

All India Aakash Test Series for NEET - 2026

OPEN MOCK TEST - 2[Click here for Code-B Sol.](#)

Test Date : 29/03/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint: $\frac{C}{5} = \frac{F-32}{9}$

Sol.: $9C = 5F - 160$

$\Rightarrow 5F = 9C + 160$

$\Rightarrow F = \frac{9}{5}C + \frac{160}{5}$

$\Rightarrow \Delta F = \frac{9}{5}\Delta C + 0$

$\Rightarrow \Delta F = \frac{9}{5}\Delta C$

$\Rightarrow \Delta F = \frac{9}{5} \times 25 = 45^\circ\text{F}$

2. Answer (2)

Hint: $S_{n^{\text{th}}} = u + \frac{a}{2}[2n - 1]$

Sol.: $24 = u + \frac{a}{2}[2 \times 10 - 1]$

$24 = u + \frac{a}{2} \times 19$

$\Rightarrow 48 = 2u + 19a \dots(i)$

and $28 = u + \frac{a}{2}[2 \times 12 - 1]$

$28 = u + \frac{23a}{2}$

$\Rightarrow 56 = 2u + 23a \dots(ii)$

Use eq. (ii) - eq. (i)

$\Rightarrow 8 = 4a$

$\Rightarrow a = 2 \text{ m/s}^2$

3. Answer (2)

Hint: $\vec{F} = q(\vec{v} \times \vec{B})$

Sol.: \vec{B} and \vec{v} are along axis of solenoid hence $\vec{v} \times \vec{B} = 0$

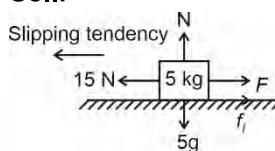
$\therefore \vec{F} = 0 \Rightarrow \vec{a} = 0$

i.e., velocity remain constant i.e. path will be straight line.

4. Answer (4)

Hint: For F to be minimum, we should have maximum friction.

Sol.:



$\Rightarrow 15 = f_f + F_{\text{min}}$

$\Rightarrow 15 = \mu N + F_{\text{min}}$

$\Rightarrow 15 = 0.2 \times 5g + F_{\text{min}}$

$\Rightarrow 15 = 10 + F_{\text{min}}$

$\Rightarrow F_{\text{min}} = 5 \text{ N}$

5. Answer (4)

Hint: Use equation of motion for uniform acceleration.

Sol.: $t_0 = \sqrt{t_1 t_2} = \sqrt{2 \times 8} = 4 \text{ second}$

6. Answer (1)

Hint: Horizontal range $R = \frac{2 \times u_x u_y}{a_y}$

Sol.: $R = \frac{2 \times 9.8 \times 19.6}{9.8} = 39.2 \text{ m}$

7. Answer (4)

Hint and Sol.: Here both observers have either zero acceleration or same accelerations. As we know work done equals to change in KE, here ΔKE of block will be different for both observers therefore, work done, KE and total work done on block will not be same, but force observed by observers will be same. Therefore accelerations of block will be same for both the observers.

8. Answer (3)

Hint and Sol: For AC current if

$I = A + B \sin \omega t$

$I_{\text{rms}} = \sqrt{A^2 + \left(\frac{B}{\sqrt{2}}\right)^2}$

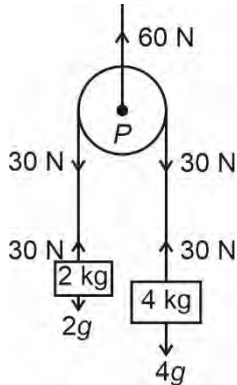
$\therefore I_{\text{rms}} = \sqrt{3^2 + \left(\frac{\sqrt{32}}{\sqrt{2}}\right)^2}$

$= \sqrt{9 + 16} = 5 \text{ A}$

9. Answer (4)

Hint: Net force on an ideal pulley is zero.

Sol.: Draw FBD of blocks and pulley.



Acceleration of 2 kg block

$$a_2 = \frac{30 - 20}{2} = 5 \text{ m/s}^2 \uparrow$$

Acceleration of 4 kg block

$$a_4 = \frac{40 - 30}{4} = 2.5 \text{ m/s}^2 \downarrow$$

10. Answer (1)

Hint and Sol.: Energy stored = Charge flown \times Potential difference

$$= 3000 \times 10^{-3} \times 3 \times 3600$$

$$= 9 \times 36 \times 10^2$$

$$= 324 \times 10^2$$

$$= 3.24 \times 10^4 \text{ joule}$$

11. Answer (2)

Hint: Use parallel axis theorem.

$$I = I_{cm} + Md^2$$

Sol.: $I_{AB} = \frac{2}{5}MR^2 + M(2R)^2$

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

$$= \frac{22}{5}MR^2$$

12. Answer (2)

Hint and Sol: Using the principle of dimensional homogeneity.

$$\Rightarrow \left[\frac{a}{V^2} \right] = [P] \Rightarrow [a] = [PV^2]$$

And $[b] = [V]$

$$\Rightarrow \left[\frac{b^2}{a} \right] = \left[\frac{V^2}{PV^2} \right] = \left[\frac{1}{P} \right] \rightarrow \text{compressibility}$$

13. Answer (3)

Hint and Sol.: $\mu_r = 1 + \chi$

$$\Rightarrow \chi = \mu_r - 1 = \frac{\mu}{\mu_0} - 1$$

14. Answer (2)

Hint: $v_{\max} = \omega A$ and $A = \sqrt{a_1^2 + a_2^2 + 2a_1a_2 \cos \phi}$

Sol.: $A = \sqrt{3^2 + 4^2 + 2 \times 3 \times 4 \times \cos \pi / 2}$

$$= 5 \text{ cm}$$

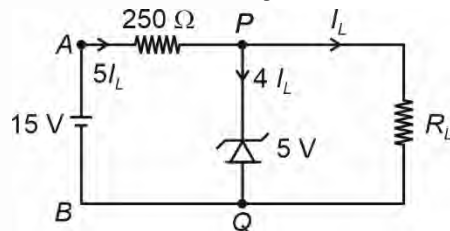
$$v_{\max} = A \cdot \omega = 5 \times 5 \times 10^{-2}$$

$$= 0.25 \text{ m/s}$$

15. Answer (3)

Hint: Use KVL and $V = IR$

Sol.: Draw circuit diagram



For A to P, use $\Delta V = IR$

$$\Rightarrow (15 - 5) = 5I_L \times 250$$

$$\Rightarrow I_L = \frac{10}{5 \times 250} = \frac{2}{250} = \frac{8}{1000}$$

$$= 8 \text{ mA}$$

Now $5 = I_L R_L$

$$\Rightarrow 5 = 8 \times 10^{-3} R_L$$

$$\Rightarrow R_L = \frac{5}{8} \times 10^3 = 625 \Omega$$

16. Answer (4)

Hint: Work done by force = change in KE

Sol.: $W = \Delta K$

$$\Rightarrow F \cdot S = \frac{1}{2} I \cdot \omega^2$$

$$\Rightarrow 10 \times 1 = \frac{1}{2} (mR^2) \omega^2$$

$$\Rightarrow 10 = \frac{1}{2} \times 5 \times \left(\frac{5}{100} \right)^2 \times \omega^2$$

$$\Rightarrow 10 = \frac{1}{2} \times 5 \times \frac{1}{400} \times \omega^2$$

$$\Rightarrow \omega^2 = \frac{10 \times 2 \times 400}{5} = 4 \times 400$$

$$\Rightarrow \omega = 40 \text{ rad/s}$$

17. Answer (2)

Hint: Energy density = $\frac{1}{2}Y \times (\text{strain})^2$

Sol.: Energy density = $\frac{1}{2}Y \times (\text{strain})^2$

$$= \frac{1}{2} \times 1.0 \times 10^{11} \times (5 \times 10^{-3})^2$$

$$= \frac{10^{11}}{2} \times 25 \times 10^{-6}$$

$$= 12.5 \times 10^5 \text{ joule/m}^3$$

18. Answer (3)

Hint and Sol: Charge is invariant quantity.

Scalar quantities like mass, speed etc depend on frame of reference.

19. Answer (3)

Hint: Energy density in magnetic field B

$$= \frac{B^2}{2\mu}$$

Sol.: Energy stored in solenoid
= Energy density \times volume

$$= \frac{B^2}{2\mu} \times Al$$

$$= \frac{B^2}{2 \times 3\mu_0} \times Al \quad [\because \mu = 3\mu_0]$$

$$= \frac{B^2 Al}{6\mu_0}$$

20. Answer (2)

Hint and Sol.: For adiabatic process

(1) $Q = 0$ and from first law of thermodynamics,
work done $W = -\Delta U$

$$\therefore W = \frac{-nR(T_2 - T_1)}{\gamma - 1}$$

and adiabatic process equation $PV^\gamma = \text{constant}$

21. Answer (4)

Hint: $U = nC_V T$ and $C_V = \frac{5R}{2}$ for diatomic gas

Sol.: $U = n \times \frac{5R}{2} T$

$$= \frac{5}{2} (nRT) = \frac{5}{2} PV$$

$$= \frac{5}{2} \times 10^5 \times 10^{-3} \quad [1 \text{ litre} = 10^{-3} \text{m}^3]$$

$$= \frac{500}{2} = 250 \text{ joule}$$

22. Answer (3)

Hint: $KE = -\frac{PE}{2} = \frac{GMm}{2r}$

Sol.: $KE = \frac{GMm}{2\left(R + \frac{R}{20}\right)} = \frac{10 GMm}{21R}$

23. Answer (3)

Hint: In uniform electric field (E), $V = E \times d$

Sol.: $12 = E \times 5 \quad \dots(i)$

$V = E \times 2 \quad \dots(ii)$

$$\Rightarrow \frac{V}{12} = \frac{2}{5} \Rightarrow V = \frac{24}{5} \text{ volt}$$

24. Answer (2)

Hint: Use photoelectric equation

Sol.:

$$e \times 3V_0 = \frac{hc}{\lambda} - \frac{hc}{\lambda_0} \quad \dots(i)$$

$$\text{and } e \times V_0 = \frac{hc}{2\lambda} - \frac{hc}{\lambda_0} \quad \dots(ii)$$

use (i) \div (ii)

$$\Rightarrow \frac{3}{1} = \frac{\frac{1}{\lambda} - \frac{1}{\lambda_0}}{\frac{1}{2\lambda} - \frac{1}{\lambda_0}}$$

$$\Rightarrow \frac{3}{2\lambda} - \frac{3}{\lambda_0} = \frac{1}{\lambda} - \frac{1}{\lambda_0}$$

$$\frac{3}{2\lambda} - \frac{1}{\lambda} = \frac{3}{\lambda_0} - \frac{1}{\lambda_0}$$

$$\Rightarrow \frac{(3-2)}{2\lambda} = \frac{2}{\lambda_0}$$

$$\Rightarrow \frac{1}{2\lambda} = \frac{2}{\lambda_0}$$

$$\Rightarrow \lambda_0 = 4\lambda$$

25. Answer (1)

Hint: Q value of reaction = Total BE of products - total BE of reactants

Sol.: $Q = 4x_2 - 4x_1$

$$= 4(x_2 - x_1)$$

26. Answer (1)

Hint: Two cells 5 V, 1 Ω and 10 V, 1 Ω can be considered parallel across points A and B and

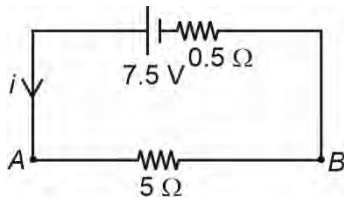
$$E_{eq} = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2} \text{ and } V = IR$$

$$r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$$

Sol.: Equivalent emf across A and B

$$E_{eq} = \frac{5 \times 1 + 10 \times 1}{1 + 1} = \frac{15}{2} = 7.5 \text{ volt}$$

$$r_{eq} = \frac{1 \times 1}{1 + 1} = \frac{1}{2} \Omega$$



$$i = \frac{V}{R} = \frac{7.5}{5 + 0.5} = \frac{7.5}{5.5} \text{ A}$$

$$\text{Now, } V_{AB} = IR = \frac{7.5 \times 5}{5.5} = \frac{75}{11} \text{ volt}$$

27. Answer (1)

Hint: For not to strike, radius of circular path of charge 'q' should be less than half of the radius of solenoid.

Sol.: Radius of circular path

$$R = \frac{mv}{qB} \text{ and } B = \mu_0 ni$$

$$\Rightarrow R = \frac{r}{2}$$

$$v = \frac{\mu_0 q r n i}{2m}$$

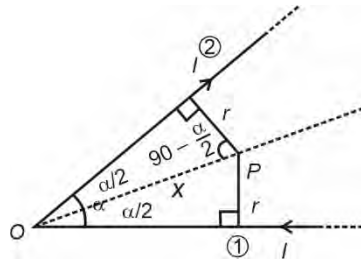
28. Answer (1)

Hint and Sol: Kirchhoff's Junction law is based upon conservation of charge and Kirchhoff's loop law follows conservative nature of electrostatic field.

29. Answer (3)

Hint: Use $B = \frac{\mu_0 I}{4\pi r} [\sin \alpha + \sin \beta]$ for both section and then add the B.

Sol.: Refer the figure



$$\text{Here } \sin \frac{\alpha}{2} = \frac{r}{x}$$

$$r = x \sin \frac{\alpha}{2} \dots (1)$$

Now magnetic field B at P due to any one section

$$B = \frac{\mu_0 I}{4\pi r} \left[\sin \left(90 - \frac{\alpha}{2} \right) + \sin 90 \right]$$

$$= \frac{\mu_0 I}{4\pi x \sin \frac{\alpha}{2}} \left[\cos \frac{\alpha}{2} + 1 \right]$$

$$= \frac{\mu_0 I}{4\pi x \sin \frac{\alpha}{2}} 2 \cos^2 \left(\frac{\alpha}{4} \right)$$

$$\left[\text{using } 1 + \cos \alpha = 2 \cos^2 \frac{\alpha}{2} \right]$$

$$= \frac{\mu_0 I}{4\pi x} \frac{2 \cos^2 (\alpha/4)}{2 \sin \frac{\alpha}{4} \cos \frac{\alpha}{4}}$$

$$= \frac{\mu_0 I}{4\pi x} \cot \left(\frac{\alpha}{4} \right) \otimes$$

$$\text{Due to both wires it will be } \frac{\mu_0 i}{2\pi x} \cot \left(\frac{\pi}{4} \right) \otimes$$

30. Answer (3)

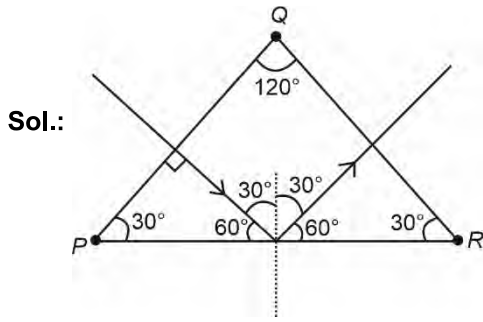
Hint and Sol.: In the presence of external magnetic field the size of magnetic domains may increase or decrease.

31. Answer (4)

Hint: For electromagnet material, hysteresis loop area must be smaller. Therefore material should have low retentivity and low coercivity.

32. Answer (1)

Hint: Use the concept of total internal reflection.



The rays which will undergo TIR at PR will emerge from face QR .

$$\mu \times \sin 30^\circ = 1 \Rightarrow \mu_{\min} = 2$$

i.e. $\mu \geq 2 \Rightarrow$ i.e. rays for which refractive index is greater than 2 will emerge from face QR .

33. Answer (4)

Hint and Sol.: No. of beats = $n_1 - n_2$

$$= 163 - 160$$

$$= 3$$

34. Answer (4)

Hint: Tension in string will be zero i.e., no restoring force therefore no vibration

Sol.: In this case $g_{\text{eff}} = 0$

$$\therefore T = 2\pi \sqrt{\frac{l}{g_{\text{eff}}}} = \infty$$

35. Answer (3)

Hint: Elastic potential energy will convert into kinetic energy.

Sol.: $\frac{1}{2}mv^2 = \frac{1}{2}Kx^2$ [for rubber cord $K = \frac{YA}{l}$]

$$\Rightarrow mv^2 = \frac{YA}{L}x^2$$

$$\Rightarrow v^2 = \frac{YA}{Lm}x^2 = \frac{5 \times 10^8 \times 10^{-6} \times (2 \times 10^{-2})^2}{10 \times 10^{-2} \times 50 \times 10^{-3}}$$

$$= \frac{5 \times 10^2 \times 4 \times 10^{-4}}{50 \times 10^{-4}}$$

$$= 40$$

$$\Rightarrow v = \sqrt{40} = 2\sqrt{10} \text{ m/s}$$

36. Answer (2)

Hint: Change in surface energy = increment in free surface \times surface tension

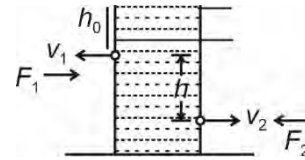
Sol.: Here change in free surface area = $2A$

$$\Delta U = 2A \times T$$

37. Answer (2)

Hint: Net horizontal force is difference of thrust forces at two openings and $v_e = \sqrt{2gh}$

Sol.: Using torricelli's theorem



$$v_1 = \sqrt{2gh_0} \text{ and } v_2 = \sqrt{2g(h_0 + h)}$$

And thrust force = ρav^2 (a is area of openings)

$$\text{Net thrust force} = F_2 - F_1$$

$$= \rho av_2^2 - \rho av_1^2$$

$$= \rho a[v_2^2 - v_1^2]$$

$$= \rho a[2g(h + h_0) - 2gh_0]$$

$$F_{\text{net}} = 2\rho agh$$

38. Answer (3)

Hint: Use principle of calorimetry

Sol.: Heat gain = Heat loss

$$mS_B(36 - 20) = mS_A(60 - 36)$$

$$\Rightarrow \frac{S_A}{S_B} = \frac{16}{24} = \frac{4}{6} = \frac{2}{3}$$

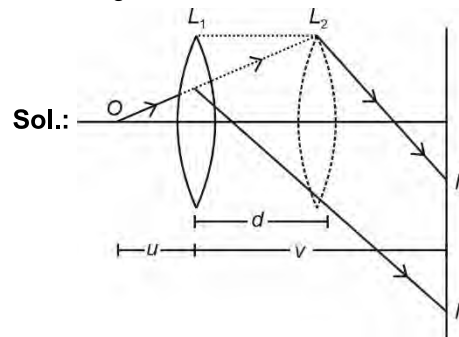
39. Answer (3)

Hint and Sol.: Magnifying power $M = \frac{f_o}{f_e}$

$$M' = \frac{2f_o}{f_e} = 2M$$

40. Answer (3)

Hint: Use case of displacement method for finding focal length of convex lens.



