All India Aakash Test Series for NEET - 2024

OPEN MOCK TEST - 3

Click here for Code-F sol.

Test Date : 21/04/2024

ANSWERS

1. (2)	41. (3)	81. (3)	121. (4)	161. (3)
2. (4)	42. (3)	82. (1)	122. (4)	162. (4)
3. (2)	43. (2)	83. (3)	123. (2)	163. (2)
4. (2)	44. (2)	84. (1)	124. (2)	164. (3)
5. (1)	45. (2)	85. (3)	125. (3)	165. (3)
6. (2)	46. (1)	86. (1)	126. (1)	166. (2)
7. (1)	47. (3)	87. (4)	127. (4)	167. (4)
8. (2)	48. (3)	88. (2)	128. (4)	168. (3)
9. (1)	49. (2)	89. (1)	129. (1)	169. (3)
10. (2)	50. (2)	90. (4)	130. (2)	170. (4)
11. (3)	51. (4)	91. (3)	131. (3)	171. (1)
12. (1)	52. (4)	92. (2)	132. (2)	172. (3)
13. (2)	53. (2)	93. (3)	133. (2)	173. (3)
14. (2)	54. (4)	94. (2)	134. (1)	174. (4)
15. (3)	55. (2)	95. (3)	135. (2)	175. (1)
16. (3)	56. (1)	96. (2)	136. (2)	176. (2)
17. (3)	57. (3)	97. (2)	137. (1)	177. (2)
18. (3)	58. (3)	98. (3)	138. (2)	178. (2)
19. (2)	59. (3)	99. (4)	139. (1)	179. (2)
20. (1)	60. (3)	100. (3)	140. (2)	180. (1)
21. (3)	61. (2)	101. (4)	141. (4)	181. (4)
22. (2)	62. (2)	102. (3)	142. (4)	182. (2)
23. (1)	63. (4)	103. (1)	143. (3)	183. (4)
24. (3)	64. (2)	104. (3)	144. (2)	184. (1)
25. (3)	65. (3)	105. (4)	145. (2)	185. (2)
26. (2)	66. (3)	106. (3)	146. (1)	186. (4)
27. (2)	67. (3)	107. (2)	147. (2)	187. (2)
28. (3)	68. (4)	108. (3)	148. (2)	188. (1)
29. (1)	69. (2)	109. (1)	149. (2)	189. (2)
30. (1)	70. (3)	110. (1)	150. (1)	190. (1)
31. (4)	71. (4)	111. (1)	151. (3)	191. (2)
32. (3)	72. (4)	112. (1)	152. (3)	192. (3)
33. (4)	73. (1)	113. (3)	153. (2)	193. (1)
34. (2)	74. (2)	114. (3)	154. (4)	194. (3)
35. (1)	75. (1)	115. (2)	155. (1)	195. (3)
36. (4)	76. (2)	116. (3)	156. (3)	196. (4)
37. (1)	77. (1)	117. (1)	157. (4)	197. (3)
38. (3)	78. (3)	118. (2)	158. (4)	198. (3)
39. (1)	79. (3)	119. (1)	159. (2)	199. (2)
40. (2)	80. (4)	120. (3)	160. (4)	200. (2)

HINTS & SOLUTIONS

[PHYSICS]

SECTION - A

1. Answer (2)

Hint: $LC = 1MSD - 1VSD$

Sol.: $1\,MSD = \frac{1}{20}$ cm

$1VSD = \frac{16}{20}MSD = 0.8\,MSD$

$LC = 1MSD - 1VSD$

$= 0.2 \times \frac{1}{20}\text{ cm} = \frac{1}{100}\text{ cm} = 0.01\text{ cm}$

2. Answer (4)

Hint & Sol: Power = Force × velocity

$\text{Pressure} = \frac{F}{A}$

Hence, power and pressure have different dimensions

3. Answer (2)

Hint: $(B.E.)_{\text{Reaction}} = (B.E.)_{\text{Product}} - (B.E.)_{\text{Reactant}}$

Sol.: $(B.E.)_{\text{Reaction}} = (B.E.)_R - (B.E.)_P - (B.E.)_Q$

$= 230 - 112 - 106$

$= 12$ MeV

4. Answer (2)

Hint: $\left|\vec{a}+\vec{b}\right| = \sqrt{a^2+b^2+2ab\cos\theta}$

$\left|\vec{a}-\vec{b}\right| = \sqrt{a^2+b^2-2ab\cos\theta}$

Sol.: $\left|\hat{a}+\hat{b}\right| = 1$

Angle between $\hat{a}$ and $\hat{b}$ will be 120°

$\left|\hat{a}-\hat{b}\right| = \sqrt{1+1-2\times1\times1\cos120^\circ} = \sqrt{3}$

5. Answer (1)

Hint: If $\vec{A} \perp \vec{B}$ then $\vec{A}\cdot\vec{B} = 0$

Sol.: $\vec{A}\cdot\vec{B} = 0$

$2 + \alpha + 4\alpha = 0$

$5\alpha = -2$

$\alpha = -\frac{2}{5}$

6. Answer (2)

Hint: $\frac{t_a}{t_d} = \sqrt{\frac{g-a}{g+a}}$

Sol.: $\frac{t_a}{t_d} = \sqrt{\frac{g-a}{g+a}} = \frac{2}{3}$

$\frac{g-a}{g+a} = \frac{4}{9}$

$9g - 9a = 4g + 4a$

$5g = 13a$

$a = \frac{5g}{13}$

7. Answer (1)

Hint: $a_{\text{avg}} = \left|\frac{\vec{v}-\vec{u}}{\Delta t}\right|$

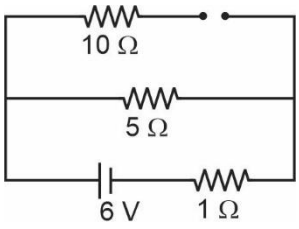
Sol.: $a_{\text{avg}} = \frac{v-u}{t} = \frac{\sqrt{2g\times5}+\sqrt{2g\times20}}{0.01}$

$= \frac{10+20}{0.01} = 30\times10^2 = 3\times10^3\ \text{m/s}^2$

8. Answer (2)

Hint: At steady state capacitor act as open circuit.

Sol.: At steady state



$i = \frac{6}{6} = 1$ A

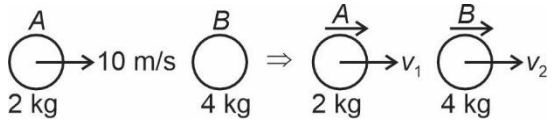
$V = 5 \times 1 = 5$ V

$Q = CV = 2\times5 = 10\ \mu\text{C}$

9. Answer (1)

Hint: $e = \frac{|\vec{v}_2 - \vec{v}_1|}{|\vec{u}_1 - \vec{u}_2|}$

Sol.:



$10 \times 2 = 2v_1 + 4v_2$ …(i)

$\frac{1}{2} = \frac{v_2 - v_1}{10}$

$\Rightarrow v_2 - v_1 = 5$ …(ii)

From equation (i) and (ii)

$v_1 = 0$, $v_2 = 5$ m/s

10. Answer (2)

Hint: $W_{req} = K_f - K_i$

Sol.: Work req. = ΔKE_{loss}

$= \frac{1}{2}mv^2\left(1 + \frac{K^2}{R^2}\right)$

$= \frac{1}{2} \times 2 \times 100\left(1 + \frac{2}{5}\right)$

$= \frac{100 \times 7}{5} = 140$ J

11. Answer (3)

Hint: $\frac{\Delta W}{\Delta Q} = \frac{\gamma - 1}{\gamma}$

Sol.: In isobaric process.

$\frac{W}{\Delta Q} = \frac{\gamma - 1}{\gamma}$

$\Delta Q = \frac{\gamma}{\gamma - 1}W$

$= \frac{\frac{7}{5}}{\frac{2}{5}} \times 60 = \frac{7 \times 60}{2} = 210$ J

12. Answer (1)

Hint: $T_{max} - T_{min} = 6mg$

Sol.: $\frac{T_{max}}{T_{min}} = 4$ also, $T_{max} - T_{min} = 6mg$

$4T_{min} - T_{min} = 6mg$

$T_{min} = 2mg$

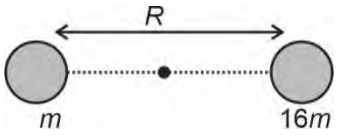
$T_{max} = 8mg$

$= 8 \times 2 \times 10 = 160$ N

13. Answer (2)

Hint: Potential due to bodies $= -\frac{GM}{r}$

Sol.:



$V = -\frac{Gm}{\frac{R}{2}} - \frac{G(16m)}{\frac{R}{2}}$

$= -\frac{34Gm}{R}$

14. Answer (2)

Hint: $\cos\phi = \frac{R}{Z}$

Sol.: $Z = \sqrt{(X_C - X_L)^2 + R^2}$

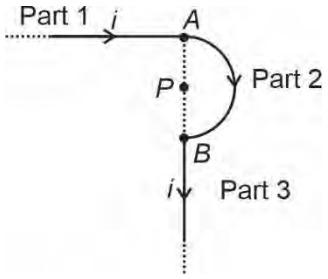
$= \sqrt{(70-40)^2 + 30^2} = 30\sqrt{2}$

$\cos\phi = \frac{30}{30\sqrt{2}} = \frac{1}{\sqrt{2}}$

15. Answer (3)

Hint: Magnetic field at centre of semi-circular ring $= \frac{\mu_0 i}{4R}$

Sol.:



Field at P due to part 1 $= \frac{\mu_0 i}{4\pi R} \otimes$

Field at P due to part 2 $= \frac{\mu_0 i}{4R} \otimes$

Field at P due to part 3 = 0

Net field at $P = \frac{\mu_0 i}{4R}\left[\frac{1}{\pi} + 1\right]$ pointed into the paper.

16. Answer (3)

Hint: $v = a\omega\cos(\omega t + \phi_0)$

Sol.: $x = a\sin(\omega t + \phi_0)$

$v = a\omega\cos(\omega t + \phi_0)$

at $t = 0, v = \frac{a\omega}{2}$

$\frac{a\omega}{2} = a\omega\cos\phi_0$

$\frac{1}{2} = \cos\phi_0$

$\Rightarrow \quad \phi_0 = \frac{\pi}{3}$

17. Answer (3)

Hint: Uniformly charged infinite sheet produces uniform electric field in its surrounding.

Sol.: In uniform field, force experience of dipole is zero but $\vec{\tau} = \vec{P} \times \vec{E}$

18. Answer (3)

Hint: $V = \frac{KQ}{R}$

Sol.: $R = (27)^{\frac{1}{3}} r = 3r$

Potential of bigger drop $= \frac{27Kq}{3r} = \frac{9Kq}{r} = 9 \times 2$ V

= 18 V

19. Answer (2)

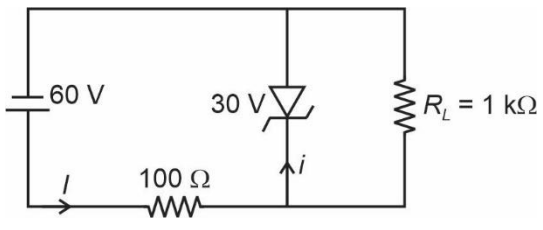
Hint: In reversed biased diode offers infinite resistance.

Sol.: $i = \frac{V}{R_{eq}} = \frac{30}{10+5} = 2$ A

20. Answer (1)

Hint: Zener diode act as a voltage regulator

Sol.:



$I = \frac{30}{100} = 300$ mA

Current through $R_L = \frac{30}{1\ \text{k}\Omega} = 30$ mA

Current through Zener diode = 300 – 30

= 270 mA

21. Answer (3)

Hint: Speed of wave in a medium given by $v = \frac{\omega}{K}$

Sol.:

$A = 0.5 \qquad A' = 2A = 1.0$

$f = 1$ Hz $\qquad f' = 0.5$ Hz, $\omega' = \pi$

$v \qquad\qquad v' = v$

$\lambda = 1 \qquad \lambda' = \frac{v}{f'} = \frac{2v}{f} = 2\lambda$

$K' = \frac{2\pi}{\lambda'} = \pi$

Equation of wave will be

$y = 1.0\sin(\pi t - \pi(-x))$

$y = 1.0\sin(\pi t + \pi x)$

22. Answer (2)

Hint: $e = \frac{\ell_2 - 3\ell_1}{2}$

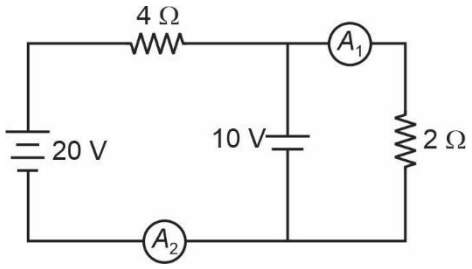
Sol.: $e = \frac{\ell_2 - 3 \times 16}{2}$

$\ell_2 = 48 + 2 \times 1 = 50$ cm

23. Answer (1)

Hint: Ideal ammeter has zero resistance.

Sol.:



Reading of $A_2 \rightarrow \frac{20-10}{4} = 2.5$ A

Reading of $A_1 \Rightarrow \frac{10}{2} = 5$ A

24. Answer (3)

Hint: $C = \frac{Q}{V}$, $\Delta H = \frac{1}{2}\frac{C_1C_2}{C_1+C_2}(V_1 - V_2)^2$

Sol.: $V_1 = \frac{10}{2} = 5$ V

$\Delta H = \frac{1}{2} \times \frac{2 \times 4}{6} \times (5-0)^2$

$= \frac{2}{3} \times 25 = \frac{50}{3}\mu J$

25. Answer (3)

Hint: $F = q\vec{V} \times \vec{B}$

Sol.: $F = qvB$

$F = 2 \times 2 \times 2 \times 10^{-3}$

$= 8 \times 10^{-3}$ N

$= 8$ mN

26. Answer (2)

Hint: $\Delta\phi = \frac{2\pi}{\lambda}.\Delta x$

Sol.: $\Delta\phi = \frac{2\pi}{\lambda} \times \frac{\lambda}{6} = \frac{\pi}{3}$

27. Answer (2)

Hint & Sol.: $I = \frac{I_0}{2}\cos^2 60^\circ = \frac{I_0}{8}$

28. Answer (3)

Hint: $\delta = (\mu - 1)A$

Sol.: $\delta = (1.5 - 1) \times 6 = 3°$

29. Answer (1)

Hint: $L = f_0 + f_e$

Sol.: $\frac{f_0}{f_e} = 49$

$f_0 = 49f_e$

$f_0 + f_e = L$

$50f_e = 100$

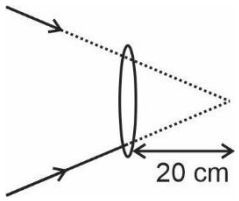
$f_e = 2$ cm

$f_0 = 98$ cm

30. Answer (1)

Hint: $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Sol.:



$u = +20$ cm, $v = ?$, $f = +40$

$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{40} + \frac{1}{20} = \frac{1+2}{40}$

$\Rightarrow \quad v = \frac{40}{3}$ cm

31. Answer (4)

Hint: $L = n^2\mu_0 Al$

Sol.: Since, $L \propto$ (Linear dimension)^3

$L' \propto$ (3 linear dimension)^3

$L' = 27L$

32. Answer (3)

Hint: $\eta\% = \frac{P_{out}}{P_{in}} \times 100$

Sol.: $90 = \frac{P_{out}}{3\text{ kW}} \times 100$

$P_{out} = 2.7$ kW $= I_S V_S$

$5V_S = 2700$

$V_S = \frac{2700}{5} = 540$ V

33. Answer (4)

Hint & Sol.:

- Charged particles may experience attractive as well as repulsive force.
- Charge at rest produce only electric field only.

