All India Aakash Test Series for NEET - 2025

OPEN MOCK TEST - 4

Click here for Code-F sol.

Test Date : 27/04/2025

ANSWERS

1. (1)	37. (4)	73. (3)	109. (3)	145. (3)
2. (3)	38. (2)	74. (1)	110. (4)	146. (2)
3. (2)	39. (3)	75. (4)	111. (3)	147. (2)
4. (4)	40. (1)	76. (2)	112. (1)	148. (2)
5. (3)	41. (4)	77. (1)	113. (2)	149. (2)
6. (1)	42. (1)	78. (2)	114. (1)	150. (2)
7. (1)	43. (1)	79. (4)	115. (2)	151. (2)
8. (2)	44. (2)	80. (1)	116. (3)	152. (4)
9. (4)	45. (2)	81. (1)	117. (2)	153. (3)
10. (1)	46. (2)	82. (2)	118. (4)	154. (4)
11. (3)	47. (2)	83. (1)	119. (3)	155. (3)
12. (3)	48. (3)	84. (4)	120. (3)	156. (2)
13. (1)	49. (3)	85. (2)	121. (4)	157. (2)
14. (2)	50. (2)	86. (2)	122. (4)	158. (3)
15. (1)	51. (1)	87. (1)	123. (3)	159. (3)
16. (2)	52. (4)	88. (2)	124. (3)	160. (2)
17. (3)	53. (4)	89. (3)	125. (1)	161. (2)
18. (3)	54. (3)	90. (2)	126. (2)	162. (3)
19. (2)	55. (1)	91. (4)	127. (2)	163. (3)
20. (3)	56. (2)	92. (2)	128. (3)	164. (3)
21. (3)	57. (3)	93. (3)	129. (3)	165. (2)
22. (4)	58. (2)	94. (3)	130. (2)	166. (3)
23. (2)	59. (4)	95. (4)	131. (3)	167. (1)
24. (1)	60. (4)	96. (3)	132. (1)	168. (2)
25. (2)	61. (2)	97. (3)	133. (3)	169. (2)
26. (2)	62. (2)	98. (4)	134. (3)	170. (2)
27. (3)	63. (2)	99. (2)	135. (2)	171. (2)
28. (3)	64. (3)	100. (4)	136. (2)	172. (4)
29. (4)	65. (4)	101. (3)	137. (3)	173. (3)
30. (2)	66. (4)	102. (3)	138. (3)	174. (3)
31. (3)	67. (2)	103. (4)	139. (3)	175. (4)
32. (1)	68. (2)	104. (2)	140. (2)	176. (4)
33. (2)	69. (3)	105. (3)	141. (3)	177. (2)
34. (4)	70. (4)	106. (3)	142. (4)	178. (2)
35. (2)	71. (4)	107. (1)	143. (1)	179. (2)
36. (2)	72. (4)	108. (1)	144. (3)	180. (3)

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint: The maximum energy will be stored in inductor at steady state.

Sol.: $I = \frac{V}{R} = \frac{40}{20} = 2$ A

$U = \frac{1}{2}LI^2$

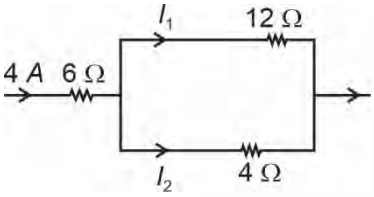
$= \frac{1}{2} \times 2 \times 4 = 4$ J

2. Answer (3)

Hint: Use current dividing rule

$I_2 = \frac{12\,I}{12+4}$

Sol.: Current through 4 Ω



$I_2 = \frac{12}{12+4} \times 4 = 3$ A

$P = I_2^2 R = 9 \times 4 = 36$ W

3. Answer (2)

Hint: $\vec{v}_{avg} = \frac{\vec{u}+\vec{v}}{2}$ for uniform acceleration

Sol.: $\left|\vec{v}_{avg}\right| = \frac{2u\cos\theta}{2} = u\cos\theta = 20 \times \frac{1}{2}$

$= 10$ m s^{-1}

4. Answer (4)

Hint: Use parallel axis theorem

Sol.: $I_{YY'} = I_{com} + MR^2$

$I_{YY'} = \frac{MR^2}{4} + MR^2$

$= \frac{5}{4}MR^2$

Given $I = \frac{MR^2}{2} = 10$ kg m^2

$I_{YY'} = \frac{5}{2} \times 10 = 25$ kg m^2

5. Answer (3)

Hint: $a = \frac{\text{Net pulling force}}{\text{Total mass}}$

Sol.: $a = \frac{100 - 0.5 \times 10 \times 10}{20}$

$a = \frac{100-50}{20} = \frac{5}{2}$ m s^{-2}

6. Answer (1)

Hint: Heat absorbed in process AB is $nC_p\Delta T$

Sol.: Q = $nC_p\Delta T$

$= \frac{5}{2}\ nR\Delta T$

$= \frac{5}{2}\ [3\,P_0V_0 - P_0V_0]$

$= 5\,P_0V_0$

7. Answer (1)

Hint: $g' = \frac{GM}{R^3}r = \frac{GM}{R^3}\left(\frac{R}{2}\right) = \frac{GM}{2R^2}$

Sol.: $g'' = \frac{GM}{\left(R + \frac{R}{2}\right)^2} = \frac{4}{9}\frac{GM}{R^2}$

$= \frac{8}{9}\frac{GM}{2R^2} = \frac{8}{9}g'$

8. Answer (2)

Hint & Sol.: (i) When two charges are brought closer to each other, their potential energy increases or decreases depending on the sign of the charges.

(ii) $U = -PE\cos\theta$

$\Rightarrow U = PE$ at $\theta = 180°$

9. Answer (4)

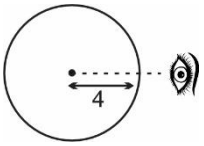
Hint: $I_s = \frac{\phi}{I} = \frac{NAB}{K}$

Sol.: Current sensitivity of the galvanometer is defined as the deflection per unit current.

10. Answer (1)

Hint: Use formula of refraction through curved surface.

Sol.:



$$\frac{\mu_2}{v}-\frac{\mu_1}{u}=\frac{\mu_2-\mu_1}{R}$$

$$\frac{1}{v}+\frac{1.5}{4}=\frac{1-1.5}{-4}$$

$$\frac{1}{v}+\frac{3}{8}=\frac{1}{8}$$

$$\frac{1}{v}=\frac{1}{8}-\frac{3}{8}=\frac{-2}{8}=-\frac{1}{4}$$

$v = -4$ cm

11. Answer (3)

Hint & Sol.: The beta rays are emitted when a proton in nucleus is converted into neutron or a neutron in nucleus is converted into proton.

12. Answer (3)

Hint & Sol.: The maximum kinetic energy of emitted photoelectron is independent of intensity of light for fixed frequency but depends on the energy = $h\nu$, where ν is frequency of incident radiation.

13. Answer (1)

Hint: $\frac{1}{\lambda}=RZ^2\left[\frac{1}{n_1^2}-\frac{1}{n_2^2}\right]$

Sol.: $\lambda \propto \frac{1}{Z^2}$

So, the longest wavelength will be produced by Hydrogen.

14. Answer (2)

Hint & Sol.: The net flow of electrons (drift current) from p-side to n-side is possible in reverse biased diode.

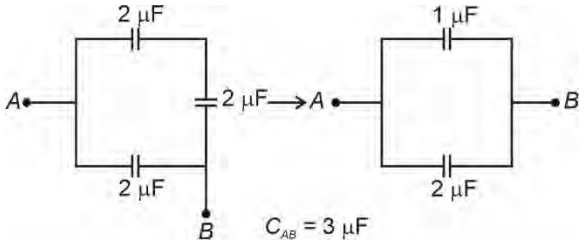
15. Answer (1)

Hint: De-Broglie wavelength $\lambda=\frac{h}{mv}$

Sol.: Decreasing velocity will increase the wavelength. The fringe width $\beta=\frac{\lambda D}{d}$ will increase.

16. Answer (2)

Hint & Sol.:



17. Answer (3)

Hint: Accelerating the container will increase pressure at *A*.

Sol.: $(P_A - P_B) = \rho la$

where *l* is the distance between points *A* and *B*.

18. Answer (3)

Hint: $\mu=\frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

Sol.: $\frac{1}{\sin\left(\frac{A}{2}\right)}=\frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

$$90^\circ=\frac{A+\delta_m}{2}$$

$180^\circ - A = \delta_m$

19. Answer (2)

Hint & Sol.: $U_B = U_E = \frac{1}{4}\varepsilon_0 E_0^2 = \frac{1}{4}\frac{B_0^2}{\mu_0}$

Energy density of an EM wave is distributed equally in both electric and magnetic fields.

20. Answer (3)

Hint: Tension in the string provides necessary centripetal force.

Sol.: 60 N = $m\omega^2 r$

$T' = (m)(2\omega)^2(2r)$

$T' = 8\, m\omega^2 r$

$T' = 8T = 8 \times 60 = 480$ N

21. Answer (3)

Hint: Additional work done = Surface tension × change in area

Sol.: $W = 8\pi R^2 T$

$W' = 8\pi(2R)^2 T = 4(8\pi R^2 T) = 4W$

$\Delta W = W' - W = 3W$

22. Answer (4)

Hint: Electric field due to uniformly charged infinite wire, $E = \frac{\lambda}{2\pi\varepsilon_0 r}$

Sol.: E is proportional to $\frac{1}{r}$

23. Answer (2)

Hint: Magnetic field at centre = $\frac{\mu_0 IN}{2r}$

Sol.: $B = \frac{4\pi \times 10^{-7} \times 7.0 \times 100}{2 \times 4.4 \times 10^{-2}}$

$$B = \frac{4 \times \frac{22}{7} \times 10^{-7} \times 7.0 \times 100}{2 \times 4.4 \times 10^{-2}}$$

$B = 10^{-2}\,\text{T}$

24. Answer (1)

Hint & Sol.:

(i) The magnetic susceptibility of diamagnetic material is slightly negative and independent of temperature change.

(ii) The magnetic susceptibility of paramagnetic material is inversely proportional to temperature.

(iii) The magnetic susceptibility of ferromagnetic material decreases with increase in temperature. A ferromagnetic material becomes paramagnetic at curie temperature.

25. Answer (2)

Hint & Sol.: We get output as 1 when both input are zero.

$\therefore$ NOR gate

$\Rightarrow Y = \overline{A+B}$

26. Answer (2)

Hint: The extension in rod due to self-weight is $\frac{MgL}{2AY}$

Sol.: $\Delta L = \frac{MgL}{2AY}$

$$Y = \frac{MgL}{2A\Delta L}$$

$$= \frac{50 \times 10 \times 1}{2 \times 50 \times 10^{-6} \times 10^{-3}}$$

$= 5 \times 10^9\ \text{N/m}^2$

27. Answer (3)

Hint: $P = \vec{F} \cdot \vec{v}$

Sol.: $x = t^3$

$$v = \frac{dx}{dt} = 3t^2\Big|_{t=1} = 3\ \text{m s}^{-1}$$

$$\frac{dv}{dt} = a = 6t\big|_{t=1} = 6\ \text{m s}^{-2}$$

$F = ma = 6\ \text{N}$

$P = \vec{F} \cdot \vec{v}$

$= 6 \times 3$

$= 18\ \text{W}$

28. Answer (3)

Hint & Sol.: $[\tau] = \left[\text{ML}^2\text{T}^{-2}\right] = [\text{P.E.}]$

29. Answer (4)

Hint: $v_0 = A\omega$ and $a_0 = \omega^2 A$

Sol.: $v_0 = 5 \times 10 = 50\ \text{m s}^{-1}$

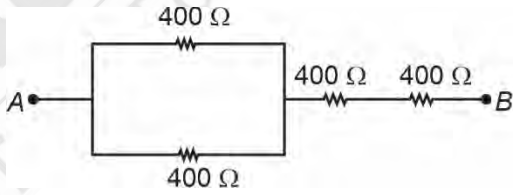
$a_0 = 100 \times 5 = 500\ \text{m s}^{-2}$

30. Answer (2)

Hint: When a wire is stretched to n times, the resistance increases to n^2 times.

Sol.: $R' = 16\,R = 1600\ \Omega$

$R_1 = R_2 = R_3 = R_4 = \frac{1600}{4} = 400\ \Omega$



$R_{eq} = 1000\ \Omega$

31. Answer (3)

Hint: Kinetic energy in pure rotation, $KE = \frac{1}{2} I\omega^2$

Sol.: $KE = \frac{1}{2} \times \frac{24}{\pi^2} \times \left(\frac{120 \times 2\pi}{60}\right)^2$

$$= \frac{1}{2} \times \frac{24}{\pi^2} \times 16\pi^2$$

$KE_R = 192\ \text{J}$

32. Answer (1)

Hint: Rate of radiation emitted by a blackbody $E = \sigma A T^4$

Sol.: $E = \sigma 4\pi R^2 (300)^4$

$E' = \sigma 4\pi \frac{R^2}{4} (600)^4$

$\frac{E'}{E} = \left(\frac{1}{4}\right)(2)^4 = \frac{16}{4} = 4$

$E' = 4E$

33. Answer (2)

Hint: $\frac{PV}{T}$ = constant for all ideal gases.

Sol.: PV^2 = constant

$(PV)(V)$ = constant

TV = constant

$T_1V_1 = T_2V_2$

$T_0V_0 = 3V_0T_2$

$T_2 = \frac{T_0}{3}$

34. Answer (4)

Hint: $q = CV$ and $i_d = \frac{dq}{dt} = \frac{CdV}{dt}$

Sol.: $i_d = \frac{CdV}{dt}$

$\frac{1}{10^{-6}} = \frac{dV}{dt}$

$\frac{dV}{dt} = 10^6$ V/s

35. Answer (2)

Hint : The resistivity of semiconductor decreases with increase in temperature.

Sol.: $T_1 > T_2$

$R_1 < R_2$

$P_1 < P_2$

$T_1 > T_{2s}$

36. Answer (2)

Hint: The charge on capacitor doesn't change.

Sol.: (1) (C) capacitance increases

(2) $V = \frac{Q}{C}$ decreases

(3) $U = \frac{1}{2}\frac{Q^2}{C}$ decreases

(4) Product of $Q \times V$ decreases

37. Answer (4)

Hint: Time constant (τ) = RC

Sol.: [Q] = [current] [time]

[current] = $\left[\frac{Q}{\text{time}}\right] = \left[\frac{Q}{RC}\right]$

38. Answer (2)

Hint: Rate of flow of heat is same in both metal rods.

Sol.: $\frac{(100 - T)K}{L} = \frac{(T - 0)4K}{2L}$

$100 - T = 2T$

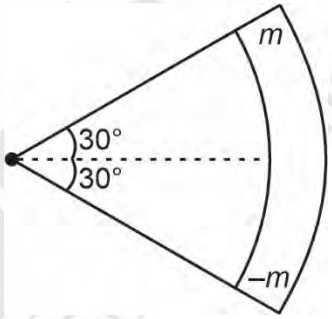
$3T = 100°C$

$T = \frac{100°C}{3}$

39. Answer (3)

Hint: Magnetic moment = Pole strength × effective length

Sol.:



$M = mL$

$L = \frac{R \times \pi}{3} \Rightarrow R = \frac{3L}{\pi}$

$M' = M\,2R\sin 30° = mR$

$= \frac{3mL}{\pi} = \frac{3M}{\pi}$

40. Answer (1)

Hint: Capacitive reactance is $X_C = \frac{1}{\omega C}$

Sol.: $X_C = \frac{10^6}{2 \times \pi \times \frac{50}{\pi} \times 250}$

$= \frac{10^6}{250 \times 100} = 40\ \Omega$

$I = \frac{V}{X_C} = \frac{220}{40} = \frac{11}{2}$ A

$I_0 = I\sqrt{2} = \frac{11}{\sqrt{2}}$ A

41. Answer (4)

Hint: The total power = $\frac{P_1P_2}{P_1+P_2} = V \times I$

Sol.: $P_t = \frac{P_1P_2}{P_1+P_2} = \frac{12\times4}{12+4}$ kW = 3 kW

$I = \frac{P}{V} = \frac{3\text{ kW}}{200\text{ V}} = \frac{3000}{200} = 15$ A

$P' = I^2R_i$

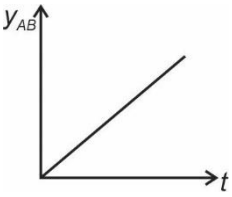
$= (15)^2 \times \frac{200\times200}{4000}$

$= \frac{225\times40}{4}$ W = 2.25 kW

42. Answer (1)

Hint: The relative acceleration of both the balls is zero.