From figure

$$v + u = D \dots (i)$$

$$\text{and } v - u = d \dots (ii)$$

$$\text{Solving these eq. } v = \frac{D + d}{2}$$

$$u = \left(\frac{D-d}{2} \right)$$

For 1st position of lens

$$m_1 = \frac{l_1}{o} = \frac{v}{u} = \frac{(D+d)/2}{(D-d)/2} \dots(iii)$$

For 2nd position of lens

$$m_2 = \frac{l_2}{o} = \frac{v}{u} = \frac{(D-d)/2}{(D+d)/2} \dots(iv)$$

From eq (iii) and (iv)

$$\frac{l_2}{l_1} = \frac{(D-d)^2}{(D+d)^2}$$

41. Answer (4)

Hint: Position of n^{th} dark fringe

$$y = \frac{(2n-1)\lambda D}{2d}$$

Sol.: For 2nd dark fringe $n = 2$

$$y = \frac{3\lambda D}{2d}$$

$$\lambda = \frac{2yd}{3D} = \frac{2 \times 10^{-3} \times 0.9 \times 10^{-3}}{3 \times 1}$$

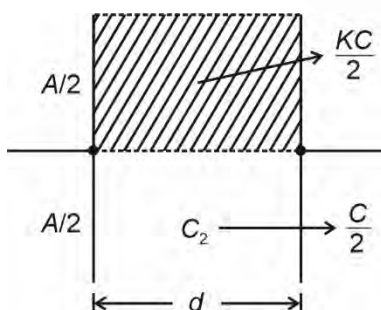
$$= 6 \times 10^{-7} \text{ m}$$

$$= 6 \times 10^{-5} \text{ cm}$$

42. Answer (3)

Hint: Use parallel combination of upper half and lower half capacitances

Sol.: $C_{eq} = C_1 + C_2$

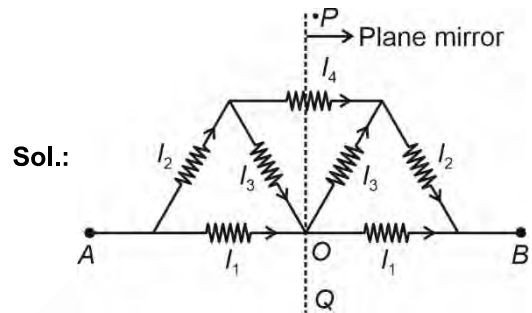


$$= \frac{KC}{2} + \frac{C}{2}$$

$$= (K+1) \frac{C}{2}$$

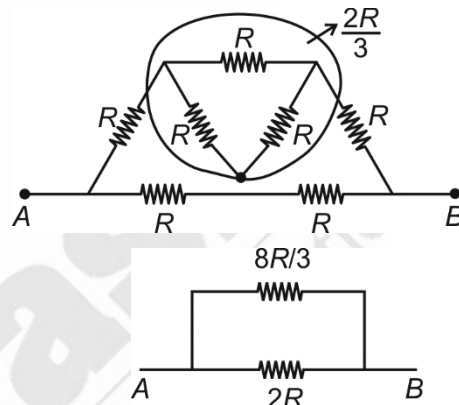
43. Answer (4)

Hint: Use mirror symmetry and simplify



Sol.:

At node: There is no current distribution from upper branches (I_3, I_3) to horizontal branch (I_1, I_1) i.e. O is false node. Upper part is separated from horizontal branch at O. Now redraw the circuit.



$$R_{AB} = \left(\frac{2 \times 8/3}{2 + 8/3} \right) R = \frac{16/3R}{14/3} = \frac{16}{14} R$$

$$= \frac{8}{7} R = \frac{8}{7} \Omega$$

44. Answer (2)

Hint and Sol.: Energy $\propto \frac{1}{n^2}$, radius $\propto n^2$ and angular momentum $\propto n$

$$\text{speed} \propto \frac{1}{n}$$

45. Answer (3)

Hint and Sol.:

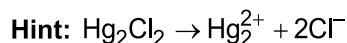
$$V_A - (5 \times 1) - 15 + (5 \times 10^{-3} \times 10^3) = V_B$$

$$V_A - 5 - 15 + 5 = V_B$$

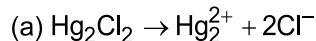
$$\Rightarrow V_B - V_A = -15 \text{ V}$$

[CHEMISTRY]

46. Answer (1)

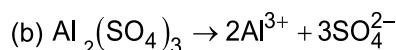


Sol.:



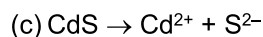
$$K_{\text{sp}} = [\text{Hg}_2^{2+}][\text{Cl}^-]^2 = S \times (2S)^2 = (4S)^3$$

$$S = \left(\frac{K_{\text{sp}}}{4}\right)^{\frac{1}{3}}$$

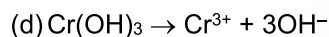


$$K_{\text{sp}} = [\text{Al}^{3+}]^2[\text{SO}_4^{2-}]^3 = (2S)^2 \times (3S)^3 = 108 S^5$$

$$S = \left(\frac{K_{\text{sp}}}{108}\right)^{\frac{1}{5}}$$



$$K_{\text{sp}} = S^2 \Rightarrow S = (K_{\text{sp}})^{1/2}$$



$$K_{\text{sp}} = [\text{Cr}^{3+}][\text{OH}^-]^3 = S \times (3S)^3 = 27S^4$$

$$S = \left(\frac{K_{\text{sp}}}{27}\right)^{1/4}$$

47. Answer (1)

Hint: Average atomic mass = $\frac{(\%)_1 M_1 + (\%)_2 M_2}{100}$

Sol.: Average atomic mass = $\frac{20 \times 10 + 80 \times 11}{100}$
= 10.8 u

48. Answer (3)

Hint: Minimum mass of sulphur possible in a compound is 32 u

Sol.: % of an element = $\frac{\text{Weight of element}}{\text{Molecular weight of compound}} \times 100$

$$2 = \frac{32}{M} \times 100$$

$$M = 1600 \text{ u}$$

49. Answer (4)

Hint: $r_n = \frac{0.529 n^2}{Z} \text{ \AA}$

Sol.: $\frac{r_{\text{He}^+}}{r_{\text{Li}^{2+}}} = \frac{0.529 \times \frac{2^2}{2}}{0.529 \times \frac{3^2}{3}}$

$$\frac{r_{\text{He}^+}}{r_{\text{Li}^{2+}}} = \frac{2}{3}$$

50. Answer (4)

Hint: $\lambda = \frac{h}{mv}$

Sol.: $\lambda = \frac{6.626 \times 10^{-34}}{10 \times 10^{-3} \times 10^3}$
= $6.626 \times 10^{-35} \text{ m}$

51. Answer (1)

Hint: O has least negative electron gain enthalpy.

Sol.: Ne has highest positive electron gain enthalpy among group 18 elements.

52. Answer (2)

Hint: First ionization enthalpy of N > O

Sol.:

$$\text{C} \rightarrow 1086 \text{ kJ mol}^{-1}$$

$$\text{N} \rightarrow 1402 \text{ kJ mol}^{-1}$$

$$\text{O} \rightarrow 1314 \text{ kJ mol}^{-1}$$

$$\text{F} \rightarrow 1681 \text{ kJ mol}^{-1}$$

53. Answer (4)

Hint: BF_3 has three 120° bond angles

Sol.: Molecule Bond angle

$$\text{CH}_4 \quad 109.5^\circ$$

$$\text{NH}_3 \quad 107^\circ$$

$$\text{H}_2\text{O} \quad 104.5^\circ$$

54. Answer (3)

Hint: B_2 and O_2 have unpaired electrons so they are paramagnetic.

Sol.: Bond order of O_2^+ = $\frac{1}{2}(10 - 5) = 2.5$

Bond order of N_2^+ = $\frac{1}{2}(9 - 4) = 2.5$

55. Answer (2)

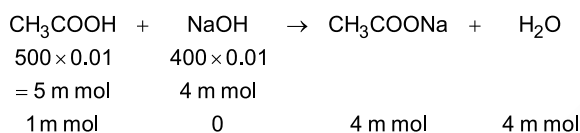
Hint: At constant T, $\Delta S = 2.303nR \log \frac{P_1}{P_2}$

Sol.: $\Delta S = 2 \times R \times 2.303 \times \log \frac{3}{1}$
= $4.606 \times R \times 0.4771 \approx 2.2 R$

56. Answer (2)

Hint: $\Delta G = \Delta H - T\Delta S$ **Sol.:** $T\Delta S_{\text{sys}}$ is the energy which is not available to do useful work.If $\Delta H = -ve$ and $\Delta S = +ve$, then $\Delta G = -ve$ at all temperatures.

57. Answer (1)

Hint: $\text{pH} = \text{pK}_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$ **Sol.:**

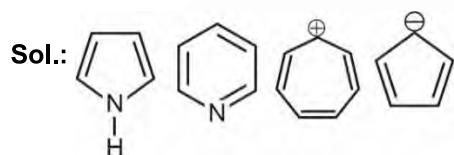
$$\text{pH} = 4.76 + \log \frac{4}{1}$$

$$= 4.76 + \log 2^2$$

$$= 4.76 + 2 \times 0.3$$

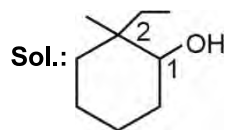
$$= 5.36$$

58. Answer (3)

Hint: An aromatic species is cyclic, planar and contains $(4n + 2)\pi$ delocalised electrons.

are aromatic species

59. Answer (3)

Hint: $-\text{OH}$ is given priority as functional group.

2-Ethyl-2-methylcyclohexan-1-ol

60. Answer (1)

Hint: Percentage of Br

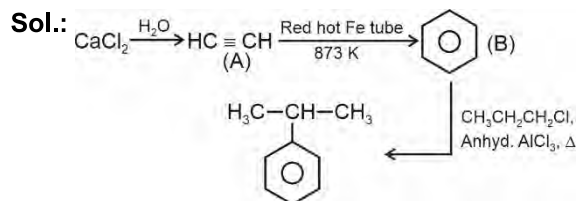
=

$$\frac{\text{Atomic mass of Br} \times \text{Mass of AgBr}}{\text{Molecular mass of AgBr} \times \text{Total mass of organic compound}} \times 100$$

$$\text{Sol.:\% Br} = \frac{80 \times 0.188 \times 100}{188 \times 0.4}$$

$$= 20\%$$

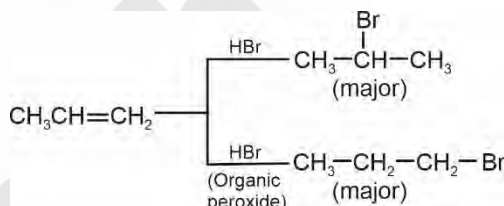
61. Answer (2)

Hint: Acetylene undergoes cyclic polymerisation to form benzene.

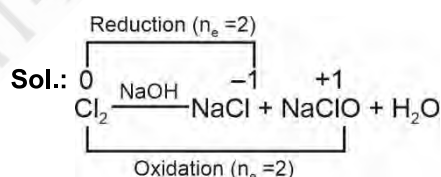
62. Answer (3)

Hint: Allyl free radical is more stable than benzyl free radical.**Sol.:** $-\text{COOH}$, $-\text{CHO}$, $-\text{CN}$ show $-\text{R}$ effect when attached with benzene ring.

63. Answer (1)

Hint: In presence of organic peroxide, anti Markovnikov addition takes place.**Sol.:**P and Q are structural isomers of each other and both are achiral molecules. Both P & Q form $\text{CH}_3-\text{CH}=\text{CH}_2$ on heating with alcoholic KOH

64. Answer (1)

Hint: Equivalent mass = $\frac{\text{Molar mass}}{\text{n factor}}$ 

$$\text{n factor} = \frac{2 \times 2}{2 + 2} = 1$$

$$\text{Equivalent mass} = \frac{71}{1} = 71$$

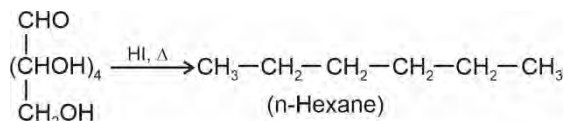
65. Answer (2)

Hint: In a disproportionation reaction an element in one oxidation state is simultaneously oxidised and reduced.**Sol.:** In reaction $2\text{F}_2 + 2\text{OH}^- \rightarrow 2\text{F}^- + \text{OF}_2 + \text{H}_2\text{O}$, no element is simultaneously oxidised and reduced, so it is not a disproportionation reaction.

66. Answer (2)

Hint: Glucose is an aldohexose as it is a six carbon monosaccharide with aldehyde group at first carbon.

Sol.:



67. Answer (1)

Hint: Deficiency of vitamin C causes scurvy

Sol.: Vitamin

Deficiency disease

Vitamin K → Increased blood clotting time

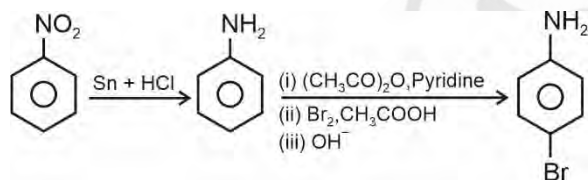
Vitamin D → Rickets

Vitamin A → Xerophthalmia

68. Answer (2)

Hint: Acetylation of aniline with $(\text{CH}_3\text{CO})_2\text{O}$, pyridine leads to formation of monosubstituted product.

Sol.:



69. Answer (1)

Hint: In aqueous medium, solvation of amines also affects basic nature.

Sol.: For ethyl substituted amines, the correct order of basic strength is $(\text{C}_2\text{H}_5)_2\text{NH} > (\text{C}_2\text{H}_5)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2 > \text{NH}_3$

70. Answer (1)

Hint: $\text{NH}_4\text{NO}_3 \xrightarrow{\Delta} \text{N}_2\text{O} + 2\text{H}_2\text{O}$

Sol.: $\text{NH}_4\text{Cl}(\text{aq}) + \text{NaNO}_2(\text{aq}) \rightarrow \text{N}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) + \text{NaCl}(\text{g})$

$(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \xrightarrow{\text{Heat}} \text{N}_2 + 4\text{H}_2\text{O} + \text{Cr}_2\text{O}_3$

$\text{Ba}(\text{N}_3)_2 \rightarrow \text{Ba} + 3\text{N}_2$

71. Answer (2)

Hint: H_2O has extensive hydrogen bonding.

Sol.: Sulphur atom is less electronegative as compared to oxygen and hence its molecules do not show intermolecular H-bonding. Boiling point of compound also depends on molecular mass hence, the correct order of boiling points of hydrides of group 16 elements is

$\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$

72. Answer (1)

Hint: Si, Ge and Sn has almost equal electronegativity.

Sol.: The correct order of electronegativity of group 14 elements is

$\text{C} > \text{Pb} > \text{Si} = \text{Ge} = \text{Sn}$

73. Answer (2)

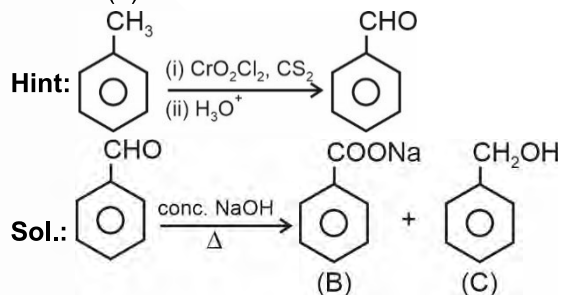
Hint: Group reagent for Fe^{3+} is NH_4OH in presence of NH_4Cl

Sol.: $\text{Cu}^{2+} \rightarrow \text{H}_2\text{S}$ gas in presence of dil. HCl

$\text{Sr}^{2+} \rightarrow (\text{NH}_4)_2\text{CO}_3$ in presence of NH_4OH

$\text{Zn}^{2+} \rightarrow \text{H}_2\text{S}$ in presence of NH_4OH

74. Answer (1)



75. Answer (2)

Hint: AlCl_3 is a lewis acid and used as catalyst in Friedel-Crafts reactions.

Sol.: In $-\text{COOH}$ group is deactivating group and gets bonded with lewis acid in Friedel-Crafts reaction.

