) 25 (4) 50

47. The radical,  is aromatic because it has :-

- (1) 6p-orbitals and 7 unpaired electrons
 (2) 6p-orbitals and 6 unpaired electrons
 (3) 7p-orbitals and 6 unpaired electrons
 (4) 7p-orbitals and 7 unpaired electrons
48. Which of the following is electron-deficient ?
 (1) PH₃ (2) (CH₃)₂
 (3) (SiH₃)₂ (4) (BH₃)₂

49. Which of the following statements about the interstitial compounds is **incorrect** ?

- (1) They have higher melting points than the pure metal
 (2) They retain metallic conductivity
 (3) They are chemically reactive
 (4) They are much harder than the pure metal

50. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0 M HNO₃?

(70% by mass)

- (1) 54.0 g
 (2) 45.0 g
 (3) 90.0 g
 (4) 70.0 g

51. Which of the following lanthanoid ions is diamagnetic?

(Atoms, Ce = 58, Sm = 62, Yb = 70, Eu = 63)

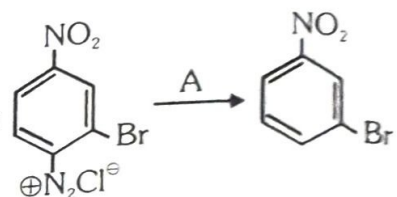
- (1) Yb²⁺ (2) Ce²⁺
 (3) Sm²⁺ (4) Eu²⁺

52. Which one of the following molecules contains no π bond ?

- (1) NO₂ (2) CO₂ (3) H₂O (4) SO₂

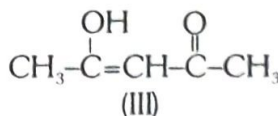
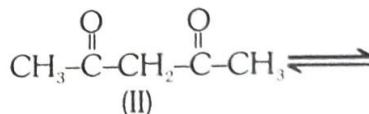
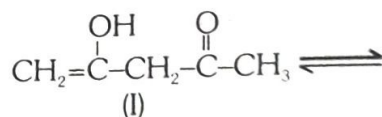
53. Based on equation $E = -2.178 \times 10^{-18}$ J certain conclusions are written. Which of them is correct ?

- (1) For $n = 1$, the electron has a more negative energy than it does for $n = 6$ which means the electron is more loosely bound in the smallest allowed orbit.
 (2) The negative sign in equation simply means 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
 (3) Larger the value of n , the larger is the orbit radius
 (4) Equation can be used to calculate the change in energy when the electron change orbit

54. In the reaction 

- (1) H⁺/H₂O
 (2) HgSO₄/H₂SO₄
 (3) Cu₂Cl₂
 (4) H₃PO₂ and H₂O

55. The order of stability of the following tautomeric compounds is :-

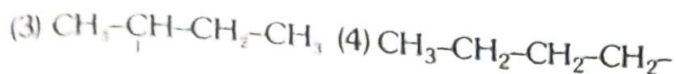


- (1) II > III > I (2) I > II > III
 (3) III > II > I (4) II > I > III

56. Nylon is an example of :-

- (1) Polythene (2) Polyester
 (3) Polysaccharide (4) Polyimide

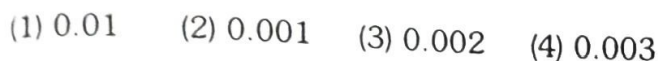
37. XeF_2 is isostructural with :-
 (1) $BaCl_2$ (2) TeF_2 (3) ICl_2 (4) $SbCl_3$
38. The basic structural unit of silicates is :-
 (1) SiO_4^{4-} (2) SiO (3) SiO_4^{+} (4) SiO_3^{2-}
39. Which of the following structure is similar to graphite?
 (1) B_2H_6 (2) BN (3) B (4) B_4C
60. The structure of isobutyl group in an organic compound is :-



61. The number of carbon atoms per unit cell of diamond unit cell is :-



62. 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 :-



63. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers?

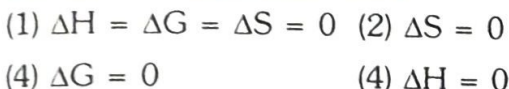
$$n = 3, l = 1 \text{ and } m_l = -1$$



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



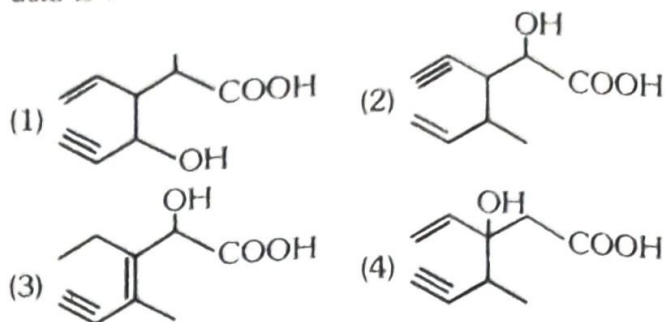
65. A reaction having equal energies of activation for forward and reverse reactions has :-