34. Answer (2)

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

Sol.: $\frac{\lambda_P}{\lambda_Q} = \frac{P_Q}{P_P} = \frac{4}{1}$

35. Answer (1)

Hint: $K_{max} = h\nu - h\nu_0$

Sol.: $K_{max} = h\nu - h\nu_0$

$= h(2 \times 10^{14} - 0.5 \times 10^{14}) = 1.5 \times 10^{14} \times 6 \times 10^{-34}$

$= 9 \times 10^{-20}$ J

SECTION - B

36. Answer (4)

Hint: In parallel grouping effective resistance decreases.

Sol.: $P = \frac{V^2}{R_{eq}}$, $i = \frac{V}{R_{eq}}$

On closing the key $R_{eq}\downarrow$ $P\uparrow$ $i\uparrow$

37. Answer (1)

Hint: $\lambda_m \propto \frac{1}{T}$

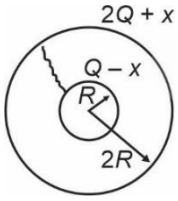
Sol.: $\lambda_1 < \lambda_2 < \lambda_3$

$T_1 > T_2 > T_3$

38. Answer (3)

Hint: Both shell acquire common potential after connection.

Sol.:



Let x charge flow from inner shell to outer shell.

$$V_{inner} = \frac{K(Q-x)}{R} + \frac{K(2Q+x)}{2R}$$

$$V_{outer} = \frac{K(Q-x)}{2R} + \frac{K(2Q+x)}{2R}$$

$V_{inner} = V_{outer}$

$Q = x$

Hence, net charge on outer shell = $3Q$

39. Answer (1)

Hint: In free fall motion mechanical energy remains constant.

Sol.: At highest point.

ME = $mgh + 0$

At $\frac{h}{5}$ height

$$PE = \frac{mgh}{5}$$

$$KE = mgh - \frac{mgh}{5} = \frac{4mgh}{5}$$

$$\text{Ratio} = \frac{4}{1}$$

40. Answer (2)

Hint: $N = \frac{N_0}{2^n}$

Sol.: $\frac{N}{N_0} \times 100 = \frac{100}{2^n} = \frac{100}{2^4} = \frac{100}{16} = 6.25\%$

41. Answer (3)

Hint: $\bar{A} + \bar{B} = \overline{A \cdot B}$

Sol.: $\bar{A} + \bar{B} = \overline{AB} = \text{NAND}$

42. Answer (3)

Hint: V = Potential gradient × length

Sol.: $V_A = \frac{5}{100} \times 20 = 1\,V$

$V_B = \frac{5}{100} \times 60 = 3$ V

Hence, $V_B - V_A = 2V$

43. Answer (2)

Hint: $P_L = P_1 + P_2$

Sol.: $P_1 = \frac{100}{20} = +5$ D

$P_2 = -\frac{100}{40} = -2.5$ D

$P_L = 2.5$ D

44. Answer (2)

Hint: $r_d = \frac{\Delta V}{\Delta I}$

Sol.: $r_d = \frac{\Delta V}{\Delta I} = \frac{0.85 - 0.80}{20 \times 10^{-3}}$

$$= \frac{0.05}{20 \times 10^{-3}} = \frac{50}{20} = 2.5\ \Omega$$

45. Answer (2)

Hint: $T = 2\pi\sqrt{\frac{M}{k}}$

Sol.: At equilibrium

$$X_i = \frac{(m_1 + m_2 + m_3)g}{k}$$

Now after removal of m_2 and m_3, in equilibrium extension would be

$$x_f = \frac{m_1 g}{k}$$

$$A = X_i - X_f$$

$$= \frac{(m_1 + m_2 + m_3)g}{k} - \frac{m_1 g}{k}$$

$$= \frac{(m_2 + m_3)g}{k}$$

$$T = 2\pi\sqrt{\frac{m_1}{k}}$$

46. Answer (1)

Hint: $U = -\vec{M} \cdot \vec{B}$

Sol.: $U = -(100 + 150) = -250$ J

47. Answer (3)

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

Sol.: $\vec{V} = 2t\hat{i} + 4t^2\hat{j}$

$$\frac{d\vec{V}}{dt} = 2\hat{i} + 8t\hat{j}$$

$$\vec{F} = m\vec{a} = 2\hat{i} + 8t\hat{j}$$

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

$= 4t + 32t^3$

$P(t = 2) = 4 \times 2 + 32 \times 8$

$= 8 + 256 = 264$ watt

48. Answer (3)

Hint: $a\sin\theta = n\lambda$ for minima

Sol.: $2 \times 10^{-6}\sin 30° = \lambda$

$\lambda = 1 \times 10^{-6}$ cm

$= 100$ Å

49. Answer (2)

Hint: Apply angular momentum conservation.

Sol.: From law of conservation of angular momentum about hinge.

$$\frac{mv3L}{4} = \frac{3mL^2}{3} \times \omega + m\left(\frac{3L}{4}\right)^2 \omega$$

$$\frac{3mvL}{4} = mL^2\omega + \frac{9}{16}mL^2\omega$$

$$\frac{3mvL}{4} = \frac{25mL^2\omega}{16}$$

$$\omega = \frac{12v}{25L}$$

50. Answer (2)

Hint: $w_{net} = k_f - k_i$

Sol.: $x = 2\sqrt{t+1}$

$$\frac{dx}{dt} = \frac{2}{2\sqrt{t+1}}$$

$$\Rightarrow \quad v = \frac{1}{\sqrt{t+1}}$$

$$w_{net} = k_f - k_i$$

$$= \frac{1}{2}m\left(v_f^2 - v_i^2\right)$$

$$= \frac{1}{2}0.1\left(\frac{1}{t_f+1} - \frac{1}{t_i+1}\right)$$

$$= \frac{1}{2}0.1\left(\frac{1}{3} - \frac{1}{1}\right)$$

$$w_{net} = -\frac{1}{30}\text{J}$$

[CHEMISTRY]

SECTION - A

51. Answer (4)

Hint: $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$

Sol.: $\Delta x \times m\Delta v \geq \frac{h}{4\pi}$

$$0.2\times10^{-12}\times9.1\times10^{-31}\times\Delta v = \frac{6.626\times10^{-34}}{4\times3.14}$$

$\therefore \Delta v = 2.89 \times 10^{8}\ ms^{-1}$

52. Answer (4)

Hint: Atomic mass of sulphur is 32 u

Sol.: For minimum molecular mass at least one sulphur atom should be present

Mass percentage of an element

$$= \frac{\text{Mass of an element}}{\text{Molecular mass}}\times100$$

$$8 = \frac{32}{\text{Molecular mass}}\times100$$

Molecular mass = 400 u

53. Answer (2)

Hint: IUPAC official name of an element with atomic number 102 is Nobelium.

Sol.: Atomic number of Lawrencium, Rutherfordium, Bohrium and Mendelevium respectively are 103, 104, 107 and 101.

54. Answer (4)

Hint: Bond order = $\frac{1}{2}(N_b - N_a)$

Where,

N_b = Number of electrons in bonding molecular orbital.

N_a = Number of electrons in antibonding molecular orbital

Sol.:

$$O_2^+ = (\sigma1s)^2(\sigma^*1s)^2(\sigma2s)^2(\sigma^*2s)^2(\sigma2p_z)^2(\pi2p_x^2 \equiv \pi2p_y^2)$$

$$(\pi^*2p_x^1 \equiv \pi^*2p_y)$$

$$\text{Bond order} = \frac{1}{2}(10-5) = 2.5$$

$$N_2^- = (\sigma1s)^2(\sigma^*1s)^2(\sigma2s)^2(\sigma^*2s)^2(\pi2p_x^2 \equiv \pi2p_y^2)$$

$$(\sigma2p_z)^2(\pi^*2p_x^1 \equiv \pi^*2p_x^0)$$

$$\text{Bond order} = \frac{1}{2}(10-5) = 2.5$$

$$C_2^+ = (\sigma1s)^2(\sigma^*1s)^2(\sigma2s)^2(\sigma^*2s)^2(\pi2p_x^2 \equiv \pi2p_y^1)$$

$$\text{Bond order} = \frac{1}{2}(7-4) = 1.5$$

$$F_2^- = (\sigma1s)^2(\sigma^*1s)^2(\sigma2s)^2(\sigma^*2s)^2(\sigma2p_z)^2(\pi2p_x^2 \equiv \pi2p_y^2)$$

$$(\pi^*2p_x^2 \equiv \pi^*2p_y^2)(\sigma^*2p_z^1)$$

$$\text{Bond order} = \frac{1}{2}(10-9) = 0.5$$

55. Answer (2)

Hint: pH of a salt of weak acid and strong base

$$= 7 + \frac{1}{2}(pKa + \log C)$$

Sol.: K_2SO_4 and KNO_3 are the salt of strong acid and strong base. So, their pH are independent of concentration.

1. **Potassium Sulphate (K_2SO_4):** Salt of strong acid and strong base.
2. Sodium Acetate CH_3COONa salt of weak acid and strong base.
3. **Ammonium Sulphate ($(NH_4)_2SO_4$):** Salt of strong acid and weak base.
4. **Potassium Nitrate (KNO_3):** Salt of strong acid and strong base.

56. Answer (1)

Hint: $\Delta T_f = iK_fm$

Sol.: m(molality) = $\frac{20}{122.5\times500}\times1000$

$$= \frac{400}{1225} = 0.326$$

For weak acid,

$K_a = c\alpha^2$

$$\alpha = \sqrt{\frac{K_a}{c}} = \sqrt{\frac{1.4\times10^{-3}}{0.326}}$$

$$= \sqrt{4.3\times10^{-3}}$$

$$= \sqrt{43\times10^{-4}}$$

$= 6.55 \times 10^{-2}$

$\alpha = 0.0655$

$i = \frac{1-\alpha+n\alpha}{1}$ here n = 2

$i = 1 - \alpha + 2\alpha$

$i = 1 + \alpha$

$i = 1 + 0.0655$

$i = 1.0655$

$\Delta T_f = 1.0655 \times 1.86 \times 0.326$

$\Delta T_f = 0.65$ K

57. Answer (3)

Hint: Due to the presence of common ion (chloride ion), solubility of AgCl decreases.

Sol.: $NaCl(aq) \longrightarrow \underset{0.2\ M}{Na^+(aq)} + \underset{0.2\ M}{Cl^-(aq)}$

Let the solubility of AgCl in 0.2 M NaCl be s mol L^{-1}

$AgCl \rightleftharpoons \underset{s}{Ag^+} + \underset{(s+0.2)}{Cl^-}$

$K_{sp} = s \times (s + 0.2)$

[As solubility of AgCl is very low]

[$\therefore$ s <<< 0.2 M]

[$(s + 0.2) \approx 0.2$]

$\therefore 1.8 \times 10^{-10} = 0.2\ s$

$\therefore\ s = \dfrac{1.8 \times 10^{-10}}{0.2} = 9 \times 10^{-10}$ mol L^{-1}

58. Answer (3)

Hint: Number of radial nodes = n – l – 1

Total number of nodes = n – 1

Sol.: For 3*d* orbitals

n = 3

l = 2

Number of radial nodes = n – l – 1 = 3 – 2 – 1 = 0

Total number of nodes = n – 1 = 3 – 1 = 2

59. Answer (3)

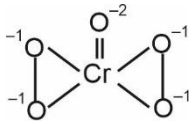
Hint: H_2S gas has rotten egg like smell

Sol. $\underset{(salt)}{Na_2S} + H_2SO_4 \longrightarrow Na_2SO_4 + H_2S(gas)$

60. Answer (3)

Hint: CrO_5 has 2 peroxide linkages.

Sol.:



Oxidation state of Cr be x

$\therefore x + (-1) \times 4 + (-2) = 0$

$\Rightarrow x = +6$

61. Answer (2)

Hint: $\Delta U = q + w$

Sol.: For isothermal expansion of an ideal gas into vacuum, $\Delta U = 0$, w = 0

According to first law of thermodynamics

$\Delta U = q + w$

q = 0;

Bomb calorimeter measures heat absorbed at constant volume.

62. Answer (2)

Hint: Higher the molecular mass and more surface area are the factors which results in high boiling point of the compounds.

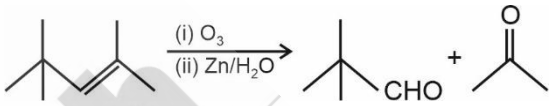
Sol.: Molecular mass and surface area increases then van der Waals forces of attraction also increases and thus, boiling points also increases.

As the branching increases, surface area decreases for isomeric alkanes, hence boiling point also decreases.

63. Answer (4)

Hint: Ozonolysis of alkenes leads to the formation of aldehydes, ketones, alcohols or carboxylic acid by cleavage of unsaturated bonds of alkene.

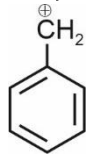
Sol.:



64. Answer (2)

Hint: Species which does not have α–hydrogen will not show hyperconjugation.

Sol.: Hyperconjugation involves delocalisation of σ electrons of C – H bond of an alkyl group directly attached to an atom of unsaturated system or to an atom with vacant *p* orbital.

Benzyl cation  does not show hyper conjugation.

65. Answer (3)

Hint: $\Rightarrow W = Zit$ (Faraday's first law)

$\dfrac{W_1}{E_1} = \dfrac{W_2}{E_2}$ (Faraday's second law)

Sol.: For cell A

$W_{Cu} = Z_{cu}it \Rightarrow \dfrac{63.5 \times 1 \times t}{2 \times 96500} = 0.5$

$\therefore\ t = \dfrac{2 \times 96500 \times 0.5}{63.5} \approx 1520$ s

Again, $\dfrac{W_{cu}}{E_{cu}} = \dfrac{W_{Ag}}{E_{Ag}}$

$\Rightarrow \dfrac{0.5 \times 2}{63.5} = \dfrac{W_{Ag} \times 1}{108}$

$\Rightarrow W_{Ag} = \dfrac{0.5 \times 2 \times 108}{63.5} = 1.7$ g

66. Answer (3)

Hint & Sol.: Due to inert pair effect Pb^{2+} is more stable than Pb^{4+}.

$[SiCl_6]^{2-}$ does not exist because six large chloride ions cannot be accommodated around Si^{4+} due to limitation of its size.