76. Answer (2)

Hint:

Sol.:

$\text{>C=O} \xrightarrow[\text{HCl}]{\text{Zn-Hg}} \text{>CH}_2$ (Clemmensen Reduction)

$\text{>C=O} \xrightarrow[\text{glycol}, \Delta]{\text{(i) NH}_2\text{NH}_2, \text{(ii) KOH/ethylene glycol}, \Delta} \text{>CH}_2 + \text{N}_2$ (Wolff-Kishner Reduction)

77. Answer (4)

Hint: $P_T = X_A P_A^\circ + X_B P_B^\circ$

$Y_A = \frac{X_A P_A^\circ}{P_T}$

Sol.: $P_A = P_A^\circ X_A = 250$

$X_A = \frac{250}{400} = \frac{5}{8}$

$$X_B = \frac{3}{8}$$

$$Y_A = \frac{250}{400 \times \frac{5}{8} + 200 \times \frac{3}{8}} = \frac{250}{250 + 75} = \frac{250}{325} = \frac{10}{13}$$

$$Y_B = \frac{3}{13}$$

$$\text{Molar ratio} = \frac{Y_A}{Y_B} = \frac{10/13}{3/13} = \frac{10}{3}$$

78. Answer (1)

Hint: In case of negative deviation from Raoult's law, the intermolecular attractive forces between A – A and B – B are weaker than those between A – B.

Sol.: Solution of CH_3COCH_3 and CHCl_3 shows negative deviation from Raoult's law.

Solution of $\text{C}_6\text{H}_5\text{NH}_2$ and $\text{C}_6\text{H}_5\text{OH}$ shows negative deviation from Raoult's law.

Solution of CH_3COCH_3 and CS_2 shows positive deviation from Raoult's law.

Solution of CH_3COCH_3 and $\text{C}_2\text{H}_5\text{OH}$ shows positive deviation from Raoult's law.

79. Answer (2)

$$\text{Hint: } \Lambda_m^\circ \text{CH}_3\text{COOH} = \lambda_m^\circ \text{CH}_3\text{COO}^- + \lambda_m^\circ \text{H}^+$$

Sol.:

$$\begin{aligned} \Lambda_m^\circ \text{CH}_3\text{COOH} &= \Lambda_m^\circ(\text{HCl}) + \Lambda_m^\circ(\text{NaAC}) - \Lambda_m^\circ(\text{NaCl}) \\ &= (425.9 + 91.0 - 126.4) \text{ S cm}^2 \text{ mol}^{-1} \\ &= 390.5 \text{ S cm}^2 \text{ mol}^{-1} \end{aligned}$$

$$\alpha = \frac{\Lambda_m(\text{CH}_3\text{COOH})}{\Lambda_m^\circ(\text{CH}_3\text{COOH})} = \frac{13}{390.5} = 0.033$$

$$\% \text{ degree of dissociation} = 0.033 \times 100 = 3.3\%$$

80. Answer (2)

$$\text{Hint: } E_{\text{H}^+/\text{H}_2} = E_{\text{H}^+/\text{H}_2}^\circ - \frac{0.059}{2} \log \frac{P_{\text{H}_2}}{[\text{H}^+]^2}$$

$$\text{Sol.: } E_{\text{H}^+/\text{H}_2}^\circ = 0, P_{\text{H}_2} = 1 \text{ bar}$$

$$E_{\text{H}^+/\text{H}_2} = 0 - \frac{0.059}{2} \log \frac{1}{[\text{H}^+]^2}$$

$$= \frac{-0.059}{2} [\log 1 - 2 \log(\text{H}^+)]$$

$$= \frac{-0.059}{2} (0 + 2 \text{ pH})$$

$$= \frac{-0.059}{2} \times 2 \times 2$$

$$= -0.118 \text{ V}$$

81. Answer (1)

Hint: A is pre exponential factor in Arrhenius equation

$$k = Ae^{-E_a/RT}$$

$$\text{Sol.: } \log k = \log A - \frac{E_a}{2.303RT}$$

$$\log A = \log k + \frac{E_a}{2.303RT}$$

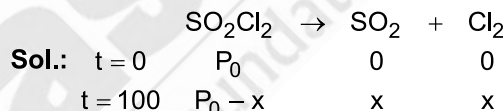
$$\log A = \log 2 \times 10^{-5} + \frac{57.441}{8.314 \times 2.303 \times 300}$$

$$= (-5 + 0.3) + \frac{57.441}{5744.1}$$

$$\therefore A = 2 \times 10^{-5}$$

82. Answer (3)

$$\text{Hint: Rate} = K \times P_{\text{SO}_2\text{Cl}_2}$$



$$P_0 + x = P_T$$

$$0.4 + x = 0.5$$

$$x = 0.1 \text{ atm}$$

$$k = \frac{2.303}{t} \log \frac{P_0}{P_t} = \frac{2.303}{100} \log \frac{0.4}{0.3}$$

$$k = \frac{2.303}{100} (\log 4 - \log 3)$$

$$= \frac{2.303}{100} (2 \times 0.3010 - 0.477)$$

$$= \frac{2.303}{100} (0.6020 - 0.477)$$

$$= 2.303 \times 0.125 \times 10^{-2}$$

$$= 2.87 \times 10^{-3} \text{ s}^{-1}$$

$$\text{Rate} = k \times P_{\text{SO}_2\text{Cl}_2}$$

$$= 2.87 \times 10^{-3} \times 0.25$$

$$= 0.7175 \times 10^{-3}$$

$$= 7.175 \times 10^{-4} \text{ atm s}^{-1}$$

83. Answer (3)

Hint: Spin only magnetic moment, $\mu = \sqrt{n(n+2)}$ BM**Sol.:** $[\text{MnBr}_4]^{2-} \rightarrow n = 5, \mu = 5.9 \text{ BM}$ $[\text{Fe}(\text{CN})_6]^{3-} \rightarrow n = 1, \mu = 1.7 \text{ BM}$ $[\text{Fe}(\text{CN})_6]^{4-} \rightarrow n = 0, \mu = 0$ $[\text{CoF}_6]^{3-} \rightarrow n = 4, \mu = 4.9 \text{ BM}$

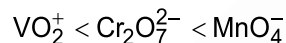
84. Answer (3)

Hint: Due to the presence of strong field ligand, the splitting of t_{2g} and e_g level would be more and it results in absorption of light of shorter wavelength.**Sol.:** Coordination entity wavelength of light absorbed (nm) $[\text{CoCl}(\text{NH}_3)_5]^{2+}$ 535 $[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$ 500 $[\text{Co}(\text{NH}_3)_6]^{3+}$ 475 $[\text{Co}(\text{CN})_6]^{3-}$ 310

85. Answer (4)

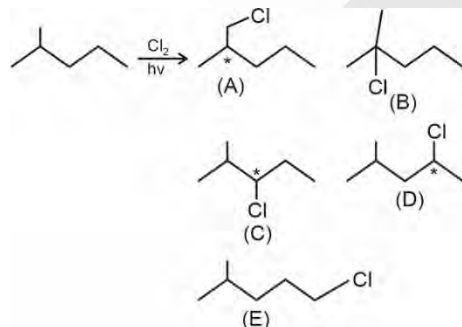
Hint: La^{3+} and Ce^{4+} have $4f^0$ configuration.**Sol.:** Ac and Th show +3 and +4 oxidation state respectively.

86. Answer (2)

Hint & Sol.: The oxidising power follows the order

This is due to the increasing stability of the lower species in which they are reduced.

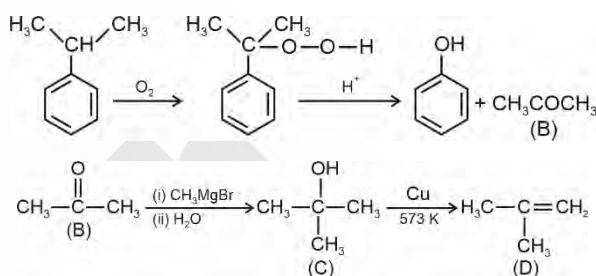
87. Answer (3)

Hint: Monochlorination of 2-Methylpentane also leads to the formation of optical isomers.**Sol.:**

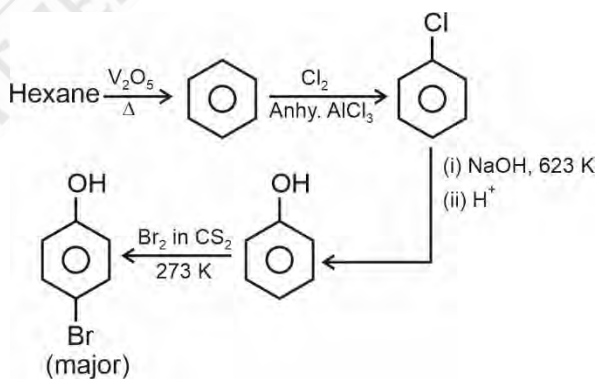
88. Answer (4)

Hint: Electron withdrawing group increases the acidic strength of carboxylic acid.**Sol.:**Correct order of acidic strength of species is : $\text{NC} - \text{CH}_2\text{COOH} > \text{HCOOH} > \text{ClCH}_2\text{CH}_2\text{COOH} > \text{C}_6\text{H}_5\text{COOH}$

89. Answer (1)

Hint: Cumene is oxidised in the presence of O_2 to form cumene peroxide**Sol.:**

90. Answer (2)

Hint: n-Hexane in the presence of V_2O_5 at 773 K temperature and 10-20 atm pressure forms **Sol.:**

[BIOLOGY]

91. Answer (3)

Hint: Wheat belongs to the class Monocotyledonae.**Sol.:** Order of wheat is Poales.

92. Answer (4)

Hint: Bacteria are characterised by the presence of a rigid cell wall.**Sol.:** *Mycoplasma*, *Euglena* and *Plasmodium* are devoid of cell wall.

93. Answer (2)

Hint: Some pteridophytes are heterosporous vascular cryptogams.

Sol.: In Mosses, spores on liberation germinate into filamentous stage called protonema. Spore mother cells undergo meiosis to form spores. Both bryophytes and pteridophytes are found in damp and shady places and consist of antheridia and archegonia. Sporophytes are dependent on gametophytes in bryophytes.

94. Answer (3)

Hint: Gemmae are found in liverworts.

Sol.: Liverworts (*Marchantia*) reproduce using green, multicellular, asexual buds called gemmae.

95. Answer (4)

Hint: If one margin of the appendage overlaps that of the next one in a particular direction, it is called twisted aestivation.

Sol.: Twisted aestivation is observed in cotton.

96. Answer (2)

Hint: In the seed of pepper, persistent nucellus is called perisperm.

Sol.: Aggregate fruits develop from polycarpellary, apocarpous ovary of a single flower.

97. Answer (3)

Hint: Both mitochondria and chloroplasts utilise chemiosmotic model for ATP synthesis.

Sol.: In mitochondria, oxidation reduction of molecules drives ATP synthesis, while in chloroplast, light energy does the same. In mitochondria, final electron accept is O_2 while in chloroplast, its $NADPH + H^+$.

98. Answer (3)

Hint: Monocot stem lacks endodermis.

Sol.:

Dicot root – Presence of pericycle that gives rise to vascular cambium and cork cambium.

Monocot stem – Has scattered conjoint, closed vascular bundles.

Monocot root – Presence of casparian strips in the endodermis and polyarch vascular bundles.

Dicot stem – Has parenchymatous pith and collenchymatous hypodermis.

99. Answer (4)

Hint: Smaller and larger subunits unite to form a ribosome. At higher Mg^+ concentration, two ribosomes unite to form a dimer.

Sol.: r-RNA is formed in nucleolus. Ribosomes are found in all living cells.

100. Answer (3)

Hint: Variations and new genetic combinations are produced by crossing over.

Sol.: Meiosis helps in introducing variations and formation of new genetic combinations.

101. Answer (1)

Hint: Centriole duplication occurs in S-phase.

Sol.: Meiosis II is initiated immediately after cytokinesis, usually before the chromosomes have fully elongated. Yeast can progress through cell cycle in only about 90 minutes.

102. Answer (3)

Hint: Given figure represents telophase stage.

Sol.: In the final stage of karyokinesis, chromosomes cluster at opposite spindle poles and their identity is lost as discrete elements.

103. Answer (2)

Hint: Jan Ingenhousz worked on aquatic plants to prove the release of O_2 from green parts of plants.

Sol.:

Julius von Sachs	–	Provided evidence for the synthesis of glucose in green plants
Cornelius van Niel	–	Based on his studies, demonstrated that hydrogen released from a suitable oxidisable compound, reduces carbon dioxide to carbohydrates
T.W. Engelmann	–	Observed accumulation of bacteria in blue and red light region of split spectrum

104. Answer (3)

Hint: Water splitting complex is associated with PS-II, which is present only in non-cyclic photo phosphorylation.

Sol.: Non-cyclic photophosphorylation requires the external electron donor.

105. Answer (3)

Hint: This is the final product of glycolysis.

Sol.: Pyruvic acid is a common product formed during the breakdown of proteins and carbohydrates.

106. Answer (4)

Hint: Eliminate the locations of cartilage

Sol.: Cartilage is present in the tip of nose, outer ear joints, between adjacent bones of the vertebral column, limbs and hands in adults. Limb bones, such as the long bones of the legs, serve weight-bearing functions. The articular cartilage of long bones have chondrocytes but shaft of long bones does not contain chondrocytes.

107. Answer (4)

Hint: Exclude the features associated with forewings

Sol.: The first pair of wings arises from mesothorax and the second pair from metathorax. Forewings (mesothoracic) called tegmina are opaque, dark and leathery and cover the hind wings when at rest. The hind wings are transparent, membranous and are used in flight.

108. Answer (1)

Hint: Frogs are ureotelic in nature.

Sol.: Both humans and frogs excrete urea and thus are ureotelic animals. Humans possess cerebellar hemispheres and salivary glands while these structures are absent in frogs.

The frog's heart has three chambers, two atria and one ventricle and is covered by a membrane called pericardium. Human's heart is protected by a double walled membranous bag, pericardium, enclosing the pericardial fluid.

109. Answer (2)

Hint: Alternation of generation

Sol.: There are some cnidarians which exist in both forms *i.e.*, polyp and medusa. They exhibit alternation of generation (Metagenesis), *i.e.*, polyps produce medusae asexually and medusae form the polyps sexually (*e.g.*, *Obelia*).

In some animals, the body is externally and internally divided into segments with a serial repetition of at least some organs. This pattern is called metameric segmentation and the phenomenon is known as metamerism.

Metastasis is the characteristic property of malignant tumors.

Moulting is a process where animals shed their exoskeleton.

110. Answer (4)

Hint: All of them are chordates.

Sol.: *Columba* belongs to the class Aves. *Canis* belongs to the class Mammalia and *Carcharodon* belongs to the class Chondrichthyes. All of them

are chordates and are fundamentally characterised by the presence of a notochord, a dorsal and hollow nerve cord and paired pharyngeal gill slits. Birds and mammals exhibit complete double circulation while cartilaginous fishes exhibit single circulation.

Notochord is persistent throughout the life in cartilaginous fishes.

111. Answer (3)

Hint: 'X' – Proteins

Sol.: Proteins form 10-15% of the total cellular mass. Glucagon is a proteinaceous hormone. Myoglobin, collagen and RuBisCO are proteins while inulin is a homopolysaccharide.

112. Answer (2)

Hint: High pH leads to the left shift of the oxygen dissociation curve.

Sol.: In the alveoli, where there is high pO_2 , low pCO_2 , lesser H^+ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin, whereas in the tissues, where low pO_2 , high pCO_2 , high H^+ concentration and higher temperature exist, the conditions are favourable for dissociation of oxygen from the oxyhaemoglobin.

113. Answer (1)

Hint: Athletes have stronger heart muscles.

Sol.: One of the differences between untrained individuals and trained athletes is that the athletes have lower heart rates, greater end-systolic ventricular volume, and greater stroke volume at rest. In athletes, end diastolic volume is increased due to increase in heart size, so stroke volume is much more than the normal in spite of more end systolic volume than a normal person.

114. Answer (4)

Hint: The total number of cervical vertebrae in an adult human is 7.

Sol.: The vertebral column is differentiated into cervical (7), thoracic (12), lumbar (5), sacral (1-fused) and coccygeal (1-fused) regions starting from the skull.

Each middle ear contains three tiny bones – malleus, incus and stapes, collectively called ear ossicles.

The facial region is made up of 14 skeletal elements which form the front part of the skull.

115. Answer (3)

Hint: Constriction of arterioles increases blood pressure

Sol.: Angiotensin II is a very potent vasoconstrictor and increases blood pressure and thus GFR. Cells in the atria of the heart secrete atrial natriuretic factor (ANF). Stretching of the atria occurs when blood volume increases, this stimulates the secretion of ANF. ANF increases GFR by dilating afferent arteriole to increase amount of blood for filtration and relaxation of mesangial cells to increase surface area for filtration.

116. Answer (3)

Hint: Methionine is the precursor of ethylene.

Sol.: Early and quicker maturity of conifers is caused by gibberellin. Rest all are the functions of ethylene.

117. Answer (2)

Hint: Centrosome is made up of two centrioles, arranged perpendicularly.

Sol.: Every chromosome essentially has a primary constriction or centromere.

118. Answer (4)

Hint: Rust disease in wheat is caused by *Puccinia*, member of class Basidiomycetes.

Sol.: Sex organs are absent in basidiomycetes (*Puccinia*).

119. Answer (2)

Hint: The leaves in gymnosperms are well adapted to extremes of temperatures, humidity and wind.

Sol.: *Equisetum* produces same kind of spores, hence female gametophyte is not formed.

120. Answer (3)

Hint: In racemose inflorescence, flowers are borne in acropetal succession.

Sol.: In racemose inflorescence, the shoot axis grows indefinitely.

121. Answer (2)

Hint: Under favourable conditions, bacteria reproduce mainly by fission.

Sol.: *Agaricus*, being a member of basidiomycetes, have basidium in which karyogamy and meiosis takes place.