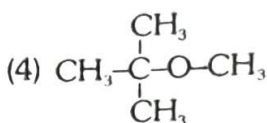
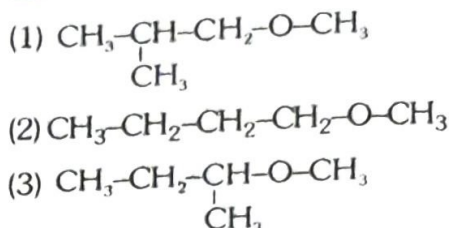
66. At $25^\circ C$ molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is $9.54 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ and at infinite dilution its molar conductance is $238 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$. The degree of ionisation of ammonium hydroxide at the same concentration and temperature is :-



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



68. Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HCl ?



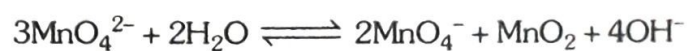
69. Antiseptics and disinfectants either kill or prevent growth of microorganisms. Identify which of the following statements is **not true** :-

- (1) Disinfectants harm the living tissues
 (2) A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant
 (3) Chlorine and Iodine are used as strong disinfectants
 (4) Dilute solutions of Boric acid and Hydrogen Peroxide are strong antiseptics

70. A magnetic moment of 1.73 BM will be shown by one among the following :-



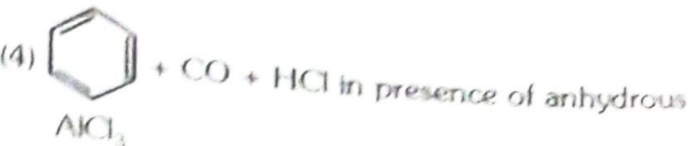
71. $KMnO_4$ can be prepared from K_2MnO_4 as per the reaction :-



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



72. Reaction by which Benzaldehyde cannot be prepared -



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

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

74. A metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72g cm^{-3} . The molar mass of the metal is :-

- (1) 20g mol^{-1} (2) 40g mol^{-1}
 (3) 30g mol^{-1} (4) 27g mol^{-1}

75. Dipole induced dipole interactions are present in which of the following pairs :-

- (1) SiF_4 and He atoms (2) H_2O and alcohol
 (3) Cl_2 and CCl_4 (4) HCl and He atoms

76. Roasting of sulphides gives the gas X as a by product. This is 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 reducing agent and its acid has never been isolated. The gas X is :-

- (1) SO_3 (2) H_2S (3) SO_2 (4) CO_2

77. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?

- (1) $-\text{NO}_2$ (2) $-\text{C}\equiv\text{N}$
 (3) $-\text{SO}_3\text{H}$ (4) $-\text{COOH}$

78. 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, 4-Trinitrobenzene
 (2) 1, 2-Dinitrobenzene
 (3) 1, 3-Dinitrobenzene
 (4) 1, 4-Dinitrobenzene

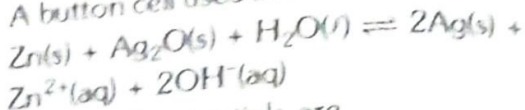
79. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of electrode would be ?

- (1) 1.18 V (2) 0.059 V
 (3) 0.59 V (4) 0.118 V

80. Which of the following is a polar molecule ?

- (1) XeF_4 (2) BF_3 (3) SF_4 (4) SiF_4

81. A button cell used in watches function as follows



If half cell potentials are
 $\text{Zn}^{2+}(\text{aq}) + 2e^- \rightarrow \text{Zn(s)}; E^\circ = -0.76\text{V}$
 $\text{Ag}_2\text{O(s)} + \text{H}_2\text{O(l)} + 2e^- \rightarrow 2\text{Ag(s)} + 2\text{OH}^-(\text{aq}); E^\circ = 0.34\text{V}$

The cell potential will be :-
 (1) 1.34 V (2) 1.10 V (3) 0.42 V (4) 0.28 V

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

- (1) PF_3 (2) CO (3) F^- (4) BF_3

83. Which of the following compounds will not undergo Friedal-Craft's reaction easily :-

- (1) Toluene (2) Cumene
 (3) Xylene (4) Nitrobenzene

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

- (1) $\text{CH}_2=\text{CH}-\text{C}\equiv\text{CH}$ (2) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$
 (3) $\text{CH}_2=\underset{\text{CH}_3}{\text{C}}-\text{CH}=\text{CH}_2$ (4) $\text{CH}_2=\underset{\text{Cl}}{\text{C}}-\text{CH}=\text{CH}_2$