Most of the MX_4 are covalent in nature. Exceptions are SnF_4 and PbF_4 which are ionic in nature.

67. Answer (3)

Hint: Unit of rate constant (k) $\Rightarrow$

$$\frac{\text{Concentration}}{\text{Time}} \times \frac{1}{(\text{Concentration})^n}$$

Where n $\Rightarrow$ Order of reaction

Sol.: Zero order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{(\text{mol L}^{-1})^0}$

$= \text{mol}^1\ \text{L}^{-1}\ \text{s}^{-1}$

First order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{(\text{mol L}^{-1})^1} = \text{s}^{-1}$

Second order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{(\text{mol L}^{-1})^2}$

$= \text{mol}^{-1}\ \text{L}\ \text{s}^{-1}$

Third order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{(\text{mol L}^{-1})^3}$

$= \text{mol}^{-2}\ \text{L}^2\ \text{s}^{-1}$

68. Answer (4)

Hint: When an electron is added to O, the added electron goes to the smaller n = 2 quantum level and suffers significant repulsion from the other electrons present in this level.

Sol.:

Element	$\Delta_{eg}H$ (kJ mol^{-1})
O	–141
S	–200
Se	–195
Te	–190

69. Answer (2)

Hint: Stronger the intermolecular forces of attraction, higher is the boiling point.

Sol.: Water has extensive hydrogen bonding which leads to highest boiling point among the hydrides of the elements of group 16

So, correct order of boiling point is

$H_2S < H_2Se < H_2Te < H_2O$

70. Answer (3)

Hint: Enthalpy of atomisation depends upon the number of unpaired electrons.

Sol.: Zn = $3d^{10}\ 4s^2$

In Zn, there is no unpaired electron. As a result, metallic bonding is weak and enthalpy of atomisation is low.

71. Answer (4)

Hint: $\Delta_t = \frac{4}{9}\Delta_0$

Sol.: For same metal, same ligands and same metal ligand distance.

$$\Delta_t = \frac{4}{9}\Delta_0$$

Consequently the orbital splitting energies are not sufficiently large for forcing pairing and therefore low spin complexes are rarely observed.

72. Answer (4)

Hint: Complex in which a metal is bound to more than one kind of donor atom is called heteroleptic complex

Sol.: $[Cu(CN)_4]^{3-}$, $[Co(NH_3)_6]^{3+}$, $[PtCl_4]^{2-}$ are homoleptic complex. While $[Co(NH_3)_4Cl_2]^+$ is heteroleptic complex.

73. Answer (1)

Hint: $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

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

Sol.: $XeOF_4$ has square pyramidal shape

XeO_2F_2 has see saw shape

74. Answer (2)

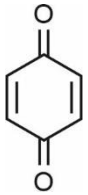
Hint: Those compounds which contain unpaired e^- are paramagnetic in nature

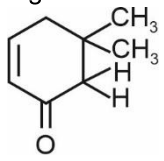
Sol.: La^{3+} and Lu^{3+} have $4f^0$ and $4f^{14}$ electronic configuration respectively. So these are colourless in nature

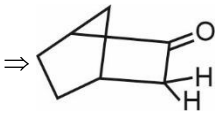
Pr^{3+} has 2 unpaired electrons. So it is paramagnetic but Yb^{2+} has no unpaired electrons ($4f^{14}$) so it is diamagnetic in nature.

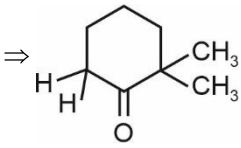
75. Answer (1)

Hint: Keto compounds containing enolizable hydrogen show tautomerism.

Sol.: $\Rightarrow$  does not contain enolisable hydrogen.

$\Rightarrow$  $\Rightarrow$ 2 enolisable hydrogen at α-carbon.

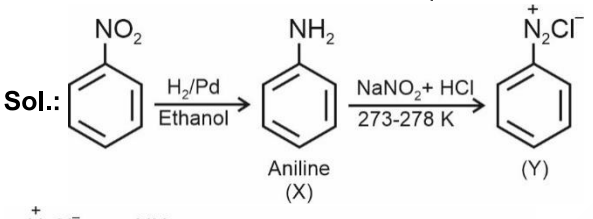

⇒ 2-enolisable hydrogen atoms at α-carbon.

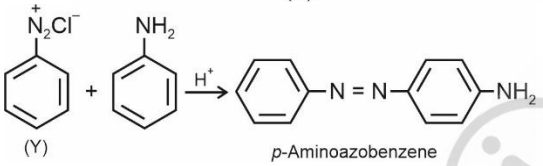

⇒ 2-enolisable H atoms at α-carbon.

76. Answer (2)

Hint: Aniline undergoes diazotization on reaction with $NaNO_2$ + HCl at 273-278 K temperature.

Sol.:

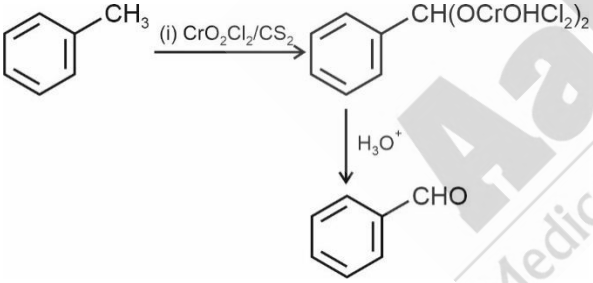




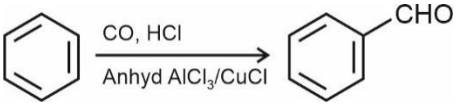
77. Answer (1)

Hint: Etard reaction involves use of chromyl chloride as oxidising agent to oxidise methyl group to chromium complex which on hydrolysis gives corresponding benzaldehyde.

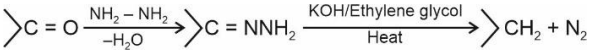
Sol.: Etard reaction



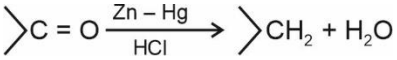
Gattermann – Koch Reaction



Wolff – Kishner Reduction



Clemmensen Reduction

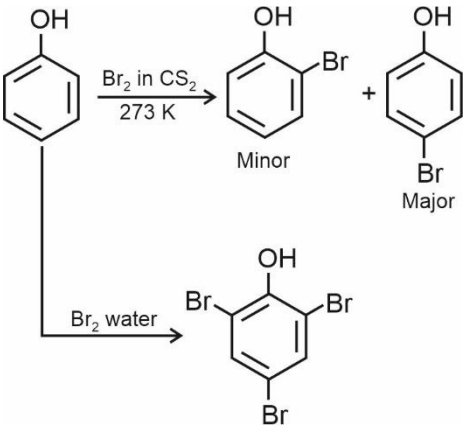


78. Answer (3)

Hint: Halogenation of phenol with bromine results in the formation of different products under different experimental conditions.

On reaction with Br_2 in the solvent of low polarity, mono bromophenol is formed.

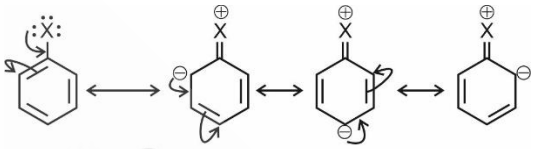
Sol.



79. Answer (3)

Hint: In haloarenes, C–X bond acquires a partial double bond character due to resonance.

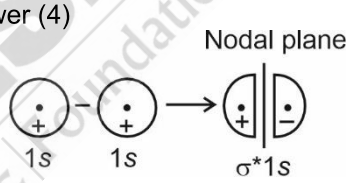
Sol.:



A bond cleavage in haloarenes is difficult than haloalkane and therefore, they are less reactive towards nucleophilic substitution reactive.

80. Answer (4)

Hint:



Sol.: σ^*2p_z has 1 nodal plane

$\sigma 1s$ has 0 nodal plane

π^*2p_y has 2 nodal planes

81. Answer (3)

Hint: Electron withdrawing group stabilises the carboxylate anion and strengthens the acid.

Sol.: –F and –Cl are electron withdrawing groups where –F has more electron withdrawing nature. Three –Cl groups are more electron withdrawing that of one –F group. While $-CH_3$ is electron donating group which destabilises the carboxylate anion and weakens the acid.

So, the correct order of acidic strength is

$CCl_3COOH > FCH_2COOH > ClCH_2COOH > CH_3COOH$

82. Answer (1)

Hint: Lead chromate form sodium tetra hydroxoplumbate (II)

Sol.

$$PbCrO_4 + 4NaOH \rightleftharpoons \underset{\text{Sodiumtetra hydroxoplumbate(II)}}{Na_2[Pb(OH)_4]} + Na_2CrO_4$$

83. Answer (3)

Hint: Starch is a polysaccharide of plants.

Sol.:

- Sucrose, on hydrolysis gives dextrorotatory glucose and laevorotatory fructose.
- Maltose is composed of two α-D-Glucose units.

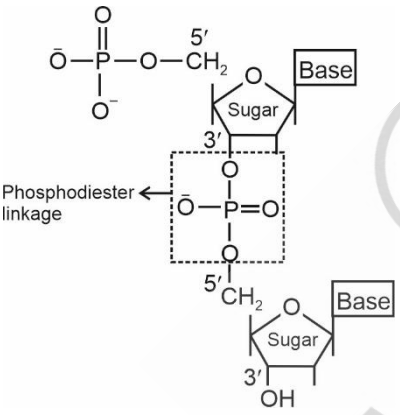
84. Answer (1)

Hint: Boiling point depends on strength of intermolecular interactions

Sol.: In aldehydes and ketones dipole-dipole interactions occur. So they have high boiling points than the hydrocarbons of comparable molecular masses where only weak van der Waals forces exists.

85. Answer (3)

Hint:



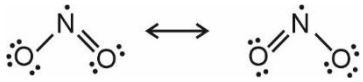
Sol.: Nucleotides are joined together by phosphodiester linkage between 5′ and 3′ carbon atoms of the pentose sugar.

SECTION - B

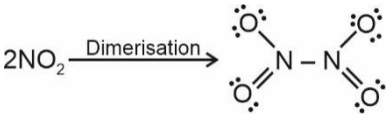
86. Answer (1)

Hint: NO_2 is an odd electron molecule.

Sol.:



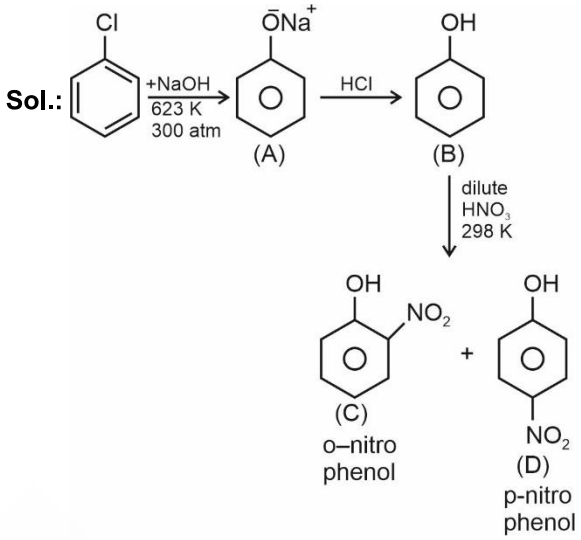
It behaves as a typical odd electron molecule and dimerise to form stable N_2O_4 molecule with even number of electrons.



87. Answer (4)

Hint: Phenol is ortho para directing and gives electrophilic substitution reaction at ortho and para position.

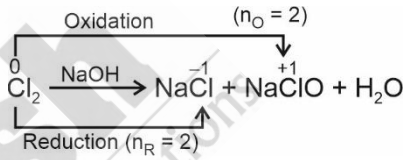
Sol.:



88. Answer (2)

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

Sol.:



$$n_{factor} = \frac{n_R . n_O}{n_R + n_O} = \frac{2 \times 2}{2 + 2} = 1$$

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

89. Answer (1)

Hint: Heat at constant volume = ΔU

Heat at constant pressure = ΔH

Sol.: $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

$\Rightarrow \Delta H = \Delta U + \Delta n_g RT$

$\Rightarrow \Delta n_g = 3 - 3 = 0$

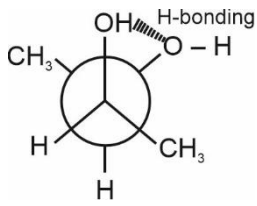
$\therefore \Delta H = \Delta U + 0 \times R \times T$

$\Delta H = -20$ kJ

90. Answer (4)

Hint: Generally the staggered conformation is most stable. But due to possibility of hydrogen bonding, Gauche form can be more stable.

Sol.:



91. Answer (3)

Hint: $R-NH_2+CHCl_3+3KOH \xrightarrow{Heat} R-NC+3KCl+3H_2O$

Sol.: Primary aliphatic amines and aromatic amines react with nitrous acid and form diazonium salts. Secondary and tertiary amines react with nitrous acid in a different manner.

92. Answer (2)

Hint: Spin only magnetic moment

$\mu = \sqrt{n(n+2)}$ BM

Sol.:

	Species	No. of Unpaired Electron	μ(BM)
I.	$[Fe(CN)_6]^{3-}$	1	$\sqrt{1(1+2)}=1.7$
II.	$[MnF_6]^{3-}$	4	$\sqrt{4(4+2)}=4.9$
III.	$[Co(H_2O)_6]^{3+}$	0	0

93. Answer (3)

Hint: 75% completion involves 2 half-lives and $t_{1/2}=\frac{0.693}{k}$.

Sol.: Half life $t_{1/2}=\frac{0.693}{6.93\times10^{-4}}=10^3$ s

2 half lives $\Rightarrow 2\times10^3$ s

94. Answer (2)

Hint: $\Delta G^\circ = -nFE^\circ_{cell}$

Sol.: $\overset{-3}{C_2}H_6 \longrightarrow \overset{+4}{CO_2}$

n = [4 – (–3)] × 2 ⇒ 14

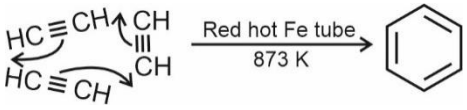
$\Delta G^\circ = -nFE^\circ_{cell}$

$-x = -14\times96500\times E^\circ_{cell}$

$\therefore E^\circ_{cell}=\frac{x}{14\times96500}$

95. Answer (3)

Hint: 3 moles of ethyne forms 1 mole of benzene in cyclic polymerisation.

Sol.: 

⇒ 3 mole ethyne ≡ 26 × 3 g ethyne ≡ 1 mole of benzene

$\therefore$ 15.6 g of ethyne $\equiv \frac{78}{26\times3}\times15.6 \Rightarrow$ 15.6 g benzene

Combustion of benzene ⇒

$C_6H_6+\frac{15}{2}O_2 \longrightarrow 6CO_2+3H_2O$

1 mol $\frac{15}{2}$ mol

⇒ 78 g benzene reacts with $\frac{15}{2}\times32$ gm of O_2

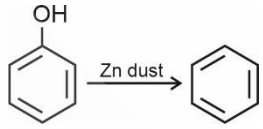
$\therefore$ 15.6 g benzene will react with

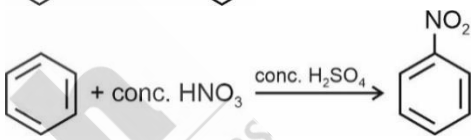
$\Rightarrow \frac{15\times32\times15.6}{2\times78}=48$ g of O_2

96. Answer (2)

Hint: Nitration of Benzene is done using a mixture of conc. HNO_3 and conc. H_2SO_4.