122. Answer (3)

Hint: They are small bristle-like fibres sprouting out of the cell.

Sol.: Fimbriae are surface structures of bacteria, which have a role in attachment and adhesion.

123. Answer (4)

Hint: This stage is marked by terminalisation of chiasmata.

Sol.: Diakinesis is associated with the disintegration of the nuclear envelope.

124. Answer (1)

Hint: Cytochrome *c* acts as a mobile carrier for transfer of electron between complex III and IV.

Sol.: Complex IV of ETS contains cyt *a* and *a*₃ along with two copper centres.

125. Answer (2)

Hint: Given diagram represent L.S. of an embryo of grass.

Sol.: In the given figure A, B, C and D represent scutellum, coleoptile, epiblast and coleorhiza respectively.

126. Answer (4)

Hint: Fragrance is a cue, not a reward.

Sol.: Freshwater plants like *Vallisneria* show epihydrophyly. Cleistogamous flowers do not require pollinating agents.

127. Answer (3)

Hint: There are many traits which are not distinct in their occurrence and are spread across a gradient.

Sol.: In polygenic inheritance, extreme phenotypes are less frequent but intermediate ones are more frequent.

128. Answer (4)

Hint: Thalassemia is a quantitative blood problem of synthesising too few globin molecules.

Sol.: α -thalassemia is autosomal recessive disorder, caused due to deletion or mutation of HBA1 and HBA2 gene.

129. Answer (4)

Hint: Given pedigree shows the inheritance pattern of autosomal recessive disorder.

Sol.: In autosomal recessive disorder, unaffected parent can have affected progeny (Genotype of III-1 (Aa) and III-7 (aa)). The progeny of III-1 and III-7 can be non-affected.

130. Answer (3)

Hint: Euchromatin is a transcriptionally active form of chromatin.

Sol.: Euchromatin has loosely packed chromatin as compared to heterochromatin, which is densely packed chromatin. Heterochromatin is absent in prokaryotes.

131. Answer (1)

Hint: Function of midbrain

Sol.: The midbrain is located between the thalamus/hypothalamus of the forebrain and pons of the hindbrain. The midbrain receives and integrates visual, tactile and auditory inputs. The cerebellum integrates information received from the semicircular canals of the ear and the auditory system. Hypothalamus controls the body temperature, eating and drinking.

Limbic system along with the hypothalamus regulates sexual behaviour and autonomic responses.

132. Answer (3)

Hint: Produces the hormone which is antagonistic to calcitonin.

Sol.: The parathyroid glands secrete a peptide hormone called parathyroid hormone (PTH). Parathyroid hormone (PTH) increases the Ca^{2+} levels in the blood. PTH acts on bones and stimulates the process of bone resorption (dissolution/ demineralisation). Thyroxine supports the process of red blood cell formation. Melatonin produced by pineal gland influences metabolism, pigmentation, the menstrual cycle as well as our defense capability.

133. Answer (2)

Hint: Fraternal twins are also known as non-identical twins.

Sol.: At puberty, only 60,000-80,000 primary follicles are left in each ovary. Moderate levels of estrogens in the blood inhibit both the release of GnRH by the hypothalamus and secretion of LH and FSH by the anterior pituitary. Secretions of male accessory glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes. Fraternal twins are also known as dizygotic twins.

134. Answer (4)

Hint: Semen is artificially introduced in uterus.

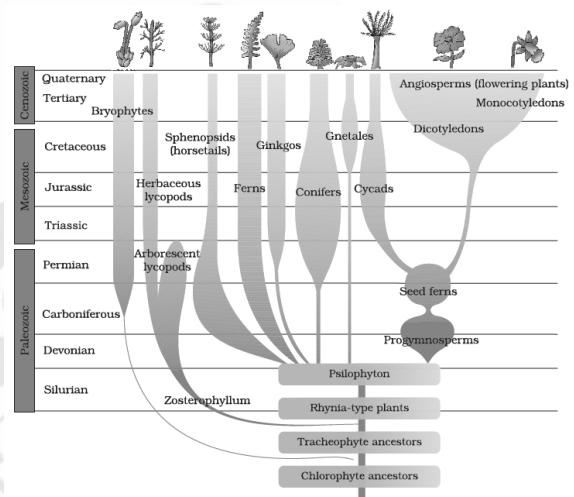
Sol.: Infertility cases either due to inability of the male partner to inseminate the female or due to very low sperm counts in the ejaculates, could be corrected by artificial insemination (AI) technique. In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus (IUI – Intra-Uterine Insemination) of the female.

ZIFT involves transfer of embryo (with upto 8 blastomeres) into the fallopian tube.

135. Answer (1)

Hint: Exclude the direct descendants of Psilophyton

Sol.:



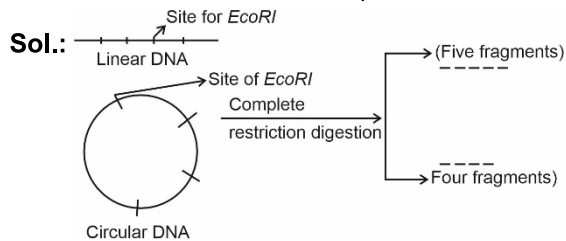
136. Answer (2)

Hint: *Haemophilus influenzae* is responsible for the disease pneumonia.

Sol.: Bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for the disease pneumonia in humans which infects the alveoli (air filled sacs) of the lungs. Rhino viruses cause one of the most infectious human ailments – the common cold. They infect the nose and respiratory passage but not the lungs. A healthy person acquires both the infections by inhaling the droplets/aerosols released by an infected person or even by sharing glasses and utensils with an infected person.

137. Answer (3)

Hint: Number of fragments generated in circular DNA = No. of restriction sites present



138. Answer (4)

Hint: Exclude the genetically modified plants.

Sol.: In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre). The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow-milk. Bt toxin gene has been cloned from the bacteria and been expressed in plants to provide resistance against insects without the need for insecticides; in effect created a bio-pesticide.

139. Answer (2)

Hint: X is a hyperglycemic and Y is a sex hormone

Sol.: The process of childbirth is called parturition which is induced by a complex neuroendocrine mechanism involving cortisol, estrogens and oxytocin.

Estrogens produce wide ranging actions such as stimulation of growth and activities of female secondary sex organs, development of growing ovarian follicles, appearance of female secondary sex characters (e.g., high pitch of voice, etc.) and mammary gland development. Estrogens also regulate female sexual behaviour.

Estrogen is steroidal in nature.

140. Answer (3)

Hint: Exclude the retrovirus

Sol.: Using *Agrobacterium* vectors, transgenic tobacco were created. *Agrobacterium tumefaciens*, a pathogen of several dicot plants is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a tumor and direct these tumor cells to produce the chemicals required by the pathogen. The tumor inducing (Ti) plasmid of *Agrobacterium tumefaciens* has now been modified into a cloning vector which is no more pathogenic to the plants but is still able to use the mechanisms to deliver genes of our interest into a variety of plants.

141. Answer (1)

Hint: All transformants are not recombinants.

Sol.: If one ligates a foreign DNA at the *Sa*I site present in tetracycline resistance gene of the vector pBR322, the recombinant plasmids will lose tetracycline resistance due to insertion of foreign DNA but can still be selected out from non-recombinant ones by plating the transformants on tetracycline containing medium. The transformants growing on ampicillin containing medium are then transferred on a medium containing tetracycline. The recombinants will grow in ampicillin containing medium but not on that containing tetracycline. But, non-recombinants will grow on the medium containing both these antibiotics.

142. Answer (1)

Hint: Brush bordered epithelium possesses microvilli at its free surface.

Sol.: The epithelium of proximal convoluted tubule (PCT) of nephron in the kidney has microvilli. The columnar epithelium is found in the lining of stomach and intestine and helps in secretion and absorption. The squamous epithelium is present in the parietal layer of Bowman's capsule.

143. Answer (4)

Hint: Function of hepatic caeca

Sol.: A ring of 6-8 blind tubules called hepatic or gastric caecae is present at the junction of foregut and midgut, which secretes digestive juice. At the junction of midgut and hindgut is present another ring of 100-150 yellow coloured thin filamentous Malpighian tubules. They help in removal of excretory products from haemolymph. Crop is responsible for storage of food and gizzard causes grinding of food.

144. Answer (1)

Hint: Presence of three germinal layers

Sol.: *Ascaris* is an aschelminth. *Nereis* is an annelid. *Bombyx* is an arthropod and *Aplysia* is a mollusc.

All of these organisms are bilaterally symmetrical. *Ascaris* and *Aplysia* are not metamericly segmented. *Ascaris* is a pseudocoelomate.

145. Answer (2)

Hint: Lecithin

Sol.: Some lipids have phosphorous and a phosphorylated organic compound in them. These are phospholipids. They are found in cell membrane. Lecithin is one example.

146. Answer (3)

Hint: A healthy human breathes 12-16 times/minute.

Sol.: On an average, a healthy human breathes 12-16 times/minute. Functional Residual Capacity is the volume of air that will remain in the lungs after a normal expiration. This includes ERV+RV (2100-2300 mL). Vital Capacity (VC) includes ERV, TV and IRV (4000-4600 mL). The solubility of CO₂ in blood plasma is 20-25 times higher than that of O₂.

147. Answer (2)

Hint: A type of granulocyte

Sol.: Neutrophils, eosinophils and basophils are different types of granulocytes, while lymphocytes and monocytes are the agranulocytes. Neutrophils are the most abundant cells (60-65 per cent) of the total WBCs and basophils are the least (0.5-1 per cent) among them. Neutrophils and monocytes (6-8 per cent) are phagocytic cells which destroy foreign organisms entering the body.

148. Answer (1)

Hint: *Labeo* is a fresh water fish while *Carcharodon* is a marine fish.

Sol.: Mammals, many terrestrial amphibians and marine fishes mainly excrete urea and are called ureotelic animals. Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water and are called uricotelic animals. Ammonia is the most toxic form of nitrogenous waste and requires large amount of water for its elimination, whereas uric acid, being the least toxic, can be removed with a minimum loss of water. Ureotelic animals loss moderate amount of water for excretion of their nitrogenous waste products.

149. Answer (4)

Hint: Have only one afferent process.

Sol.: Based on the number of axon and dendrites, the neurons are divided into three types, *i.e.*, multipolar (with one axon and two or more dendrites; found in the cerebral cortex), bipolar (with one axon and one dendrite, found in the retina of eye) and unipolar (cell body with one axon only; found usually in the embryonic stage).

150. Answer (4)

Hint: Involves use of tentacles

Sol.: *Hydra* can use its tentacles for capturing its prey and also use them for locomotion. Flagellar movement helps in the swimming of spermatozoa, maintenance of water current in the canal system of sponges and in locomotion of Protists like *Euglena*.

151. Answer (3)

Hint: Can cross the plasma membrane

Sol.: On the basis of their chemical nature, hormones can be divided into groups :

- (i) Peptide, polypeptide, protein hormones (*e.g.*, insulin, glucagon, pituitary hormones, hypothalamic hormones, *etc.*)
- (ii) Steroids (*e.g.*, cortisol, testosterone, estradiol and progesterone)
- (iii) Iodothyronines (thyroxine)
- (iv) Amino-acid derivatives (*e.g.*, epinephrine).

152. Answer (1)

Hint: Notochord is persistent in cephalochordates.

Sol.: The digestive tract of birds and arthropods have additional chambers, the crop and gizzard. *Corvus* is a bird while *Culex* is an arthropod. Mammals are viviparous with few exceptions (*Ornithorhynchus*) and they show direct development. Notochord is persistent in cephalochordates, cyclostomes and cartilaginous fishes. In protochordates, notochord is not replaced by vertebral column.

153. Answer (3)

Hint: Caused by HPV

Sol.: Except for hepatitis-B, genital herpes and HIV infections, other sexually transmitted diseases like syphilis, genital herpes, chlamydia, genital warts, trichomoniasis, *etc.*, are completely curable if detected early and treated properly.

154. Answer (1)

Hint: Exclude the Australian marsupials.

Sol.: Placental mammals in Australia exhibit adaptive radiation in evolving into varieties of placental mammals each of which appears to be 'similar' to a corresponding marsupial. Anteater, bobcat, flying squirrel and lemur are examples of placental mammals while koala, wombat and numbat are examples of Australian marsupials.

155. Answer (3)

Hint: Opioids are depressants.

Sol.: Morphine is a very effective sedative and painkiller, and is very useful in patients who have undergone surgery. Excessive dosage of cocaine causes hallucinations. Other well known plants with hallucinogenic properties are *Atropa belladonna* and *Datura*.

156. Answer (1)

Hint: Packaging of chromatin at higher level requires non-histone chromosomal (NHC) protein.

Sol.: Histone proteins, NHC proteins and DNA are involved in formation of the nucleosome that further forms chromatin.

157. Answer (2)

Hint: Repetitive DNA are thought to have no direct coding function.

Sol.:

According to HGP the average gene consists of 3000 bases.

Frederick Sanger is credited for the development of both protein & DNA sequencing.

158. Answer (3)

Hint: Statins have been commercialised as blood-cholesterol lowering agents produced by yeast.

Sol.: Statins are synthesised by *Monascus purpureus*.

159. Answer (1)

Hint: Competition is a $-$, $-$ relationship, while commensalism is a $+$, 0 relationship.

Sol.: Parasitism and predation are the two kinds of population interactions, which show ' $+$ ' and ' $-$ ' kind of interaction between the individuals.

160. Answer (4)

Hint: Environmental factors affect primary productivity.

Sol.: Primary productivity is not affected by type of herbivores and respiratory losses.

161. Answer (3)

Hint: Introduction of terror of Bengal in our lakes is an example of alien species invasion.

Sol.: Introduction of water hyacinth in India damaged the native species, is an example of alien-species invasion.

162. Answer (4)

Hint: Sacred lakes is a type of *in-situ* conservation.

Sol.: Gene banks is a type of *ex-situ* conservation.

163. Answer (4)

Hint: Turner's syndrome is a chromosomal disorder in which females are sterile.

Sol.: Turner's syndrome is caused due to the loss of an 'X' chromosome.

164. Answer (1)

Hint & Sol.: tRNA has an inverted L-shaped tertiary structure.

165. Answer (3)

Hint: The pyramid of energy is always upright.

Sol.: Pyramid of biomass in a sea and pyramid of number in a parasitic food chain is inverted in shape.

166. Answer (2)

Hint: BOD test measures the rate of uptake of oxygen by micro-organisms in a sample of water.

Sol.: During biological treatment, aerobic bacteria are used to treat sewage water till the BOD is reduced.

167. Answer (2)

Hint: Triangular age pyramid depicts expanding population.

Sol.: A bell-shaped age pyramid correctly depicts a stable or a mature population.

168. Answer (4)

Hint: Both DNA and RNA polymerase polymerise in $5' \rightarrow 3'$ direction

Sol.: DNA polymerase cannot initiate process of replication on its own. RNA polymerase uses DNA as template.

169. Answer (1)

Hint: Replication takes place in $5' \rightarrow 3'$ direction

Sol.: Strand A and strand B has the polarity of $5' \rightarrow 3'$ and $3' \rightarrow 5'$ respectively. Okazaki fragment marked (i) occurs prior those marked (ii) and (iii).

Both leading and lagging strand formed simultaneously.

RNA primer provide free $3'$ -hydroxyl group which is essential for DNA polymerase to begin the process of replication.

170. Answer (1)

Hint: Transfer of energy within an ecosystem is not 100% efficient.

Sol.: Ecosystems are not exempted from the second law of thermodynamics. They need a constant supply of energy to synthesis the molecules they require, to counteract the universal tendency towards increasing disorderliness.

171. Answer (2)

Hint: Denaturation of enzyme

Sol.: In PCR, a thermostable DNA polymerase (isolated from a bacterium, *Thermus aquaticus*), which remains active during the high temperature induced denaturation of double stranded DNA is used.

172. Answer (4)

Hint: Made in 1983

Sol.: In 1983, Eli Lilly, an American company prepared two DNA sequences corresponding to 'A' and 'B' chains of human insulin and introduced them in plasmids of *E. coli* to produce insulin chains. Chains 'A' and 'B' were produced separately, extracted and combined by creating disulfide bonds to form human insulin. Probe is a ssDNA/RNA tagged with a radioactive molecule.

173. Answer (1)

Hint: Identify a female accessory duct

Sol.: The oviducts (fallopian tubes), uterus and vagina constitute the female accessory ducts. The female external genitalia include mons pubis, labia majora, labia minora, hymen and clitoris.

174. Answer (2)

Hint: Function of oxytocin

Sol.: Oxytocin acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin. The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of the uterus through the birth canal – parturition.

175. Answer (2)

Hint: Saheli inhibits implantation but does not inhibit ovulation.

Sol.: Natural methods work on the principle of avoiding chances of ovum and sperms meeting. Periodic abstinence, withdrawal method and lactational amenorrhea are some examples of natural methods of contraception. Lactational amenorrhea (absence of menstruation) method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition.

Multiload 375 is an example of copper releasing IUD while Saheli is a non-steroidal pill.

176. Answer (4)

Hint: Theory of special creation

Sol.: Conventional religious literature tells us about the theory of special creation. This theory has three connotations. One, that all living

organisms (species or types) that we see today were created as such. Two, that the diversity was always the same since creation and will be the same in future also. Three, that Earth is about 4000 years old.

177. Answer (3)

Hint: Houseflies act as mechanical carriers for this disease.