Sol.: $y_{AB} = v_{AB} \times t$



43. Answer (1)

Hint: Maximum acceleration is achieved at the extreme position.

Sol.: $a_{max} = \frac{k}{m}A$

$a_{max} = \frac{1200}{4} \times 2 \times 10^{-2}$ m s^{-2}

= 6 m s^{-2}

44. Answer (2)

Hint & Sol.: In a transverse wave, energy and not the matter is transferred from one point to the other.

45. Answer (2)

Hint: Use Lenz's law

Sol.: The magnetic field due to both the currents are perpendicular to the plane and going into the plane. To decrease the magnetic flux, the induced current will be anti-clockwise.

[CHEMISTRY]

46. Answer (2)

Hint: Higher the value of K_H at a given pressure, lower is the solubility of the gas in the liquid.

Sol.: $K_H \propto \frac{1}{\text{Solubility}}$

Order of K_H = He > N_2 > H_2 > O_2

Order of solubility = O_2 > H_2 > N_2 > He

47. Answer (2)

Hint: Complex $[CrCl_3 \cdot xNH_3]$ is an octahedral complex.

Sol.: $\Delta T_{b(complex)}$

= $\Delta T_{b(glucose)}$

$ik_{bm} = 3(ik_{bm})$

$i \times 1 = 3 \times 1 \times 1$

i = 3 [$\therefore$ product of 3 ions]

$\therefore$ x = 5

Complex = $[CrCl(NH_3)_5]Cl_2$

48. Answer (3)

Hint: Molecule with zero bond order does not exist.

Sol.: He_2 = 4 electrons

B.O. $= \frac{1}{2}(2-2) = 0$

49. Answer (3)

Hint: For adiabatic condition, q = 0

Sol.: According to first law of thermodynamics,

$\Delta U = q + w$

Under free expansion $P_{ext} = 0$

Under adiabatic condition q = 0 $\therefore$ w = 0

$\therefore$ $\Delta U = q + w$

$\Delta U = 0$

50. Answer (2)

Hint: Basic buffer = Weak base and its salt with strong acid.

Sol.:

	HCl	+	NH_4OH	$\rightleftharpoons$	NH_4Cl	+	H_2O
Initial mole	0.1 × 0.1		0.2 × 0.1		–		–
	= 0.01		0.02				
Final mole	–		0.01		0.01		0.01

Since solution contains NH_4OH and NH_4Cl i.e. weak base and salt of weak base with strong acid. Hence, basic buffer.

51. Answer (1)

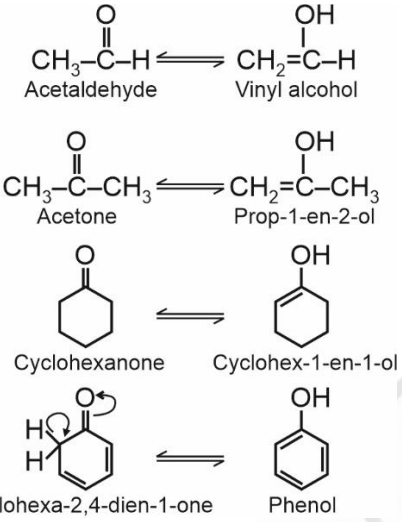
Hint: Electron enters in one of the antibonding molecular orbitals.

Sol.: O_2^- : $(\sigma 1s)^2(\sigma^*1s)^2(\sigma 2s)^2(\sigma^*2s)^2(\sigma 2p_z)^2(\pi 2p_x)^2$ $(\pi 2p_y)^2(\pi^*2p_x)^2(\pi^*2p_y)^1$

52. Answer (4)

Hint: If the enolic form is stabilised by conjugation, the enol content increases.

Sol.:



53. Answer (4)

Hint: Lyophilic sols are more stable than lyophobic sols.

Sol.: Lyophobic sols used stabilising agents for their preservation.

54. Answer (3)

Hint: $[Co(NH_3)_3Cl(CN)(H_2O)]$ exhibits 4 geometrical isomers.

Sol.:

Complex	Number of geometrical isomers
$[Co(NH_3)_6]^{3+}$	0
$[Pt(NH_3)_2Cl_2]$	2
$[Co(NH_3)_2Cl_2(H_2O)_2]$	5
$[Co(NH_3)_3Cl(CN)(H_2O)]$	4

55. Answer (1)

Hint: The ability of 'O' to stabilise high oxidation states exceeds that of 'F'.

Sol.: Cr^{2+} changes from d^4 to d^3 and hence is reducing whereas, Mn^{3+} to Mn^{2+} results in half-filled (d^5) configuration which has extra stability.

56. Answer (2)

Hint: $\mu = \sqrt{n(n+2)}$ BM (Magnetic moment)

Sol.: $[Fe(CN)_6]^{3-} = \sqrt{1(1+2)} = \sqrt{3} = 1.7$ BM

$[Co(NH_3)_6]^{3+} = \sqrt{0(0+2)} = 0$ BM

$[NiCl_4]^{2-} = \sqrt{2(2+2)} = 2.82$ BM

$[Fe(H_2O)_6]^{2+} = \sqrt{4(4+2)} = 4.89$ BM

57. Answer (3)

Hint: E_{cell} is not an additive property

For strong electrolytes, $\Lambda_m = \Lambda_m^\circ - A\sqrt{C}$

Sol.: E°_{cell} remains constant upon changing the concentration of a cell.

Λ_m increases slowly with dilution, (For strong electrolytes) $\Lambda_m = \Lambda_m^\circ - A\sqrt{C}$

E_{cell} does not change upon changing the volume of a cell at a particular concentration.

58. Answer (2)

Hint: Melting point of H_2S = 188 K

Sol.:

Hydrides	Melting point (K)
H_2O	273
H_2S	188
H_2Se	208
H_2Te	222

59. Answer (4)

Hint: Hydrogen chloride is produced by heating NaCl with conc. H_2SO_4.

Sol.: $NaCl + H_2SO_4 \xrightarrow{420K} NaHSO_4 + HCl$

$4HCl + O_2 \xrightarrow[723\,K]{CuCl_2} 2Cl_2 + 2H_2O$

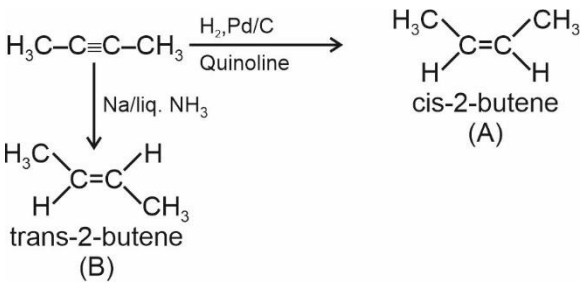
$2KMnO_4 + 16HCl \rightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2$

$4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$

60. Answer (4)

Hint: Alkynes on reduction with sodium and liquid ammonia yields trans alkene.

Sol.:



61. Answer (2)

Hint: $\Delta_f H° = \Delta_{sub}H° + \Delta_i H° + \Delta_a H° + \Delta_{eg}H° + \Delta_{lattice}H°$

Sol.:

$$Na(s) \rightarrow Na(g) \rightarrow Na^+(g) + e^-$$
$$\frac{1}{2}Cl_2(g) \rightarrow Cl(g) + e^- \rightarrow Cl^-(g)$$
$$Na^+(g) + Cl^-(g) \downarrow NaCl(s)$$

$\Delta_f H° = 108 + 496 + 121 + (-348.6) + (-788)$

$= -411.2 \text{ kJ mol}^{-1}$

62. Answer (2)

Hint: Diborane catches fire spontaneously upon exposure to air.

Sol.: $B_2H_6 + 3O_2 \rightarrow B_2O_3 + 3H_2O$

$\Delta H = -1976 \text{ kJ mol}^{-1}$

63. Answer (2)

Hint & Sol.: Conductivity decreases with dilution as number of ions per unit volume that carry current in a solution decreases with dilution.

64. Answer (3)

Hint: Second electron gain enthalpy of an element is always positive.

Sol.: $O(g) \rightarrow O^-(g)$ (First $\Delta_{eg}H$)

$O^-(g) \rightarrow O^{2-}(g)$ (Second $\Delta_{eg}H$) (Always endothermic)

65. Answer (4)

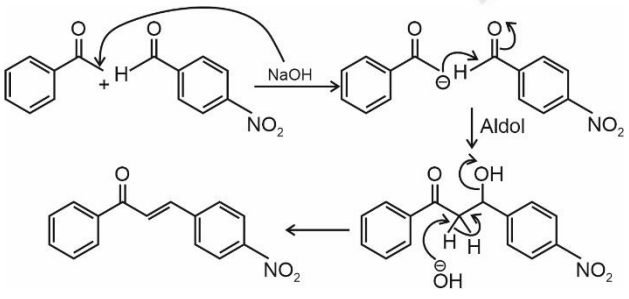
Hint: Lower is the value of pK_a, stronger is the acid.

Sol.: Strong (+M) causing groups at para position will increase the pK_a whereas, electron withdrawing (–M) groups will decrease the pK_a of benzoic acid

66. Answer (4)

Hint: Reactions occurring between different carbonyl compounds, one acting as a nucleophile in it's enol form and the other as an electrophile and called cross-condensation.

Sol.:



67. Answer (2)

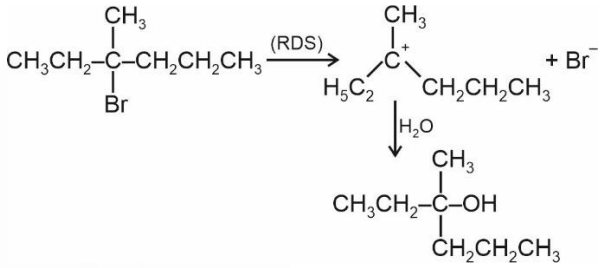
Hint & Sol.:

Haloalkane	Dipole moment/Debye
$CH_3 - F$	1.847
$CH_3 - Cl$	1.860
$CH_3 - Br$	1.830
$CH_3 - I$	1.636

68. Answer (2)

Hint: Reaction proceeds via S_N1 mechanism.

Sol.:



- Reaction is favoured by high polarity solvents

69. Answer (3)

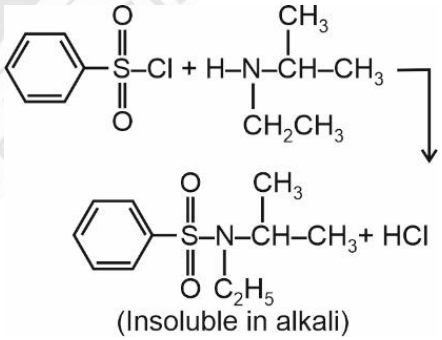
Hint: Uracil is present in RNA

Sol.: Nitrogenous bases in RNA are Adenine, Guanine, Cytosine and Uracil

70. Answer (4)

Hint: Secondary amine reacts with Hinsberg's reagent to give an alkali insoluble product.

Sol.:



(Insoluble in alkali)

71. Answer (4)

Hint: In equal masses of O_2 and N_2, N_2 will have more number of atoms.

Sol.: Molality and mole fraction are temperature independent quantities.

72. Answer (4)

Hint: $K_a = \frac{c\alpha^2}{1-\alpha}$

$\alpha << 1$

$1 - \alpha \approx 1$

$K_a = c\alpha^2$

Sol.: $K_a = c\alpha^2$

$= 10^{-1} \times (10^{-2})^2$

$= 10^{-5}$

73. Answer (3)

Hint: $(CH_3COO)_2Pb + Na_2CrO_4 \rightarrow$

$PbCrO_4 + 2CH_3COONa$

(yellow precipitate)

Sol.: AgBr (Pale yellow ppt) is sparingly soluble in NH_4OH

AgI (Yellow ppt) is insoluble in NH_4OH

74. Answer (1)

Hint: 101 – Mendelevium

Sol.: 102 – Nobelium

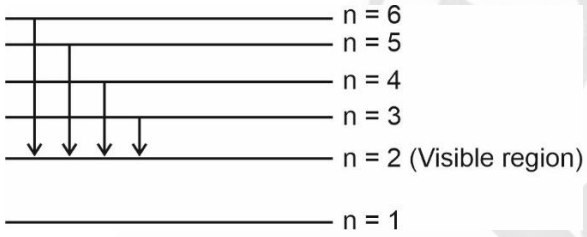
103 – Lawrencium

106 – Seaborgium

75. Answer (4)

Hint: For visible region, $n_1 = 2$ and $n_2 = 3, 4, 5 \ldots$

Sol.:



76. Answer (2)

Hint: $h\nu = h\nu_0 + KE$

$\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + KE$

Sol.: $\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + KE$

$$w = \left(\frac{6.626\times10^{-34}\times3\times10^{8}}{300\times10^{-9}}\right) - \left(\frac{2.97\times10^{5}}{6.023\times10^{23}}\right)$$

$= (6.626 \times 10^{-19}) - (4.931 \times 10^{-19})$

$= 1.695 \times 10^{-19}$J

77. Answer (1)

Hint: A negative E° means that the redox couple is a stronger reducing agent than H^+/H_2 couple.

Sol.: Al^{3+}/Al, E° = –1.66 V

∴ It is the strongest reducing agent among all other options.

E° of Sn^{2+}/Sn is less negative than Cr^{3+}/Cr and Al^{3+}/Al.

∴ It is a stronger oxidising agent than Cr^{3+} and Ai^{3+}. But E° of Sn^{2+}/Sn is less than Ag^+/Ag

∴ It is a stronger reducing agent than Ag^+/Ag

78. Answer (2)

Hint: w = zit

z = electrochemical equivalent of substance deposited.

Sol.: w = zit

$$11.2\ g = \frac{119}{x}\times\frac{1\times5\times60\times60}{96500}$$

$$x = \frac{119\times5\times36}{11.2\times965} = \frac{21420}{10808}$$

$= 1.98 \approx 2$

79. Answer (4)

Hint & Sol.:

$XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

$XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

80. Answer (1)

Hint: Order of first ionisation enthalpy, Fe > Co > Ni > Mn > Cr

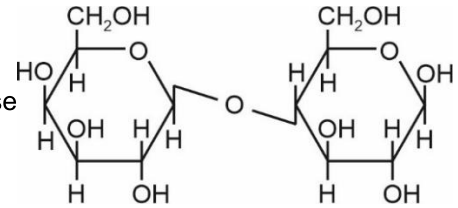
Sol.: $2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$

$2Fe^{2+} + S_2O_8^{2-} \rightarrow 2Fe^{3+} + 2SO_4^{2-}$

81. Answer (1)

Hint: Lactose is made of β-D-galactose and β-D-glucose.

Sol.: Lactose



82. Answer (2)

Hint:

$$\%\ \text{of S} = \frac{32\times\text{weight of } BaSO_4}{233\times\text{weight of organic substance}}\times100$$

Sol.: $\%\ \text{of S} = \frac{32\times0.466}{233\times0.16}\times100$

$= 40\%$

83. Answer (1)

Hint: 'H_2' is the limiting reactant.