Sol.:

1. 

2. 

3. Wurtz Reaction:

$2R-Cl+Na \xrightarrow[Ether]{Dry} R-R+NaCl$

4. Decarboxylation:

$CH_3-C(=O)-ONa \xrightarrow[\Delta]{CaO+NaOH} CH_4+Na_2CO_3$

97. Answer (2)

Hint: $\frac{P_1^0-P_1}{P_1^0}=x_2$ x = mole fraction of solute

Sol. $\frac{P_1^0-P_1}{P_1^0}=x_2$

$\frac{12.3-P_1}{12.3}=\frac{0.5}{0.5+55.5}$

$\frac{12.3-P_1}{12.3}=\frac{0.5}{56}$

$688.8-56P_1=6.15$

$P_1=\frac{682.65}{56}=12.19$ kPa

98. Answer (3)

Hint: Addition of inert gas at constant pressure will increase the volume of equilibrium mixture.

Sol.: As the volume of equilibrium mixture increase on addition of inert gas, then number of moles per unit volume gets decreased. So equilibrium will shift towards the side where number of moles per unit volume increases.

99. Answer (4)

Hint: Y is CH_3COCl which undergoes Rosenmund reduction to form CH_3CHO.

Sol.: $CH_3COOH \xrightarrow{SOCl_2} CH_3COCl \xrightarrow{NH_3} CH_3CONH_2$ (X) (Y)

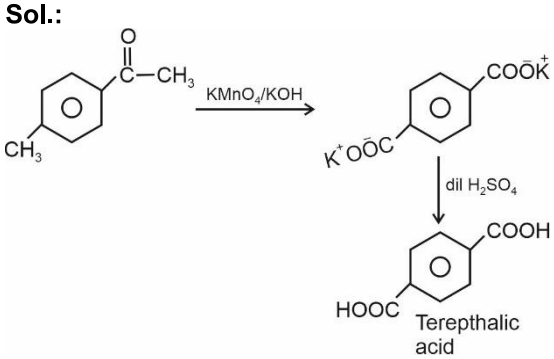
$CH_3CONH_2 \xrightarrow{Br_2 + KOH} CH_3NH_2$ (A)

$CH_3COCl \xrightarrow[Pd-BaSO_4]{H_2} CH_3CHO + HCl$ (Y) (Molecular mass = 44 u)

100. Answer (3)

Hint: $KMnO_4/KOH$ converts ketones into carboxylic acid

Sol.:



[BOTANY]

SECTION - A

101. Answer (4)

Hint: He is a British zoologist

Sol.: Theodore Schwann based on his studies concluded that the presence of cell wall is a unique character of the plant cell.

102. Answer (3)

Hint: Cisternae are seen in E.R.

Sol.: Cristae increase the surface area of inner membrane of mitochondria.

103. Answer (1)

Hint: Replication of DNA takes place in S phase

Sol.: There is no DNA replication in interkinesis.

104. Answer (3)

Hint: Synaptonemal complex is formed in second sub phase of prophase I

Sol.: This complex is formed in zygotene.

105. Answer (4)

Hint: Arthropoda is a phylum of housefly.

Sol.: Flora helps in identification of plants only.

106. Answer (3)

Hint: It forms basidiocarp.

Sol.: Mushroom belongs to the class basidiomycetes.

107. Answer (2)

Hint: Viroids and prions are sub-viral agents.

Sol.: Viroids and prions are acellular structures.

108. Answer (3)

Hint: *Volvox* is a colonial alga.

Sol.: *Chlamydomonas* – Unicellular

Ulothrix – filamentous

Kelps – Profusely branched

109. Answer (1)

Hint: Members of this group mostly show external fertilisation.

Sol.: Algae are non-embryophytes.

110. Answer (1)

Hint: Inferior ovary is present in epigynous flowers.

Sol.: In ray florets of sunflower, inferior ovary is seen.

111. Answer (1)

Hint: Stem tendrils are seen in gourds.

Sol.: Cucumber has stem tendrils.

112. Answer (1)

Hint: Heartwood is central region of wood.

Sol.: Heartwood does not conduct water and minerals. Sapwood conducts water.

113. Answer (3)

Hint: Medullary rays are seen in stems.

Sol.: Conjunctive tissues are seen in root.

114. Answer (3)

Hint: Sugarcane stores carbohydrate as sugar in their stems

Sol.: Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield.

115. Answer (2)

Hint: Light energy is utilised for the creation of proton gradient for photophosphorylation.

Sol.: In respiration, energy of oxidation-reduction is utilised for the production of proton gradient. In light reaction of photosynthesis splitting of H_2O molecules takes place and the protons get accumulated within the lumen of thylakoids.

116. Answer (3)

Hint: Pollination by water is quite rare in flowering plants and is limited to about 30 genera.

Sol.: Wind pollinated flowers often have a single ovule in each ovary and numerous flowers packed into an inflorescence.

117. Answer (1)

Hint: *Porphyra* is a red alga.

Sol.: The red algae usually reproduce vegetatively by fragmentation. They reproduce asexually by non-motile spores and sexually by non-motile gametes.

118. Answer (2)

Hint: In non-cyclic photophosphorylation, PS II is involved where evolution of O_2 occurs.

Sol: Cyclic photophosphorylation does not involve PS II.

119. Answer (1)

Hint: RuBisCO catalyses carboxylation of RuBP.

Sol.: Primary CO_2 acceptor in C_3 plants is RuBP. RuBisCO catalyses the reaction:

$CO_2 + RuBP \rightarrow 3PGA$

120. Answer (3)

Hint.: Oxygen is the terminal hydrogen acceptor.

Sol: Oxaloacetic acid is the first member of TCA cycle.

121. Answer (4)

Hint: The internode elongation of stem just prior to flowering is known as bolting.

Sol.: Gibberellins induce bolting in rosette habit plants.

122. Answer (4)

Hint: The alleles for starch grain size in pea plant show incomplete dominance.

Sol.: Dominance is not an autonomous feature of a gene or the product that it has information for. It depends as much on the gene product and production of a particular phenotype from this product as it does on the particular phenotype that we choose to examine, in case more than one phenotype is influenced by the same gene.

123. Answer (2)

Hint: Filiform apparatus is present inside the synergids.

Sol.: Synergids are present inside the embryo sac. Filiform apparatus guides the entry of pollen tube into the synergid.

124. Answer (2)

Hint: Turner's syndrome is caused by monosomy.

Sol.: Persons inflicted with Turner's syndrome have genotype 44 + XO. They have one less chromosome.

125. Answer (3)

Hint: Female birds are heterogametic.

Sol.: The AA + ZW type of chromosome complement is seen in female birds.

126. Answer (1)

Hint & Sol.: N-glycosidic linkage joins a nitrogenous base to a sugar.

127. Answer (4)

Hint: In *lac* operon, there are three structural genes.

Sol.: One of the structural gene, *lac z* gene codes for β galactosidase.

128. Answer (4)

Hint: Euchromatin is lightly stained region of chromatin.

Sol.: Features of heterochromatin are as follows:

- It is darkly stained region.
- Chromatin is densely packed.
- It is transcriptionally inactive.

129. Answer (1)

Hint: Cyclosporin A an immunosuppressive agent is commercially produced by a fungus.

Sol.: Cyclosporin A is produced by *Trichoderma*.

130. Answer (2)

Hint: Epiphytes get benefit from mango tree in the form of shelter but mango tree remains unharmed.

Sol.: This interaction is commensalism.

131. Answer (3)

Hint: Intrinsic rate of natural increase is represented by r.

Sol.: The value of 'r' for Norway rat is 0.015.

132. Answer (2)

Hint: In pond ecosystem, biomass of zooplanktons is more than that of phytoplanktons

Sol.: In pond ecosystem, the pyramid of biomass is usually inverted.

133. Answer (2)

Hint: Steller's sea cow was used for food

Sol.: Steller's sea cow became extinct due to over exploitation by humans.

134. Answer (1)

Hint: During catabolism, inorganic substances are formed.

Sol.: Catabolism is breakdown of detritus into simpler inorganic substances.

135. Answer (2)

Hint: Mutually associated organisms may show co-extinction.

Sol.: When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct.

SECTION - B

136. Answer (2)

Hint: Satellite is a region beyond secondary constriction in SAT chromosome.

Sol.: It is a non-staining region of SAT chromosome.

137. Answer (1)

Hint: Homologous chromosomes are aligned at two equatorial plates in this phase.

Sol.: In metaphase I, two metaphasic plates are formed.

138. Answer (2)

Hint: Autotrophs fix atmospheric CO_2.

Sol.: Heterotrophic bacteria depend on other organisms for their food.

139. Answer (1)

Hint: Wheat is a member of family Gramineae. Cotton and china rose are the members of family Malvaceae. Tulip is a member of family Liliaceae.

Sol.: Perianth represented by membranous scales called lodicules are found in family Gramineae.

140. Answer (2)

Hint: *Selaginella* is a pteridophyte.

Sol.: *Selaginella* has vascular tissues. Seeds are seen in gymnosperms and angiosperms.

141. Answer (4)

Hint: Carbohydrates are most preferred respiratory substrates.

Sol.: Glucose is a carbohydrate.

142. Answer (4)

Hint: It is a gaseous phytohormone.

Sol.: Ethylene hastens the thinning in cherry and walnut.

143. Answer (3)

Hint: The specialised cells around the vascular bundles in the leaves of C_4 plants are called bundle sheath cells.

Sol.: Maize is a C_4 plant. Bundle sheath cells are characterised by having a large number of chloroplasts, thick walls impervious to gaseous exchange and no intercellular spaces.

144. Answer (2)

Hint: Egg apparatus has an egg cell and two synergids.

Sol.: All cells of egg apparatus are haploid.

Egg apparatus is situated at micropylar end of the embryo sac.

145. Answer (2)

Hint: Thalassemia can be alpha or beta.

Sol.: Thalassemia is controlled by two closely linked genes HBA1 and HBA2 on chromosome 16. β thalassemia is controlled by a single gene HBB on chromosome 11.

146. Answer (1)

Hint: During aminoacylation of tRNA, amino acids are activated.

Sol.: After activation of amino acids, the activated amino acids are linked to their cognate tRNA.

147. Answer (2)

Hint: Small subunits of protein coat in viruses are called capsomeres.

Sol.: The protein coat called capsid is made up of small subunits called capsomeres. They protect the nucleic acid. These capsomeres are arranged in helical or polyhedral geometric forms.

148. Answer (2)

Hint: BOD is biochemical oxygen demand. More the BOD of waste water, more is its polluting potential.

Sol.: If BOD is more, then it has high organic matter.

149. Answer (2)

Hint: Genetically fixed adaptations pass on from generation to generation.

Sol.: The ability of kangaroo rat to concentrate urine is genetically fixed adaptation.

150. Answer (1)

Hint: Kaziranga National Park in Assam is known for the Great Indian one-horned rhinoceros.

Sol.: Dachigam National Park in Jammu and Kashmir is home to the famous musk deer or hangul.

[ZOOLOGY]

SECTION - A

151. Answer (3)

Hint: Fluid connective tissue

Sol.: In all connective tissues except blood, the cells secrete fibres of structural proteins called collagen or elastin. Cartilage, bone and blood are various types of specialised connective tissues.

152. Answer (3)

Hint: Protection against chemical stresses

Sol.: Compound epithelium covers the moist surface of buccal cavity. Compound epithelium is multi-layered. Some of the columnar or cuboidal cells get specialised for secretion and are called glandular epithelium.

153. Answer (2)

Hint: Part of hindbrain

Sol.: Pons region in hindbrain contains pneumotaxic centre that can moderate the functions of respiratory rhythm centre. Neural signals from this centre can reduce the duration of inspiration resulting in the alteration of respiratory rate.

154. Answer (4)

Hint: Body cavity is absent in platyhelminths.

Sol.: In some animals, the body cavity is not lined by mesoderm, instead the mesoderm is present as scattered pouches in between the ectoderm and endoderm, such body cavity is called pseudocoelom and the animals possessing them are called pseudocoelomates. *e.g.*, aschelminths. The animals in which the body cavity is absent are called acoelomates. The members of phylum Platyhelminthes are acoelomates.

155. Answer (1)

Hint: Exclude a platyhelminth

Sol.: *Ctenoplana* belongs to the phylum Ctenophora. They exhibit bioluminescence. *Fasciola* and *Ancylostoma* are triploblastic animals. *Sycon* is a sponge that belongs to the phylum Porifera.

156. Answer (3)

Hint: Helps in locomotion and respiration

Sol.: In echinoderms, water vascular system helps in locomotion, capture and transport of food and respiration. Water canal system is present in sponges. Fertilisation is usually external in echinoderms. The adult echinoderms are radially symmetrical but larvae are bilaterally symmetrical.

157. Answer (4)

Hint: Cranium is cartilaginous

Sol.: The body of cyclostomes is devoid of scales and paired fins. Cranium and vertebral column are cartilaginous.

158. Answer (4)

Hint: Molecular weight is not more than 800 Da.

Sol.: The acid-insoluble fraction, has only four types of organic compounds, *i.e.*, proteins, nucleic acids, polysaccharides and lipids. The acid-soluble pool represents roughly the cytoplasmic composition. Glucose is a monosaccharide which is present in acid-soluble fraction.

159. Answer (2)

Hint: Glucose transport

Sol.:

Protein	Functions
Collagen	Intercellular ground substance
Trypsin	Enzyme
Insulin	Hormone
Antibody	Fights infectious agents
Receptor	Sensory reception (smell, taste, hormone, etc.)
GLUT-4	Enables glucose transport into cells

160. Answer (4)

Hint: Bile is released from gall bladder.

Sol.: In frogs, digestion of food takes place by the action of HCl and gastric juices secreted from the walls of the stomach. Partially digested food in stomach is called chyme. Liver secretes bile that is stored in the gall bladder. Pancreas secretes pancreatic juice, containing digestive enzymes.

161. Answer (3)

Hint: Receives blood through vena cava

Sol.: A triangular structure called sinus venosus joins the right atrium in the heart of frog. It receives blood through the major veins called vena cava. The ventricle opens into a sac-like structure called conus arteriosus on the ventral side of the heart.

162. Answer (4)

Hint: Position of heart and sternum in humans

Sol.: The thoracic chamber is formed dorsally by the vertebral column, ventrally by the sternum, laterally by the ribs and on the lower side by the dome-shaped diaphragm.