85. 6.02×10^{20} molecules of urea are present in 100 ml of its solution. The concentration of solution is :-

- (1) 0.1 M (2) 0.02 M
 (3) 0.01 M (4) 0.001M

86. Maximum deviation from ideal gas is expected from :-

- (1) $\text{NH}_3(\text{g})$ (2) $\text{H}_2(\text{g})$ (3) $\text{N}_2(\text{g})$ (4) $\text{CH}_4(\text{g})$

87. Which of the following is paramagnetic ?

- (1) NO^+ (2) CO (3) O_2^- (4) CN^-

88. Identify the correct order of solubility in aqueous medium :-

- (1) $\text{Na}_2\text{S} > \text{ZnS} > \text{CuS}$ (2) $\text{CuS} > \text{ZnS} > \text{Na}_2\text{S}$
 (3) $\text{ZnS} > \text{Na}_2\text{S} > \text{CuS}$ (4) $\text{Na}_2\text{S} < \text{CuS} > \text{ZnS}$

89. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 20°C to 35°C ? ($R = 8.314\text{ J mol}^{-1}\text{ K}^{-1}$)

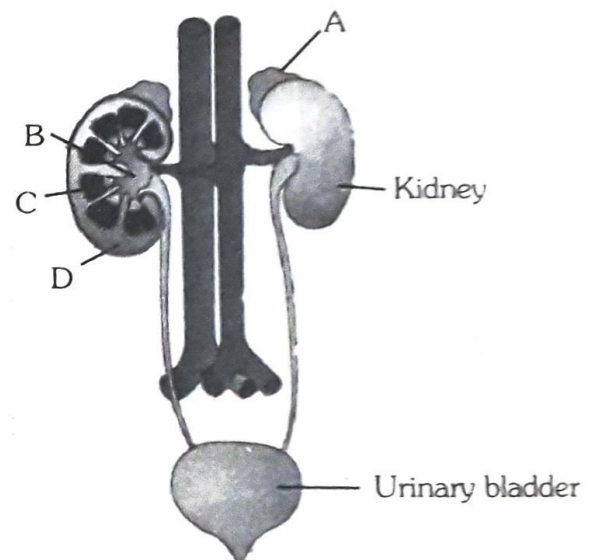
- (1) 15.1 kJ mol^{-1} (2) 342 kJ mol^{-1}
 (3) 269 kJ mol^{-1} (4) 34.7 kJ mol^{-1}

90. Which is the strongest acid in the following ?

- (1) H_2SO_3 (2) H_2SO_4 (3) HClO_3 (4) HClO_4

91. 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 divergent evolution
 - (2) Homologous organs that have evolved due to convergent evolution
 - (3) Homologous organs that have evolved due to divergent evolution
 - (4) Analogous organs that have evolved due to convergent evolution
92. Select the correct statement with respect to locomotion in humans:
- (1) The joint between adjacent vertebrae is a fibrous joint
 - (2) A decreased level of progesterone causes osteoporosis in old people
 - (3) Accumulation of uric acid crystals in joints causes their inflammation
 - (4) The vertebral column has 10 thoracic vertebrae
93. A phosphoglyceride is always made up of :
- (1) a saturated or unsaturated fatty acid esterified to a phosphate group which is also attached to a glycerol molecule
 - (2) only a saturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
 - (3) only a unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
 - (4) a saturated or unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached
94. Perisperm differs from endosperm in:
- (1) its formation by fusion of secondary nucleus with several sperms
 - (2) being a haploid tissue
 - (3) having no reserve food
 - (4) being a diploid tissue
95. A sedentary sea anemone gets attached to the shell lining of hermit crab. The association is :
- (1) Amensalism
 - (2) Ectoparasitism
 - (3) Symbiosis
 - (4) Commensalism

96. The cell-mediated immunity inside the human body is carried out by :
- (1) Erythrocytes
 - (2) T lymphocytes
 - (3) B-lymphocytes
 - (4) Thrombocytes
97. Which of the following are likely to be present in deep sea water ?
- (1) Saprophytic fungi
 - (2) Archaeobacteria
 - (3) Eubacteria
 - (4) Blue-green algae
98. One of the representatives of Phylum Arthropoda is :
- (1) flying fish
 - (2) cuttlefish
 - (3) silverfish
 - (4) pufferfish
99. Megasporangium is equivalent to :
- (1) Ovule
 - (2) Embryo sac
 - (3) Fruit
 - (4) Nucellus
100. Kyoto Protocol was endorsed at :
- (1) CoP - 4
 - (2) CoP - 3
 - (3) CoP - 5
 - (4) CoP - 6
101. Figure shows human urinary system with structures labelled A to D. Select option which correctly identifies them and gives their characteristics and/or functions.