Sol.: $N_2 + 3H_2 \rightleftharpoons 2NH_2$

1 3/2

Number of moles of NH_3 formed is decided only by H_2. Number of moles of NH_3 formed = $\frac{2}{3} \times \frac{3}{2} = 1$

1 mole $NH_3(g)$ formed

i.e. 22.4 L $NH_3(g)$ formed

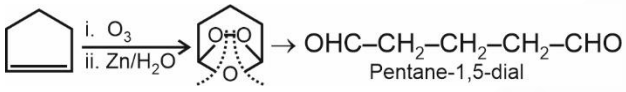
84. Answer (4)

Hint: Zeros between two non-zero digits are significant.

Sol.: 0.200 g has 3 significant figures.

85. Answer (2)

Hint & Sol.:



86. Answer (2)

Hint: $\Delta T_f = iK_f m$

Sol.: Maximum depression in freezing point, minimum is the freezing point of the solution

$\Delta T_f = iK_f m$

For $Al_2(SO_4)_3$ i = 5

$\Delta T_f = 5 \times K_f \times 0.1$

$= 0.5\ K_f$

Maximum depression in freezing point, therefore minimum is the freezing point of the solution.

87. Answer (1)

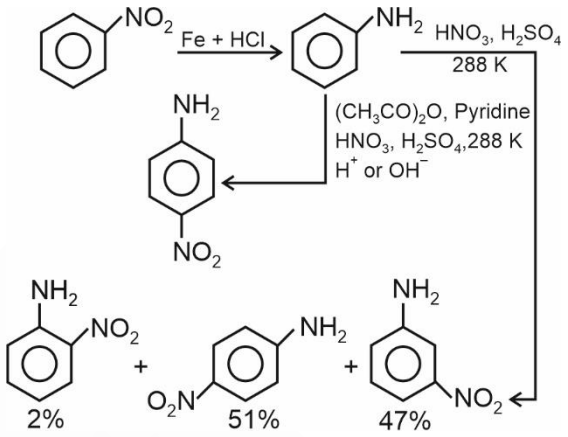
Hint & Sol.: 95% C_2H_5OH by volume forms minimum boiling azeotrope.

Components of azeotropic mixture cannot be separated by fractional distillation.

88. Answer (2)

Hint: In nitration, by protecting $-NH_2$ group by acetylation reaction, p-derivative is obtained as major product.

Sol.:



89. Answer (3)

Hint: Zn^{2+} gives yellow colour when hot.

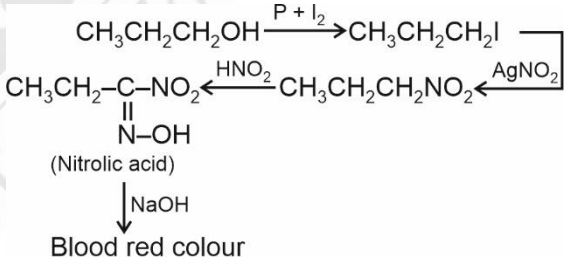
Sol.:

Colour when cold	Colour when hot	Cation
White	Yellow	Zn^{2+}

90. Answer (2)

Hint: Victor Meyer's test is a test for alcohols. Primary alcohols give blood red colour.

Sol.:



[BIOLOGY]

91. Answer (4)

Hint: In *Zostera*, pollen grains are long ribbon like and carried passively inside water.

Sol.: Wind pollination is quite common in grasses. In sugarcane, pollen grains are light and non-sticky, so that they can easily be carried by air currents. Marine water plant like *Zostera* is pollinated by water.

92. Answer (2)

Hint: Cyclosporin A is produced by a fungus.

Sol.: *Trichoderma polysporum* produces cyclosporin A, which can be used as an immunosuppressive agent in organ-transplant patients.

93. Answer (3)

Hint: Chloroplast can synthesises some of their proteins and capable of self duplication.

Sol.: The chloroplast contains small, double-stranded, circular DNA molecules and 70S ribosomes.

94. Answer (3)

Hint: Recombination nodule is the site at which crossover occured.

Crossing over is the exchange of genetic material between two homologous chromosomes.

Sol.: During pachytene, the four chromatids of each bivalent chromosomes become distinct and clearly appears as tetrads, and this stage is characterised by appearance of recombination nodules.

95. Answer (4)

Hint: Coenocytic hyphae are continuous tubes filled with multinucleated cytoplasm, found in phycomycetes.

Sol.: Members of phycomycetes can asexually be reproduced by zoospores, aplanospores, sporangiospores. Members of Ascomycetes produces sexual spores, ascospores.

96. Answer (3)

Hint: Gynaecomastia is expressed in Klinefelter's inflicted individuals.

Sol.: Down's syndrome develops due to trisomy of chromosome number 21, and affected individual is characterised by: short stature, small round head, big and wrinkled tongue, and furrowed tongue etc.

97. Answer (3)

Hint: *Sorghum* is a C_4 plant.

Sol.: In *Sorghum* primary CO_2 acceptor is a three-carbon molecule phosphoenolpyruvate (PEP).

98. Answer (4)

Hint: Some of the most fascinating cases of mutualism in nature are seen in plant-pollinator interaction.

Sol.: Fig and wasp show plant-animal mutualism.

99. Answer (2)

Sol.: More than 50,000 genetically different strains of rice, and 1,000 varieties of mango occur in India due to genetic variations.

100. Answer (4)

Hint: Complex IV refers to cytochrome *c* oxidase complex.

Sol.: Cytochrome *c* oxidase complex contains cytochrome *a* and a_3, and two copper centres.

101. Answer (3)

Hint: It is used to initiate flowering and for synchronizing fruit-set in pineapple.

Sol.: Ethylene promotes rapid internode petiole elongation in deep water rice plants.

102. Answer (3)

Hint: In eukaryotes there are at least three RNA polymerase in the nucleus.

Sol.: There is single DNA-dependent RNA polymerase that catalyses transcription of all types of RNA in bacteria.

103. Answer (4)

Hint: In *Michelia*, carpels are free

Sol.: In *Michelia*, gynoecium is multicarpellary apocarpous. Castor is a monoecious plant in which only autogamy is prevented but not geitonogamy. Coleoptile encloses leaf primordia.

104. Answer (2)

Hint: Prokaryotes lack membrane bound structures.

Sol.: Inclusion bodies are not membrane bound and lie freely in the cytoplasm.

105. Answer (3)

Hint: Existence of tRNA was known before genetic code was postulated

Sol.: tRNA was also known as soluble RNA. The three-dimensional structure of the tRNA was proposed to be inverted L-shaped, this is the actual structure of tRNA. There are no tRNAs for stop codons.

106. Answer (3)

Hint: Exclude the amino acid

Sol.: Glutamic acid is an acidic amino acid. Haem is the prosthetic group for enzymes named catalase and peroxidase.

Malonate is the competitive inhibitor for the enzyme succinic dehydrogenase (whose substrate is succinate).

Malonate closely resembles succinate in structure.

107. Answer (1)

Hint: Columnar epithelium

Sol.: Columnar epithelial cells are characterized by tall and slender cells. This epithelium is found in lining of intestine. Cuboidal epithelium is present in ducts of glands and tubular parts of nephrons in kidney. Squamous epithelium is found in the walls of blood vessels and air sacs of lungs.

108. Answer (1)

Hint: One of the parts of brain stem

Sol.: Pneumotaxic centre, present in the pons region of brain, can moderate the functions of respiratory rhythm centre (located in the medulla). Hypothalamus controls secretion of hormones, urge for drinking, *etc*.

Thalamus is a major coordinating centre for sensory and motor signalling.

109. Answer (3)

Hint: Leads to atrial systole

Sol.: In a standard ECG:

- 'P' wave - Depolarisation of atria
- QRS complex - Depolarisation of ventricles
- T wave – Repolarization of ventricles

110. Answer (4)

Hint: Acid-base balance

Sol.: Tubular secretion is an important step in urine formation as it helps in the maintenance of ionic and acid base balance of body fluids. Concentration of filtrate occurs as it moves down the descending limb of loop of Henle as it is permeable to water but almost impermeable to electrolytes.

PCT helps to maintain the pH and ionic balance of the body fluids by selective secretion of hydrogen ions and ammonia into the filtrate and by absorption of HCO_3^- from it.

111. Answer (3)

Hint: Numerically equal to the number of fingers in your left hand

Sol.: Brain box = cranial bones = 8

Vertebrae in lumbar region = 5

True ribs = 7 pairs

Tarsals in a hindlimb = 7

Phalanges in a forelimb = 14

112. Answer (1)

Hint: Grey matter

Sol.:

Cerebral cortex	–	Contains neuronal cell bodies which provide grey colour
Corpus callosum	–	Tract of nerve fibers connecting cerebral hemispheres
Midbrain	–	Cerebral aqueduct passes through it
Medulla oblongata	–	Contains centres which control respiration, cardiovascular reflexes and gastric secretions

113. Answer (2)

Hint: Cretinism

Sol.: Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to cretinism. Thyroid gland is located on the either side of trachea, it secretes thyroxine.

Adrenal glands are located one at above each kidney.

Pituitary gland is present in the bony depression called sella tursica; and thymus is present ventral to aorta.

114. Answer (1)

Hint: Equal to twice the number of eyes present in a man

Sol.: A male *Periplaneta* has anal style, anal cerci, titillator and phallic gland.

A female *Periplaneta* has collaterial gland, anal cerci and spermathecae.

Bidder's canal is present exclusively in male frogs.

115. Answer (2)

Hint: *Rana tigrina* has a bony endoskeleton.

Sol.: Hind brain consists of cerebellum and medulla oblongata. There are 10 pairs of cranial nerves arising from the brain of frogs.

Brain is enclosed in a bony structure called brain box.

Pons is absent in frogs.

116. Answer (3)

Sol.: Law of segregation is based on the fact that during gamete formation, factors of a pair separate or segregate from each other so that a gamete carries only one factor of a character.

117. Answer (2)

Hint: Phenylketonuria is an example of Pleiotropy.

Sol.: F_1 progeny did not resemble either of the parents in case of incomplete dominance, for e.g., flower colour in snapdragon. AB blood group is a good example of co-dominance. Human skin colour is an example of polygenic inheritance.

118. Answer (4)

Hint: DNA replication is energetically a very expensive process.

Sol.: Deoxyribonucleoside triphosphates serve dual purposes like acting as substrates and also provides energy for polymerisation reaction.

119. Answer (3)

Hint: Thalassemia is autosomal recessive disorder.

Sol.: Haemophilia is a sex-linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny. The possibility of a female being haemophilic is extremely rare.

In this condition, a single protein that is a part of the cascade of proteins involved in clotting of blood is affected.

120. Answer (3)

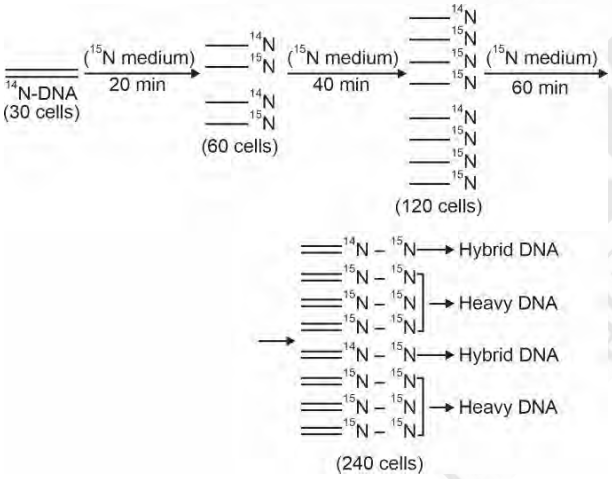
Hint: Polynucleotide phosphorylase carry out enzymatic synthesis of RNA

Sol.: Severo Ochoa enzyme is polynucleotide phosphorylase, it was helpful in polymerising RNA with defined sequences in a template-independent manner.

121. Answer (4)

Hint: DNA replicates semi-conservatively, was first shown in *Escherichia coli* and subsequently in higher organisms *E.coli* divides in 20 minutes.

Sol.:



So, the number of cells having only (^{15}N) is

$\Rightarrow$ (240 – 60) = 180 cells

122. Answer (4)

Hint: Pre-mitotic phase is G_2 phase

Sol.: Mitochondria, chloroplast and Golgi bodies duplicate in G_2 phase. No splitting of centromeres occurs in anaphase I. In plant cells, cell plate formation during cytokinesis occurs in centrifugal manner.

123. Answer (3)

Hint: Theodor Schwann, a British zoologist concluded that presence of cell wall is characteristic of plant cells.

Sol.: The content of nucleolus is continuous with the rest of the nucleoplasm as it is not a membrane bound structure.

124. Answer (3)

Hint: Prophase is the first stage of karyokinesis of mitosis

Sol.: Prophase follows the S and G_2 phases of interphase. Prophase I of meiosis I is typically longer and more complex in comparison with prophase of mitosis.

125. Answer (1)

Hint: Mango belongs to order Sapindales.

Sol.: Taxonomic categories of mango are as follows:

Family - Anacardiaceae

Order - Sapindales

Class - Dicotyledonae

Division - Angiospermae

126. Answer (2)

Hint: In dicot stem, vascular bundles are conjoint, open and with endarch protoxylem.

Sol.: In dicot stem, hypodermis is collenchymatous, endodermis is single layered, bundle sheath is absent and pericycle is made up of sclerenchyma.

127. Answer (2)

Hint: Cytokinine is derived from adenine.

Sol.: Cytokinine promote lateral shoot growth.

128. Answer (3)

Hint: The majority of baculoviruses used as biocontrol agents are in the genus Nucleopolyhedrovirus (NPV).

Sol.: Baculoviruses have species-specific, narrow spectrum insecticidal applications. They have no negative impacts on mammals and birds.

129. Answer (3)

Hint: Decomposition is largely an oxygen requiring process.

Sol.: Rate of decomposition is slower if detritus is rich in lignin and chitin.

130. Answer (2)

Hint: Speciation is generally a function of time. Unlike temperate, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification.

Sol.: Tropics are less seasonal, receive more solar energy and highly productive.

131. Answer (3)

Hint: Look for a lipid molecule amongst all

Sol.: Lipids are found in the retentate portion obtained upon the chemical analysis of a living tissue.

While adenylic acid, glucose and glycine are monomers which will be found in the filtrate portion.

132. Answer (1)

Hint: *Pristis* is a member of class Chondrichthyes.

Sol.:

Petromyzon	Possesses 6-15 pairs of gill slits
Chelone	Oviparous
Pristis	Males have claspers
Hirudinaria	Monoecious

133. Answer (3)

Hint: Ion necessary for blood clotting

Sol.:

Element	% Weight of Earth's crust	% Weight of human's body
Hydrogen (H)	0.14	0.5
Carbon (C)	0.03	18.5
Oxygen (O)	46.6	65.0
Nitrogen (N)	Very little	3.3
Sulphur (S)	0.03	0.3
Sodium (Na)	2.8	0.2
Calcium (Ca)	3.6	1.5
Magnesium (Mg)	2.1	0.1
Silicon (Si)	27.7	Negligible

134. Answer (3)

Hint: Eliminate the secondary lymphoid organs

Sol.: Primary lymphoid organs – Thymus and bone marrow are the sites where immature lymphocytes differentiate into antigen-sensitive lymphocytes.

Secondary lymphoid organs – Spleen, lymph nodes, tonsils, appendix and Peyer's patches.

135. Answer (2)

Hint: Red-coloured pigment

Sol.: Haemoglobin consists of 4 subunits and constitutes the quaternary structure.

Collagen, which is the most abundant protein in the animal world, forms the secondary structure. Chitin is present in the exoskeleton of arthropods and cellulose is present in the cotton fibres.