Sol.: *Wuchereria* (*W. bancrofti* and *W. malayi*), the filarial worms are the causative agent of elephantiasis or filariasis. The pathogens are transmitted to a healthy person through the bite of an infected female mosquito vector. Dengue and chikungunya are also vector-borne diseases which are transmitted to the healthy individuals by the bite of an infected *Aedes* mosquito. *Entamoeba histolytica* is a protozoan parasite in the large intestine of humans which causes amoebiasis (amoebic dysentery).

178. Answer (2)

Hint: 20-25 per cent of CO₂ is transported by RBCs

Sol.: Nearly 20-25 per cent of CO₂ is transported by RBCs whereas 70 per cent of it is carried as bicarbonate. About 7 per cent of CO₂ is carried in a dissolved state through the plasma.

Neutrophils are the most abundant cells (60-65 per cent) of the total WBCs and basophils are the least (0.5-1 per cent) among them. Lymphocytes constitute 20-25% of the total WBCs.

179. Answer (2)

Hint: Congestion of the lungs is one of the main symptoms of heart failure.

Sol.: Heart failure means the state of heart when it is not pumping blood effectively enough to meet the needs of the body. It is sometimes called congestive heart failure because congestion of the lungs is one of the main symptoms of this disease. Heart failure is not the same as cardiac arrest (when the heart stops beating) or a heart attack (when the heart muscle is suddenly damaged by an inadequate blood supply).

180. Answer (4)

Hint: Ball and socket joint

Sol.: Synovial joints help in locomotion and many other movements. Ball and socket joint (between humerus and pectoral girdle; hip joint), hinge joint (knee joint), pivot joint (between atlas and axis), gliding joint (between the carpals) and saddle joint (between carpal and metacarpal of thumb) are some examples.



All India Aakash Test Series for NEET - 2026

OPEN MOCK TEST - 2[Click here for Code-A Sol.](#)

Test Date : 29/03/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint and Sol.:

$$V_A - (5 \times 1) - 15 + (5 \times 10^{-3} \times 10^3) = V_B$$

$$V_A - 5 - 15 + 5 = V_B$$

$$\Rightarrow V_B - V_A = -15 \text{ V}$$

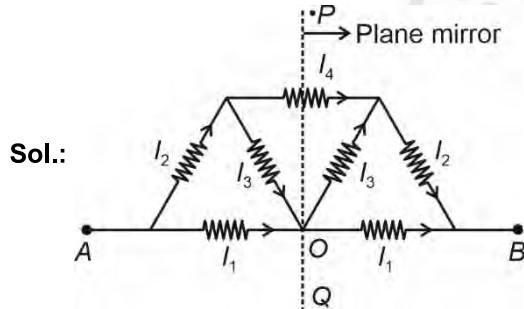
2. Answer (2)

Hint and Sol.: Energy $\propto \frac{1}{n^2}$, radius $\propto n^2$ and angular momentum $\propto n$

$$\text{speed} \propto \frac{1}{n}$$

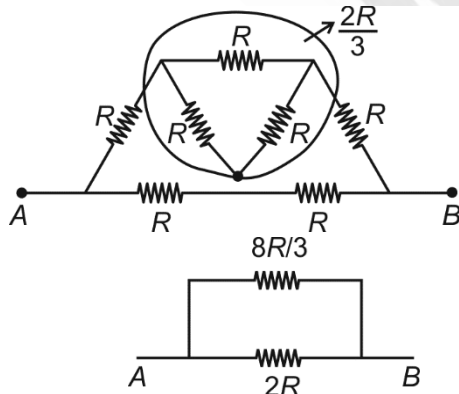
3. Answer (4)

Hint: Use mirror symmetry and simplify



Sol.:

At node: There is no current distribution from upper branches (I_3, I_3) to horizontal branch (I_1, I_1) i.e. O is false node. Upper part is separated from horizontal branch at O. Now redraw the circuit.



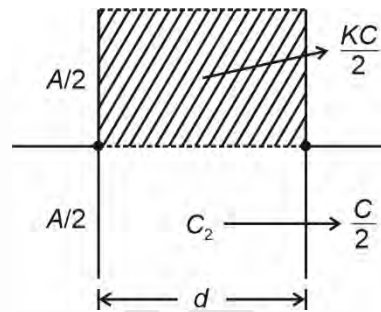
$$R_{AB} = \left(\frac{2 \times \frac{8}{3}}{2 + \frac{8}{3}} \right) R = \frac{16/3R}{14/3} = \frac{16}{14} R$$

$$= \frac{8}{7} R = \frac{8}{7} \Omega$$

4. Answer (3)

Hint: Use parallel combination of upper half and lower half capacitances

$$\text{Sol.} \quad C_{eq} = C_1 + C_2$$



$$= \frac{KC}{2} + \frac{C}{2}$$

$$= (K + 1) \frac{C}{2}$$

5. Answer (4)

Hint: Position of n^{th} dark fringe

$$y = \frac{(2n - 1)\lambda D}{2d}$$

Sol.: For 2nd dark fringe $n = 2$

$$y = \frac{3\lambda D}{2d}$$

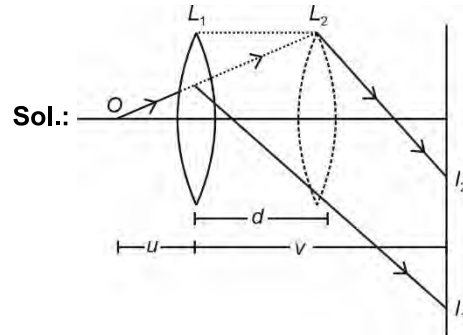
$$\lambda = \frac{2yd}{3D} = \frac{2 \times 10^{-3} \times 0.9 \times 10^{-3}}{3 \times 1}$$

$$= 6 \times 10^{-7} \text{ m}$$

$$= 6 \times 10^{-5} \text{ cm}$$

6. Answer (3)

Hint: Use case of displacement method for finding focal length of convex lens.



Sol.:

From figure

$$v + u = D \dots(i)$$

$$\text{and } v - u = d \dots(ii)$$

$$\text{Solving these eq. } v = \frac{D + d}{2}$$

$$u = \left(\frac{D - d}{2} \right)$$

For 1st position of lens

$$m_1 = \frac{l_1}{o} = \frac{v}{u} = \frac{(D + d)/2}{(D - d)/2} \dots(iii)$$

For 2nd position of lens

$$m_2 = \frac{l_2}{o} = \frac{v}{u} = \frac{(D - d)/2}{(D + d)/2} \dots(iv)$$

From eq (iii) and (iv)

$$\frac{l_2}{l_1} = \frac{(D - d)^2}{(D + d)^2}$$

7. Answer (3)

Hint and Sol.: Magnifying power $M = \frac{f_o}{f_e}$

$$M' = \frac{2f_o}{f_e} = 2M$$

8. Answer (3)

Hint: Use principle of calorimetry

Sol.: Heat gain = Heat loss

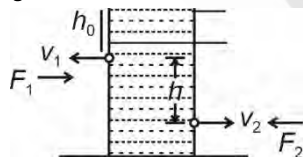
$$mS_B(36 - 20) = mS_A(60 - 36)$$

$$\Rightarrow \frac{S_A}{S_B} = \frac{16}{24} = \frac{4}{6} = \frac{2}{3}$$

9. Answer (2)

Hint: Net horizontal force is difference of thrust forces at two openings and $v_e = \sqrt{2gh}$

Sol.: Using torricelli's theorem



$$v_1 = \sqrt{2gh_0} \text{ and } v_2 = \sqrt{2g(h_0 + h)}$$

And thrust force = ρav^2 (a is area of openings)

$$\text{Net thrust force} = F_2 - F_1$$

$$= \rho av_2^2 - \rho av_1^2$$

$$= \rho a[v_2^2 - v_1^2]$$

$$= \rho a[2g(h_0 + h) - 2gh_0]$$

$$F_{\text{net}} = 2\rho agh$$

10. Answer (2)

Hint: Change in surface energy = increment in free surface \times surface tension

Sol.: Here change in free surface area = $2A$

$$\Delta U = 2A \times T$$

11. Answer (3)

Hint: Elastic potential energy will convert into kinetic energy.

$$\text{Sol.} \frac{1}{2}mv^2 = \frac{1}{2}kx^2 \left[\text{for rubber cord } K = \frac{YA}{l} \right]$$

$$\Rightarrow mv^2 = \frac{YA}{L}x^2$$

$$\Rightarrow v^2 = \frac{YA}{Lm}x^2 = \frac{5 \times 10^8 \times 10^{-6} \times (2 \times 10^{-2})^2}{10 \times 10^{-2} \times 50 \times 10^{-3}}$$

$$= \frac{5 \times 10^2 \times 4 \times 10^{-4}}{50 \times 10^{-4}}$$

$$= 40$$

$$\Rightarrow v = \sqrt{40} = 2\sqrt{10} \text{ m/s}$$

12. Answer (4)

Hint: Tension in string will be zero i.e., no restoring force therefore no vibration

Sol.: In this case $g_{\text{eff}} = 0$

$$\therefore T = 2\pi\sqrt{\frac{l}{g_{\text{eff}}}} = \infty$$

13. Answer (4)

Hint and Sol.: No. of beats = $n_1 - n_2$

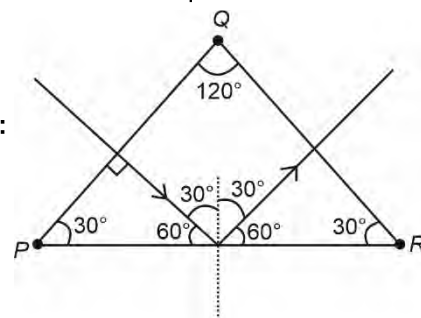
$$= 163 - 160$$

$$= 3$$

14. Answer (1)

Hint: Use the concept of total internal reflection.

Sol.:



The rays which will undergo TIR at PR will emerge from face QR .

$$\mu \times \sin 30^\circ = 1 \Rightarrow \mu_{\text{min}} = 2$$

i.e. $\mu \geq 2 \Rightarrow$ i.e. rays for which refractive index is greater than 2 will emerge from face QR .

15. Answer (4)

Hint: For electromagnet material, hysteresis loop area must be smaller. Therefore material should have low retentivity and low coercivity.

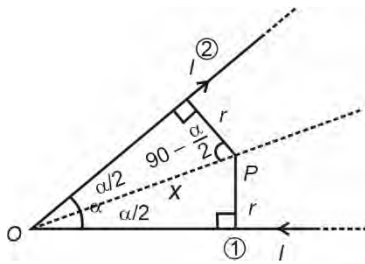
16. Answer (3)

Hint and Sol.: In the presence of external magnetic field the size of magnetic domains may increase or decrease.

17. Answer (3)

Hint: Use $B = \frac{\mu_0}{4\pi r} I [\sin\alpha + \sin\beta]$ for both section and then add the B .

Sol.: Refer the figure



Here $\sin \frac{\alpha}{2} = \frac{r}{x}$

$r = x \sin \frac{\alpha}{2} \dots(1)$

Now magnetic field B at P due to any one section

$$B = \frac{\mu_0}{4\pi r} \left[\sin \left(90 - \frac{\alpha}{2} \right) + \sin 90 \right]$$

$$= \frac{\mu_0}{4\pi} \frac{I}{x \sin \frac{\alpha}{2}} \left[\cos \frac{\alpha}{2} + 1 \right]$$

$$= \frac{\mu_0}{4\pi} \frac{I}{x \sin \frac{\alpha}{2}} 2 \cos^2 \left(\frac{\alpha}{4} \right)$$

$\left[\text{using } 1 + \cos \alpha = 2 \cos^2 \frac{\alpha}{2} \right]$

$$= \frac{\mu_0}{4\pi} \frac{I}{x} \frac{2 \cos^2 (\alpha / 4)}{2 \sin \frac{\alpha}{4} \cos \frac{\alpha}{4}}$$

$$= \frac{\mu_0}{4\pi} \frac{I}{x} \cot \left(\frac{\alpha}{4} \right) \otimes$$

Due to both wires it will be $\frac{\mu_0 I}{2\pi x} \cot \left(\frac{\pi}{4} \right) \otimes$

18. Answer (1)

Hint and Sol: Kirchhoff's Junction law is based upon conservation of charge and Kirchhoff's loop law follows conservative nature of electrostatic field.

19. Answer (1)

Hint: For not to strike, radius of circular path of charge 'q' should be less than half of the radius of solenoid.

Sol.: Radius of circular path

$$R = \frac{mv}{qB} \text{ and } B = \mu_0 ni$$

$$\Rightarrow R = \frac{r}{2}$$

$$v = \frac{\mu_0 q r ni}{2m}$$

20. Answer (1)

Hint: Two cells 5 V, 1 Ω and 10 V, 1 Ω can be considered parallel across points A and B and

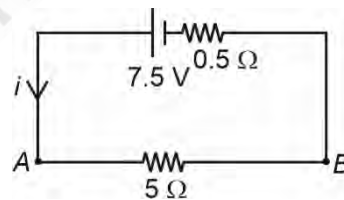
$$E_{eq} = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2} \text{ and } V = IR$$

$$r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$$

Sol.: Equivalent emf across A and B

$$E_{eq} = \frac{5 \times 1 + 10 \times 1}{1 + 1} = \frac{15}{2} = 7.5 \text{ volt}$$

$$r_{eq} = \frac{1 \times 1}{1 + 1} = \frac{1}{2} \Omega$$



$$i = \frac{V}{R} = \frac{7.5}{5 + 0.5} = \frac{7.5}{5.5} \text{ A}$$

Now, $V_{AB} = IR = \frac{7.5 \times 5}{5.5} = \frac{75}{11} \text{ volt}$

21. Answer (1)

Hint: Q value of reaction = Total BE of products – total BE of reactants

Sol.: $Q = 4x_2 - 4x_1$

$$= 4(x_2 - x_1)$$

22. Answer (2)

Hint: Use photoelectric equation**Sol.:**

$$e \times 3V_0 = \frac{hc}{\lambda} - \frac{hc}{\lambda_0} \quad \dots(i)$$

$$\text{and } e \times V_0 = \frac{hc}{2\lambda} - \frac{hc}{\lambda_0} \quad \dots(ii)$$

use (i) \div (ii)

$$\Rightarrow \frac{3}{1} = \frac{\frac{1}{\lambda} - \frac{1}{\lambda_0}}{\frac{1}{2\lambda} - \frac{1}{\lambda_0}}$$

$$\Rightarrow \frac{3}{2\lambda} - \frac{3}{\lambda_0} = \frac{1}{\lambda} - \frac{1}{\lambda_0}$$

$$\frac{3}{2\lambda} - \frac{1}{\lambda} = \frac{3}{\lambda_0} - \frac{1}{\lambda_0}$$

$$\Rightarrow \frac{(3-2)}{2\lambda} = \frac{2}{\lambda_0}$$

$$\Rightarrow \frac{1}{2\lambda} = \frac{2}{\lambda_0}$$

$$\Rightarrow \lambda_0 = 4\lambda$$

23. Answer (3)

Hint: In uniform electric field (E), $V = E \times d$

$$\text{Sol.} : 12 = E \times 5 \quad \dots(i)$$

$$V = E \times 2 \quad \dots(ii)$$

$$\Rightarrow \frac{V}{12} = \frac{2}{5} \Rightarrow V = \frac{24}{5} \text{ volt}$$

24. Answer (3)

$$\text{Hint: } KE = -\frac{PE}{2} = \frac{GMm}{2r}$$

$$\text{Sol.} : KE = \frac{GMm}{2\left(R + \frac{R}{20}\right)} = \frac{10GMm}{21R}$$

25. Answer (4)

Hint: $U = nC_V T$ and $C_V = \frac{5R}{2}$ for diatomic gas

$$\text{Sol.} : U = n \times \frac{5R}{2} T$$

$$= \frac{5}{2} (nRT) = \frac{5}{2} PV$$

$$= \frac{5}{2} \times 10^5 \times 10^{-3} \quad [1 \text{ litre} = 10^{-3} \text{ m}^3]$$

$$= \frac{500}{2} = 250 \text{ joule}$$

26. Answer (2)

Hint and Sol.: For adiabatic process(1) $Q = 0$ and from first law of thermodynamics, work done $W = -\Delta U$

$$\therefore W = \frac{-nR(T_2 - T_1)}{\gamma - 1}$$

and adiabatic process equation $PV^\gamma = \text{constant}$

27. Answer (3)

Hint: Energy density in magnetic field B

$$= \frac{B^2}{2\mu}$$

Sol.: Energy stored in solenoid
= Energy density \times volume

$$= \frac{B^2}{2\mu} \times Al$$

$$= \frac{B^2}{2 \times 3\mu_0} \times Al \quad [\because \mu = 3\mu_0]$$

$$= \frac{B^2 Al}{6\mu_0}$$

28. Answer (3)

Hint and Sol: Charge is invariant quantity.

Scalar quantities like mass, speed etc depend on frame of reference.