163. Answer (2)

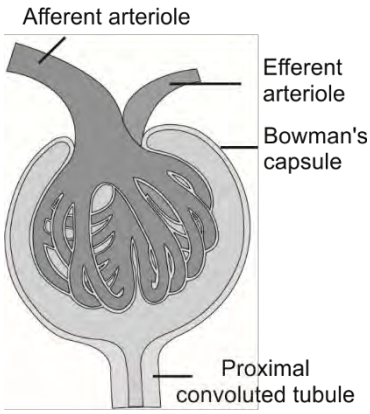
Hint: Carries O_2 and CO_2

Sol.: Erythrocytes or RBCs are devoid of nucleus in most of the mammals including humans. Monocytes, lymphocytes and basophils are types of leucocyte. They are nucleated.

164. Answer (3)

Hint: Bowman's capsule encloses glomerulus

Sol.:



165. Answer (3)

Hint: ANF is antagonistic to RAAS.

Sol.: An increase in blood flow to the atria of the heart can cause the release of ANF that causes vasodilation (dilation of blood vessels) and thereby decreases the blood pressure. ANF acts as a check on the renin-angiotensin mechanism.

166. Answer (2)

Hint: Caused due to accumulation of uric acid crystals

Sol.: Gout is inflammation of joints due to accumulation of uric acid crystals. Tetany is characterised by wild contractions in muscles due to low Ca^{++} in body fluids.

167. Answer (4)

Hint: Hypothalamus lies at the base of it.

Sol.: Thalamus is a major coordinating centre for sensory and motor signaling. Corpus callosum is a tract of nerve fibres which connects left and right cerebral hemispheres. Hypothalamus lies at the base of the thalamus. Pons is a part of hindbrain.

168. Answer (3)

Hint: Human protein-enriched milk

Sol.: The milk of transgenic cow, 'Rosie' was nutritionally more balanced due to the presence of human α-lactalbumin. Human ADA is responsible for maturation of lymphocytes. Its deficiency causes SCID.

Human α-1-antitrypsin is present in the milk of transgenic sheep, 'Tracy'.

169. Answer (3)

Hint: Catecholamines are emergency hormones.

Sol.: Catecholamines increase heart beat, strength of heart contraction and the rate of respiration. They are also responsible for pupillary dilation and piloerection.

Catecholamines also stimulate the breakdown of glycogen resulting in an increased concentration of glucose in blood. In addition, they also stimulate lipolysis and proteolysis.

170. Answer (4)

Hint: Secreted by the tissues which are not organised endocrine glands

Sol.: GIP (Gastric Inhibitory Peptide) inhibits gastric secretion and motility.

Hormones which interact with membrane bound receptors do not enter the target cells, but generate second messengers.

171. Answer (1)

Hint: Exclude thyroid related diseases

Sol.: Addison's disease is caused due to under production of adrenal cortex hormones. Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to stunted growth, called cretinism. Graves' disease is a form of hyperthyroidism.

172. Answer (3)

Hint: Exclude the components of pectoral girdle

Sol.: At the point of fusion of ilium, ischium and pubis is a cavity called acetabulum to which the thigh bone articulates. Glenoid cavity and acromion are associated with pectoral girdle. The two halves of the pelvic girdle meet ventrally to form the pubic symphysis containing fibrous cartilage.

173. Answer (3)

Hint: Sperms are produced in seminiferous tubules.

Sol.: Sperms transport pathway in human males: Seminiferous tubules $\rightarrow$ rete testis $\rightarrow$ vasa efferentia $\rightarrow$ epididymis $\rightarrow$ vas deferens $\rightarrow$ ejaculatory duct $\rightarrow$ urethra.

174. Answer (4)

Hint: Required for metabolic changes

Sol.: During pregnancy, increased levels of hormones like estrogen, progesterone, cortisol, thyroxine, *etc*., are essential for supporting the foetal growth, metabolic changes in the mother and maintenance of pregnancy.

175. Answer (1)

Hint: Erectile structure

Sol.: Mons pubis is a cushion of fatty tissue covered by skin and pubic hair. Ovary is primary sex organ in females. Fallopian tube is a female accessory duct.

176. Answer (2)

Hint: Vasectomy is a terminal method of contraception.

Sol.:

(i) Condoms - Prevent the entry of semen into female reproductive tract

(ii) CuT - Suppresses sperm motility

(iii) Saheli - Non-steroidal OCP (oral contraceptive pill)

(iv) Tubectomy - Terminal method of contraception

177. Answer (2)

Hint: Exclude the theory given by Hugo de Vries

Sol.: Natural selection and branching descent are the two key concepts of Darwinian theory of evolution. Single step large mutation is called saltation. Hugo de Vries proposed the mutation theory. Genetic drift causes the change in gene frequency by chance in a small population.

178. Answer (2)

Hint: Potato is a stem modification.

Sol.: Sweet potato and potato are the examples of analogous structures as sweet potato is a modified root while potato is a modified stem. Homology indicates the common ancestry.

179. Answer (2)

Hint: Helps in grinding of food particles

Sol.: Gizzard is also called proventriculus. Crop is used for storing of food.

A ring of 6 to 8 blind tubules present at the junction of foregut and midgut is called hepatic caeca, which secrete digestive juice.

180. Answer (1)

Hint: Several antibodies are present in colostrum.

Sol.: Colostrum is an effective way of immunity transfer from mother to newborns because it has abundant IgA, which protects the baby from the infections.

181. Answer (4)

Hint: Identify a helminth.

Sol.: *Wuchereria* is transmitted by female *Culex* and causes filariasis. *Ascaris* causes ascariasis. Amoebiasis is caused by *Entamoeba*. *Salmonella typhi* causes typhoid. *Salmonella* and *Entamoeba* are transmitted through contaminated food and water.

182. Answer (2)

Hint: Store house of calcium ions.

Sol.: White muscle fibres have few mitochondria. They depend on anaerobic process for energy.

Red muscle fibres contain plenty of mitochondria which can utilise the large amounts of oxygen stored in them for ATP production.

The amount of sarcoplasmic reticulum is high in white muscle fibres

183. Answer (4)

Hint: Isolated from a bacterium

Sol.: *Hin*d II is a restriction endonuclease. It was isolated from *Haemophilus influenzae*.

Protease digests proteins and RNase digests RNA. DNA polymerase participates in the replication of DNA.

184. Answer (1)

Hint: Use of anti-sense RNA

Sol.: RNAi involves silencing of mRNA due to the formation of ds-RNA formed by binding of antisense RNA and sense RNA.

185. Answer (2)

Hint: Exclude methods for females only

Sol.: Use of condoms has increased in recent years due to its additional benefit of protecting user from contracting STIs and AIDS. Diaphragm, vaults, cervical caps are barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus.

SECTION-B

186. Answer (4)

Hint: Blood and bone are specialised connective tissues.

Sol.: Areolar connective tissue is the most widely distributed loose connective tissue in the body of complex animals. Ligaments are dense regular connective tissue that connect bone to bone. Adipose is a fat storing tissue.

187. Answer (2)

Hint: Subphylum Vertebrata

Sol.: Phylum Chordata is divided into three subphyla : Urochordata, Cephalochordata and Vertebrata. In urochordates, notochord is present only in larval tail while in cephalochordates, it extends from head to tail region and is persistent throughout their life. Notochord is persistent throughout the life of cyclostomes and members of class Chondrichthyes.

188. Answer (1)

Hint: Cytosine is a nitrogenous base.

Sol.: Cytosine - Pyrimidine

Codeine - Alkaloid

Glycogen - Polysaccharide

Anthocyanin - Pigment

189. Answer (2)

Hint: Stored in salivary gland of infected mosquito

Sol.: Sporozoites are the infective stage of *Plasmodium* that enter into human body. Gametocytes produce gametes. Sporozoites in liver cells develop into cryptozoites, which later divides into cryptomerozoites.

190. Answer (1)

Hint: Urea synthesis occurs in liver.

Sol.: Hepatic vein carries largest amount of urea. Renal vein carries least amount of urea. Hepatic portal vein drains blood from intestine to liver.

191. Answer (2)

Hint: Symptoms of diabetes

Sol.: Renal calculi = Mass of crystallised salts within the kidney

Glomerulonephritis = Inflammation of glomeruli

Glycosuria = Presence of glucose in urine

192. Answer (3)

Hint: True ribs

Sol.: First 7 pairs of ribs are vertebrosternal. 8th, 9th and 10th pairs of ribs do not articulate directly with the sternum, they join with 7th pair of rib by hyaline cartilage and are called vertebrochondral ribs. Last 2 pairs of ribs are called floating ribs.

193. Answer (1)

Hint: Continues to form pigmented and opaque structure

Sol.: Thick anterior part of choroid is ciliary body. The ciliary body continues forward to form a pigmented and opaque structure called iris. In front of lens, the aperture surrounded by iris is called pupil. Cornea is the anterior part of sclera.

194. Answer (3)

Hint: Caused due hyposecretion of insulin

Sol.: ADH/Vasopressin synthesised by hypothalamus and released by posterior pituitary, acts on kidneys and stimulates reabsorption of water and electrolytes. Its hyposecretion leads to diabetes insipidus. Diabetes mellitus is due to hyposecretion of insulin. Hyposecretion of thyroxine causes simple goitre. Hypersecretion of GH in adults causes acromegaly.

195. Answer (3)

Hint: First movements observed during 5th month

Sol.: By the end of second trimester (24 weeks), the body of foetus is covered with fine hair, eyelids separate and eyelashes are formed.

196. Answer (4)

Hint: Gamete Intra Fallopian Transfer

Sol.: GIFT is transfer of an ovum collected from donor into the fallopian tube of another female who cannot produce ova but provides suitable environment for fertilisation and further development.

ZIFT involves transfer of zygote or early embryo (upto 8 blastomeres) into fallopian tube.

197. Answer (3)

Hint: Birds usually eat grains.

Sol.: Seed eating finch was common ancestor of Darwin's finches present on Galapagos islands. According to the needs of different environment, finches developed different shapes of beaks and feeding habits like insect eating, fruit eating, cactus eating, *etc*.

198. Answer (3)

Hint: Identify the fungal infection.

Sol.: Typhoid is a bacterial disease caused by *Salmonella typhi*. Fungi like *Trichophyton*, *Microsporum, etc*. cause ringworm. HIV infections, mumps, genital herpes and dengue are viral diseases.

199. Answer (2)

Hint: One of the most common antibiotic.

Sol.: Ampicillin resistance gene and tetracycline resistance gene act as selectable marker which help in selecting transformants and recombinants from non-transformants and non-recombinants respectively.

200. Answer (2)

Hint: Sensory in function

Sol.: Olfactory bulbs are extensions of the brain's limbic system. The tongue detects tastes through taste buds. Ciliary body is present in the eyes. Stapes is the smallest bone present in the middle ear.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2024

OPEN MOCK TEST - 3

Click here for Code-E sol.

Test Date : 21/04/2024

ANSWERS

1. (2)	41. (2)	81. (4)	121. (2)	161. (1)
2. (4)	42. (2)	82. (3)	122. (3)	162. (4)
3. (2)	43. (2)	83. (3)	123. (3)	163. (3)
4. (2)	44. (3)	84. (1)	124. (1)	164. (3)
5. (1)	45. (3)	85. (2)	125. (1)	165. (1)
6. (2)	46. (2)	86. (3)	126. (2)	166. (4)
7. (1)	47. (1)	87. (4)	127. (1)	167. (3)
8. (2)	48. (3)	88. (3)	128. (2)	168. (3)
9. (1)	49. (1)	89. (2)	129. (2)	169. (4)
10. (2)	50. (4)	90. (2)	130. (3)	170. (2)
11. (3)	51. (4)	91. (3)	131. (2)	171. (3)
12. (3)	52. (4)	92. (2)	132. (1)	172. (3)
13. (1)	53. (2)	93. (3)	133. (4)	173. (2)
14. (2)	54. (4)	94. (2)	134. (4)	174. (4)
15. (3)	55. (2)	95. (3)	135. (1)	175. (3)
16. (1)	56. (1)	96. (4)	136.(1)	176. (2)
17. (2)	57. (3)	97. (1)	137. (2)	177. (1)
18. (3)	58. (3)	98. (2)	138. (2)	178. (4)
19. (3)	59. (3)	99. (4)	139. (2)	179. (2)
20. (3)	60. (3)	100. (1)	140. (1)	180. (4)
21. (3)	61. (1)	101. (4)	141. (2)	181. (1)
22. (2)	62. (2)	102. (3)	142. (2)	182. (2)
23. (2)	63. (1)	103. (1)	143. (3)	183. (2)
24. (1)	64. (4)	104. (3)	144. (4)	184. (2)
25. (3)	65. (4)	105. (4)	145. (4)	185. (2)
26. (1)	66. (3)	106. (3)	146. (2)	186. (2)
27. (2)	67. (2)	107. (2)	147. (1)	187. (2)
28. (4)	68. (4)	108. (3)	148. (2)	188. (3)
29. (3)	69. (3)	109. (1)	149. (1)	189. (3)
30. (4)	70. (3)	110. (1)	150. (2)	190. (4)
31. (1)	71. (3)	111. (3)	151. (3)	191. (3)
32. (1)	72. (2)	112. (2)	152. (3)	192. (3)
33. (3)	73. (4)	113. (2)	153. (2)	193. (1)
34. (2)	74. (2)	114. (4)	154. (4)	194. (3)
35. (2)	75. (2)	115. (4)	155. (1)	195. (2)
36. (2)	76. (3)	116. (3)	156. (3)	196. (1)
37. (2)	77. (1)	117. (1)	157. (4)	197. (2)
38. (3)	78. (3)	118. (2)	158. (4)	198. (1)
39. (3)	79. (1)	119. (1)	159. (2)	199. (2)
40. (1)	80. (3)	120. (3)	160. (4)	200. (4)

HINTS & SOLUTIONS

[PHYSICS]

SECTION - A

1. Answer (2)

Hint: $LC = 1MSD - 1VSD$

Sol.: $1\,MSD = \frac{1}{20}$ cm

$1VSD = \frac{16}{20}MSD = 0.8\,MSD$

$LC = 1MSD - 1VSD$

$= 0.2 \times \frac{1}{20}\text{ cm} = \frac{1}{100}\text{ cm} = 0.01\text{ cm}$

2. Answer (4)

Hint & Sol: Power = Force × velocity

$\text{Pressure} = \frac{F}{A}$

Hence, power and pressure have different dimensions

3. Answer (2)

Hint: $(B.E.)_{\text{Reaction}} = (B.E.)_{\text{Product}} - (B.E.)_{\text{Reactant}}$

Sol.: $(B.E.)_{\text{Reaction}} = (B.E.)_R - (B.E.)_P - (B.E.)_Q$

$= 230 - 112 - 106$

$= 12$ MeV

4. Answer (2)

Hint: $\left|\vec{a}+\vec{b}\right| = \sqrt{a^2+b^2+2ab\cos\theta}$

$\left|\vec{a}-\vec{b}\right| = \sqrt{a^2+b^2-2ab\cos\theta}$

Sol.: $\left|\hat{a}+\hat{b}\right| = 1$

Angle between $\hat{a}$ and $\hat{b}$ will be 120°

$\left|\hat{a}-\hat{b}\right| = \sqrt{1+1-2\times1\times1\cos120^\circ} = \sqrt{3}$

5. Answer (1)

Hint: If $\vec{A} \perp \vec{B}$ then $\vec{A}\cdot\vec{B} = 0$

Sol.: $\vec{A}\cdot\vec{B} = 0$

$2 + \alpha + 4\alpha = 0$

$5\alpha = -2$

$\alpha = -\frac{2}{5}$

6. Answer (2)

Hint: $\frac{t_a}{t_d} = \sqrt{\frac{g-a}{g+a}}$

Sol.: $\frac{t_a}{t_d} = \sqrt{\frac{g-a}{g+a}} = \frac{2}{3}$

$\frac{g-a}{g+a} = \frac{4}{9}$

$9g - 9a = 4g + 4a$

$5g = 13a$

$a = \frac{5g}{13}$

7. Answer (1)

Hint: $a_{\text{avg}} = \left|\frac{\vec{v}-\vec{u}}{\Delta t}\right|$

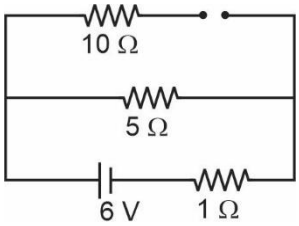
Sol.: $a_{\text{avg}} = \frac{v-u}{t} = \frac{\sqrt{2g\times5}+\sqrt{2g\times20}}{0.01}$

$= \frac{10+20}{0.01} = 30\times10^2 = 3\times10^3\ \text{m/s}^2$

8. Answer (2)

Hint: At steady state capacitor act as open circuit.