136. Answer (2)

Hint: α-1-antitrypsin is used to treat emphysema

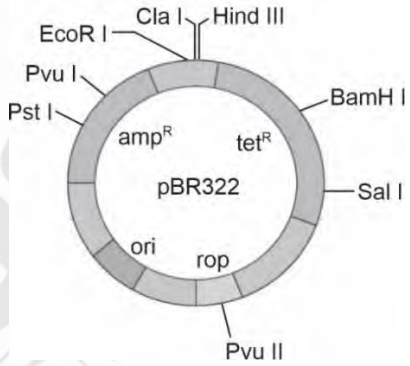
Sol.: Transgenic sheep was used to produce the human protein (α-1-antitrypsin) to treat emphysema.

The milk produced by 'Rosie' contained the human alpha-lactalbumin.

137. Answer (3)

Hint: First restriction endonuclease to be characterized

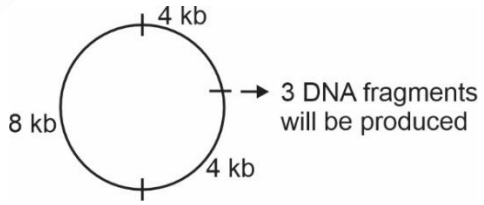
Sol.:



138. Answer (3)

Hint: DNA fragments separate according to their size.

Sol.:



But only two DNA bands will be visible after gel electrophoresis as bands with 4 kb size are of the same size, thus they will travel the same distance over the gel.

139. Answer (3)

Hint: At puberty, only 60,000-80,000 primary follicles are left in each ovary.

Sol.: No more oogonia are formed and added after birth. These cells start dividing and enter into prophase-I of the first meiotic division and get temporarily arrested at that stage and are called primary oocytes.

140. Answer (2)

Hint: Site of fertilisation

Sol.: Entry of sperm into the ovum induces the completion of second meiotic division which is also unequal and results in the formation of a second polar body and a haploid ootid. Primary oocyte within the tertiary follicle grows in size and completes its first meiotic division. It is an unequal division resulting in the formation of a large haploid secondary oocyte and a tiny first polar body.

141. Answer (3)

Hint: Hormonal method of contraception

Sol.:

Hormonal methods	Inhibit ovulation and implantation
The non-steroidal preparation called 'Saheli'	Does not inhibit ovulation but prevents implantation; and it is also called 'once a week' pill
Condoms	Protect users from contracting STIs

142. Answer (4)

Hint: *Nereis* is dioecious.

Sol.: Earthworm and leeches are monoecious. Flatworms are bilaterally symmetrical, triploblastic and acoelomate animals. *Taenia* absorbs nutrients directly from body surface, but it is an acoelomate animal.

143. Answer (1)

Hint: Proteinaceous enzymes get denatured at high temperature.

Sol.: Almost all enzymes are protein and like any protein, they have secondary and tertiary structure.

An active site in an enzyme is formed by the tertiary confirmation in which substrate (such as H_2CO_3) fits.

144. Answer (3)

Hint: Right shifting of oxygen dissociation curve

Sol.: In tissues, where low pO_2, high pCO_2, high H^+ concentration and high temperature exists, these conditions are favourable for the dissociation of oxyhaemoglobin to release O_2.

145. Answer (3)

Hint: Closure of tricuspid and bicuspid valves

Sol.: As action potential reaches the entire ventricular musculature, it leads to the beginning of ventricular systole; thus increasing the ventricular pressure that causes the closure of tricuspid and bicuspid valves, producing the first heart sound called 'lub'.

146. Answer (2)

Hint: Podocytes are present in Bowman's capsule.

Sol.: Filtration membrane in kidney is formed of 3 layers. They are:

(i) The endothelium of glomerular blood vessels

(ii) Acellular basement membrane

(iii) Epithelium of Bowman's capsule

The epithelial cells of Bowman's capsule, called podocytes, are arranged in an intricate manner to leave slit pores that act as filtration slits.

147. Answer (2)

Hint: An auto-immune disorder

Sol.: Muscular dystrophy-Progressive degeneration of skeletal muscles due to genetic disorder.

Osteoporosis is an age-related disorder characterised by decreased bone mass and increased chances of fractures.

Myasthenia gravis is an auto-immune disorder affecting neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle.

148. Answer (2)

Hint: Used for amplification of nucleic acids

Sol.: PCR is being used to detect mutations in genes in suspected cancer patients. It is a powerful technique to identify many other genetic disorders. ELISA is based on the principle of antigen-antibody interaction. Infection by pathogen can be detected by the presence of antigens (proteins, glycoproteins, *etc.*) or by detecting the antibodies synthesised against the pathogen.

Serum and urine analysis are conventional methods of disease diagnosis.

149. Answer (2)

Hint: Development of secondary sexual characters

Sol.: Estrogen is a steroid hormone which has wide ranging actions such as stimulation of growth and activities of female secondary sex organs, development of growing follicles and appearance of secondary sex characters.

Estrogen interacts *via* intracellular receptors.

Prolactin helps in formation of milk after pregnancy.

Luteinizing hormone is a proteinaceous hormone secreted from the pituitary gland; it interacts with the interstitial cells of testis.

150. Answer (2)

Hint: Mesorchium is related with kidney.

Sol.: In female frogs, a pair of ovaries are situated near kidneys. A pair of oviducts arising from the ovaries open into the cloaca separately. In males, testes are found adhered to the upper parts of kidneys by a double fold of peritoneum called mesorchium.

151. Answer (2)

Hint: Produces a sense of euphoria

Sol.: *Cannabis sativa* yields natural cannabinoids that produce hallucinogenic effect.

Coca alkaloid or cocaine from *Erythroxylum coca* – has stimulating action.

Morphine acts as effective sedative and painkiller

152. Answer (4)

Hint: Eliminate the characteristics associated with cardiac and smooth muscle fibres.

Sol.: Skeletal muscles are present in thighs. The muscle fibres associated with them are multinucleated and voluntary in nature. Cardiac muscle fibres are cylindrical, uninucleated and branched.

Smooth muscle fibres are fusiform in shape.

153. Answer (3)

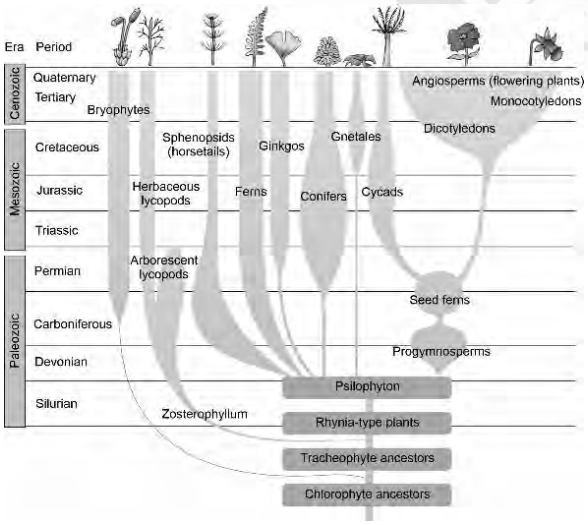
Hint: A flat bone

Sol.: The lungs are situated in the thoracic chamber which is anatomically an air-tight chamber. The thoracic chamber is formed dorsally by the vertebral column, ventrally by the sternum, laterally by the ribs and on the lower side by the dome-shaped diaphragm.

154. Answer (4)

Hint: Ferns and conifers share the same ancestors.

Sol.:



155. Answer (3)

Hint: Also known as gene gun

Sol.: In micro-injection, recombinant DNA is directly injected into the nucleus of an animal cell. Heat shock is a method in which the host cells and recombinant DNA are incubated on ice and then placed briefly at 42°C and then placed back on ice. This enables the bacteria to take up the recombinant DNA.

Electroporation is a technique that uses an electrical field to create temporary pores in cell membrane, allowing substances to pass through it.

156. Answer (2)

Hint: Algin is obtained from the brown algae.

Sol.: In bryophytes, the dominant phase is independent, photosynthetic, thalloid or erect haploid gametophyte.

Red algae reproduce asexually by non-motile spores.

157. Answer (2)

Hint: Oxygen evolving complex (OEC) is located on the inner side of the membrane of the thylakoid associated with PS II.

Sol.: In cyclic photophosphorylation, external source of electrons is not required and no oxygen is evolved. Both cyclic and noncyclic photophosphorylation synthesizes ATP.

158. Answer (3)

Hint: Structural gene transcribes mRNA for polypeptide synthesis. *Lac z* gene codes for β-galactosidase.

Sol.: *Lac y* gene codes for permease which increases the permeability of cell to β-galactosides.

159. Answer (3)

Hint: In female heterogamety, female individual produces two different types of gametes, e.g. (Birds-ZZ and ZW types)

Sol.: In butterflies, sex-determination is exactly opposite the condition found in grasshoppers. Here, female produce two types of eggs (A + Z and A + 0 type)

160. Answer (2)

Hint: It is inner most layer of cortex in dicot root.

Sol.: All tissues on the inner side of the endodermis such as pericycle, vascular bundles and pith constitute the stele.

161. Answer (2)

Hint: Gross primary productivity is equal to net primary productivity plus respiration loss.

Sol.: Net primary productivity is the available biomass for the consumption to heterotrophs.

162. Answer (3)

Hint: Non-living, rigid structure is called cell wall that surrounds the plasma membrane.

Sol.: Algal cell wall is made up of cellulose, galactans, mannans and calcium carbonate.

163. Answer (3)

Hint: Viroids were discovered by T.O. Diener.

Sol.: Viroids are infectious RNA particles which are devoid of protein coat. These are smaller in size than viruses.

164. Answer (3)

Hint: The mode of arrangement of sepals or petals in a floral bud with respect to the other member of same whorl is called aestivation, *Cassia* shows imbricate aestivation.

Sol.:

Plant flowers	Type of aestivation
(a) *Cassia*	• Imbricate
(b) Cotton	• Twisted
(c) *Calotropis*	• Valvate
(d) Pea	• Vexillary

165. Answer (2)

Hint: Dichogamy refers to different maturation time of androecium and gynoecium in the same flower. *E.g*: sunflower.

Sol.: Tapetum is polyploid and nourishes the developing pollen grains. Each cell of sporogenous tissue is capable of giving rise to a microspore tetrad.

166. Answer (3)

Hint: The mesocarp of coconut is fibrous.

Sol.: Mango and coconut are developed from monocarpellary superior ovaries.

167. Answer (1)

Hint: The dominant phase of pteridophytes is a sporophyte. They are first vascular terrestrial plants.

Sol.: Pteridophytes are found in cool, damp and shady places.

They are the first tracheophytes. Their gametophyte require water for fertilisation.

168. Answer (2)

Sol.: Phosphoenolpyruvate is acted upon by pyruvate kinase and gets converted into pyruvic acid. This step is substrate level phosphorylation, releasing ATP.

169. Answer (2)

Hint: Cilia and flagella are hair-like outgrowths of the cell membrane. Prokaryotes lack cilia.

Sol.: Centrioles in a centrosome lie perpendicular to each other in which each has an organisation like the cartwheel. Prokaryotic flagella are structurally different from eukaryotic ones.

170. Answer (2)

Hint: Steller's sea cow got extinct from Russia

Sol.:

Extinct organism	Locations
Thylacine	Australia
Dodo	Mauritius
Quagga	Africa
Steller's sea cow	Russia

171. Answer (2)

Hint: Implantation

Sol.: The trophoblast layer of the embryo gets attached to the endometrium and the inner cell mass gets differentiated. As a result, the blastocyst becomes embedded in the endometrium of uterus. This is called implantation.

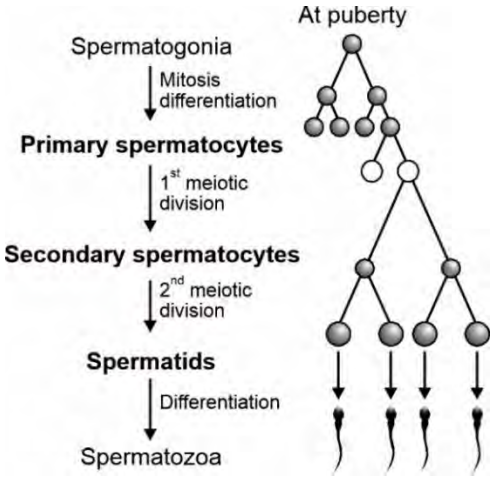
Zona pellucida is an acellular layer surrounding the secondary oocyte.

Corona radiata is a layer of follicles surrounding the ovum.

172. Answer (4)

Hint: Both are formed after 2nd meiotic division.

Sol.: The process of converting spermatids into spermatozoa is called spermiogenesis.



173. Answer (3)

Hint: More than 12 weeks

Sol.: The Government of India legalised MTP in 1971 with some strict conditions to avoid its misuse. After 12 weeks of pregnancy but before 24 weeks, opinion of atleast two registered medical practitioners is needed legally to perform MTP.

174. Answer (3)

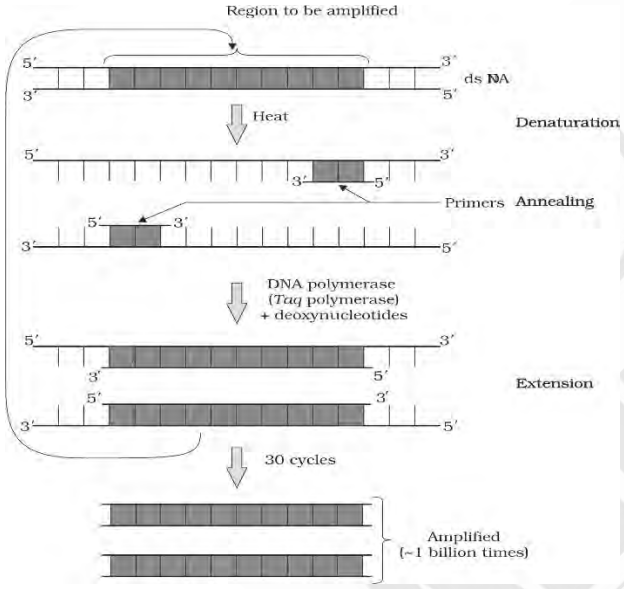
Hint: Exclude dinosaurs

Sol.: *Ichthyophis* is a limbless amphibian. *Pteranodon* was a flying reptile and *Stegosaurus* was a dinosaur. *Salamandra* is a tailed amphibian.

175. Answer (4)

Hint: Phosphodiester bond formation

Sol.: During the denaturation step, hydrogen bonds between the DNA strands are broken to create single stranded DNA templates.



176. Answer (4)

Hint: Resting axonal membrane is impermeable to negatively charged proteins.

Sol.: Ionic gradient across the resting membrane is maintained by the active transport of ions by the sodium-potassium pump which transports $3Na^+$ outwards for $2K^+$ into the cell.

177. Answer (2)

Hint: Include the disease related to the hormones of posterior pituitary.

Sol.: Acromegaly - Hypersecretion of GH

Graves' disease- Hypersecretion of thyroxine.

Addison's disease-Hyposecretion of hormones of adrenal cortex

Diabetes insipidus-Hyposecretion of ADH/ vasopressin

178. Answer (2)

Hint: All living members of this class are ectoparasites on some fishes.

Sol.:

(1)	Chondrichthyes	–	Ventral mouth, gill slits without operculum
(2)	*Pterophyllum*	–	Class Osteichthyes
(3)	Class Amphibia	–	Usually oviparous with indirect development
(4)	*Chameleon*	–	Class Reptilia
(5)	*Psittacula*	–	Class Aves

179. Answer (2)

Hint: Exclude the vectors used for plants

Sol.: The first step towards gene therapy, is that the lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient.

180. Answer (3)

Hint: Development occurs through 13 nymphal stages to reach the adult form

Sol.: The development of *P. americana* is paurometabolous meaning their development is through nymphal stages. The nymphs look very much like adults.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2025

OPEN MOCK TEST - 4

Click here for Code-E sol.