29. Answer (2)

$$\text{Hint: } \text{Energy density} = \frac{1}{2} Y \times (\text{strain})^2$$

$$\text{Sol.} : \text{Energy density} = \frac{1}{2} Y \times (\text{strain})^2$$

$$= \frac{1}{2} \times 1.0 \times 10^{11} \times (5 \times 10^{-3})^2$$

$$= \frac{10^{11}}{2} \times 25 \times 10^{-6}$$

$$= 12.5 \times 10^5 \text{ joule/m}^3$$

30. Answer (4)

Hint: Work done by force = change in KE

$$\text{Sol.} : W = \Delta K$$

$$\Rightarrow F \cdot S = \frac{1}{2} I \cdot \omega^2$$

$$\Rightarrow 10 \times 1 = \frac{1}{2} (mR^2) \omega^2$$

$$\Rightarrow 10 = \frac{1}{2} \times 5 \times \left(\frac{5}{100}\right)^2 \times \omega^2$$

$$\Rightarrow 10 = \frac{1}{2} \times 5 \times \frac{1}{400} \times \omega^2$$

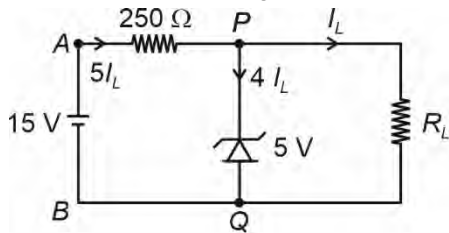
$$\Rightarrow \omega^2 = \frac{10 \times 2 \times 400}{5} = 4 \times 400$$

$$\Rightarrow \omega = 40 \text{ rad/s}$$

31. Answer (3)

Hint: Use KVL and $V = IR$

Sol.: Draw circuit diagram



For A to P, use $\Delta V = IR$

$$\Rightarrow (15 - 5) = 5I_L \times 250$$

$$\Rightarrow I_L = \frac{10}{5 \times 250} = \frac{2}{250} = \frac{8}{1000}$$

$$= 8 \text{ mA}$$

$$\text{Now } 5 = I_L R_L$$

$$\Rightarrow 5 = 8 \times 10^{-3} R_L$$

$$\Rightarrow R_L = \frac{5}{8} \times 10^3 = 625 \Omega$$

32. Answer (2)

Hint: $v_{\max} = \omega A$ and $A = \sqrt{a_1^2 + a_2^2 + 2a_1a_2 \cos \phi}$

$$\text{Sol. : } A = \sqrt{3^2 + 4^2 + 2 \times 3 \times 4 \times \cos \pi / 2}$$

$$= 5 \text{ cm}$$

$$v_{\max} = A \cdot \omega = 5 \times 5 \times 10^{-2}$$

$$= 0.25 \text{ m/s}$$

33. Answer (3)

Hint and Sol. : $\mu_r = 1 + \chi$

$$\Rightarrow \chi = \mu_r - 1 = \frac{\mu}{\mu_0} - 1$$

34. Answer (2)

Hint and Sol: Using the principle of dimensional homogeneity.

$$\Rightarrow \left[\frac{a}{V^2} \right] = [P] \Rightarrow [a] = [PV^2]$$

$$\text{And } [b] = [V]$$

$$\Rightarrow \left[\frac{b^2}{a} \right] = \left[\frac{V^2}{PV^2} \right] = \left[\frac{1}{P} \right] \rightarrow \text{compressibility}$$

35. Answer (2)

Hint: Use parallel axis theorem.

$$I = I_{\text{cm}} + Md^2$$

$$\text{Sol. : } I_{AB} = \frac{2}{5}MR^2 + M(2R)^2$$

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

$$= \frac{22}{5}MR^2$$

36. Answer (1)

Hint and Sol.: Energy stored = Charge flown \times Potential difference

$$= 3000 \times 10^{-3} \times 3 \times 3600$$

$$= 9 \times 36 \times 10^2$$

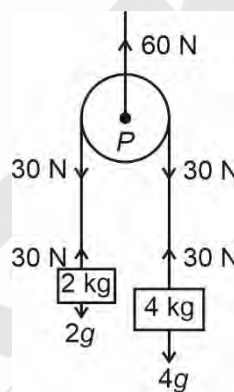
$$= 324 \times 10^2$$

$$= 3.24 \times 10^4 \text{ joule}$$

37. Answer (4)

Hint: Net force on an ideal pulley is zero.

Sol.: Draw FBD of blocks and pulley.



Acceleration of 2 kg block

$$a_2 = \frac{30 - 20}{2} = 5 \text{ m/s}^2 \uparrow$$

Acceleration of 4 kg block

$$a_4 = \frac{40 - 30}{4} = 2.5 \text{ m/s}^2 \downarrow$$

38. Answer (3)

Hint and Sol: For AC current if

$$I = A + B \sin \omega t$$

$$I_{\text{rms}} = \sqrt{A^2 + \left(\frac{B}{\sqrt{2}} \right)^2}$$

$$\therefore I_{\text{rms}} = \sqrt{3^2 + \left(\frac{\sqrt{32}}{\sqrt{2}} \right)^2}$$

$$= \sqrt{9 + 16} = 5 \text{ A}$$

39. Answer (4)

Hint and Sol.: Here both observers have either zero acceleration or same accelerations. As we know work done equals to change in KE, here ΔKE of block will be different for both observers therefore, work done, KE and total work done on block will not be same, but force observed by observers will be same. Therefore accelerations of block will be same for both the observers.

40. Answer (1)

Hint: Horizontal range $R = \frac{2 \times u_x u_y}{a_y}$

$$\text{Sol.: } R = \frac{2 \times 9.8 \times 19.6}{9.8} = 39.2 \text{ m}$$

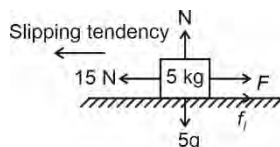
41. Answer (4)

Hint: Use equation of motion for uniform acceleration.

$$\text{Sol.: } t_0 = \sqrt{t_1 t_2} = \sqrt{2 \times 8} = 4 \text{ second}$$

42. Answer (4)

Hint: For F to be minimum, we should have maximum friction.

Sol.:

$$\Rightarrow 15 = f_f + F_{\min}$$

$$\Rightarrow 15 = \mu N + F_{\min}$$

$$\Rightarrow 15 = 0.2 \times 5g + F_{\min}$$

$$\Rightarrow 15 = 10 + F_{\min}$$

$$\Rightarrow F_{\min} = 5 \text{ N}$$

43. Answer (2)

$$\text{Hint: } \vec{F} = q(\vec{v} \times \vec{B})$$

Sol.: \vec{B} and \vec{v} are along axis of solenoid hence $\vec{v} \times \vec{B} = 0$

$$\therefore \vec{F} = 0 \Rightarrow \vec{a} = 0$$

i.e., velocity remain constant i.e. path will be straight line.

44. Answer (2)

$$\text{Hint: } S_{n^{\text{th}}} = u + \frac{a}{2}[2n - 1]$$

$$\text{Sol.: } 24 = u + \frac{a}{2}[2 \times 10 - 1]$$

$$24 = u + \frac{a}{2} \times 19$$

$$\Rightarrow 48 = 2u + 19a \quad \dots(i)$$

$$\text{and } 28 = u + \frac{a}{2}[2 \times 12 - 1]$$

$$28 = u + \frac{23a}{2}$$

$$\Rightarrow 56 = 2u + 23a \quad \dots(ii)$$

Use eq. (ii) – eq. (i)

$$\Rightarrow 8 = 4a$$

$$\Rightarrow a = 2 \text{ m/s}^2$$

45. Answer (3)

$$\text{Hint: } \frac{C}{5} = \frac{F - 32}{9}$$

$$\text{Sol.: } 9C = 5F - 160$$

$$\Rightarrow 5F = 9C + 160$$

$$\Rightarrow F = \frac{9}{5}C + \frac{160}{5}$$

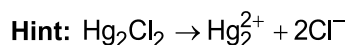
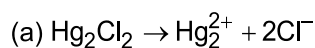
$$\Rightarrow \Delta F = \frac{9}{5} \Delta C + 0$$

$$\Rightarrow \Delta F = \frac{9}{5} \Delta C$$

$$\Rightarrow \Delta F = \frac{9}{5} \times 25 = 45^\circ \text{F}$$

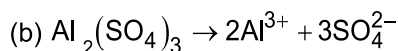
[CHEMISTRY]

46. Answer (1)

**Sol.:**

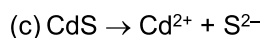
$$K_{\text{sp}} = [\text{Hg}_2^{2+}][\text{Cl}^-]^2 = S \times (2S)^2 = (4S)^3$$

$$S = \left(\frac{K_{\text{sp}}}{4}\right)^{\frac{1}{3}}$$

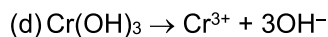


$$K_{\text{sp}} = [\text{Al}^{3+}]^2 [\text{SO}_4^{2-}]^3 = (2S)^2 \times (3S)^3 = 108 S^5$$

$$S = \left(\frac{K_{\text{sp}}}{108}\right)^{\frac{1}{5}}$$



$$K_{sp} = S^2 \Rightarrow S = (K_{sp})^{1/2}$$



$$K_{sp} = [\text{Cr}^{3+}][\text{OH}^-]^3 = S \times (3S)^3 = 27 S^4$$

$$S = \left(\frac{K_{sp}}{27}\right)^{1/4}$$

47. Answer (1)

$$\text{Hint: Average atomic mass} = \frac{(\%)_1 M_1 + (\%)_2 M_2}{100}$$

$$\text{Sol.: Average atomic mass} = \frac{20 \times 10 + 80 \times 11}{100} = 10.8 \text{ u}$$

48. Answer (3)

Hint: Minimum mass of sulphur possible in a compound is 32 u

$$\text{Sol.: } \% \text{ of an element} = \frac{\text{Weight of element}}{\text{Molecular weight of compound}} \times 100$$

$$2 = \frac{32}{M} \times 100$$

$$M = 1600 \text{ u}$$

49. Answer (4)

$$\text{Hint: } r_n = \frac{0.529 n^2}{Z} \text{ \AA}$$

$$\text{Sol.: } \frac{r_{\text{He}^+}}{r_{\text{Li}^{2+}}} = \frac{0.529 \times \frac{2^2}{2}}{0.529 \times \frac{3^2}{3}}$$

$$\frac{r_{\text{He}^+}}{r_{\text{Li}^{2+}}} = \frac{2}{3}$$

50. Answer (4)

$$\text{Hint: } \lambda = \frac{h}{mv}$$

$$\text{Sol.: } \lambda = \frac{6.626 \times 10^{-34}}{10 \times 10^{-3} \times 10^3} = 6.626 \times 10^{-35} \text{ m}$$

51. Answer (1)

Hint: O has least negative electron gain enthalpy.

Sol.: Ne has highest positive electron gain enthalpy among group 18 elements.

52. Answer (2)

Hint: First Ionization enthalpy of N > O

Sol.:

$$\text{C} \rightarrow 1086 \text{ kJ mol}^{-1}$$

$$\text{N} \rightarrow 1402 \text{ kJ mol}^{-1}$$

$$\text{O} \rightarrow 1314 \text{ kJ mol}^{-1}$$

$$\text{F} \rightarrow 1681 \text{ kJ mol}^{-1}$$

53. Answer (4)

Hint: BF_3 has three 120° bond angles

Sol.: Molecule Bond angle

$$\text{CH}_4 \quad 109.5^\circ$$

$$\text{NH}_3 \quad 107^\circ$$

$$\text{H}_2\text{O} \quad 104.5^\circ$$

54. Answer (3)

Hint: B_2 and O_2 have unpaired electrons so they are paramagnetic.

$$\text{Sol.: Bond order of } \text{O}_2^+ = \frac{1}{2}(10 - 5) = 2.5$$

$$\text{Bond order of } \text{N}_2^+ = \frac{1}{2}(9 - 4) = 2.5$$

55. Answer (2)

$$\text{Hint: At constant T, } \Delta S = 2.303nR \log \frac{P_1}{P_2}$$

$$\text{Sol.: } \Delta S = 2 \times R \times 2.303 \times \log \frac{3}{1} = 4.606 \times R \times 0.4771 \approx 2.2 R$$

56. Answer (2)

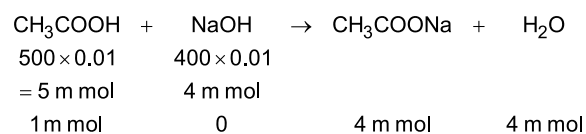
Hint: $\Delta G = \Delta H - T\Delta S$

Sol.: $T\Delta S_{\text{sys}}$ is the energy which is not available to do useful work.

If $\Delta H = -ve$ and $\Delta S = +ve$, then $\Delta G = -ve$ at all temperatures.

57. Answer (1)

$$\text{Hint: } \text{pH} = \text{pK}_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$$

Sol.:

$$\text{pH} = 4.76 + \log \frac{4}{1}$$

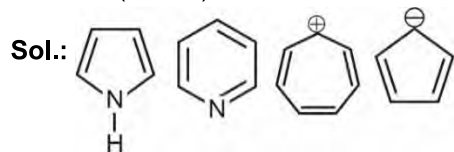
$$= 4.76 + \log 2^2$$

$$= 4.76 + 2 \times 0.3$$

$$= 5.36$$

58. Answer (3)

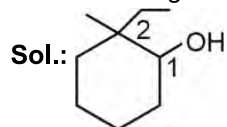
Hint: An aromatic species is cyclic, planar and contains $(4n + 2)\pi$ delocalised electrons.



are aromatic species

59. Answer (3)

Hint: $-\text{OH}$ is given priority as functional group.



2-Ethyl-2-methylcyclohexan-1-ol

60. Answer (1)

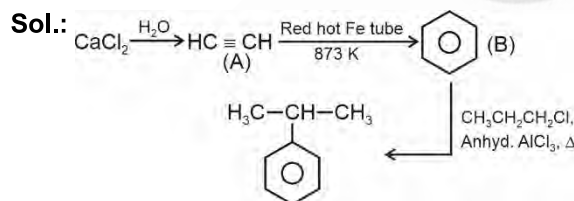
Hint: Percentage of Br

$$= \frac{\text{Atomic mass of Br} \times \text{Mass of AgBr}}{\text{Molecular mass of AgBr} \times \text{Total mass of organic compound}} \times 100$$

$$\begin{aligned} \text{Sol.: } \% \text{ Br} &= \frac{80 \times 0.188 \times 100}{188 \times 0.4} \\ &= 20\% \end{aligned}$$

61. Answer (2)

Hint: Acetylene undergoes cyclic polymerisation to form benzene.



62. Answer (3)

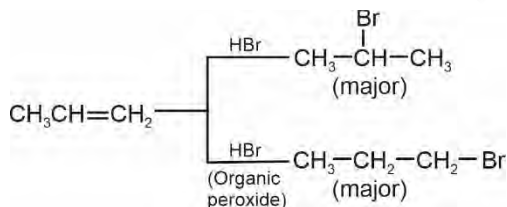
Hint: Allyl free radical is more stable than benzyl free radical.

Sol.: $-\text{COOH}$, $-\text{CHO}$, $-\text{CN}$ show $-\text{R}$ effect when attached with benzene ring.

63. Answer (1)

Hint: In presence of organic peroxide, anti Markovnikov addition takes place.

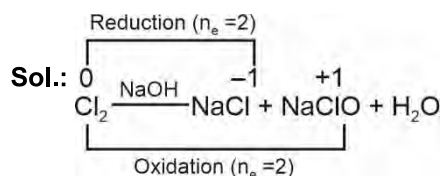
Sol.:



P and Q are structural isomers of each other and both are achiral molecules. Both P & Q form $\text{CH}_3-\text{CH}=\text{CH}_2$ on heating with alcoholic KOH

64. Answer (1)

Hint: Equivalent mass = $\frac{\text{Molar mass}}{n \text{ factor}}$



$$n \text{ factor} = \frac{2 \times 2}{2 + 2} = 1$$


$$\text{Equivalent mass} = \frac{71}{1} = 71$$

65. Answer (2)

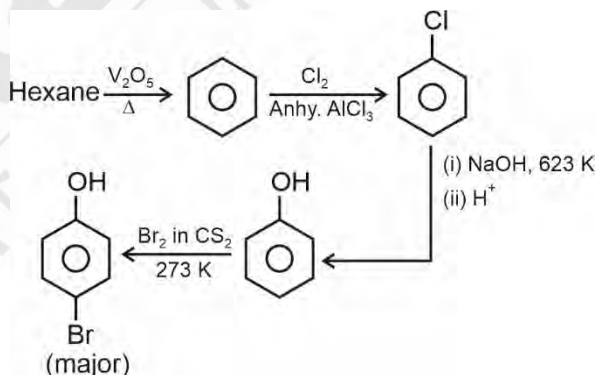
Hint: In a disproportionation reaction an element in one oxidation state is simultaneously oxidised and reduced.

Sol.: In reaction $2\text{F}_2 + 2\text{OH}^- \rightarrow 2\text{F}^- + \text{OF}_2 + \text{H}_2\text{O}$, no element is simultaneously oxidised and reduced, so it is not a disproportionation reaction.

66. Answer (2)

Hint: n-Hexane in the presence of V_2O_5 at 773 K temperature and 10-20 atm pressure forms 

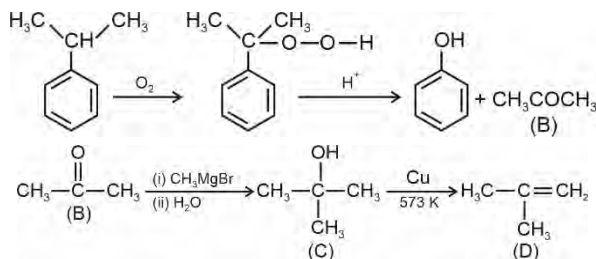
Sol.:



67. Answer (1)

Hint: Cumene is oxidised in the presence of O_2 to form cumene peroxide

Sol.:



68. Answer (4)

Hint: Electron withdrawing group increases the acidic strength of carboxylic acid.

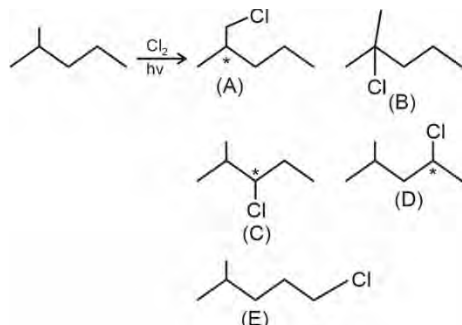
Sol.:

Correct order of acidic strength of species is : NC – CH₂COOH > HCOOH > ClCH₂CH₂COOH > C₆H₅COOH

69. Answer (3)

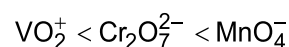
Hint: Monochlorination of 2-Methylpentane also leads to the formation of optical isomers.