- (1) D-Cortex - outer part of kidney and do not contain any part of nephrons
- (2) A-Adrenal gland - located at the anterior part of kidney. Secrete Catecholamines which stimulate glycogen breakdown
- (3) B-Pelvis - broad funnel shaped space inner to hilum, directly connected to loops of Henle
- (4) C-Medulla-inner zone of kidney and contains complete nephrons

102. In china rose the flowers are :
- (1) Zygomorphic, epigynous with twisted aestivation
 - (2) Actinomorphic, hypogynous with twisted aestivation
 - (3) Actinomorphic, epigynous with valvate aestivation
 - (4) Zygomorphic, hypogynous with imbricate aestivation

103. The Golgi complex plays a major role :
- (1) in post translational modification of proteins and glycosidation of lipids
 - (2) in trapping the light and transforming it into chemical energy
 - (3) in digesting proteins and carbohydrates
 - (4) as energy transferring organelles

104. What external changes are visible after the last moult of a cockroach nymph?
- (1) Labium develops
 - (2) Mandibles become harder
 - (3) Anal cerci develop
 - (4) Both fore wings with hind wings develop

105. Isogamous condition with non-flagallated gametes is found in :
- | | |
|----------------------|--------------------------|
| (1) <i>Fucus</i> | (2) <i>Chlamydomonas</i> |
| (3) <i>Spirogyra</i> | (4) <i>Volvox</i> |

106. Transition state structure of the substrate formed during an enzymatic reaction is :
- (1) permanent and stable
 - (2) transient but stable
 - (3) permanent but unstable
 - (4) transient and unstable

107. Select the answer which correctly matches the endocrine gland with the hormone it secretes and its function/deficiency symptom :

	Endocrine gland	Hormone	Function/deficiency symptoms
(1)	Corpus luteum	Testosterone	Stimulates spermatogenesis
(2)	Anterior pituitary	Oxytocin	Stimulates uterus contraction during child birth
(3)	Posterior pituitary	Growth Hormone (GH)	Oversecretion stimulates abnormal growth
(4)	Thyroid gland	Thyroxine	Lack of iodine in diet results in goitre

108. The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of :
- (1) Inactivation of glycosidase enzyme in recombinant bacteria
 - (2) Non-recombinant bacteria contain beta-galactosidase
 - (3) Insertional inactivation of alpha-galactosidase in non-recombinant bacteria
 - (4) Insertional inactivation of beta-galactosidase in recombinant bacteria

109. Monoecious plant of *Chara* shows occurrence of
- (1) upper oogonium and lower antheridium on the same plant
 - (2) antheridiophore and archegoniophore on the same plant
 - (3) stamen and carpel on the same plant
 - (4) upper antheridium and lower oogonium on the same plant

110. Advantage of cleistogamy is :-

- (1) Vivipary
- (2) Higher genetic variability
- (3) More vigorous offspring
- (4) No dependence on pollinators

111. The H-zone in the skeletal muscle fibre is due to

- (1) extension of myosin filaments in the central portion of the A-band
- (2) the absence of myofibrils in the central portion of A-band
- (3) the central gap between myosin filaments in the A-band
- (4) the central gap between actin filaments extending through myosin filaments in the A-band

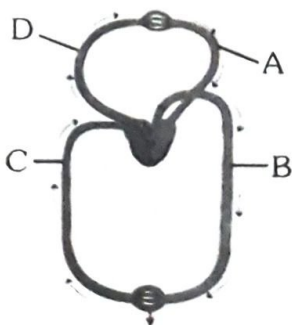
112. Artificial insemination means :

- (1) introduction of sperms of a healthy donor directly into the ovary
- (2) yransfer of sperms of a healthy donor to a test tube containing ova
- (3) transfer of sperms of husband to a test tube containing ova
- (4) artificial introduction of sperms of a healthy donor into the vagina

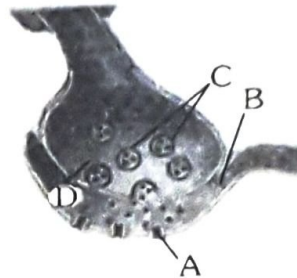
113. Which group of animals belong to the same phylum?