Sol.: At steady state



$i = \frac{6}{6} = 1\,\text{A}$

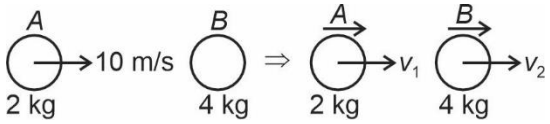
$V = 5 \times 1 = 5\,\text{V}$

$Q = CV = 2\times5 = 10\ \mu\text{C}$

9. Answer (1)

Hint: $e = \frac{|\vec{v}_2 - \vec{v}_1|}{|\vec{u}_1 - \vec{u}_2|}$

Sol.:



$10 \times 2 = 2v_1 + 4v_2$ …(i)

$\frac{1}{2} = \frac{v_2 - v_1}{10}$

$\Rightarrow \quad v_2 - v_1 = 5$ …(ii)

From equation (i) and (ii)

$v_1 = 0$, $v_2 = 5$ m/s

10. Answer (2)

Hint: $W_{req} = K_f - K_i$

Sol.: Work req. = ΔKE_{loss}

$= \frac{1}{2}mv^2\left(1 + \frac{K^2}{R^2}\right)$

$= \frac{1}{2} \times 2 \times 100\left(1 + \frac{2}{5}\right)$

$= \frac{100 \times 7}{5} = 140$ J

11. Answer (3)

Hint: $F = q\vec{V} \times \vec{B}$

Sol.: $F = qvB$

$F = 2 \times 2 \times 2 \times 10^{-3}$

$= 8 \times 10^{-3}$ N

= 8 mN

12. Answer (3)

Hint: $C = \frac{Q}{V}$, $\Delta H = \frac{1}{2}\frac{C_1C_2}{C_1 + C_2}(V_1 - V_2)^2$

Sol.: $V_1 = \frac{10}{2} = 5$ V

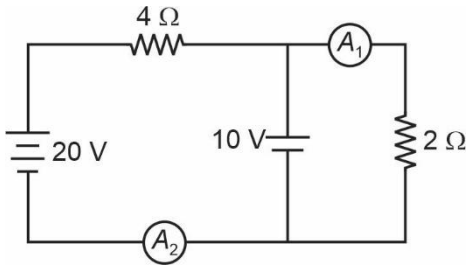
$\Delta H = \frac{1}{2} \times \frac{2 \times 4}{6} \times (5 - 0)^2$

$= \frac{2}{3} \times 25 = \frac{50}{3}\mu$J

13. Answer (1)

Hint: Ideal ammeter has zero resistance.

Sol.:



Reading of $A_2 \rightarrow \frac{20 - 10}{4} = 2.5$ A

Reading of $A_1 \Rightarrow \frac{10}{2} = 5$ A

14. Answer (2)

Hint: $e = \frac{\ell_2 - 3\ell_1}{2}$

Sol.: $e = \frac{\ell_2 - 3 \times 16}{2}$

$\ell_2 = 48 + 2 \times 1 = 50$ cm

15. Answer (3)

Hint: Speed of wave in a medium given by $v = \frac{\omega}{K}$

Sol.:

$A = 0.5$ $A' = 2A = 1.0$

$f = 1$ Hz $f' = 0.5$ Hz, $\omega' = \pi$

v $v' = v$

$\lambda = 1$ $\lambda' = \frac{v}{f'} = \frac{2v}{f} = 2\lambda$

$K' = \frac{2\pi}{\lambda'} = \pi$

Equation of wave will be

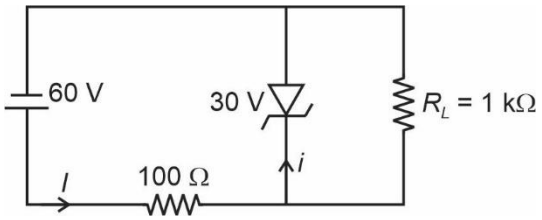
$y = 1.0\sin(\pi t - \pi(-x))$

$y = 1.0\sin(\pi t + \pi x)$

16. Answer (1)

Hint: Zener diode act as a voltage regulator

Sol.:



$I = \frac{30}{100} = 300$ mA

Current through $R_L = \frac{30}{1\,k\Omega} = 30$ mA

Current through Zener diode = 300 – 30

= 270 mA

17. Answer (2)

Hint: In reversed biased diode offers infinite resistance.

Sol.: $i = \frac{V}{R_{eq}} = \frac{30}{10+5} = 2$ A

18. Answer (3)

Hint: $V = \frac{KQ}{R}$

Sol.: $R = (27)^{\frac{1}{3}} r = 3r$

Potential of bigger drop $= \frac{27Kq}{3r} = \frac{9Kq}{r} = 9 \times 2$ V

= 18 V

19. Answer (3)

Hint: Uniformly charged infinite sheet produces uniform electric field in its surrounding.

Sol.: In uniform field, force experience of dipole is zero but $\vec{\tau} = \vec{P} \times \vec{E}$

20. Answer (3)

Hint: $v = a\omega\cos(\omega t + \phi_0)$

Sol.: $x = a\sin(\omega t + \phi_0)$

$v = a\omega\cos(\omega t + \phi_0)$

at $t = 0, v = \frac{a\omega}{2}$

$\frac{a\omega}{2} = a\omega\cos\phi_0$

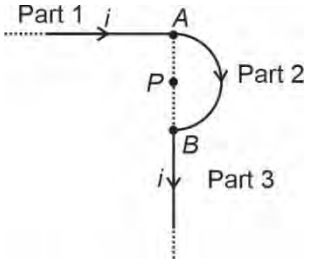
$\frac{1}{2} = \cos\phi_0$

$\Rightarrow \quad \phi_0 = \frac{\pi}{3}$

21. Answer (3)

Hint: Magnetic field at centre of semi-circular ring $= \frac{\mu_0 i}{4R}$

Sol.:



Field at P due to part 1 $= \frac{\mu_0 i}{4\pi R} \otimes$

Field at P due to part 2 $= \frac{\mu_0 i}{4R} \otimes$

Field at P due to part 3 = 0

Net field at $P = \frac{\mu_0 i}{4R}\left[\frac{1}{\pi} + 1\right]$ pointed into the paper.

22. Answer (2)

Hint: $\cos\phi = \frac{R}{Z}$

Sol.: $Z = \sqrt{(X_C - X_L)^2 + R^2}$

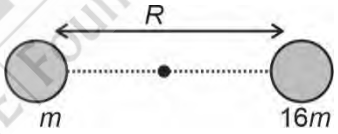
$= \sqrt{(70-40)^2 + 30^2} = 30\sqrt{2}$

$\cos\phi = \frac{30}{30\sqrt{2}} = \frac{1}{\sqrt{2}}$

23. Answer (2)

Hint: Potential due to bodies $= -\frac{GM}{r}$

Sol.:



$V = -\frac{Gm}{\frac{R}{2}} - \frac{G(16m)}{\frac{R}{2}}$

$= -\frac{34Gm}{R}$

24. Answer (1)

Hint: $T_{max} - T_{min} = 6mg$

Sol.: $\frac{T_{max}}{T_{min}} = 4$ also, $T_{max} - T_{min} = 6mg$

$4T_{min} - T_{min} = 6mg$

$T_{min} = 2mg$

$T_{max} = 8mg$

= 8 × 2 × 10 = 160 N

25. Answer (3)

Hint: $\frac{\Delta W}{\Delta Q} = \frac{\gamma - 1}{\gamma}$

Sol.: In isobaric process.

$$\frac{W}{\Delta Q}=\frac{\gamma-1}{\gamma}$$

$$\Delta Q=\frac{\gamma}{\gamma-1}W$$

$$=\frac{\frac{7}{5}}{\frac{2}{5}}\times 60=\frac{7\times 60}{2}=210\text{ J}$$

26. Answer (1)

Hint: $K_{max}=h\nu-h\nu_0$

Sol.: $K_{max}=h\nu-h\nu_0$

$=h(2\times 10^{14}-0.5\times 10^{14})=1.5\times 10^{14}\times 6\times 10^{-34}$

$=9\times 10^{-20}$ J

27. Answer (2)

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

Sol.: $\frac{\lambda_P}{\lambda_Q}=\frac{P_Q}{P_P}=\frac{4}{1}$

28. Answer (4)

Hint & Sol.:

- Charged particles may experience attractive as well as repulsive force.
- Charge at rest produce only electric field only.

29. Answer (3)

Hint: $\eta\%=\frac{P_{out}}{P_{in}}\times 100$

Sol.: $90=\frac{P_{out}}{3\text{ kW}}\times 100$

$P_{out}=2.7\text{ kW}=I_SV_S$

$5V_S=2700$

$V_S=\frac{2700}{5}=540\text{ V}$

30. Answer (4)

Hint: $L=n^2\mu_0Al$

Sol.: Since, $L\propto$ (Linear dimension)^3

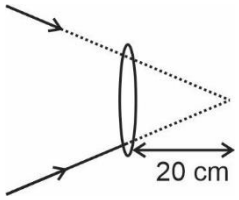
$L'\propto$ (3 linear dimension)^3

$L'=27L$

31. Answer (1)

Hint: $\frac{1}{v}-\frac{1}{u}=\frac{1}{f}$

Sol.:



$u=+20$ cm, $v=?$, $f=+40$

$$\frac{1}{v}=\frac{1}{f}+\frac{1}{u}=\frac{1}{40}+\frac{1}{20}=\frac{1+2}{40}$$

$$\Rightarrow\quad v=\frac{40}{3}\text{ cm}$$

32. Answer (1)

Hint: $L=f_0+f_e$

Sol.: $\frac{f_0}{f_e}=49$

$f_0=49f_e$

$f_0+f_e=L$

$50f_e=100$

$f_e=2$ cm

$f_0=98$ cm

33. Answer (3)

Hint: $\delta=(\mu-1)A$

Sol.: $\delta=(1.5-1)\times 6=3°$

34. Answer (2)

Hint:

Sol.: $I=\frac{I_0}{2}\cos^2 60°=\frac{I_0}{8}$

35. Answer (2)

Hint: $\Delta\phi=\frac{2\pi}{\lambda}.\Delta x$

Sol.: $\Delta\phi=\frac{2\pi}{\lambda}\times\frac{\lambda}{6}=\frac{\pi}{3}$

SECTION - B

36. Answer (2)

Hint: $w_{net}=k_f-k_i$

Sol.: $x=2\sqrt{t+1}$

$$\frac{dx}{dt}=\frac{2}{2\sqrt{t+1}}$$

$$\Rightarrow \quad v = \frac{1}{\sqrt{t+1}}$$

$$w_{net} = k_f - k_i$$

$$= \frac{1}{2}m\left(v_f^2 - v_i^2\right)$$

$$= \frac{1}{2}0.1\left(\frac{1}{t_f+1} - \frac{1}{t_i+1}\right)$$

$$= \frac{1}{2}0.1\left(\frac{1}{3} - \frac{1}{1}\right)$$

$$w_{net} = -\frac{1}{30}\text{J}$$

37. Answer (2)

Hint: Apply angular momentum conservation.

Sol.: From law of conservation of angular momentum about hinge.

$$\frac{mv3L}{4} = \frac{3mL^2}{3} \times \omega + m\left(\frac{3L}{4}\right)^2 \omega$$

$$\frac{3mvL}{4} = mL^2\omega + \frac{9}{16}mL^2\omega$$

$$\frac{3mvL}{4} = \frac{25mL^2\omega}{16}$$

$$\omega = \frac{12v}{25L}$$

38. Answer (3)

Hint: $a\sin\theta = n\lambda$ for minima

Sol.: $2 \times 10^{-6}\sin 30° = \lambda$

$\lambda = 1 \times 10^{-6}$ cm

$= 100$ Å

39. Answer (3)

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

Sol.: $\vec{V} = 2t\hat{i} + 4t^2\hat{j}$

$$\frac{d\vec{V}}{dt} = 2\hat{i} + 8t\hat{j}$$

$$\vec{F} = m\vec{a} = 2\hat{i} + 8t\hat{j}$$

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

$= 4t + 32t^3$

$P(t = 2) = 4 \times 2 + 32 \times 8$

$= 8 + 256 = 264$ watt

40. Answer (1)

Hint: $U = -\vec{M} \cdot \vec{B}$

Sol.: $U = -(100 + 150) = -250$ J

41. Answer (2)

Hint: $T = 2\pi\sqrt{\frac{M}{k}}$

Sol.: At equilibrium

$$X_i = \frac{(m_1 + m_2 + m_3)g}{k}$$

Now after removal of m_2 and m_3, in equilibrium extension would be

$$x_f = \frac{m_1 g}{k}$$

$$A = X_i - X_f$$

$$= \frac{(m_1 + m_2 + m_3)g}{k} - \frac{m_1 g}{k}$$

$$= \frac{(m_2 + m_3)g}{k}$$

$$T = 2\pi\sqrt{\frac{m_1}{k}}$$

42. Answer (2)

Hint:

Sol.: $r_d = \frac{\Delta V}{\Delta I} = \frac{0.85 - 0.80}{20 \times 10^{-3}}$

$$= \frac{0.05}{20 \times 10^{-3}} = \frac{50}{20} = 2.5\ \Omega$$

43. Answer (2)

Hint: $P_L = P_1 + P_2$

Sol.: $P_1 = \frac{100}{20} = +5$ D

$$P_2 = -\frac{100}{40} = -2.5\text{ D}$$

$P_L = 2.5$ D

44. Answer (3)

Hint: V = Potential gradient × length

Sol.: $V_A = \frac{5}{100} \times 20 = 1\,V$

$V_B = \frac{5}{100} \times 60 = 3\ V$

Hence, $V_B - V_A = 2V$

45. Answer (3)

Hint: $\bar{A} + \bar{B} = \overline{A \cdot B}$

Sol.: $\bar{A} + \bar{B} = \overline{AB} = \text{NAND}$

46. Answer (2)

Hint: $N = \frac{N_0}{2^n}$

Sol.: $\frac{N}{N_0} \times 100 = \frac{100}{2^n} = \frac{100}{2^4} = \frac{100}{16} = 6.25\%$

47. Answer (1)

Hint: In free fall motion mechanical energy remains constant.