Test Date : 27/04/2025

ANSWERS

1. (1)	37. (4)	73. (2)	109. (1)	145. (3)
2. (3)	38. (3)	74. (2)	110. (3)	146. (2)
3. (2)	39. (3)	75. (2)	111. (4)	147. (3)
4. (4)	40. (2)	76. (4)	112. (3)	148. (3)
5. (3)	41. (2)	77. (4)	113. (1)	149. (3)
6. (1)	42. (1)	78. (2)	114. (1)	150. (2)
7. (1)	43. (2)	79. (3)	115. (3)	151. (2)
8. (2)	44. (4)	80. (2)	116. (2)	152. (3)
9. (4)	45. (3)	81. (1)	117. (3)	153. (3)
10. (1)	46. (2)	82. (3)	118. (3)	154. (1)
11. (3)	47. (3)	83. (4)	119. (2)	155. (3)
12. (3)	48. (2)	84. (4)	120. (2)	156. (2)
13. (1)	49. (1)	85. (1)	121. (1)	157. (2)
14. (2)	50. (2)	86. (2)	122. (3)	158. (2)
15. (1)	51. (2)	87. (3)	123. (3)	159. (1)
16. (2)	52. (4)	88. (3)	124. (4)	160. (3)
17. (3)	53. (1)	89. (2)	125. (4)	161. (2)
18. (3)	54. (2)	90. (2)	126. (3)	162. (3)
19. (2)	55. (1)	91. (3)	127. (3)	163. (3)
20. (3)	56. (1)	92. (2)	128. (4)	164. (3)
21. (2)	57. (4)	93. (4)	129. (2)	165. (2)
22. (2)	58. (2)	94. (3)	130. (3)	166. (2)
23. (1)	59. (1)	95. (3)	131. (3)	167. (3)
24. (1)	60. (2)	96. (4)	132. (4)	168. (3)
25. (4)	61. (4)	97. (2)	133. (3)	169. (2)
26. (1)	62. (1)	98. (4)	134. (4)	170. (2)
27. (3)	63. (3)	99. (3)	135. (2)	171. (3)
28. (2)	64. (4)	100. (3)	136. (2)	172. (2)
29. (4)	65. (4)	101. (4)	137. (2)	173. (2)
30. (2)	66. (4)	102. (3)	138. (2)	174. (2)
31. (2)	67. (3)	103. (3)	139. (2)	175. (4)
32. (4)	68. (2)	104. (2)	140. (2)	176. (4)
33. (2)	69. (2)	105. (4)	141. (3)	177. (3)
34. (1)	70. (4)	106. (2)	142. (3)	178. (3)
35. (3)	71. (4)	107. (1)	143. (1)	179. (4)
36. (2)	72. (3)	108. (2)	144. (4)	180. (2)

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint: The maximum energy will be stored in inductor at steady state.

Sol.: $I = \frac{V}{R} = \frac{40}{20} = 2$ A

$U = \frac{1}{2}LI^2$

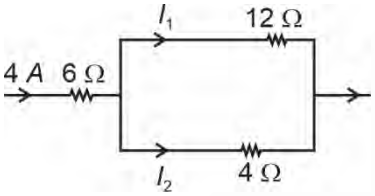
$= \frac{1}{2} \times 2 \times 4 = 4$ J

2. Answer (3)

Hint: Use current dividing rule

$I_2 = \frac{12\,I}{12+4}$

Sol.: Current through 4 Ω



$I_2 = \frac{12}{12+4} \times 4 = 3$ A

$P = I_2^2 R = 9 \times 4 = 36$ W

3. Answer (2)

Hint: $\vec{v}_{avg} = \frac{\vec{u}+\vec{v}}{2}$ for uniform acceleration

Sol.: $\left|\vec{v}_{avg}\right| = \frac{2u\cos\theta}{2} = u\cos\theta = 20 \times \frac{1}{2}$

$= 10$ m s^{-1}

4. Answer (4)

Hint: Use parallel axis theorem

Sol.: $I_{YY'} = I_{com} + MR^2$

$I_{YY'} = \frac{MR^2}{4} + MR^2$

$= \frac{5}{4}MR^2$

Given $I = \frac{MR^2}{2} = 10$ kg m^2

$I_{YY'} = \frac{5}{2} \times 10 = 25$ kg m^2

5. Answer (3)

Hint: $a = \frac{\text{Net pulling force}}{\text{Total mass}}$

Sol.: $a = \frac{100 - 0.5 \times 10 \times 10}{20}$

$a = \frac{100-50}{20} = \frac{5}{2}$ m s^{-2}

6. Answer (1)

Hint: Heat absorbed in process AB is $nC_p\Delta T$

Sol.: Q = $nC_p\Delta T$

$= \frac{5}{2}\ nR\Delta T$

$= \frac{5}{2}\ [3\,P_0V_0 - P_0V_0]$

$= 5\,P_0V_0$

7. Answer (1)

Hint: $g' = \frac{GM}{R^3}r = \frac{GM}{R^3}\left(\frac{R}{2}\right) = \frac{GM}{2R^2}$

Sol.: $g'' = \frac{GM}{\left(R+\frac{R}{2}\right)^2} = \frac{4}{9}\frac{GM}{R^2}$

$= \frac{8}{9}\frac{GM}{2R^2} = \frac{8}{9}g'$

8. Answer (2)

Hint & Sol.: (i) When two charges are brought closer to each other, their potential energy increases or decreases depending on the sign of the charges.

(ii) $U = -PE\cos\theta$

$\Rightarrow U = PE$ at $\theta = 180°$

9. Answer (4)

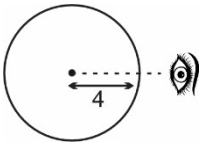
Hint: $I_s = \frac{\phi}{I} = \frac{NAB}{K}$

Sol.: Current sensitivity of the galvanometer is defined as the deflection per unit current.

10. Answer (1)

Hint: Use formula of refraction through curved surface.

Sol.:



$$\frac{\mu_2}{v}-\frac{\mu_1}{u}=\frac{\mu_2-\mu_1}{R}$$

$$\frac{1}{v}+\frac{1.5}{4}=\frac{1-1.5}{-4}$$

$$\frac{1}{v}+\frac{3}{8}=\frac{1}{8}$$

$$\frac{1}{v}=\frac{1}{8}-\frac{3}{8}=\frac{-2}{8}=-\frac{1}{4}$$

$v = -4$ cm

11. Answer (3)

Hint & Sol.: The beta rays are emitted when a proton in nucleus is converted into neutron or a neutron in nucleus is converted into proton.

12. Answer (3)

Hint & Sol.: The maximum kinetic energy of emitted photoelectron is independent of intensity of light for fixed frequency but depends on the energy = $h\nu$, where ν is frequency of incident radiation.

13. Answer (1)

Hint: $\frac{1}{\lambda}=RZ^2\left[\frac{1}{n_1^2}-\frac{1}{n_2^2}\right]$

Sol.: $\lambda \propto \frac{1}{Z^2}$

So, the longest wavelength will be produced by Hydrogen.

14. Answer (2)

Hint & Sol.: The net flow of electrons (drift current) from p-side to n-side is possible in reverse biased diode.

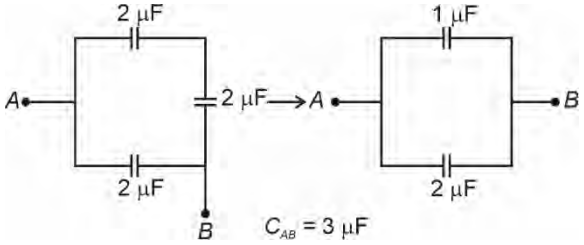
15. Answer (1)

Hint: De-Broglie wavelength $\lambda=\frac{h}{mv}$

Sol.: Decreasing velocity will increase the wavelength. The fringe width $\beta=\frac{\lambda D}{d}$ will increase.

16. Answer (2)

Hint & Sol.:



17. Answer (3)

Hint: Accelerating the container will increase pressure at *A*.

Sol.: $(P_A - P_B) = \rho la$

where *l* is the distance between points *A* and *B*.

18. Answer (3)

Hint: $\mu=\frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

Sol.: $\frac{1}{\sin\left(\frac{A}{2}\right)}=\frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

$$90^\circ=\frac{A+\delta_m}{2}$$

$180^\circ - A = \delta_m$

19. Answer (2)

Hint & Sol.: $U_B = U_E = \frac{1}{4}\varepsilon_0 E_0^2 = \frac{1}{4}\frac{B_0^2}{\mu_0}$

Energy density of an EM wave is distributed equally in both electric and magnetic fields.

20. Answer (3)

Hint: Tension in the string provides necessary centripetal force.

Sol.: 60 N = $m\omega^2 r$

$T' = (m)(2\omega)^2(2r)$

$T' = 8\, m\omega^2 r$

$T' = 8T = 8 \times 60 = 480$ N

21. Answer (2)

Hint: Use Lenz's law

Sol.: The magnetic field due to both the currents are perpendicular to the plane and going into the plane. To decrease the magnetic flux, the induced current will be anti-clockwise.

22. Answer (2)

Hint & Sol.: In a transverse wave, energy and not the matter is transferred from one point to the other.

23. Answer (1)

Hint: Maximum acceleration is achieved at the extreme position.

Sol.: $a_{max} = \frac{k}{m}A$

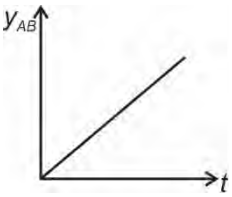
$a_{max} = \frac{1200}{4} \times 2 \times 10^{-2}$ m s^{-2}

= 6 m s^{-2}

24. Answer (1)

Hint: The relative acceleration of both the balls is zero.

Sol.: $y_{AB} = v_{AB} \times t$



25. Answer (4)

Hint: The total power = $\frac{P_1P_2}{P_1+P_2} = V \times I$

Sol.: $P_t = \frac{P_1P_2}{P_1+P_2} = \frac{12\times4}{12+4}$ kW = 3 kW

$I = \frac{P}{V} = \frac{3\text{ kW}}{200\text{ V}} = \frac{3000}{200} = 15$ A

$P' = I^2R_i$

$= (15)^2 \times \frac{200\times200}{4000}$

$= \frac{225\times40}{4}$ W = 2.25 kW

26. Answer (1)

Hint: Capacitive reactance is $X_C = \frac{1}{\omega C}$

Sol.: $X_C = \frac{10^6}{2\times\pi\times\frac{50}{\pi}\times250}$

$= \frac{10^6}{250\times100} = 40\ \Omega$

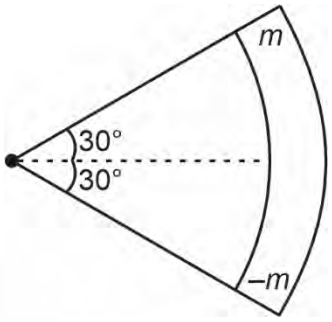
$I = \frac{V}{X_C} = \frac{220}{40} = \frac{11}{2}$A

$I_0 = I\sqrt{2} = \frac{11}{\sqrt{2}}$A

27. Answer (3)

Hint: Magnetic moment = Pole strength × effective length

Sol.:



$M = mL$

$L = \frac{R\times\pi}{3} \Rightarrow R = \frac{3L}{\pi}$

$M' = M\,2R\sin30° = mR$

$= \frac{3mL}{\pi} = \frac{3M}{\pi}$

28. Answer (2)

Hint: Rate of flow of heat is same in both metal rods.

Sol.: $\frac{(100-T)K}{L} = \frac{(T-0)4K}{2L}$

$100 - T = 2T$

$3T = 100°C$

$T = \frac{100°C}{3}$

29. Answer (4)

Hint: Time constant (τ) = RC

Sol.: [Q] = [current] [time]

[current] = $\left[\frac{Q}{\text{time}}\right] = \left[\frac{Q}{RC}\right]$

30. Answer (2)

Hint: The charge on capacitor doesn't change.

Sol.: (1) (C) capacitance increases

(2) $V = \frac{Q}{C}$ decreases

(3) $U = \frac{1}{2}\frac{Q^2}{C}$ decreases

(4) Product of $Q \times V$ decreases

31. Answer (2)

Hint : The resistivity of semiconductor decreases with increase in temperature.

Sol.: $T_1 > T_2$

$R_1 < R_2$

$P_1 < P_2$

$T_1 > T_{2s}$

33. Answer (4)

Hint: $q = CV$ and $i_d = \frac{dq}{dt} = \frac{CdV}{dt}$

Sol.: $i_d = \frac{CdV}{dt}$

$\frac{1}{10^{-6}} = \frac{dV}{dt}$

$\frac{dV}{dt} = 10^6$ V/s

33. Answer (2)

Hint: $\frac{PV}{T}$ = constant for all ideal gases.

Sol.: PV^2 = constant

$(PV)(V)$ = constant

TV = constant

$T_1V_1 = T_2V_2$

$T_0V_0 = 3V_0T_2$

$T_2 = \frac{T_0}{3}$

34. Answer (1)

Hint: Rate of radiation emitted by a blackbody $E = \sigma AT^4$

Sol.: $E = \sigma 4\pi R^2 (300)^4$

$E' = \sigma 4\pi \frac{R^2}{4}(600)^4$

$\frac{E'}{E} = \left(\frac{1}{4}\right)(2)^4 = \frac{16}{4} = 4$

$E' = 4E$

35. Answer (3)

Hint: Kinetic energy in pure rotation, $KE = \frac{1}{2}I\omega^2$

Sol.: $KE = \frac{1}{2} \times \frac{24}{\pi^2} \times \left(\frac{120 \times 2\pi}{60}\right)^2$

$= \frac{1}{2} \times \frac{24}{\pi^2} \times 16\pi^2$

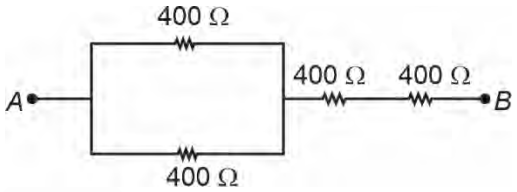
$KE_R = 192$ J

36. Answer (2)

Hint: When a wire is stretched to n times, the resistance increases to n^2 times.

Sol.: $R' = 16R = 1600\ \Omega$

$R_1 = R_2 = R_3 = R_4 = \frac{1600}{4} = 400\ \Omega$



$R_{eq} = 1000\ \Omega$

37. Answer (4)

Hint: $v_0 = A\omega$ and $a_0 = \omega^2 A$

Sol.: $v_0 = 5 \times 10 = 50$ m s^{-1}

$a_0 = 100 \times 5 = 500$ m s^{-2}

38. Answer (3)

Hint & Sol.: $[\tau] = [ML^2T^{-2}] = [\text{P.E.}]$

39. Answer (3)

Hint: $P = \vec{F} \cdot \vec{v}$

Sol.: $x = t^3$

$v = \frac{dx}{dt} = 3t^2\Big|_{t=1} = 3$ m s^{-1}

$\frac{dv}{dt} = a = 6t\Big|_{t=1} = 6$ m s^{-2}

$F = ma = 6$ N

$P = \vec{F} \cdot \vec{v}$

$= 6 \times 3$

$= 18$ W

40. Answer (2)

Hint: The extension in rod due to self-weight is $\frac{MgL}{2AY}$

Sol.: $\Delta L = \frac{MgL}{2AY}$

$Y = \frac{MgL}{2A\Delta L}$

$= \frac{50 \times 10 \times 1}{2 \times 50 \times 10^{-6} \times 10^{-3}}$

$= 5 \times 10^9$ N/m^2

41. Answer (2)

Hint & Sol.: We get output as 1 when both input are zero.

$\therefore$ NOR gate

$\Rightarrow Y = \overline{A+B}$

42. Answer (1)

Hint & Sol.:

(i) The magnetic susceptibility of diamagnetic material is slightly negative and independent of temperature change.