Sol.:



70. Answer (2)

Hint & Sol.: The oxidising power follows the order



This is due to the increasing stability of the lower species in which they are reduced.

71. Answer (4)

Hint: La³⁺ and Ce⁴⁺ have 4f⁰ configuration.

Sol.: Ac and Th show +3 and +4 oxidation state respectively.

72. Answer (3)

Hint: Due to the presence of strong field ligand, the splitting of t_{2g} and e_g level would be more and it results in absorption of light of shorter wavelength.

Sol.: Coordination entity wavelength of light absorbed (nm)

[CoCl(NH ₃) ₅] ²⁺	535
[Co(NH ₃) ₅ (H ₂ O)] ³⁺	500
[Co(NH ₃) ₆] ³⁺	475
[Co(CN) ₆] ³⁻	310

73. Answer (3)

Hint: Spin only magnetic moment, $\mu = \sqrt{n(n+2)}$ BM

Sol.: [MnBr₄]²⁻ → n = 5, $\mu = 5.9$ BM

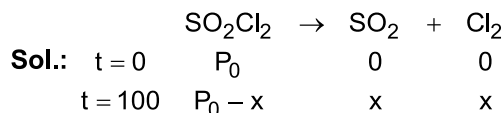
[Fe(CN)₆]³⁻ → n = 1, $\mu = 1.7$ BM

[Fe(CN)₆]⁴⁻ → n = 0, $\mu = 0$

[CoF₆]³⁻ → n = 4, $\mu = 4.9$ BM

74. Answer (3)

Hint: Rate = k × P_{SO₂Cl₂}



$$P_0 + x = P_T$$

$$0.4 + x = 0.5$$

$$x = 0.1 \text{ atm}$$

$$k = \frac{2.303}{t} \log \frac{P_0}{P_t} = \frac{2.303}{100} \log \frac{0.4}{0.3}$$

$$k = \frac{2.303}{100} (\log 4 - \log 3)$$

$$= \frac{2.303}{100} (2 \times 0.3010 - 0.477)$$

$$= \frac{2.303}{100} (0.6020 - 0.477)$$

$$= 2.303 \times 0.125 \times 10^{-2}$$

$$= 2.87 \times 10^{-3} \text{ s}^{-1}$$

$$\text{Rate} = k \times P_{\text{SO}_2\text{Cl}_2}$$

$$= 2.87 \times 10^{-3} \times 0.25$$

$$= 0.7175 \times 10^{-3}$$

$$= 7.175 \times 10^{-4} \text{ atm s}^{-1}$$

75. Answer (1)

Hint: A is pre exponential factor in Arrhenius equation

$$k = A e^{-E_a/RT}$$

$$\text{Sol.: $\log k = \log A - \frac{E_a}{2.303RT}$$$

$$\log A = \log k + \frac{E_a}{2.303RT}$$

$$\log A = \log 2 \times 10^{-5} + \frac{57.441}{8.314 \times 2.303 \times 300}$$

$$= (-5 + 0.3) + \frac{57.441}{5744.1}$$

$$\therefore A = 2 \times 10^{-5}$$

76. Answer (2)

$$\text{Hint: } E_{\text{H}^+/\text{H}_2} = E_{\text{H}^+/\text{H}_2}^\circ - \frac{0.059}{2} \log \frac{P_{\text{H}_2}}{[\text{H}^+]^2}$$

$$\text{Sol.: } E_{\text{H}^+/\text{H}_2}^\circ = 0, P_{\text{H}_2} = 1 \text{ bar}$$

$$E_{\text{H}^+/\text{H}_2} = 0 - \frac{0.059}{2} \log \frac{1}{[\text{H}^+]^2}$$

$$= \frac{-0.059}{2} [\log 1 - 2 \log(\text{H}^+)]$$

$$= \frac{-0.059}{2} (0 + 2 \text{ pH})$$

$$= \frac{-0.059}{2} \times 2 \times 2$$

$$= -0.118 \text{ V}$$

77. Answer (2)

$$\text{Hint: } \Lambda_m^\circ \text{CH}_3\text{COOH} = \lambda_m^\circ \text{CH}_3\text{COO}^- + \lambda_m^\circ \text{H}^+$$

Sol.:

$$\Lambda_m^\circ \text{CH}_3\text{COOH} = \Lambda_m^\circ(\text{HCl}) + \Lambda_m^\circ(\text{NaAc}) - \Lambda_m^\circ(\text{NaCl})$$

$$= (425.9 + 91.0 - 126.4) \text{ S cm}^2 \text{ mol}^{-1}$$

$$= 390.5 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\alpha = \frac{\Lambda_m(\text{CH}_3\text{COOH})}{\Lambda_m^\circ(\text{CH}_3\text{COOH})} = \frac{13}{390.5} = 0.033$$

$$\% \text{ degree of dissociation} = 0.033 \times 100 = 3.3\%$$

78. Answer (1)

Hint: In case of negative deviation from Raoult's law, the intermolecular attractive forces between A – A and B – B are weaker than those between A – B.

Sol.: Solution of CH_3COCH_3 and CHCl_3 shows negative deviation from Raoult's law.

Solution of $\text{C}_6\text{H}_5\text{NH}_2$ and $\text{C}_6\text{H}_5\text{OH}$ shows negative deviation from Raoult's law.

Solution of CH_3COCH_3 and CS_2 shows positive deviation from Raoult's law.

Solution of CH_3COCH_3 and $\text{C}_2\text{H}_5\text{OH}$ shows positive deviation from Raoult's law.

79. Answer (4)

$$\text{Hint: } P_T = X_A P_A^\circ + X_B P_B^\circ$$

$$Y_A = \frac{X_A P_A^\circ}{P_T}$$

$$\text{Sol.: } P_A = P_A^\circ X_A = 250$$

$$X_A = \frac{250}{400} = \frac{5}{8}$$

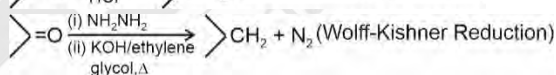
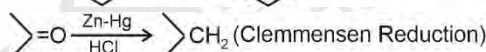
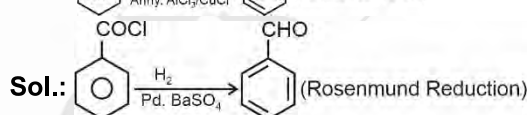
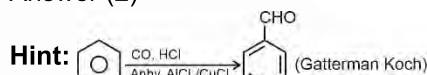
$$X_B = \frac{3}{8}$$

$$Y_A = \frac{250}{400 \times \frac{5}{8} + 200 \times \frac{3}{8}} = \frac{250}{250 + 75} = \frac{250}{325} = \frac{10}{13}$$

$$Y_B = \frac{3}{13}$$

$$\text{Molar ratio} = \frac{Y_A}{Y_B} = \frac{10/13}{3/13} = \frac{10}{3}$$

80. Answer (2)



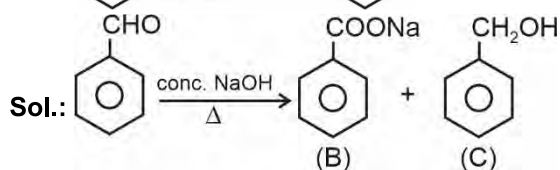
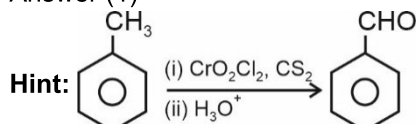
81. Answer (2)

Hint: AlCl_3 is a Lewis acid and used as catalyst in Friedel-Crafts reactions.

Sol.: In , $-\text{COOH}$ group is

deactivating group and gets bonded with Lewis acid in Friedel-Crafts reaction.

82. Answer (1)



83. Answer (2)

Hint: Group reagent for Fe^{3+} is NH_4OH in presence of NH_4Cl

Sol.: $\text{Cu}^{2+} \rightarrow \text{H}_2\text{S}$ gas in presence of dil. HCl

$\text{Sr}^{2+} \rightarrow (\text{NH}_4)_2\text{CO}_3$ in presence of NH_4OH

$\text{Zn}^{2+} \rightarrow \text{H}_2\text{S}$ in presence of NH_4OH

95. Answer (1)
Hint: Centriole duplication occurs in S-phase.
Sol.: Meiosis II is initiated immediately after cytokinesis, usually before the chromosomes have fully elongated. Yeast can progress through cell cycle in only about 90 minutes.
96. Answer (3)
Hint: Variations and new genetic combinations are produced by crossing over.
Sol.: Meiosis helps in introducing variations and formation of new genetic combinations.
97. Answer (4)
Hint: Smaller and larger subunits unite to form a ribosome. At higher Mg^{+} concentration, two ribosomes unite to form a dimer.
Sol.: r-RNA is formed in nucleolus. Ribosomes are found in all living cells.
98. Answer (3)
Hint: Monocot stem lacks endodermis.
Sol.:
 Dicot root – Presence of pericycle that gives rise to vascular cambium and cork cambium.
 Monocot stem – Has scattered conjoint, closed vascular bundles.
 Monocot root – Presence of casparian strips in the endodermis and polyarch vascular bundles.
 Dicot stem – Has parenchymatous pith and collenchymatous hypodermis.
99. Answer (3)
Hint: Both mitochondria and chloroplasts utilise chemiosmotic model for ATP synthesis.
Sol.: In mitochondria, oxidation reduction of molecules drives ATP synthesis, while in chloroplast, light energy does the same. In mitochondria, final electron accept is O_2 while in chloroplast, its $NADPH + H^{+}$.
100. Answer (2)
Hint: In the seed of pepper, persistent nucellus is called perisperm.
Sol.: Aggregate fruits develop from polycarpellary, apocarpous ovary of a single flower.
101. Answer (4)
Hint: If one margin of the appendage overlaps that of the next one in a particular direction, it is called twisted aestivation.
Sol.: Twisted aestivation is observed in cotton.
102. Answer (3)
Hint: Gemmae are found in liverworts.
Sol.: Liverworts (*Marchantia*) reproduce using green, multicellular, asexual buds called gemmae.
103. Answer (2)
Hint: Some pteridophytes are heterosporous vascular cryptogams.
Sol.: In Mosses, spores on liberation germinate into filamentous stage called protonema. Spore mother cells undergo meiosis to form spores. Both bryophytes and pteridophytes are found in damp and shady places and consist of antheridia and archegonia. Sporophytes are dependent on gametophytes in bryophytes.
104. Answer (4)
Hint: Bacteria are characterised by the presence of a rigid cell wall.
Sol.: *Mycoplasma*, *Euglena* and *Plasmodium* are devoid of cell wall.
105. Answer (3)
Hint: Wheat belongs to the class Monocotyledonae.
Sol.: Order of wheat is Poales.
106. Answer (3)
Hint: Constriction of arterioles increases blood pressure
Sol.: Angiotensin II is a very potent vasoconstrictor and increases blood pressure and thus GFR. Cells in the atria of the heart secrete atrial natriuretic factor (ANF). Stretching of the atria occurs when blood volume increases, this stimulates the secretion of ANF. ANF increases GFR by dilating afferent arteriole to increase amount of blood for filtration and relaxation of mesangial cells to increase surface area for filtration.
107. Answer (4)
Hint: The total number of cervical vertebrae in an adult human is 7.
Sol.: The vertebral column is differentiated into cervical (7), thoracic (12), lumbar (5), sacral (1-fused) and coccygeal (1-fused) regions starting from the skull.
 Each middle ear contains three tiny bones – malleus, incus and stapes, collectively called ear ossicles.
 The facial region is made up of 14 skeletal elements which form the front part of the skull.

108. Answer (1)

Hint: Athletes have stronger heart muscles.

Sol.: One of the differences between untrained individuals and trained athletes is that the athletes have lower heart rates, greater end-systolic ventricular volume, and greater stroke volume at rest. In athletes, end diastolic volume is increased due to increase in heart size, so stroke volume is much more than the normal in spite of more end systolic volume than a normal person.

109. Answer (2)

Hint: High pH leads to the left shift of the oxygen dissociation curve.

Sol.: In the alveoli, where there is high pO_2 , low pCO_2 , lesser H^+ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin, whereas in the tissues, where low pO_2 , high pCO_2 , high H^+ concentration and higher temperature exist, the conditions are favourable for dissociation of oxygen from the oxyhaemoglobin.

110. Answer (3)

Hint: 'X' – Proteins

Sol.: Proteins form 10-15% of the total cellular mass. Glucagon is a proteinaceous hormone. Myoglobin, collagen and RuBisCO are proteins while inulin is a homopolysaccharide.

111. Answer (4)

Hint: All of them are chordates.

Sol.: *Columba* belongs to the class Aves. *Canis* belongs to the class Mammalia and *Carcharodon* belongs to the class Chondrichthyes. All of them are chordates and are fundamentally characterised by the presence of a notochord, a dorsal and hollow nerve cord and paired pharyngeal gill slits. Birds and mammals exhibit complete double circulation while cartilaginous fishes exhibit single circulation.

Notochord is persistent throughout the life in cartilaginous fishes.

112. Answer (2)

Hint: Alternation of generation

Sol.: There are some cnidarians which exist in both forms *i.e.*, polyp and medusa. They exhibit alternation of generation (Metagenesis), *i.e.*, polyps produce medusae asexually and medusae form the polyps sexually (*e.g.*, *Obelia*).

In some animals, the body is externally and internally divided into segments with a serial

repetition of at least some organs. This pattern is called metameric segmentation and the phenomenon is known as metamerism.

Metastasis is the characteristic property of malignant tumors.

Moulting is a process where animals shed their exoskeleton.

113. Answer (1)

Hint: Frogs are ureotelic in nature.

Sol.: Both humans and frogs excrete urea and thus are ureotelic animals. Humans possess cerebellar hemispheres and salivary glands while these structures are absent in frogs.

The frog's heart has three chambers, two atria and one ventricle and is covered by a membrane called pericardium. Human's heart is protected by a double walled membranous bag, pericardium, enclosing the pericardial fluid.

114. Answer (4)

Hint: Exclude the features associated with forewings

Sol.: The first pair of wings arises from mesothorax and the second pair from metathorax. Forewings (mesothoracic) called tegmina are opaque, dark and leathery and cover the hind wings when at rest. The hind wings are transparent, membranous and are used in flight.

115. Answer (4)

Hint: Eliminate the locations of cartilage

Sol.: Cartilage is present in the tip of nose, outer ear joints, between adjacent bones of the vertebral column, limbs and hands in adults. Limb bones, such as the long bones of the legs, serve weight-bearing functions. The articular cartilage of long bones have chondrocytes but shaft of long bones does not contain chondrocytes.

116. Answer (3)

Hint: Euchromatin is a transcriptionally active form of chromatin.

Sol.: Euchromatin has loosely packed chromatin as compared to heterochromatin, which is densely packed chromatin. Heterochromatin is absent in prokaryotes.

117. Answer (4)

Hint: Given pedigree shows the inheritance pattern of autosomal recessive disorder.

Sol.: In autosomal recessive disorder, unaffected parent can have affected progeny (Genotype of III-1 (Aa) and III-7 (aa)). The progeny of III-1 and III-7 can be non-affected.

118. Answer (4)

Hint: Thalassemia is a quantitative blood problem of synthesising too few globin molecules.

Sol.: α -thalassemia is autosomal recessive disorder, caused due to deletion or mutation of HBA1 and HBA2 gene.

119. Answer (3)

Hint: There are many traits which are not distinct in their occurrence and are spread across a gradient.

Sol.: In polygenic inheritance, extreme phenotypes are less frequent but intermediate ones are more frequent.

120. Answer (4)

Hint: Fragrance is a cue, not a reward.

Sol.: Freshwater plants like *Vallisneria* show epihydrophyly. Cleistogamous flowers do not require pollinating agents.

121. Answer (2)

Hint: Given diagram represent L.S. of an embryo of grass.

Sol.: In the given figure A, B, C and D represent scutellum, coleoptile, epiblast and coleorhiza respectively.

122. Answer (1)

Hint: Cytochrome *c* acts as a mobile carrier for transfer of electron between complex III and IV.

Sol.: Complex IV of ETS contains cyt *a* and *a*₃ along with two copper centres.

123. Answer (4)

Hint: This stage is marked by terminalisation of chiasmata.

Sol.: Diakinesis is associated with the disintegration of the nuclear envelope.

124. Answer (3)

Hint: They are small bristle-like fibres sprouting out of the cell.

Sol.: Fimbriae are surface structures of bacteria, which have a role in attachment and adhesion.

125. Answer (2)

Hint: Under favourable conditions, bacteria reproduce mainly by fission.

Sol.: *Agaricus*, being a member of basidiomycetes, have basidium in which karyogamy and meiosis takes place.

126. Answer (3)

Hint: In racemose inflorescence, flowers are borne in acropetal succession.

Sol.: In racemose inflorescence, the shoot axis grows indefinitely.

127. Answer (2)

Hint: The leaves in gymnosperms are well adapted to extremes of temperatures, humidity and wind.

Sol.: *Equisetum* produces same kind of spores, hence female gametophyte is not formed.

128. Answer (4)

Hint: Rust disease in wheat is caused by *Puccinia*, member of class Basidiomycetes.

Sol.: Sex organs are absent in basidiomycetes (*Puccinia*).

129. Answer (2)

Hint: Centrosome is made up of two centrioles, arranged perpendicularly.