Sol.: At highest point.

ME = mgh + 0

At $\frac{h}{5}$ height

$PE = \frac{mgh}{5}$

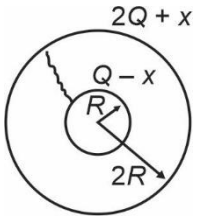
$KE = mgh - \frac{mgh}{5} = \frac{4mgh}{5}$

Ratio $= \frac{4}{1}$

48. Answer (3)

Hint: Both shell acquire common potential after connection.

Sol.:



Let x charge flow from inner shell to outer shell.

$V_{inner} = \frac{K(Q-x)}{R} + \frac{K(2Q+x)}{2R}$

$V_{outer} = \frac{K(Q-x)}{2R} + \frac{K(2Q+x)}{2R}$

$V_{inner} = V_{outer}$

$Q = x$

Hence, net charge on outer shell = $3Q$

49. Answer (1)

Hint: $\lambda_m \propto \frac{1}{T}$

Sol.: $\lambda_1 < \lambda_2 < \lambda_3$

$T_1 > T_2 > T_3$

50. Answer (4)

Hint: In parallel grouping effective resistance decreases.

Sol.: $P = \frac{V^2}{R_{eq}}$, $i = \frac{V}{R_{eq}}$

On closing the key $R_{eq}\downarrow$ $P\uparrow$ $i\uparrow$

[CHEMISTRY]

SECTION - A

51. Answer (4)

Hint: $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$

Sol.: $\Delta x \times m\Delta v \geq \frac{h}{4\pi}$

$0.2 \times 10^{-12} \times 9.1 \times 10^{-31} \times \Delta v = \frac{6.626 \times 10^{-34}}{4 \times 3.14}$

$\therefore \Delta v = 2.89 \times 10^8\ ms^{-1}$

52. Answer (4)

Hint: Atomic mass of sulphur is 32 u

Sol.: For minimum molecular mass at least one sulphur atom should be present

Mass percentage of an element

$= \frac{\text{Mass of an element}}{\text{Molecular mass}} \times 100$

$8 = \frac{32}{\text{Molecular mass}} \times 100$

Molecular mass = 400 u

53. Answer (2)

Hint: IUPAC official name of an element with atomic number 102 is Nobelium.

Sol.: Atomic number of Lawrencium, Rutherfordium, Bohrium and Mendelevium respectively are 103, 104, 107 and 101.

54. Answer (4)

Hint: Bond order = $\frac{1}{2}(N_b - N_a)$

Where,

N_b = Number of electrons in bonding molecular orbital.

N_a = Number of electrons in antibonding molecular orbital

Sol.:

$O_2^+ = (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p)_z^2 (\pi 2p_x^2 \equiv \pi 2p_y^2)$

$(\pi^* 2p_x^1 \equiv \pi^* 2p_y)$

Bond order $= \frac{1}{2}(10-5) = 2.5$

$N_2^- = (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x^2 \equiv \pi 2p_y^2)$

$(\sigma 2p)_z^2 (\pi^* 2p_x^1 \equiv \pi^* 2p_x^0)$

Bond order $= \frac{1}{2}(10-5) = 2.5$

$C_2^+ = (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x^2 \equiv \pi 2p_y^1)$

Bond order $= \frac{1}{2}(7-4) = 1.5$

$F_2^- = (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p_x^2 \equiv \pi 2p_y^2)$

$(\pi^* 2p_x^2 \equiv \pi^* 2p_y^2)(\sigma^* 2p_z^1)$

Bond order $= \frac{1}{2}(10-9) = 0.5$

55. Answer (2)

Hint: pH of a salt of weak acid and strong base

$= 7 + \frac{1}{2}(pKa + \log C)$

Sol.: K_2SO_4 and KNO_3 are the salt of strong acid and strong base. So, their pH are independent of concentration.

1. **Potassium Sulphate (K_2SO_4):** Salt of strong acid and strong base.
2. Sodium Acetate CH_3COONa salt of weak acid and strong base.
3. **Ammonium Sulphate $(NH_4)_2SO_4$:** Salt of strong acid and weak base.
4. **Potassium Nitrate (KNO_3):** Salt of strong acid and strong base.

56. Answer (1)

Hint: $\Delta T_f = iK_f m$

Sol.: m(molality) = $\frac{20}{122.5 \times 500} \times 1000$

$= \frac{400}{1225} = 0.326$

For weak acid,

$K_a = c\alpha^2$

$\alpha = \sqrt{\frac{K_a}{c}} = \sqrt{\frac{1.4 \times 10^{-3}}{0.326}}$

$= \sqrt{4.3 \times 10^{-3}}$

$= \sqrt{43 \times 10^{-4}}$

$= 6.55 \times 10^{-2}$

$\alpha = 0.0655$

$i = \frac{1 - \alpha + n\alpha}{1}$ here n = 2

$i = 1 - \alpha + 2\alpha$

$i = 1 + \alpha$

$i = 1 + 0.0655$

$i = 1.0655$

$\Delta T_f = 1.0655 \times 1.86 \times 0.326$

$\Delta T_f = 0.65$ K

57. Answer (3)

Hint: Due to the presence of common ion (chloride ion), solubility of AgCl decreases.

Sol.: $NaCl(aq) \longrightarrow \underset{0.2\ M}{Na^+(aq)} + \underset{0.2\ M}{Cl^-(aq)}$

Let the solubility of AgCl in 0.2 M NaCl be s mol L^{-1}

$AgCl \rightleftharpoons \underset{s}{Ag^+} + \underset{(s+0.2)}{Cl^-}$

$K_{sp} = s \times (s + 0.2)$

[As solubility of AgCl is very low]

[$\therefore$ s <<< 0.2 M]

[$(s + 0.2) \approx 0.2$]

$\therefore$ $1.8 \times 10^{-10} = 0.2\ s$

$\therefore$ $s = \frac{1.8 \times 10^{-10}}{0.2} = 9 \times 10^{-10}$ mol L^{-1}

58. Answer (3)

Hint: Number of radial nodes = n – l – 1

Total number of nodes = n – 1

Sol.: For 3*d* orbitals

n = 3

l = 2

Number of radial nodes = n – l – 1 = 3 – 2 – 1 = 0

Total number of nodes = n – 1 = 3 – 1 = 2

59. Answer (3)

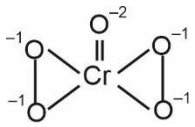
Hint: H_2S gas has rotten egg like smell

Sol. $\underset{\text{(salt)}}{Na_2S} + H_2SO_4 \longrightarrow Na_2SO_4 + H_2S(\text{gas})$

60. Answer (3)

Hint: CrO_5 has 2 peroxide linkages.

Sol.:



Oxidation state of Cr be x

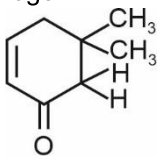
$\therefore x + (-1) \times 4 + (-2) = 0$

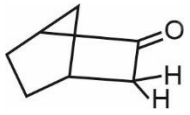
$\Rightarrow x = +6$

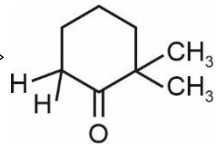
61. Answer (1)

Hint: Keto compounds containing enolizable hydrogen show tautomerism.

Sol.: $\Rightarrow$  does not contain enolisable hydrogen.

$\Rightarrow$  $\Rightarrow$ 2 enolisable hydrogen at α-carbon.

$\Rightarrow$  $\Rightarrow$ 2-enolisable hydrogen atoms at α-carbon.

$\Rightarrow$  $\Rightarrow$ 2-enolisable H atoms at α-carbon.

62. Answer (2)

Hint: Those compounds which contain unpaired e^- are paramagnetic in nature

Sol.: La^{3+} and Lu^{3+} have $4f^0$ and $4f^{14}$ electronic configuration respectively. So these are colourless in nature

Pr^{3+} has 2 unpaired electrons. So it is paramagnetic but Yb^{2+} has no unpaired electrons ($4f^{14}$) so it is diamagnetic in nature.

63. Answer (1)

Hint: $XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

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

Sol.: $XeOF_4$ has square pyramidal shape

XeO_2F_2 has see saw shape

64. Answer (4)

Hint: Complex in which a metal is bound to more than one kind of donor atom is called heteroleptic complex

Sol.: $[Cu(CN)_4]^{3-}$, $[Co(NH_3)_6]^{3+}$, $[PtCl_4]^{2-}$ are homoleptic complex. While $[Co(NH_3)_4Cl_2]^+$ is heteroleptic complex.

65. Answer (4)

Hint: $\Delta_t = \frac{4}{9}\Delta_0$

Sol.: For same metal, same ligands and same metal ligand distance.

$$\Delta_t = \frac{4}{9}\Delta_0$$

Consequently the orbital splitting energies are not sufficiently large for forcing pairing and therefore low spin complexes are rarely observed.

66. Answer (3)

Hint: Enthalpy of atomisation depends upon the number of unpaired electrons.

Sol.: Zn = $3d^{10}\,4s^2$

In Zn, there is no unpaired electron. As a result, metallic bonding is weak and enthalpy of atomisation is low.

67. Answer (2)

Hint: Stronger the intermolecular forces of attraction, higher is the boiling point.

Sol.: Water has extensive hydrogen bonding which leads to highest boiling point among the hydrides of the elements of group 16

So, correct order of boiling point is

$H_2S < H_2Se < H_2Te < H_2O$

68. Answer (4)

Hint: When an electron is added to O, the added electron goes to the smaller n = 2 quantum level and suffers significant repulsion from the other electrons present in this level.

Sol.:

Element	$\Delta_{eg}H$ (kJ mol^{-1})
O	–141
S	–200
Se	–195
Te	–190

69. Answer (3)

Hint: Unit of rate constant (k) $\Rightarrow$

$$\frac{\text{Concentration}}{\text{Time}} \times \frac{1}{(\text{Concentration})^n}$$

Where n $\Rightarrow$ Order of reaction

Sol.: Zero order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{\left(\text{mol L}^{-1}\right)^0}$

$= \text{mol}^1\ \text{L}^{-1}\ \text{s}^{-1}$

First order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{\left(\text{mol L}^{-1}\right)^1} = \text{s}^{-1}$

Second order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{\left(\text{mol L}^{-1}\right)^2}$

$= \text{mol}^{-1}\ \text{L}\ \text{s}^{-1}$

Third order reaction $\Rightarrow \frac{\text{mol L}^{-1}}{\text{s}} \times \frac{1}{\left(\text{mol L}^{-1}\right)^3}$

$= \text{mol}^{-2}\ \text{L}^2\ \text{s}^{-1}$

70. Answer (3)

Hint & Sol.: Due to inert pair effect Pb^{2+} is more stable than Pb^{4+}.

$[SiCl_6]^{2-}$ does not exist because six large chloride ions cannot be accommodated around Si^{4+} due to limitation of its size.

Most of the MX_4 are covalent in nature. Exceptions are SnF_4 and PbF_4 which are ionic in nature.

71. Answer (3)

Hint: $\Rightarrow W = Zit$ (Faraday's first law)

$\frac{W_1}{E_1} = \frac{W_2}{E_2}$ (Faraday's second law)

Sol.: For cell A

$W_{Cu} = Z_{cu}it \Rightarrow \frac{63.5 \times 1 \times t}{2 \times 96500} = 0.5$

$\therefore\ t = \frac{2 \times 96500 \times 0.5}{63.5} \approx 1520\ \text{s}$

Again, $\frac{W_{cu}}{E_{cu}} = \frac{W_{Ag}}{E_{Ag}}$

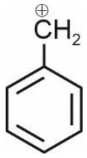
$\Rightarrow \frac{0.5 \times 2}{63.5} = \frac{W_{Ag} \times 1}{108}$

$\Rightarrow W_{Ag} = \frac{0.5 \times 2 \times 108}{63.5} = 1.7\ \text{g}$

72. Answer (2)

Hint: Species which does not have α–hydrogen will not show hyperconjugation.

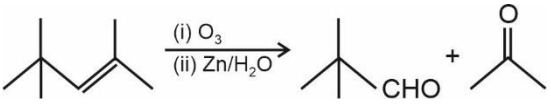
Sol.: Hyperconjugation involves delocalisation of σ electrons of C – H bond of an alkyl group directly attached to an atom of unsaturated system or to an atom with vacant *p* orbital.

Benzyl cation  does not show hyper conjugation.

73. Answer (4)

Hint: Ozonolysis of alkenes leads to the formation of aldehydes, ketones, alcohols or carboxylic acid by cleavage of unsaturated bonds of alkene.

Sol.:



74. Answer (2)

Hint: Higher the molecular mass and more surface area are the factors which results in high boiling point of the compounds.

Sol.: Molecular mass and surface area increases then van der Waals forces of attraction also increases and thus, boiling points also increases.

As the branching increases, surface area decreases for isomeric alkanes, hence boiling point also decreases.

75. Answer (2)

Hint: $\Delta U = q + w$

Sol.: For isothermal expansion of an ideal gas into vacuum, $\Delta U = 0$, $w = 0$

According to first law of thermodynamics

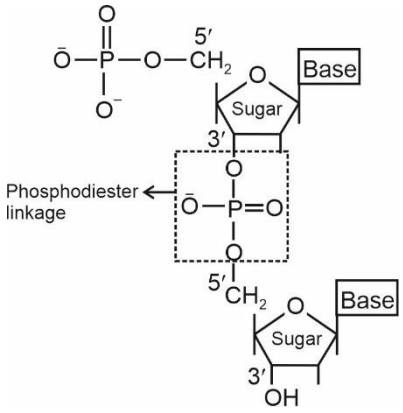
$\Delta U = q + w$

$q = 0$;

Bomb calorimeter measures heat absorbed at constant volume.

76. Answer (3)

Hint:



Sol.: Nucleotides are joined together by phosphodiester linkage between 5′ and 3′ carbon atoms of the pentose sugar.

77. Answer (1)

Hint: Boiling point depends on strength of intermolecular interactions

Sol.: In aldehydes and ketones dipole-dipole interactions occur. So they have high boiling points than the hydrocarbons of comparable molecular masses where only weak vander Waals forces exists.

78. Answer (3)

Hint: Starch is a polysaccharide of plants.

Sol.:

- Sucrose, on hydrolysis gives dextrorotatory glucose and laevorotatory fructose.
- Maltose is composed of two α-D-Glucose units.