(ii) The magnetic susceptibility of paramagnetic material is inversely proportional to temperature.

(iii) The magnetic susceptibility of ferromagnetic material decreases with increase in temperature. A ferromagnetic material becomes paramagnetic at curie temperature.

43. Answer (2)

Hint: Magnetic field at centre = $\frac{\mu_0 IN}{2r}$

Sol.: $B = \frac{4\pi \times 10^{-7} \times 7.0 \times 100}{2 \times 4.4 \times 10^{-2}}$

$B = \frac{4 \times \frac{22}{7} \times 10^{-7} \times 7.0 \times 100}{2 \times 4.4 \times 10^{-2}}$

$B = 10^{-2}\,\text{T}$

44. Answer (4)

Hint: Electric field due to uniformly charged infinite wire, $E = \frac{\lambda}{2\pi\varepsilon_0 r}$

Sol.: E is proportional to $\frac{1}{r}$

45. Answer (3)

Hint: Additional work done = Surface tension × change in area

Sol.: $W = 8\pi R^2 T$

$W' = 8\pi(2R)^2 T = 4(8\pi R^2 T) = 4W$

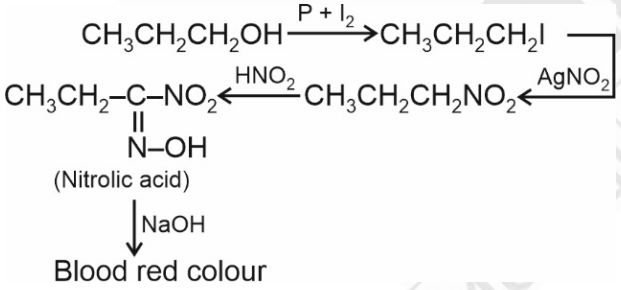
$\Delta W = W' - W = 3W$

[CHEMISTRY]

46. Answer (2)

Hint: Victor Meyer's test is a test for alcohols. Primary alcohols give blood red colour.

Sol.:



47. Answer (3)

Hint: Zn^{2+} gives yellow colour when hot.

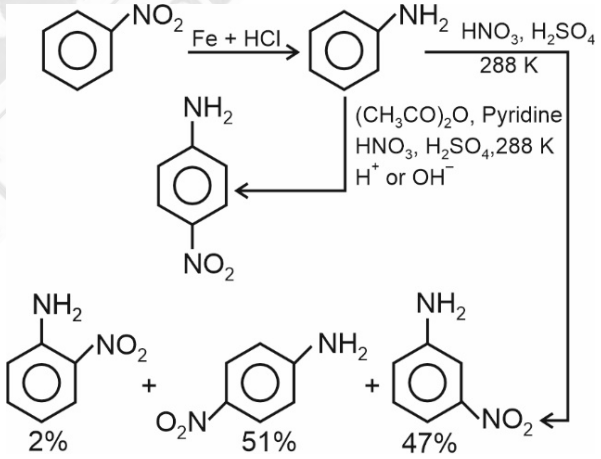
Sol.:

Colour when cold	Colour when hot	Cation
White	Yellow	Zn^{2+}

48. Answer (2)

Hint: In nitration, by protecting $-NH_2$ group by acetylation reaction, p-derivative is obtained as major product.

Sol.:



49. Answer (1)

Hint & Sol.: 95% C_2H_5OH by volume forms minimum boiling azeotrope.

Components of azeotropic mixture cannot be separated by fractional distillation.

50. Answer (2)

Hint: $\Delta T_f = iK_f m$

Sol.: Maximum depression in freezing point, minimum is the freezing point of the solution

$\Delta T_f = iK_f m$

For $Al_2(SO_4)_3$ i = 5

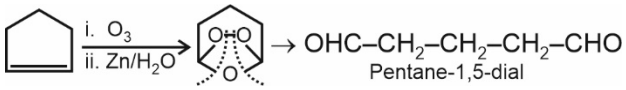
$\Delta T_f = 5 \times K_f \times 0.1$

$= 0.5\ K_f$

Maximum depression in freezing point, therefore minimum is the freezing point of the solution.

51. Answer (2)

Hint & Sol.:



52. Answer (4)

Hint: Zeros between two non-zero digits are significant.

Sol.: 0.200 g has 3 significant figures.

53. Answer (1)

Hint: 'H_2' is the limiting reactant.

Sol.: $N_2 + 3H_2 \rightleftharpoons 2NH_2$

1 3/2

Number of moles of NH_3 formed is decided only by H_2. Number of moles of NH_3 formed = $\frac{2}{3} \times \frac{3}{2} = 1$

1 mole $NH_3(g)$ formed

i.e. 22.4 L $NH_3(g)$ formed

54. Answer (2)

Hint:

$$\% \text{ of } S = \frac{32 \times \text{weight of } BaSO_4}{233 \times \text{weight of organic substance}} \times 100$$

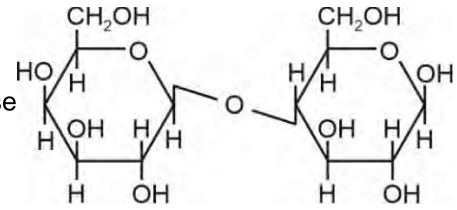
Sol.: $\% \text{ of } S = \frac{32 \times 0.466}{233 \times 0.16} \times 100$

$= 40\%$

55. Answer (1)

Hint: Lactose is made of β-D-galactose and β-D-glucose.

Sol.: Lactose



56. Answer (1)

Hint: Order of first ionisation enthalpy, Fe > Co > Ni > Mn > Cr

Sol.: $2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$

$2Fe^{2+} + S_2O_8^{2-} \rightarrow 2Fe^{3+} + 2SO_4^{2-}$

57. Answer (4)

Hint & Sol.:

$XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

$XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

58. Answer (2)

Hint: w = zit

z = electrochemical equivalent of substance deposited.

Sol.: w = zit

$$11.2\ g = \frac{119}{x} \times \frac{1 \times 5 \times 60 \times 60}{96500}$$

$$x = \frac{119 \times 5 \times 36}{11.2 \times 965} = \frac{21420}{10808}$$

$= 1.98 \approx 2$

59. Answer (1)

Hint: A negative E° means that the redox couple is a stronger reducing agent than H^+/H_2 couple.

Sol.: Al^{3+}/Al, E° = –1.66 V

∴ It is the strongest reducing agent among all other options.

E° of Sn^{2+}/Sn is less negative than Cr^{3+}/Cr and Al^{3+}/Al.

∴ It is a stronger oxidising agent than Cr^{3+} and Ai^{3+}. But E° of Sn^{2+}/Sn is less than Ag^+/Ag

∴ It is a stronger reducing agent than Ag^+/Ag

60. Answer (2)

Hint: $h\nu = h\nu_0 + KE$

$$\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + KE$$

Sol.: $\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + KE$

$$w = \left(\frac{6.626 \times 10^{-34} \times 3 \times 10^8}{300 \times 10^{-9}}\right) - \left(\frac{2.97 \times 10^5}{6.023 \times 10^{23}}\right)$$

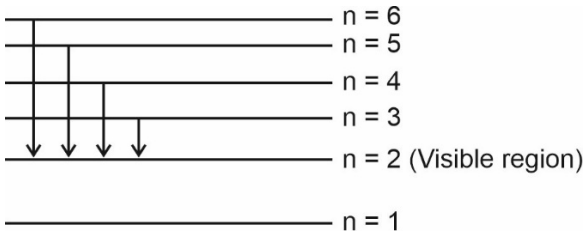
$= (6.626 \times 10^{-19}) - (4.931 \times 10^{-19})$

$= 1.695 \times 10^{-19} J$

61. Answer (4)

Hint: For visible region, $n_1 = 2$ and $n_2 = 3, 4, 5 \ldots$

Sol.:



62. Answer (1)

Hint: 101 – Mendelevium

Sol.: 102 – Nobelium

103 – Lawrencium

106 – Seaborgium

63. Answer (3)

Hint: $(CH_3COO)_2Pb + Na_2CrO_4 \rightarrow$

$PbCrO_4 + 2CH_3COONa$

(yellow precipitate)

Sol.: AgBr (Pale yellow ppt) is sparingly soluble in NH_4OH

AgI (Yellow ppt) is insoluble in NH_4OH

64. Answer (4)

Hint: $K_a = \frac{c\alpha^2}{1-\alpha}$

$\alpha << 1$

$1-\alpha \approx 1$

$K_a = c\alpha^2$

Sol.: $K_a = c\alpha^2$

$= 10^{-1} \times (10^{-2})^2$

$= 10^{-5}$

65. Answer (4)

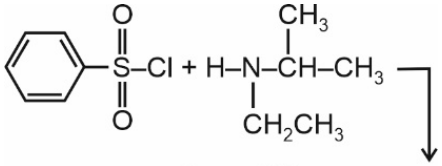
Hint: In equal masses of O_2 and N_2, N_2 will have more number of atoms.

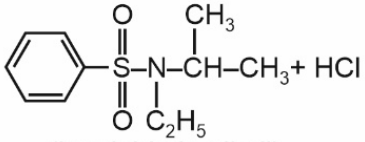
Sol.: Molality and mole fraction are temperature independent quantities.

66. Answer (4)

Hint: Secondary amine reacts with Hinsberg's reagent to give an alkali insoluble product.

Sol.:





(Insoluble in alkali)

67. Answer (3)

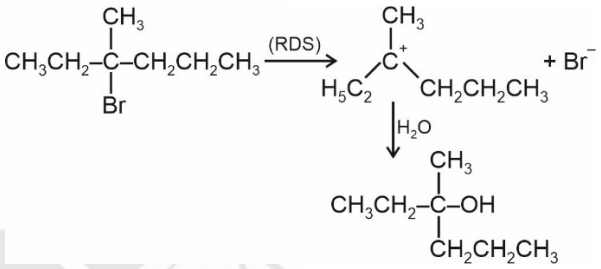
Hint: Uracil is present in RNA

Sol.: Nitrogenous bases in RNA are Adenine, Guanine, Cytosine and Uracil

68. Answer (2)

Hint: Reaction proceeds via S_N1 mechanism.

Sol.:



- Reaction is favoured by high polarity solvents

69. Answer (2)

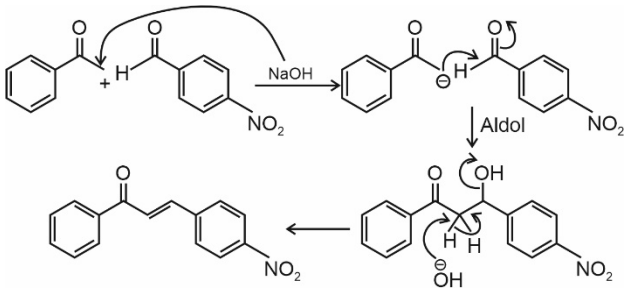
Hint & Sol.:

Haloalkane	Dipole moment/Debye
$CH_3 - F$	1.847
$CH_3 - Cl$	1.860
$CH_3 - Br$	1.830
$CH_3 - I$	1.636

70. Answer (4)

Hint: Reactions occurring between different carbonyl compounds, one acting as a nucleophile in it's enol form and the other as an electrophile and called cross-condensation.

Sol.:



71. Answer (4)

Hint: Lower is the value of pK_a, stronger is the acid.

Sol.: Strong (+M) causing groups at para position will increase the pK_a whereas, electron withdrawing (–M) groups will decrease the pK_a of benzoic acid

72. Answer (3)

Hint: Second electron gain enthalpy of an element is always positive.

Sol.: $O(g) \rightarrow O^-(g)$ (First $\Delta_{eg}H$)

$O^-(g) \rightarrow O^{2-}(g)$ (Second $\Delta_{eg}H$) (Always endothermic)

73. Answer (2)

Hint & Sol.: Conductivity decreases with dilution as number of ions per unit volume that carry current in a solution decreases with dilution.

74. Answer (2)

Hint: Diborane catches fire spontaneously upon exposure to air.

Sol.: $B_2H_6 + 3O_2 \rightarrow B_2O_3 + 3H_2O$

$\Delta H = -1976$ kJ mol^{-1}

75. Answer (2)

Hint: $\Delta_fH° = \Delta_{sub}H° + \Delta_iH° + \Delta_aH° + \Delta_{eg}H° + \Delta_{lattice}H°$

Sol.:

$$Na(s) \rightarrow Na(g) \rightarrow Na^+(g) + e^- \Big] \; Na^+(g) + Cl^-(g)$$
$$\frac{1}{2}Cl_2(g) \rightarrow Cl(g) + e^- \rightarrow Cl^-(g) \Big] \; \downarrow$$
$$NaCl(s)$$

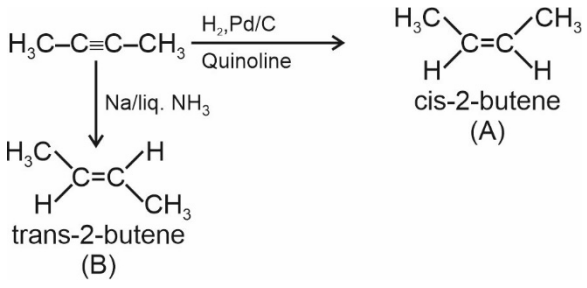
$\Delta_fH° = 108 + 496 + 121 + (-348.6) + (-788)$

$= -411.2$ kJ mol^{-1}

76. Answer (4)

Hint: Alkynes on reduction with sodium and liquid ammonia yields trans alkene.

Sol.:



77. Answer (4)

Hint: Hydrogen chloride is produced by heating NaCl with conc. H_2SO_4.

Sol.: $NaCl + H_2SO_4 \xrightarrow{420K} NaHSO_4 + HCl$

$4HCl + O_2 \xrightarrow[723\,K]{CuCl_2} 2Cl_2 + 2H_2O$

$2KMnO_4 + 16HCl \rightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2$

$4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$

78. Answer (2)

Hint: Melting point of H_2S = 188 K

Sol.:

Hydrides	Melting point (K)
H_2O	273
H_2S	188
H_2Se	208
H_2Te	222

79. Answer (3)

Hint: E_{cell} is not an additive property

For strong electrolytes, $\Lambda_m = \Lambda_m^\circ - A\sqrt{C}$

Sol.: $E°_{cell}$ remains constant upon changing the concentration of a cell.

Λ_m increases slowly with dilution, (For strong electrolytes) $\Lambda_m = \Lambda_m^\circ - A\sqrt{C}$

E_{cell} does not change upon changing the volume of a cell at a particular concentration.

80. Answer (2)

Hint: $\mu = \sqrt{n(n+2)}$ BM (Magnetic moment)

Sol.: $[Fe(CN)_6]^{3-} = \sqrt{1(1+2)} = \sqrt{3} = 1.7$ BM

$[Co(NH_3)_6]^{3+} = \sqrt{0(0+2)} = 0$ BM

$[NiCl_4]^{2-} = \sqrt{2(2+2)} = 2.82$ BM

$[Fe(H_2O)_6]^{2+} = \sqrt{4(4+2)} = 4.89$ BM

81. Answer (1)

Hint: The ability of 'O' to stabilise high oxidation states exceeds that of 'F'.

Sol.: Cr^{2+} changes from d^4 to d^3 and hence is reducing whereas, Mn^{3+} to Mn^{2+} results in half-filled (d^5) configuration which has extra stability.

82. Answer (3)

Hint: $[Co(NH_3)_3Cl(CN)(H_2O)]$ exhibits 4 geometrical isomers.