Sol.: Every chromosome essentially has a primary constriction or centromere.

130. Answer (3)

Hint: Methionine is the precursor of ethylene.

Sol.: Early and quicker maturity of conifers is caused by gibberellin. Rest all are the functions of ethylene.

131. Answer (3)

Hint: Opioids are depressants.

Sol.: Morphine is a very effective sedative and painkiller, and is very useful in patients who have undergone surgery. Excessive dosage of cocaine causes hallucinations. Other well known plants with hallucinogenic properties are *Atropa belladonna* and *Datura*.

132. Answer (1)

Hint: Exclude the Australian marsupials.

Sol.: Placental mammals in Australia exhibit adaptive radiation in evolving into varieties of placental mammals each of which appears to be 'similar' to a corresponding marsupial. Anteater, bobcat, flying squirrel and lemur are examples of placental mammals while koala, wombat and numbat are examples of Australian marsupials.

133. Answer (3)

Hint: Caused by HPV

Sol.: Except for hepatitis-B, genital herpes and HIV infections, other sexually transmitted diseases like syphilis, genital herpes, chlamydiosis, genital warts, trichomoniasis, etc., are completely curable if detected early and treated properly.

134. Answer (1)

Hint: Notochord is persistent in cephalochordates.

Sol.: The digestive tract of birds and arthropods have additional chambers, the crop and gizzard. *Corvus* is a bird while *Culex* is an arthropod. Mammals are viviparous with few exceptions (*Ornithorhynchus*) and they show direct development. Notochord is persistent in cephalochordates, cyclostomes and cartilaginous fishes. In protochordates, notochord is not replaced by vertebral column.

135. Answer (3)

Hint: Can cross the plasma membrane

Sol.: On the basis of their chemical nature, hormones can be divided into groups :

- (i) Peptide, polypeptide, protein hormones (e.g., insulin, glucagon, pituitary hormones, hypothalamic hormones, etc.)
- (ii) Steroids (e.g., cortisol, testosterone, estradiol and progesterone)
- (iii) Iodothyronines (thyroxine)
- (iv) Amino-acid derivatives (e.g., epinephrine).

136. Answer (4)

Hint: Involves use of tentacles

Sol.: *Hydra* can use its tentacles for capturing its prey and also use them for locomotion. Flagellar movement helps in the swimming of spermatozoa, maintenance of water current in the canal system of sponges and in locomotion of Protists like *Euglena*.

137. Answer (4)

Hint: Have only one afferent process.

Sol.: Based on the number of axon and dendrites, the neurons are divided into three types, i.e., multipolar (with one axon and two or more dendrites; found in the cerebral cortex), bipolar (with one axon and one dendrite, found in the retina of eye) and unipolar (cell body with one axon only; found usually in the embryonic stage).

138. Answer (1)

Hint: *Labeo* is a fresh water fish while *Carcharodon* is a marine fish.

Sol.: Mammals, many terrestrial amphibians and marine fishes mainly excrete urea and are called ureotelic animals. Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water and are called uricotelic animals. Ammonia is the most toxic form of nitrogenous waste and requires large amount of water for its elimination, whereas uric acid, being the least toxic, can be removed with a minimum loss of water. Ureotelic animals loss moderate amount of water for excretion of their nitrogenous waste products.

139. Answer (2)

Hint: A type of granulocyte

Sol.: Neutrophils, eosinophils and basophils are different types of granulocytes, while lymphocytes and monocytes are the agranulocytes. Neutrophils are the most abundant cells (60-65 per cent) of the total WBCs and basophils are the least (0.5-1 per cent) among them. Neutrophils and monocytes (6-8 per cent) are phagocytic cells which destroy foreign organisms entering the body.

140. Answer (3)

Hint: A healthy human breathes 12-16 times/minute.

Sol.: On an average, a healthy human breathes 12-16 times/minute. Functional Residual Capacity is the volume of air that will remain in the lungs after a normal expiration. This includes ERV+RV (2100-2300 mL). Vital Capacity (VC) includes ERV, TV and IRV (4000-4600 mL). The solubility of CO₂ in blood plasma is 20-25 times higher than that of O₂.

141. Answer (2)

Hint: Lecithin

Sol.: Some lipids have phosphorous and a phosphorylated organic compound in them. These are phospholipids. They are found in cell membrane. Lecithin is one example.

142. Answer (1)

Hint: Presence of three germinal layers

Sol.: *Ascaris* is an aschelminth. *Nereis* is an annelid. *Bombyx* is an arthropod and *Aplysia* is a mollusc.

All of these organisms are bilaterally symmetrical. *Ascaris* and *Aplysia* are not metamerically segmented. *Ascaris* is a pseudocoelomate.

143. Answer (4)

Hint: Function of hepatic caeca

Sol.: A ring of 6-8 blind tubules called hepatic or gastric caecae is present at the junction of foregut and midgut, which secretes digestive juice. At the junction of midgut and hindgut is present another ring of 100-150 yellow coloured thin filamentous Malpighian tubules. They help in removal of excretory products from haemolymph. Crop is responsible for storage of food and gizzard causes grinding of food.

144. Answer (1)

Hint: Brush bordered epithelium possesses microvilli at its free surface.

Sol.: The epithelium of proximal convoluted tubule (PCT) of nephron in the kidney has microvilli. The columnar epithelium is found in the lining of stomach and intestine and helps in secretion and absorption. The squamous epithelium is present in the parietal layer of Bowman's capsule.

145. Answer (1)

Hint: All transformants are not recombinants.

Sol.: If one ligates a foreign DNA at the *Sa*I site present in tetracycline resistance gene of the vector pBR322, the recombinant plasmids will lose tetracycline resistance due to insertion of foreign DNA but can still be selected out from non-recombinant ones by plating the transformants on tetracycline containing medium. The transformants growing on ampicillin containing medium are then transferred on a medium containing tetracycline. The recombinants will grow in ampicillin containing medium but not on that containing tetracycline. But, non-recombinants will grow on the medium containing both these antibiotics.

146. Answer (3)

Hint: Exclude the retrovirus

Sol.: Using *Agrobacterium* vectors, transgenic tobacco were created. *Agrobacterium tumefaciens*, a pathogen of several dicot plants is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a tumor and direct these tumor cells to produce the chemicals required by the pathogen. The tumor inducing (*Ti*) plasmid of *Agrobacterium tumefaciens* has now been modified into a cloning vector which is no more pathogenic to the plants but is still able to use the mechanisms to deliver genes of our interest into a variety of plants.

147. Answer (2)

Hint: X is a hyperglycemic and Y is a sex hormone

Sol.: The process of childbirth is called parturition which is induced by a complex neuroendocrine mechanism involving cortisol, estrogens and oxytocin.

Estrogens produce wide ranging actions such as stimulation of growth and activities of female secondary sex organs, development of growing ovarian follicles, appearance of female secondary sex characters (e.g., high pitch of voice, etc.) and mammary gland development. Estrogens also regulate female sexual behaviour.

Estrogen is steroidal in nature.

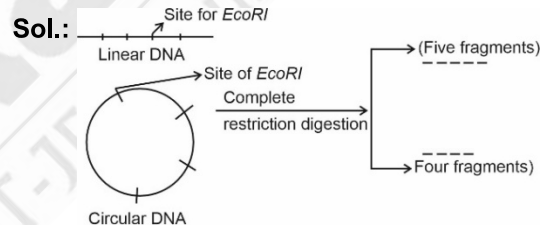
148. Answer (4)

Hint: Exclude the genetically modified plants.

Sol.: In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre). The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow-milk. Bt toxin gene has been cloned from the bacteria and been expressed in plants to provide resistance against insects without the need for insecticides; in effect created a bio-pesticide.

149. Answer (3)

Hint: Number of fragments generated in circular DNA = No. of restriction sites present



150. Answer (2)

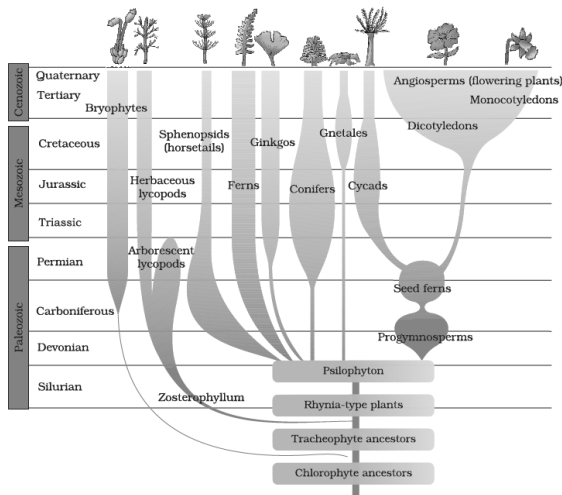
Hint: *Haemophilus influenzae* is responsible for the disease pneumonia.

Sol.: Bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for the disease pneumonia in humans which infects the alveoli (air filled sacs) of the lungs. Rhino viruses cause one of the most infectious human ailments – the common cold. They infect the nose and respiratory passage but not the lungs. A healthy person acquires both the infections by inhaling the droplets/aerosols released by an infected person or even by sharing glasses and utensils with an infected person.

151. Answer (1)

Hint: Exclude the direct descendants of Psilophyton

Sol.:



152. Answer (4)

Hint: Semen is artificially introduced in uterus.

Sol.: Infertility cases either due to inability of the male partner to inseminate the female or due to very low sperm counts in the ejaculates, could be corrected by artificial insemination (AI) technique. In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus (IUI – Intra-Uterine Insemination) of the female.

ZIFT involves transfer of embryo (with upto 8 blastomeres) into the fallopian tube.

153. Answer (2)

Hint: Fraternal twins are also known as non-identical twins.

Sol.: At puberty, only 60,000-80,000 primary follicles are left in each ovary. Moderate levels of estrogens in the blood inhibit both the release of GnRH by the hypothalamus and secretion of LH and FSH by the anterior pituitary. Secretions of male accessory glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes. Fraternal twins are also known as dizygotic twins.

154. Answer (3)

Hint: Produces the hormone which is antagonistic to calcitonin.

Sol.: The parathyroid glands secrete a peptide hormone called parathyroid hormone (PTH). Parathyroid hormone (PTH) increases the Ca^{2+} levels in the blood. PTH acts on bones and stimulates the process of bone resorption (dissolution/ demineralisation). Thyroxine supports the process of red blood cell formation. Melatonin produced by pineal gland influences metabolism, pigmentation, the menstrual cycle as well as our defense capability.

155. Answer (1)

Hint: Function of midbrain

Sol.: The midbrain is located between the thalamus/hypothalamus of the forebrain and pons of the hindbrain. The midbrain receives and integrates visual, tactile and auditory inputs. The cerebellum integrates information received from the semicircular canals of the ear and the auditory system. Hypothalamus controls the body temperature, eating and drinking.

Limbic system along with the hypothalamus regulates sexual behaviour and autonomic responses.

156. Answer (1)

Hint: Transfer of energy within an ecosystem is not 100% efficient.

Sol.: Ecosystems are not exempted from the second law of thermodynamics. They need a constant supply of energy to synthesis the molecules they require, to counteract the universal tendency towards increasing disorderliness.

157. Answer (1)

Hint: Replication takes place in $5' \rightarrow 3'$ direction

Sol.: Strand A and strand B has the polarity of $5' \rightarrow 3'$ and $3' \rightarrow 5'$ respectively. Okazaki fragment marked (i) occurs prior those marked (ii) and (iii). Both leading and lagging strand formed simultaneously.

RNA primer provide free $3'$ -hydroxyl group which is essential for DNA polymerase to begin the process of replication.

158. Answer (4)

Hint: Both DNA and RNA polymerase polymerise in $5' \rightarrow 3'$ direction

Sol.: DNA polymerase cannot initiate process of replication on its own. RNA polymerase uses DNA as template.

159. Answer (2)
Hint: Triangular age pyramid depicts expanding population.
Sol.: A bell-shaped age pyramid correctly depicts a stable or a mature population.
160. Answer (2)
Hint: BOD test measures the rate of uptake of oxygen by micro-organisms in a sample of water.
Sol.: During biological treatment, aerobic bacteria are used to treat sewage water till the BOD is reduced.
161. Answer (3)
Hint: The pyramid of energy is always upright.
Sol.: Pyramid of biomass in a sea and pyramid of number in a parasitic food chain is inverted in shape.
162. Answer (1)
Hint & Sol.: tRNA has an inverted L-shaped tertiary structure.
163. Answer (4)
Hint: Turner's syndrome is a chromosomal disorder in which females are sterile.
Sol.: Turner's syndrome is caused due to the loss of an 'X' chromosome.
164. Answer (4)
Hint: Sacred lakes is a type of *in-situ* conservation.
Sol.: Gene banks is a type of *ex-situ* conservation.
165. Answer (3)
Hint: Introduction of terror of Bengal in our lakes is an example of alien species invasion.
Sol.: Introduction of water hyacinth in India damaged the native species, is an example of alien-species invasion.
166. Answer (4)
Hint: Environmental factors affect primary productivity.
Sol.: Primary productivity is not affected by type of herbivores and respiratory losses.
167. Answer (1)
Hint: Competition is a $-$, $-$ relationship, while commensalism is a $+$, 0 relationship.
Sol.: Parasitism and predation are the two kinds of population interactions, which show ' $+$ ' and ' $-$ ' kind of interaction between the individuals.
168. Answer (3)
Hint: Statins have been commercialised as blood-cholesterol lowering agents produced by yeast.
Sol.: Statins are synthesised by *Monascus purpureus*.
169. Answer (2)
Hint: Repetitive DNA are thought to have no direct coding function.
Sol.:
 According to HGP the average gene consists of 3000 bases.
 Frederick Sanger is credited for the development of both protein & DNA sequencing.
170. Answer (1)
Hint: Packaging of chromatin at higher level requires non-histone chromosomal (NHC) protein.
Sol.: Histone proteins, NHC proteins and DNA are involved in formation of the nucleosome that further forms chromatin.
171. Answer (4)
Hint: Ball and socket joint
Sol.: Synovial joints help in locomotion and many other movements. Ball and socket joint (between humerus and pectoral girdle; hip joint), hinge joint (knee joint), pivot joint (between atlas and axis), gliding joint (between the carpals) and saddle joint (between carpal and metacarpal of thumb) are some examples.
172. Answer (2)
Hint: Congestion of the lungs is one of the main symptoms of heart failure.
Sol.: Heart failure means the state of heart when it is not pumping blood effectively enough to meet the needs of the body. It is sometimes called congestive heart failure because congestion of the lungs is one of the main symptoms of this disease. Heart failure is not the same as cardiac arrest (when the heart stops beating) or a heart attack (when the heart muscle is suddenly damaged by an inadequate blood supply).
173. Answer (2)
Hint: 20-25 per cent of CO_2 is transported by RBCs
Sol.: Nearly 20-25 per cent of CO_2 is transported by RBCs whereas 70 per cent of it is carried as bicarbonate. About 7 per cent of CO_2 is carried in a dissolved state through the plasma.
 Neutrophils are the most abundant cells (60-65 per cent) of the total WBCs and basophils are the least (0.5-1 per cent) among them. Lymphocytes constitute 20-25% of the total WBCs.

174. Answer (3)

Hint: Houseflies act as mechanical carriers for this disease.

Sol.: *Wuchereria* (*W. bancrofti* and *W. malayi*), the filarial worms are the causative agent of elephantiasis or filariasis. The pathogens are transmitted to a healthy person through the bite of an infected female mosquito vector. Dengue and chikungunya are also vector-borne diseases which are transmitted to the healthy individuals by the bite of an infected *Aedes* mosquito. *Entamoeba histolytica* is a protozoan parasite in the large intestine of humans which causes amoebiasis (amoebic dysentery).

175. Answer (4)

Hint: Theory of special creation

Sol.: Conventional religious literature tells us about the theory of special creation. This theory has three connotations. One, that all living organisms (species or types) that we see today were created as such. Two, that the diversity was always the same since creation and will be the same in future also. Three, that Earth is about 4000 years old.

176. Answer (2)

Hint: Saheli inhibits implantation but does not inhibit ovulation.

Sol.: Natural methods work on the principle of avoiding chances of ovum and sperms meeting. Periodic abstinence, withdrawal method and lactational amenorrhea are some examples of natural methods of contraception. Lactational amenorrhea (absence of menstruation) method is based on the fact that ovulation and therefore the cycle do not occur during the period of intense lactation following parturition.

Multiload 375 is an example of copper releasing IUD while Saheli is a non-steroidal pill.

177. Answer (2)

Hint: Function of oxytocin

Sol.: Oxytocin acts on the uterine muscle and causes stronger uterine contractions, which in turn stimulates further secretion of oxytocin. The stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contractions. This leads to expulsion of the baby out of the uterus through the birth canal – parturition.

178. Answer (1)

Hint: Identify a female accessory duct

Sol.: The oviducts (fallopian tubes), uterus and vagina constitute the female accessory ducts. The female external genitalia include mons pubis, labia majora, labia minora, hymen and clitoris.

179. Answer (4)

Hint: Made in 1983

Sol.: In 1983, Eli Lilly, an American company prepared two DNA sequences corresponding to 'A' and 'B' chains of human insulin and introduced them in plasmids of *E. coli* to produce insulin chains. Chains 'A' and 'B' were produced separately, extracted and combined by creating disulfide bonds to form human insulin. Probe is a ssDNA/RNA tagged with a radioactive molecule.

180. Answer (2)

Hint: Denaturation of enzyme

Sol.: In PCR, a thermostable DNA polymerase (isolated from a bacterium, *Thermus aquaticus*), which remains active during the high temperature induced denaturation of double stranded DNA is used.