- (1) Sponge, Sea anemone, Starfish
- (2) Malarial parasite, *Amoeba*, Mosquito
- (3) Earthworm, Pinworm, Tapeworm
- (4) Prawn, Scorpion, *Locusta*

114. Seed coat is **not** thin, membranous in :
 (1) Gram (2) Maize
 (3) Coconut (4) Groundnut
115. 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) Complete dominance
 (2) Codominance
 (3) Incomplete dominance
 (4) Partial dominance
116. Which of the following **cannot** be detected in a developing foetus by amniocentesis ?
 (1) Jaundice (2) Klinefelter syndrome
 (3) Sex of the foetus (4) Down syndrome
117. The first stable product of fixation of atmospheric nitrogen in leguminous plants is :
 (1) Glutamate (2) NO_2^-
 (3) Ammonia (4) NO_3^-
118. 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) Zero (2) 10 (3) 15 (4) 05
119. Secondary productivity is rate of formation of new organic matter by :
 (1) Decomposer (2) Producer
 (3) Parasite (4) Consumer
120. Infection of *Ascaris* usually occurs by :
 (1) mosquito bite
 (2) drinking water containing eggs of *Ascaris*
 (3) eating imperfectly cooked pork.
 (4) Tse-tse fly
121. Figure shows schematic plan of blood circulation in humans with labels A to D, Identify the label and give its function/s.

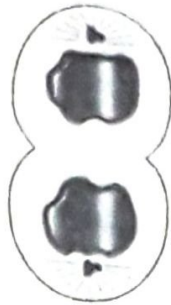


- (1) D-Dorsal aorta-takes blood from heart to body parts, $\text{PO}_2 = 95$ mm Hg
 (2) A-Pulmonary vein-takes impure blood from body parts, $\text{PO}_2 = 60$ mm Hg
 (3) B-Pulmonary artery-takes blood from heart to lungs, $\text{PO}_2 = 90$ mm Hg
 (4) C-Vena Cava-takes blood from body parts the right auricle, $\text{PCO}_2 = 45$ mm Hg
122. The tendency of population to remain in genetic equilibrium may be disturbed by :
 (1) lack of random mating
 (2) random mating
 (3) lack of migration
 (4) lack of mutations
123. A diagram showing axon terminal and synapse is given below. Identify correctly at least two of A-D.



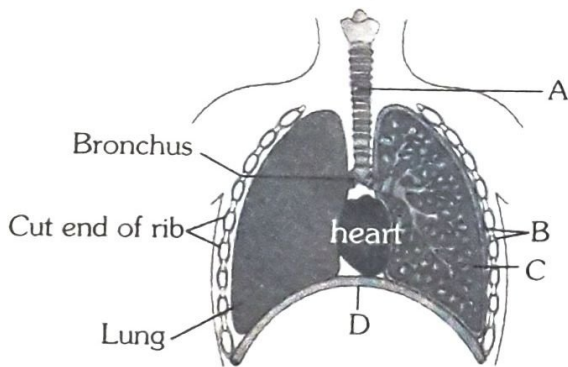
- (1) C-Neurotransmitter
 D- Ca^{++}
 (2) A-Receptor
 C-Synaptic vesicles
 (3) B-Synaptic connection
 D- K^+
 (4) A-Neurotransmitter
 B-Synaptic cleft
124. A good producer of citric acid is :
 (1) *Saccharomyces* (2) *Aspergillus*
 (3) *Pseudomonas* (4) *Clostridium*
125. Age of a tree can be estimated by :
 (1) diameter of its heartwood
 (2) its height and girth
 (3) biomass
 (4) number of annual rings
126. The process by which organisms with different evolutionary history evolve similar phenotypic adaptation in response to a common environmental challenge, is called :
 (1) Adaptive radiation
 (2) Natural selection
 (3) Convergent evolution
 (4) Non-random evolution

127. A stage in cell division is shown in the figure. Select the answer which gives correct identification of the stage with its characteristics.



(1)	Telophase	Endoplasmic reticulum and nucleolus not reformed yet.
(2)	Telophase	Nuclear envelop reforms, golgi complex reforms.
(3)	Late anaphase	Chromosomes move a away from equatorial plate, golgi complex not present.
(4)	Cytokinesis	Cell plate formed, mitochondria distributed between two daughter cells.