Sol.:

Complex	Number of geometrical isomers
$[Co(NH_3)_6]^{3+}$	0
$[Pt(NH_3)_2Cl_2]$	2
$[Co(NH_3)_2Cl_2(H_2O)_2]$	5
$[Co(NH_3)_3Cl(CN)(H_2O)]$	4

83. Answer (4)

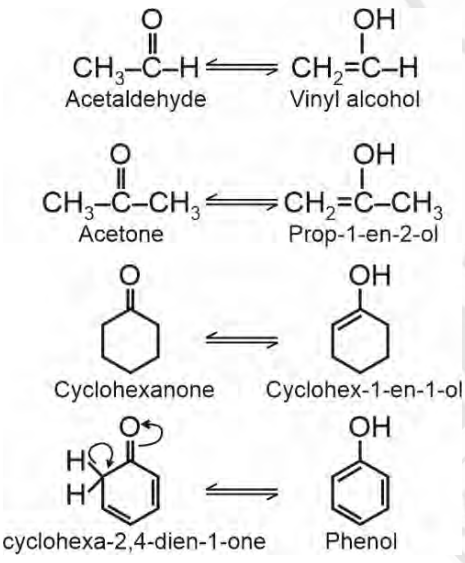
Hint: Lyophilic sols are more stable than lyophobic sols.

Sol.: Lyophobic sols used stabilising agents for their preservation.

84. Answer (4)

Hint: If the enolic form is stabilised by conjugation, the enol content increases.

Sol.:



85. Answer (1)

Hint: Electron enters in one of the antibonding molecular orbitals.

Sol.: $O_2^- : (\sigma 1s)^2(\sigma^* 1s)^2(\sigma 2s)^2(\sigma^* 2s)^2(\sigma 2p_z)^2(\pi 2p_x)^2 (\pi 2p_y)^2(\pi^* 2p_x)^2(\pi^* 2p_y)^1$

86. Answer (2)

Hint: Basic buffer = Weak base and its salt with strong acid.

Sol.:

	HCl	+	NH_4OH	$\rightleftharpoons$	NH_4Cl	+	H_2O
Initial mole	0.1×0.1		0.2×0.1		–		–
	$= 0.01$		0.02				
Final mole	–		0.01		0.01		0.01

Since solution contains NH_4OH and NH_4Cl i.e. weak base and salt of weak base with strong acid. Hence, basic buffer.

87. Answer (3)

Hint: For adiabatic condition, q = 0

Sol.: According to first law of thermodynamics,

$\Delta U = q + w$

Under free expansion $P_{ext} = 0$

Under adiabatic condition $q = 0$ $\therefore$ $w = 0$

$\therefore$ $\Delta U = q + w$

$\Delta U = 0$

88. Answer (3)

Hint: Molecule with zero bond order does not exist.

Sol.: He_2 = 4 electrons

$$B.O. = \frac{1}{2}(2-2) = 0$$

89. Answer (2)

Hint: Complex $[CrCl_3 \cdot xNH_3]$ is an octahedral complex.

Sol.: $\Delta T_{b(complex)}$

$= \Delta T_{b(glucose)}$

$ik_{bm} = 3(ik_{bm})$

$i \times 1 = 3 \times 1 \times 1$

$i = 3$ [$\therefore$ product of 3 ions]

$\therefore$ $x = 5$

Complex = $[CrCl(NH_3)_5]Cl_2$

90. Answer (2)

Hint: Higher the value of K_H at a given pressure, lower is the solubility of the gas in the liquid.

Sol.: $K_H \propto \frac{1}{\text{Solubility}}$

Order of K_H = $He > N_2 > H_2 > O_2$

Order of solubility = $O_2 > H_2 > N_2 > He$

[BIOLOGY]

91. Answer (3)

Hint: Existence of tRNA was known before genetic code was postulated

Sol.: tRNA was also known as soluble RNA. The three-dimensional structure of the tRNA was proposed to be inverted L-shaped, this is the actual structure of tRNA. There are no tRNAs for stop codons.

92. Answer (2)

Hint: Prokaryotes lack membrane bound structures.

Sol.: Inclusion bodies are not membrane bound and lie freely in the cytoplasm.

93. Answer (4)

Hint: In *Michelia*, carpels are free

Sol.: In *Michelia*, gynoecium is multicarpellary apocarpous. Castor is a monoecious plant in which only autogamy is prevented but not geitonogamy. Coleoptile encloses leaf primordia.

94. Answer (3)

Hint: In eukaryotes there are at least three RNA polymerase in the nucleus.

Sol.: There is single DNA-dependent RNA polymerase that catalyses transcription of all types of RNA in bacteria.

95. Answer (3)

Hint: It is used to initiate flowering and for synchronizing fruit-set in pineapple.

Sol.: Ethylene promotes rapid internode petiole elongation in deep water rice plants.

96. Answer (4)

Hint: Complex IV refers to cytochrome *c* oxidase complex.

Sol.: Cytochrome *c* oxidase complex contains cytochrome *a* and a_3, and two copper centres.

97. Answer (2)

Sol.: More than 50,000 genetically different strains of rice, and 1,000 varieties of mango occur in India due to genetic variations.

98. Answer (4)

Hint: Some of the most fascinating cases of mutualism in nature are seen in plant-pollinator interaction.

Sol.: Fig and wasp show plant-animal mutualism.

99. Answer (3)

Hint: *Sorghum* is a C_4 plant.

Sol.: In *Sorghum* primary CO_2 acceptor is a three-carbon molecule phosphoenolpyruvate (PEP).

100. Answer (3)

Hint: Gynaecomastia is expressed in Klinefelter's inflicted individuals.

Sol.: Down's syndrome develops due to trisomy of chromosome number 21, and affected individual is characterised by: short stature, small round head, big and wrinkled tongue, and furrowed tongue etc.

101. Answer (4)

Hint: Coenocytic hyphae are continuous tubes filled with multinucleated cytoplasm, found in phycomycetes.

Sol.: Members of phycomycetes can asexually be reproduced by zoospores, aplanospores, sporangiospores. Members of Ascomycetes produces sexual spores, ascospores.

102. Answer (3)

Hint: Recombination nodule is the site at which crossover occured.

Crossing over is the exchange of genetic material between two homologous chromosomes.

Sol.: During pachytene, the four chromatids of each bivalent chromosomes become distinct and clearly appears as tetrads, and this stage is characterised by appearance of recombination nodules.

103. Answer (3)

Hint: Chloroplast can synthesises some of their proteins and capable of self duplication.

Sol.: The chloroplast contains small, double-stranded, circular DNA molecules and 70S ribosomes.

104. Answer (2)

Hint: Cyclosporin A is produced by a fungus.

Sol.: *Trichoderma polysporum* produces cyclosporin A, which can be used as an immunosuppressive agent in organ-transplant patients.

105. Answer (4)

Hint: In *Zostera*, pollen grains are long ribbon like and carried passively inside water.

Sol.: Wind pollination is quite common in grasses. In sugarcane, pollen grains are light and non-sticky, so that they can easily be carried by air currents. Marine water plant like *Zostera* is pollinated by water.

106. Answer (2)

Hint: *Rana tigrina* has a bony endoskeleton.

Sol.: Hind brain consists of cerebellum and medulla oblongata. There are 10 pairs of cranial nerves arising from the brain of frogs.

Brain is enclosed in a bony structure called brain box.

Pons is absent in frogs.

107. Answer (1)

Hint: Equal to twice the number of eyes present in a man

Sol.: A male *Periplaneta* has anal style, anal cerci, titillator and phallic gland.

A female *Periplaneta* has collaterial gland, anal cerci and spermathecae.

Bidder's canal is present exclusively in male frogs.

108. Answer (2)

Hint: Cretinism

Sol.: Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to cretinism. Thyroid gland is located on the either side of trachea, it secretes thyroxine.

Adrenal glands are located one at above each kidney.

Pituitary gland is present in the bony depression called sella tursica; and thymus is present ventral to aorta.

109. Answer (1)

Hint: Grey matter

Sol.:

Cerebral cortex	–	Contains neuronal cell bodies which provide grey colour
Corpus callosum	–	Tract of nerve fibers connecting cerebral hemispheres
Midbrain	–	Cerebral aqueduct passes through it
Medulla oblongata	–	Contains centres which control respiration, cardiovascular reflexes and gastric secretions

110. Answer (3)

Hint: Numerically equal to the number of fingers in your left hand

Sol.: Brain box = cranial bones = 8

Vertebrae in lumbar region = 5

True ribs = 7 pairs

Tarsals in a hindlimb = 7

Phalanges in a forelimb = 14

111. Answer (4)

Hint: Acid-base balance

Sol.: Tubular secretion is an important step in urine formation as it helps in the maintenance of ionic and acid base balance of body fluids. Concentration of filtrate occurs as it moves down the descending limb of loop of Henle as it is permeable to water but almost impermeable to electrolytes.

PCT helps to maintain the pH and ionic balance of the body fluids by selective secretion of hydrogen ions and ammonia into the filtrate and by absorption of HCO_3^- from it.

112. Answer (3)

Hint: Leads to atrial systole

Sol.: In a standard ECG:

- 'P' wave - Depolarisation of atria
- QRS complex - Depolarisation of ventricles
- T wave – Repolarization of ventricles

113. Answer (1)

Hint: One of the parts of brain stem

Sol.: Pneumotaxic centre, present in the pons region of brain, can moderate the functions of respiratory rhythm centre (located in the medulla). Hypothalamus controls secretion of hormones, urge for drinking, *etc.*

Thalamus is a major coordinating centre for sensory and motor signalling.

114. Answer (1)

Hint: Columnar epithelium

Sol.: Columnar epithelial cells are characterized by tall and slender cells. This epithelium is found in lining of intestine. Cuboidal epithelium is present in ducts of glands and tubular parts of nephrons in kidney. Squamous epithelium is found in the walls of blood vessels and air sacs of lungs.

115. Answer (3)

Hint: Exclude the amino acid

Sol.: Glutamic acid is an acidic amino acid. Haem is the prosthetic group for enzymes named catalase and peroxidase.

Malonate is the competitive inhibitor for the enzyme succinic dehydrogenase (whose substrate is succinate).

Malonate closely resembles succinate in structure.

116. Answer (2)

Hint: Speciation is generally a function of time. Unlike temperate, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification.

Sol.: Tropics are less seasonal, receive more solar energy and highly productive.

117. Answer (3)

Hint: Decomposition is largely an oxygen requiring process.

Sol.: Rate of decomposition is slower if detritus is rich in lignin and chitin.

118. Answer (3)

Hint: The majority of baculoviruses used as biocontrol agents are in the genus Nucleopolyhedrovirus (NPV).

Sol.: Baculoviruses have species-specific, narrow spectrum insecticidal applications. They have no negative impacts on mammals and birds.

119. Answer (2)

Hint: Cytokinine is derived from adenine.

Sol.: Cytokinine promote lateral shoot growth.

120. Answer (2)

Hint: In dicot stem, vascular bundles are conjoint, open and with endarch protoxylem.

Sol.: In dicot stem, hypodermis is collenchymatous, endodermis is single layered, bundle sheath is absent and pericycle is made up of sclerenchyma.

121. Answer (1)

Hint: Mango belongs to order Sapindales.

Sol.: Taxonomic categories of mango are as follows:

Family - Anacardiaceae

Order - Sapindales

Class - Dicotyledonae

Division - Angiospermae

122. Answer (3)

Hint: Prophase is the first stage of karyokinesis of mitosis

Sol.: Prophase follows the S and G_2 phases of interphase. Prophase I of meiosis I is typically longer and more complex in comparison with prophase of mitosis.

123. Answer (3)

Hint: Theodor Schwann, a British zoologist concluded that presence of cell wall is characteristic of plant cells.

Sol.: The content of nucleolus is continuous with the rest of the nucleoplasm as it is not a membrane bound structure.

124. Answer (4)

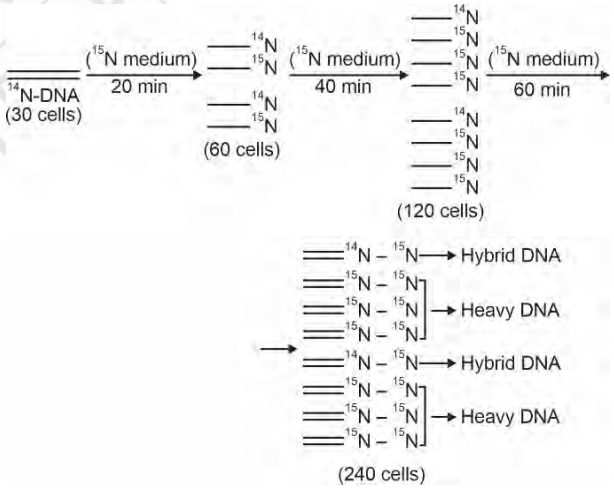
Hint: Pre-mitotic phase is G_2 phase

Sol.: Mitochondria, chloroplast and Golgi bodies duplicate in G_2 phase. No splitting of centromeres occurs in anaphase I. In plant cells, cell plate formation during cytokinesis occurs in centrifugal manner.

125. Answer (4)

Hint: DNA replicates semi-conservatively, was first shown in *Escherichia coli* and subsequently in higher organisms *E.coli* divides in 20 minutes.

Sol.:



So, the number of cells having only (^{15}N) is

$\Rightarrow$ (240 – 60) = 180 cells

126. Answer (3)

Hint: Polynucleotide phosphorylase carry out enzymatic synthesis of RNA

Sol.: Severo Ochoa enzyme is polynucleotide phosphorylase, it was helpful in polymerising RNA with defined sequences in a template-independent manner.

127. Answer (3)

Hint: Thalassemia is autosomal recessive disorder.

Sol.: Haemophilia is a sex-linked recessive disease, which shows its transmission from unaffected carrier female to some of the male progeny. The possibility of a female being haemophilic is extremely rare.

In this condition, a single protein that is a part of the cascade of proteins involved in clotting of blood is affected.

128. Answer (4)

Hint: DNA replication is energetically a very expensive process.

Sol.: Deoxyribonucleoside triphosphates serve dual purposes like acting as substrates and also provides energy for polymerisation reaction.

129. Answer (2)

Hint: Phenylketonuria is an example of Pleiotropy.

Sol.: F_1 progeny did not resemble either of the parents in case of incomplete dominance, for e.g., flower colour in snapdragon. AB blood group is a good example of co-dominance. Human skin colour is an example of polygenic inheritance.

130. Answer (3)

Sol.: Law of segregation is based on the fact that during gamete formation, factors of a pair separate or segregate from each other so that a gamete carries only one factor of a character.

131. Answer (3)

Hint: Also known as gene gun

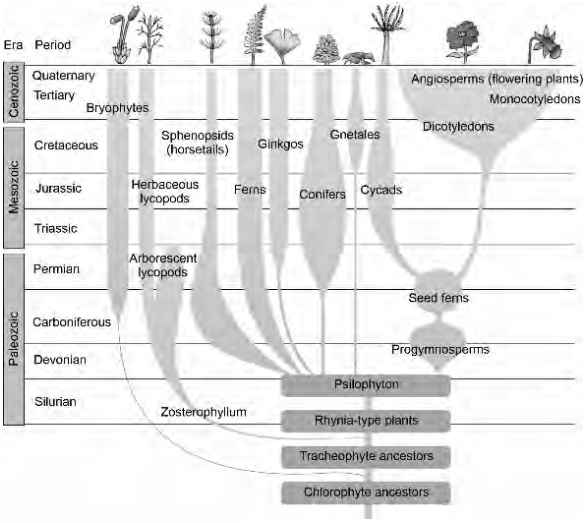
Sol.: In micro-injection, recombinant DNA is directly injected into the nucleus of an animal cell. Heat shock is a method in which the host cells and recombinant DNA are incubated on ice and then placed briefly at 42°C and then placed back on ice. This enables the bacteria to take up the recombinant DNA.

Electroporation is a technique that uses an electrical field to create temporary pores in cell membrane, allowing substances to pass through it.

132. Answer (4)

Hint: Ferns and conifers share the same ancestors.