128. 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) D – Lower end of lungs – diaphragm pulls it down during inspiration
- (2) A – trachea - long tube supported by complete cartilaginous rings for conducting inspired air
- (3) B – pleural membrane - surround ribs on both sides to provide cushion against rubbing
- (4) C – Alveoli - thin walled vascular bag like structures for exchange of gases

129. Interfascicular cambium develops from the cells of:

- (1) Pericycle
- (2) Medullary rays
- (3) Xylem parenchyma
- (4) Endodermis

130. During seed germination its stored food is mobilized by :

- (1) Gibberellin
- (2) Ethylene
- (3) Cytokinin
- (4) ABA

131. Meiosis takes place in :

- (1) Megaspore
- (2) Meiocyte
- (3) Conidia
- (4) Gemmule

132. According to Darwin, the organic evolution is due to

- (1) Reduced feeding efficiency in one species to the presence of interfering species
- (2) Intraspecific competition
- (3) Interspecific competition
- (4) Competition within closely related species

133. Which of the following criteria **does not** pertains to facilitated transport ?

- (1) Uphill transport
- (2) Requirement of special membrane proteins
- (3) High selectivity
- (4) Transport saturation

134. A major site for synthesis of lipids is :

- (1) Nucleoplasm
- (2) RER
- (3) SER
- (4) Symplast

135. Natural reservoir of phosphorus is :

- (1) Fossils
- (2) Sea water
- (3) Animal bones
- (4) Rock

136. Which of the metabolites is common to respiratory mediated breakdown of fats, carbohydrates and proteins ?

- (1) Acetyl CoA
- (2) Glucose-6-phosphate
- (3) Fructose 1,6-bisphosphate
- (4) Pyruvic acid

137. Which one of the following processes during decomposition is **correctly** described ?

- (1) Leaching – Water soluble inorganic nutrients are washed to the top layers of soil
- (2) Fragmentation – Carried out by organisms such as earthworm
- (3) Humification – Leads to the accumulation of dark coloured substance humus which undergoes microbial action at a very fast rate
- (4) Catabolism – Last step in the decomposition under fully anaerobic condition

138. If both parents are carriers for thalassemia, what are the chances of pregnancy resulting in an affected child?

- (1) 100%
- (2) No chance
- (3) 50%
- (4) 25%

139. Which of the following statements is not true of two genes that show 50% recombination frequency ?
- (1) If the genes are present on the same chromosome, they undergo more than one crossovers in every meiosis
 - (2) The genes may be on different chromosomes
 - (3) The genes are tightly linked
 - (4) The genes show independent assortment

140. One of the legal methods of birth control is :
- (1) by a premature ejaculation during coitus
 - (2) abortion by taking an appropriate medicine
 - (3) by abstaining from coitus from day 10 to 17 of the menstrual cycle
 - (4) by having coitus at the time of day break

141. Besides paddy fields, cyanobacteria are also found inside vegetative part of :
- (1) *Psilotum*
 - (2) *Pinus*
 - (3) *Cycas*
 - (4) *Equisetum*

142. Which of the following are correctly matched with respect to their taxonomic classification ?
- (1) Spiny anteater, sea urchin, sea cucumber – Echinodermata
 - (2) Flying fish, cuttlefish, silverfish – Pisces
 - (3) Centipede, millipede, spider, scorpion – Insecta
 - (4) House fly, butterfly, tsetsefly, silverfish – Insecta

143. Variation in gene frequencies within populations can occur by chance rather than by natural selection. This is referred to as :
- (1) Genetic load
 - (2) Genetic flow
 - (3) Genetic drift
 - (4) Random mating

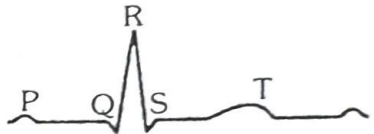
144. Select the correct match of the digested products in humans given in **column I** with their absorption site and mechanism in **column II**.

	Column I	Column II
(1)	Cholesterol, maltose	Large intestine, active absorption
(2)	Glycine, glucose	small intestine, active absorption
(3)	Fructose, Na ⁺	small intestine, passive absorption
(4)	Glycerol, fatty acids	duodenum, move as chylomicrons

145. Select the wrong statement :
- (1) *Chlamydomonas* exhibits both isogamy and anisogamy and *Fucus* shows oogamy
 - (2) Isogametes are similar in structure, function and behaviour
 - (3) Anisogametes differ either in structure, function or behaviour
 - (4) In Oomycetes female gamete is smaller and motile, while male gamete is larger and non-motile

146. Which Mendelism idea is depicted by a cross in which the F₁ generation resembles both the parents ?
- (1) co-dominance
 - (2) incomplete dominance
 - (3) law of dominance
 - (4) inheritance of one gene

147. The diagram given here is the standard ECG of a normal person. The P-wave represents the :



- (1) End of systole
 - (2) Contraction of both the atria
 - (3) Initiation of the ventricular contraction
 - (4) Beginning of the systole
148. Which enzyme/s will be produced in a cell in which there is a nonsense mutation in the lac Y gene ?
- (1) Lactose permease and transacetylase
 - (2) β -galactosidase
 - (3) Lactose permease
 - (4) Transacetylase