Sol.:



133. Answer (3)

Hint: A flat bone

Sol.: The lungs are situated in the thoracic chamber which is anatomically an air-tight chamber. The thoracic chamber is formed dorsally by the vertebral column, ventrally by the sternum, laterally by the ribs and on the lower side by the dome-shaped diaphragm.

134. Answer (4)

Hint: Eliminate the characteristics associated with cardiac and smooth muscle fibres.

Sol.: Skeletal muscles are present in thighs. The muscle fibres associated with them are multinucleated and voluntary in nature. Cardiac muscle fibres are cylindrical, uninucleated and branched.

Smooth muscle fibres are fusiform in shape.

135. Answer (2)

Hint: Produces a sense of euphoria

Sol.: *Cannabis sativa* yields natural cannabinoids that produce hallucinogenic effect.

Coca alkaloid or cocaine from *Erythroxylum coca* – has stimulating action.

Morphine acts as effective sedative and painkiller

136. Answer (2)

Hint: Mesorchium is related with kidney.

Sol.: In female frogs, a pair of ovaries are situated near kidneys. A pair of oviducts arising from the ovaries open into the cloaca separately. In males, testes are found adhered to the upper parts of kidneys by a double fold of peritoneum called mesorchium.

137. Answer (2)

Hint: Development of secondary sexual characters

Sol.: Estrogen is a steroid hormone which has wide ranging actions such as stimulation of growth and activities of female secondary sex organs, development of growing follicles and appearance of secondary sex characters.

Estrogen interacts *via* intracellular receptors.

Prolactin helps in formation of milk after pregnancy.

Luteinizing hormone is a proteinaceous hormone secreted from the pituitary gland; it interacts with the interstitial cells of testis.

138. Answer (2)

Hint: Used for amplification of nucleic acids

Sol.: PCR is being used to detect mutations in genes in suspected cancer patients. It is a powerful technique to identify many other genetic disorders. ELISA is based on the principle of antigen-antibody interaction. Infection by pathogen can be detected by the presence of antigens (proteins, glycoproteins, *etc.*) or by detecting the antibodies synthesised against the pathogen.

Serum and urine analysis are conventional methods of disease diagnosis.

139. Answer (2)

Hint: An auto-immune disorder

Sol.: Muscular dystrophy-Progressive degeneration of skeletal muscles due to genetic disorder.

Osteoporosis is an age-related disorder characterised by decreased bone mass and increased chances of fractures.

Myasthenia gravis is an auto-immune disorder affecting neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle.

140. Answer (2)

Hint: Podocytes are present in Bowman's capsule.

Sol.: Filtration membrane in kidney is formed of 3 layers. They are:

(i) The endothelium of glomerular blood vessels

(ii) Acellular basement membrane

(iii) Epithelium of Bowman's capsule

The epithelial cells of Bowman's capsule, called podocytes, are arranged in an intricate manner to leave slit pores that act as filtration slits.

141. Answer (3)

Hint: Closure of tricuspid and bicuspid valves

Sol.: As action potential reaches the entire ventricular musculature, it leads to the beginning of ventricular systole; thus increasing the ventricular pressure that causes the closure of tricuspid and bicuspid valves, producing the first heart sound called 'lub'.

142. Answer (3)

Hint: Right shifting of oxygen dissociation curve

Sol.: In tissues, where low pO_2, high pCO_2, high H^+ concentration and high temperature exists, these conditions are favourable for the dissociation of oxyhaemoglobin to release O_2.

143. Answer (1)

Hint: Proteinaceous enzymes get denatured at high temperature.

Sol.: Almost all enzymes are protein and like any protein, they have secondary and tertiary structure.

An active site in an enzyme is formed by the tertiary confirmation in which substrate (such as H_2CO_3) fits.

144. Answer (4)

Hint: *Nereis* is dioecious.

Sol.: Earthworm and leeches are monoecious. Flatworms are bilaterally symmetrical, triploblastic and acoelomate animals. *Taenia* absorbs nutrients directly from body surface, but it is an acoelomate animal.

145. Answer (3)

Hint: Hormonal method of contraception

Sol.:

Hormonal methods	Inhibit ovulation and implantation
The non-steroidal preparation called 'Saheli'	Does not inhibit ovulation but prevents implantation; and it is also called 'once a week' pill
Condoms	Protect users from contracting STIs

146. Answer (2)

Hint: Site of fertilisation

Sol.: Entry of sperm into the ovum induces the completion of second meiotic division which is also unequal and results in the formation of a second polar body and a haploid ootid. Primary oocyte within the tertiary follicle grows in size and completes its first meiotic division. It is an unequal division resulting in the formation of a large haploid secondary oocyte and a tiny first polar body.

147. Answer (3)

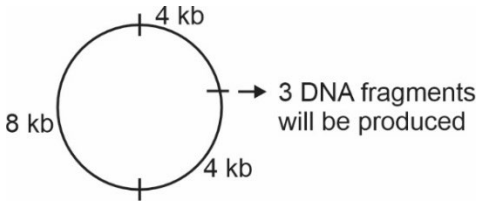
Hint: At puberty, only 60,000-80,000 primary follicles are left in each ovary.

Sol.: No more oogonia are formed and added after birth. These cells start dividing and enter into prophase-I of the first meiotic division and get temporarily arrested at that stage and are called primary oocytes.

148. Answer (3)

Hint: DNA fragments separate according to their size.

Sol.:

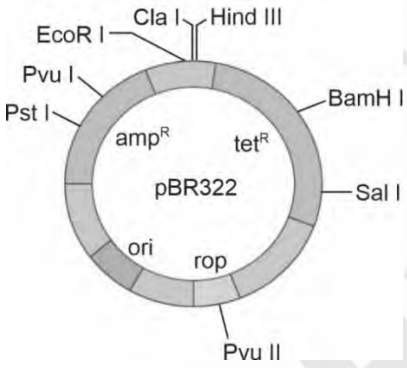


But only two DNA bands will be visible after gel electrophoresis as bands with 4 kb size are of the same size, thus they will travel the same distance over the gel.

149. Answer (3)

Hint: First restriction endonuclease to be characterized

Sol.:



150. Answer (2)

Hint: α-1-antitrypsin is used to treat emphysema

Sol.: Transgenic sheep was used to produce the human protein (α-1-antitrypsin) to treat emphysema.

The milk produced by 'Rosie' contained the human alpha-lactalbumin.

151. Answer (2)

Hint: Red-coloured pigment

Sol.: Haemoglobin consists of 4 subunits and constitutes the quaternary structure.

Collagen, which is the most abundant protein in the animal world, forms the secondary structure. Chitin is present in the exoskeleton of arthropods and cellulose is present in the cotton fibres.

152. Answer (3)

Hint: Eliminate the secondary lymphoid organs

Sol.: Primary lymphoid organs – Thymus and bone marrow are the sites where immature lymphocytes differentiate into antigen-sensitive lymphocytes.

Secondary lymphoid organs – Spleen, lymph nodes, tonsils, appendix and Peyer's patches.

153. Answer (3)

Hint: Ion necessary for blood clotting

Sol.:

Element	% Weight of Earth's crust	% Weight of human's body
Hydrogen (H)	0.14	0.5
Carbon (C)	0.03	18.5
Oxygen (O)	46.6	65.0
Nitrogen (N)	Very little	3.3
Sulphur (S)	0.03	0.3
Sodium (Na)	2.8	0.2
Calcium (Ca)	3.6	1.5
Magnesium (Mg)	2.1	0.1
Silicon (Si)	27.7	Negligible

154. Answer (1)

Hint: *Pristis* is a member of class Chondrichthyes.

Sol.:

Petromyzon	Possesses 6-15 pairs of gill slits
Chelone	Oviparous
Pristis	Males have claspers
Hirudinaria	Monoecious

155. Answer (3)

Hint: Look for a lipid molecule amongst all

Sol.: Lipids are found in the retentate portion obtained upon the chemical analysis of a living tissue.

While adenylic acid, glucose and glycine are monomers which will be found in the filtrate portion.

156. Answer (2)

Hint: Steller's sea cow got extinct from Russia

Sol.:

Extinct organism	Locations
Thylacine	Australia
Dodo	Mauritius
Quagga	Africa
Steller's sea cow	Russia

157. Answer (2)

Hint: Cilia and flagella are hair-like outgrowths of the cell membrane. Prokaryotes lack cilia.

Sol.: Centrioles in a centrosome lie perpendicular to each other in which each has an organisation like the cartwheel. Prokaryotic flagella are structurally different from eukaryotic ones.

158. Answer (2)

Sol.: Phosphoenolpyruvate is acted upon by pyruvate kinase and gets converted into pyruvic acid. This step is substrate level phosphorylation, releasing ATP.

159. Answer (1)

Hint: The dominant phase of pteridophytes is a sporophyte. They are first vascular terrestrial plants.

Sol.: Pteridophytes are found in cool, damp and shady places.

They are the first tracheophytes. Their gametophyte require water for fertilisation.

160. Answer (3)

Hint: The mesocarp of coconut is fibrous.

Sol.: Mango and coconut are developed from monocarpellary superior ovaries.

161. Answer (2)

Hint: Dichogamy refers to different maturation time of androecium and gynoecium in the same flower. *E.g*: sunflower.

Sol.: Tapetum is polyploid and nourishes the developing pollen grains. Each cell of sporogenous tissue is capable of giving rise to a microspore tetrad.

162. Answer (3)

Hint: The mode of arrangement of sepals or petals in a floral bud with respect to the other member of same whorl is called aestivation, *Cassia* shows imbricate aestivation.

Sol.:

Plant flowers	Type of aestivation
(a) *Cassia*	• Imbricate
(b) Cotton	• Twisted
(c) *Calotropis*	• Valvate
(d) Pea	• Vexillary

163. Answer (3)

Hint: Viroids were discovered by T.O. Diener.

Sol.: Viroids are infectious RNA particles which are devoid of protein coat. These are smaller in size than viruses.

164. Answer (3)

Hint: Non-living, rigid structure is called cell wall that surrounds the plasma membrane.

Sol.: Algal cell wall is made up of cellulose, galactans, mannans and calcium carbonate.

165. Answer (2)

Hint: Gross primary productivity is equal to net primary productivity plus respiration loss.

Sol.: Net primary productivity is the available biomass for the consumption to heterotrophs.

166. Answer (2)

Hint: It is inner most layer of cortex in dicot root.

Sol.: All tissues on the inner side of the endodermis such as pericycle, vascular bundles and pith constitute the stele.

167. Answer (3)

Hint: In female heterogamety, female individual produces two different types of gametes, e.g. (Birds-ZZ and ZW types)

Sol.: In butterflies, sex-determination is exactly opposite the condition found in grasshoppers. Here, female produce two types of eggs (A + Z and A + 0 type)

168. Answer (3)

Hint: Structural gene transcribes mRNA for polypeptide synthesis. *Lac z* gene codes for β-galactosidase.

Sol.: *Lac y* gene codes for permease which increases the permeability of cell to β-galactosides.

169. Answer (2)

Hint: Oxygen evolving complex (OEC) is located on the inner side of the membrane of the thylakoid associated with PS II.

Sol.: In cyclic photophosphorylation, external source of electrons is not required and no oxygen is evolved. Both cyclic and noncyclic photophosphorylation synthesizes ATP.

170. Answer (2)

Hint: Algin is obtained from the brown algae.

Sol.: In bryophytes, the dominant phase is independent, photosynthetic, thalloid or erect haploid gametophyte.

Red algae reproduce asexually by non-motile spores.

171. Answer (3)

Hint: Development occurs through 13 nymphal stages to reach the adult form

Sol.: The development of *P. americana* is paurometabolous meaning their development is through nymphal stages. The nymphs look very much like adults.

172. Answer (2)

Hint: Exclude the vectors used for plants

Sol.: The first step towards gene therapy, is that the lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient.

173. Answer (2)

Hint: All living members of this class are ectoparasites on some fishes.

Sol.:

(1)	Chondrichthyes	–	Ventral mouth, gill slits without operculum
(2)	*Pterophyllum*	–	Class Osteichthyes
(3)	Class Amphibia	–	Usually oviparous with indirect development
(4)	*Chameleon*	–	Class Reptilia
(5)	*Psittacula*	–	Class Aves

174. Answer (2)

Hint: Include the disease related to the hormones of posterior pituitary.

Sol.: Acromegaly - Hypersecretion of GH

Graves' disease- Hypersecretion of thyroxine.

Addison's disease-Hyposecretion of hormones of adrenal cortex

Diabetes insipidus-Hyposecretion of ADH/ vasopressin

175. Answer (4)

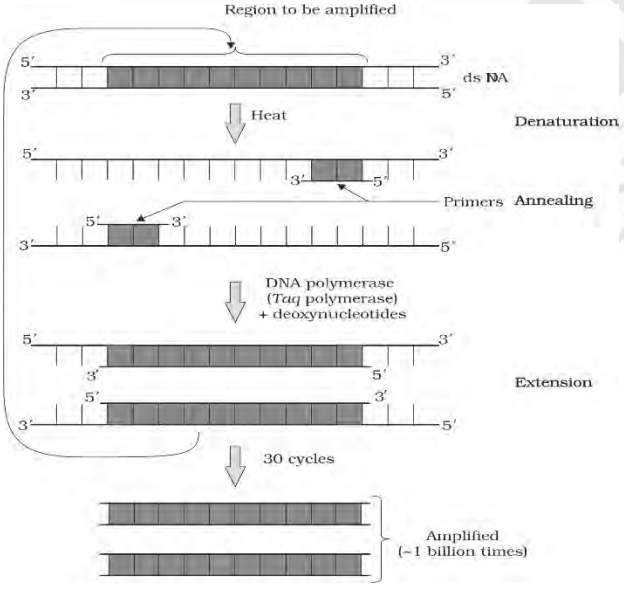
Hint: Resting axonal membrane is impermeable to negatively charged proteins.

Sol.: Ionic gradient across the resting membrane is maintained by the active transport of ions by the sodium-potassium pump which transports $3Na^+$ outwards for $2K^+$ into the cell.

176. Answer (4)

Hint: Phosphodiester bond formation

Sol.: During the denaturation step, hydrogen bonds between the DNA strands are broken to create single stranded DNA templates.



177. Answer (3)

Hint: Exclude dinosaurs

Sol.: *Ichthyophis* is a limbless amphibian. *Pteranodon* was a flying reptile and *Stegosaurus* was a dinosaur. *Salamandra* is a tailed amphibian.

178. Answer (3)

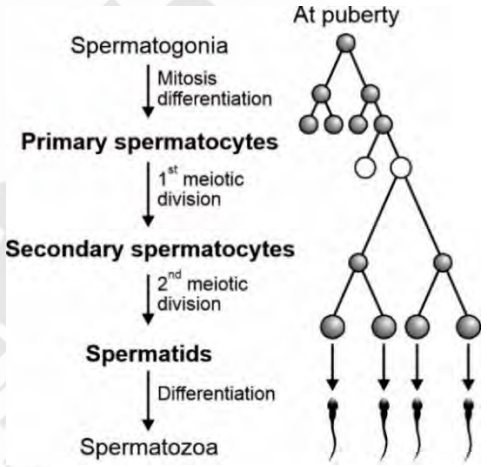
Hint: More than 12 weeks

Sol.: The Government of India legalised MTP in 1971 with some strict conditions to avoid its misuse. After 12 weeks of pregnancy but before 24 weeks, opinion of atleast two registered medical practitioners is needed legally to perform MTP.

179. Answer (4)

Hint: Both are formed after 2nd meiotic division.

Sol.: The process of converting spermatids into spermatozoa is called spermiogenesis.



180. Answer (2)

Hint: Implantation

Sol.: The trophoblast layer of the embryo gets attached to the endometrium and the inner cell mass gets differentiated. As a result, the blastocyst becomes embedded in the endometrium of uterus. This is called implantation.

Zona pellucida is an acellular layer surrounding the secondary oocyte.

Corona radiata is a layer of follicles surrounding the ovum.

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