149. The most abundant intracellular cation is :
- (1) K⁺
 - (2) Na⁺
 - (3) Ca⁺⁺
 - (4) H⁺

150. Which one of the following is **not** the function of placenta ? It :-
- (1) secretes oxytocin during parturition
 - (2) facilitates supply of oxygen and nutrients to embryo
 - (3) secretes estrogen
 - (4) facilitates removal of carbon dioxide and waste material from embryo

151. In plant breeding programme, the entire collection of plants/seeds having all the diverse alleles for all genes in a given crop is called :

- (1) germplasm collection
- (2) selection of superior recombinants
- (3) cross-hybridisation among the selected parents
- (4) evaluation and selection of parents

152. Which one of the following is **not** a correct statements ?

- (1) Key is taxonomic aid for identification of specimens
- (2) Herbarium houses dried, pressed and preserved plant specimens
- (3) Botanical gardens have collection of living plants for reference
- (4) A museum has collection of photographs of plants and animals

153. Which one of the following organelle in the figure correctly matches with its function ?



- (1) Rough endoplasmic reticulum, protein synthesis
- (2) Rough endoplasmic reticulum, formation of glycoproteins
- (3) Golgi apparatus, protein synthesis
- (4) Golgi apparatus, formation of glycolipids

154. Which of the following represents maximum number of species among global biodiversity ?

- (1) Mosses and Ferns
- (2) Algae
- (3) Lichens
- (4) Fungi

155. Which of the following Bt crops is being grown in India by the farmers ?

- | | |
|--------------|-------------|
| (1) Soyabean | (2) Maize |
| (3) Cotton | (4) Brinjal |

156. Read the following statements (A - E) and the question which follows them.

- (a) In liverworts, mosses and ferns gametes are free living
- (b) Gymnosperms and some ferns are heterosporous
- (c) Sexual reproduction in *Fucus*, *Volvox* and *Allbugo* is oogamous
- (d) The sporophyte in liverworts is more elaborate than that in mosses
- (E) Both, *Pinus* and *Marchantia* are dioecious

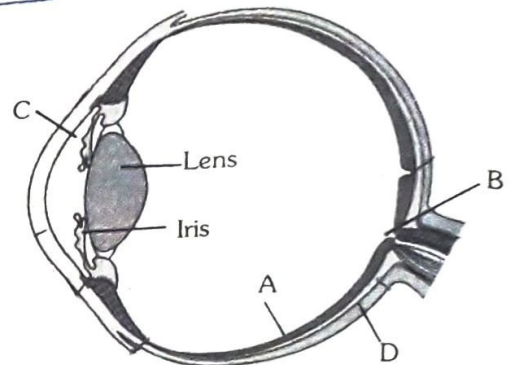
How many of the above statements are correct ?

- | | |
|----------|-----------|
| (1) Four | (2) One |
| (3) Two | (4) Three |

157. The essential chemical components of many coenzymes are :

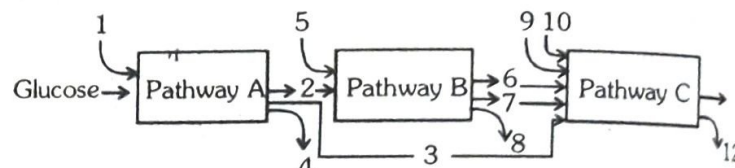
- | | |
|-------------------|-------------------|
| (1) Vitamins | (2) Proteins |
| (3) Nucleic acids | (4) Carbohydrates |

158. 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) D- Choroid - its anterior part forms ciliary body
- (2) A - Retina - contains photo receptors—rods and cones
- (3) B - Blind spot - has only a few rods and cones
- (4) C - Aqueous chamber-reflects the light which does not pass through the lens

159. The three boxes in this diagram represent the three major biosynthetic pathways in aerobic respiration. Arrows represent net reactants or products.



- Arrow number 4, 8 and 12 can all be :
- | | |
|-------------------------|------------|
| (1) FAD^+ or $FADH_2$ | (2) $NADH$ |
| (3) ATP | (4) H_2O |

160. Pigment-containing membranous extensions in some cyanobacteria are :
 (1) Chromatophores
 (2) Heterocysts
 (3) Basal bodies
 (4) Pneumatophores

161. Which one of the following statements is correct ?
 (1) Tapetum nourishes the developing pollen
 (2) Hard outer layer of pollen is called intine
 (3) Sporogenous tissue is haploid
 (4) Endothecium produces the micorspores

162. The characteristics and an example of a synovial joint in humans is :-

	Characteristics	Examples
(1)	lymph filled between two bones, limited movement	gliding joint between carpals
(2)	fluid cartilage between two bones, limited movements	Knee joint
(3)	fluid filled between two joints, provides cushion	skull bones
(4)	fluid filled synovial cavity between two bones	joint between atlas and axis

163. The Air Prevention and Control of Pollution Act came into force in :
 (1) 1990
 (2) 1975
 (3) 1981
 (4) 1985

164. Product of sexual reproduction generally generates:
 (1) Large biomass
 (2) Longer viability of seeds
 (3) Prolonged dormancy
 (4) New genetic combination leading to variation

165. Among bitter gourd, mustard, brinjal, pumpkin, chinarose, lupin, cucumber, sunnhemp, gram, guava, bean, chilli, plum, petunia, tomato, rose, withania, potato, onion, aloe and tulip how many plants have hypogynous flower ?
 (1) Eighteen
 (2) Six
 (3) Ten
 (4) Fifteen

166. 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) Over secretion of pars distalis
 (2) Deficiency of iodine in diet
 (3) Low secretion of growth hormone
 (4) Cancer of the thyroid gland

167. Which of the following is **not** correctly matched for the organism and its cell wall degrading enzyme?
 (1) Fungi – Chitinase
 (2) Bacteria – Lysozyme
 (3) Plant cells – Cellulase
 (4) Algae – Methylase

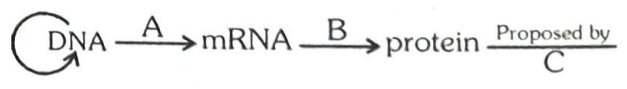
168. Menstrual flow occurs due to lack of :
 (1) Vasopressin
 (2) Progesteron
 (3) FSH
 (4) Oxytocin

169. Global warming can be controlled by :
 (1) Increasing deforestation, reducing efficiency of energy usage
 (2) Reducing deforestation cutting down use of fossil fuel
 (3) Reducing reforestation, increasing the use of fossil fuel
 (4) Increasing deforestation slowing down the growth human population

170. Which one of the following is not used for *ex situ* plant conservation ?
 (1) Botanical Gardens
 (2) Field gene banks
 (3) Seed banks
 (4) Shifting cultivation

171. During sewage treatment, biogases are produced which include :
 (1) hydrogensulphide, nitrogen, methane
 (2) methane, hydrogensulphide, carbon dioxide
 (3) methane, oxygen, hydrogensulphide
 (4) hydrogensulphide, methane, sulphur dioxide

172. The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C :



- (1) A–translation B–extension C–Rosalind Franklin
- (2) A–transcription B–replication C–James Watson
- (3) A–translation B–transcription C–Erevin Chargaff
- (4) A–transcription B–translation C–Francis Crick

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173. DNA fragments generated by the restriction endonucleases in a chemical reaction can be separated by :

- (1) Restriction mapping
- (2) Centrifugation
- (3) Polymerase chain reaction
- (3) Electrophoresis

174. The complex formed by a pair of synapsed homologous chromosomes is called :

- (1) Axoneme
- (2) Equatorial plate
- (3) Kinetochore
- (4) Bivalent

175. The **incorrect** statement with regard to Haemophilia is :

- (1) A single protein involved in the clotting of blood is affected
- (2) It is a sex-linked disease
- (3) It is a recessive disease
- (4) It is a dominant disease

176. Which of the following statements is **correct** in relation to the endocrine system ?

- (1) Releasing and inhibitory hormones are produced by the pituitary gland
- (2) Adenohypophysis is under direct neural regulation of the hypothalamus
- (3) Organs in the body like gastrointestinal tract, heart, kidney and liver do not produce any hormones
- (4) Non-nutrient chemicals produced by the body in trace amount that act as intercellular messenger are known as hormones

177. Lenticels are involved in :

- (1) Photosynthesis
- (2) Transpiration
- (3) Gaseous exchange
- (4) Food transport

178. Match the name of the animal (**column I**), with one characteristics (**column II**), and the phylum/class (**column III**) to which it belongs :

	Column I	Column II	Column III
(1)	<i>Adamsia</i>	radially symmetrical	Porifera
(2)	<i>Petromyzon</i>	ectoparasite	Cyclostomata
(3)	<i>Ichthyophis</i>	terrestrial	Reptilia
(4)	<i>Limulus</i>	Body covered by chitinous exoskeleton	Pisces

179. What is the correct sequence of sperm formation?

- (1) Spermatogonia, spermatocyte, spermatid, spermatozoa
- (2) Spermatid, spermatocyte, spermatogonia, spermatozoa
- (3) Spermatogonia, spermatocyte, spermatozoa, spermatid
- (4) Spermatogonia, spermatozoa, spermatocyte, spermatid

180. Macro molecule chitin is :

- (1) Simple polysaccharide
- (2) Nitrogen containing polysaccharide
- (3) Phosphorus containing polysaccharide
- (4) Sulphur containing polysaccharide