79. Answer (1)

Hint: Lead chromate form sodium tetra hydroxoplumbate (II)

Sol.

$$PbCrO_4 + 4NaOH \rightleftharpoons \underset{\text{Sodiumtetra hydroxoplumbate(II)}}{Na_2[Pb(OH)_4]} + Na_2CrO_4$$

80. Answer (3)

Hint: Electron withdrawing group stabilises the carboxylate anion and strengthens the acid.

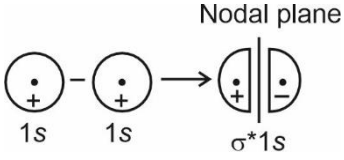
Sol.: –F and –Cl are electron withdrawing groups where –F has more electron withdrawing nature. Three –Cl groups are more electron withdrawing that of one –F group. While $-CH_3$ is electron donating group which destabilises the carboxylate anion and weakens the acid.

So, the correct order of acidic strength is

$CCl_3COOH > FCH_2COOH > ClCH_2COOH > CH_3COOH$

81. Answer (4)

Hint:



Sol.: σ^*2p_z has 1 nodal plane

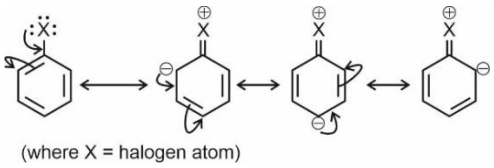
$\sigma 1s$ has 0 nodal plane

π^*2p_y has 2 nodal planes

82. Answer (3)

Hint: In haloarenes, C–X bond acquires a partial double bond character due to resonance.

Sol.:



(where X = halogen atom)

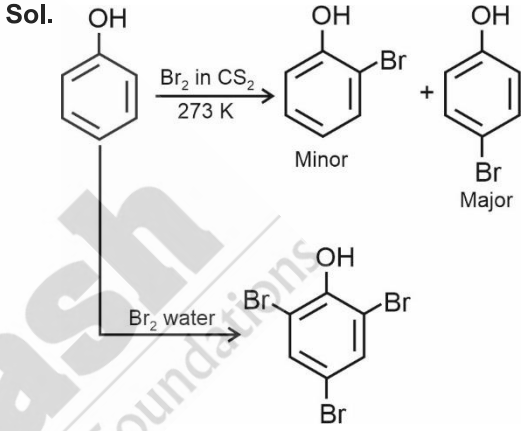
A bond cleavage in haloarenes is difficult than haloalkane and therefore, they are less reactive towards nucleophilic substitution reactive.

83. Answer (3)

Hint: Halogenation of phenol with bromine results in the formation of different products under different experimental conditions.

On reaction with Br_2 in the solvent of low polarity, mono bromophenol is formed.

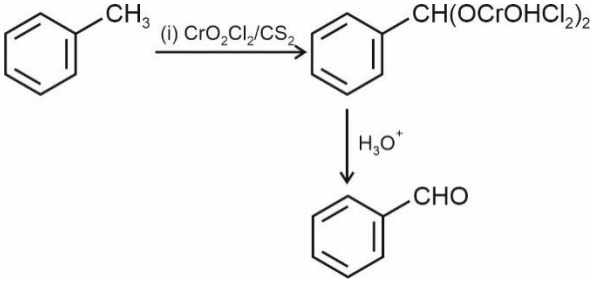
Sol.



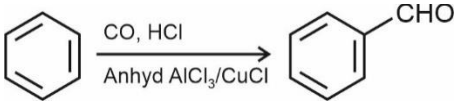
84. Answer (1)

Hint: Etard reaction involves use of chromyl chloride as oxidising agent to oxidise methyl group to chromium complex which on hydrolysis gives corresponding benzaldehyde.

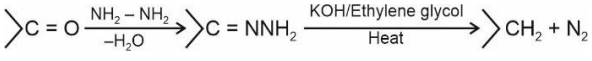
Sol.: Etard reaction



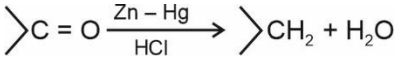
Gattermann – Koch Reaction



Wolff – Kishner Reduction



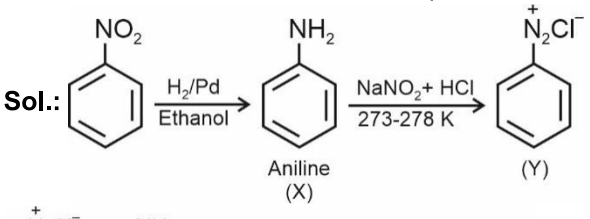
Clemmensen Reduction

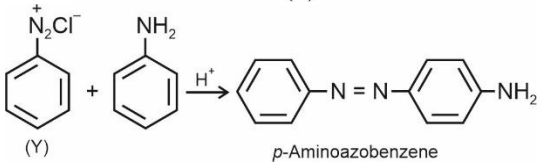


85. Answer (2)

Hint: Aniline undergoes diazotization on reaction with $NaNO_2$ + HCl at 273-278 K temperature.

Sol.:



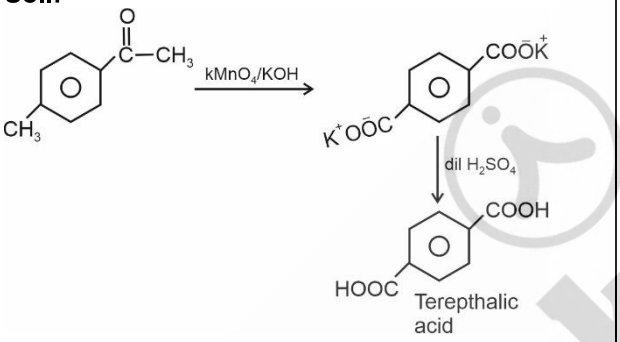


SECTION - B

86. Answer (3)

Hint: $KMnO_4/KOH$ converts ketones into carboxylic acid

Sol.:



87. Answer (4)

Hint: Y is CH_3COCl which undergoes rosenmund reduction to form CH_3CHO.

Sol.: $CH_3COOH \xrightarrow{SOCl_2} CH_3COCl \xrightarrow{NH_3} CH_3CONH_2$

(X) (Y)

$CH_3CONH_2 \xrightarrow{Br_2 + KOH} CH_3NH_2$ (A)

$CH_3COCl \xrightarrow[Pd-BaSO_4]{H_2} CH_3CHO + HCl$

(Y) (Molecular mass = 44 u)

88. Answer (3)

Hint: Addition of inert gas at constant pressure will increase the volume of equilibrium mixture.

Sol.: As the volume of equilibrium mixture increase on addition of inert gas, then number of moles per unit volume gets decreased. So equilibrium will shift towards the side where number of moles per unit volume increases.

89. Answer (2)

Hint: $\frac{P_1^0 - P_1}{P_1^0} = x_2$ x = mole fraction of solute

Sol. $\frac{P_1^0 - P_1}{P_1^0} = x_2$

$\frac{12.3 - P_1}{12.3} = \frac{0.5}{0.5 + 55.5}$

$\frac{12.3 - P_1}{12.3} = \frac{0.5}{56}$

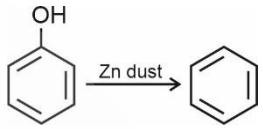
$688.8 - 56P_1 = 6.15$

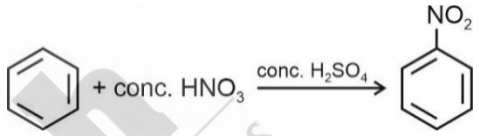
$P_1 = \frac{682.65}{56} = 12.19$ kPa

90. Answer (2)

Hint: Nitration of Benzene is done using a mixture of conc. HNO_3 and conc. H_2SO_4.

Sol.:

1. 

2. 

3. Wurtz Reaction:

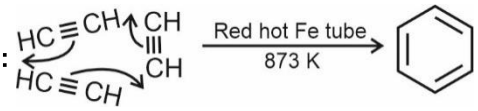
$2R - Cl + Na \xrightarrow[Ether]{Dry} R - R + NaCl$

4. Decarboxylation:

$CH_3 - C(=O)ONa \xrightarrow[\Delta]{CaO + NaOH} CH_4 + Na_2CO_3$

91. Answer (3)

Hint: 3 moles of ethyne forms 1 mole of benzene in cyclic polymerisation.

Sol.: 

$\Rightarrow$ 3 mole ethyne $\equiv$ 26 × 3 g ethyne $\equiv$ 1 mole of benzene

$\therefore$ 15.6 g of ethyne $\equiv \frac{78}{26 \times 3} \times 15.6 \Rightarrow 15.6$ g benzene

Combustion of benzene $\Rightarrow$

$C_6H_6 + \frac{15}{2}O_2 \longrightarrow 6CO_2 + 3H_2O$

1 mol $\frac{15}{2}$ mol

$\Rightarrow$ 78 g benzene reacts with $\frac{15}{2} \times 32$ gm of O_2

$\therefore$ 15.6 g benzene will react with

$\Rightarrow \frac{15 \times 32 \times 15.6}{2 \times 78} = 48$ g of O_2

92. Answer (2)

Hint: $\Delta G^\circ = -nFE^\circ_{cell}$

Sol.: $\overset{-3}{C_2}H_6 \longrightarrow \overset{+4}{CO_2}$

$n = [4 - (-3)] \times 2 \Rightarrow 14$

$\Delta G^\circ = -nFE^\circ_{cell}$

$-x = -14 \times 96500 \times E^\circ_{cell}$

$\therefore E^\circ_{cell} = \dfrac{x}{14 \times 96500}$

93. Answer (3)

Hint: 75% completion involves 2 half-lives and $t_{1/2} = \dfrac{0.693}{k}$.

Sol.: Half life $t_{1/2} = \dfrac{0.693}{6.93 \times 10^{-4}} = 10^3$ s

2 half lives $\Rightarrow 2 \times 10^3$ s

94. Answer (2)

Hint: Spin only magnetic moment

$\mu = \sqrt{n(n+2)}$ BM

Sol.:

	Species	No. of Unpaired Electron	μ(BM)
I.	$[Fe(CN)_6]^{3-}$	1	$\sqrt{1(1+2)} = 1.7$
II.	$[MnF_6]^{3-}$	4	$\sqrt{4(4+2)} = 4.9$
III.	$[Co(H_2O)_6]^{3+}$	0	0

95. Answer (3)

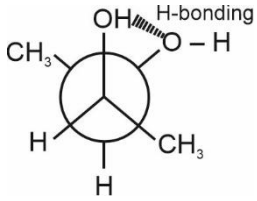
Hint: $R-NH_2 + CHCl_3 + 3KOH \xrightarrow{Heat} R-NC + 3KCl + 3H_2O$

Sol.: Primary aliphatic amines and aromatic amines react with nitrous acid and form diazonium salts. Secondary and tertiary amines react with nitrous acid in a different manner.

96. Answer (4)

Hint: Generally the staggered conformation is most stable. But due to possibility of hydrogen bonding, Gauche form can be more stable.

Sol.:



97. Answer (1)

Hint: Heat at constant volume = ΔU

Heat at constant pressure = ΔH

Sol.: $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

$\Rightarrow \Delta H = \Delta U + \Delta n_g RT$

$\Rightarrow \Delta n_g = 3 - 3 = 0$

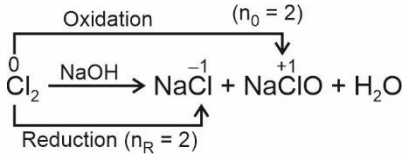
$\therefore \Delta H = \Delta U + 0 \times R \times T$

$\Delta H = -20$ kJ

98. Answer (2)

Hint: Equivalent weight = $\dfrac{\text{Molar mass}}{\text{n – factor}}$

Sol.:



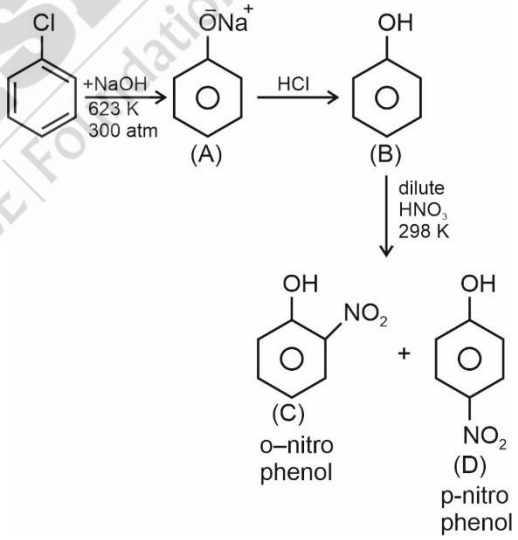
$n_{factor} = \dfrac{n_R . n_0}{n_R + n_0} = \dfrac{2 \times 2}{2+2} = 1$

Equivalent weight = $\dfrac{71}{1} = 71$

99. Answer (4)

Hint: Phenol is ortho para directing and gives electrophilic substitution reaction at ortho and para position.

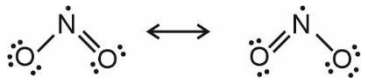
Sol.:



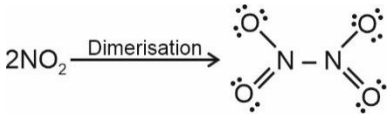
100. Answer (1)

Hint: NO_2 is an odd electron molecule.

Sol.:



It behaves as a typical odd electron molecule and dimerise to form stable N_2O_4 molecule with even number of electrons.



[BOTANY]

SECTION - A

101. Answer (4)

Hint: He is a British zoologist

Sol.: Theodore Schwann based on his studies concluded that the presence of cell wall is a unique character of the plant cell.

102. Answer (3)

Hint: Cisternae are seen in E.R.

Sol.: Cristae increase the surface area of inner membrane of mitochondria.

103. Answer (1)

Hint: Replication of DNA takes place in S phase

Sol.: There is no DNA replication in interkinesis.

104. Answer (3)

Hint: Synaptonemal complex is formed in second sub phase of prophase I

Sol.: This complex is formed in zygotene.

105. Answer (4)

Hint: Arthropoda is a phylum of housefly.

Sol.: Flora helps in identification of plants only.

106. Answer (3)

Hint: It forms basidiocarp.

Sol.: Mushroom belongs to the class basidiomycetes.

107. Answer (2)

Hint: Viroids and prions are sub viral agents.

Sol.: Viroids and prions are acellular structures.

108. Answer (3)

Hint: *Volvox* is a colonial alga.

Sol.: *Chlamydomonas* – Unicellular

Ulothrix – filamentous

Kelps – Profusely branched

109. Answer (1)

Hint: Members of this group mostly show external fertilisation.

Sol.: Algae are non-embryophytes.

110. Answer (1)

Hint: Inferior ovary is present in epigynous flowers.

Sol.: In ray florets of sunflower, inferior ovary is seen.

111. Answer (3)

Hint: Female birds are heterogametic.

Sol.: The AA + ZW type of chromosome complement is seen in female birds.

112. Answer (2)

Hint: Turner's syndrome is caused by monosomy.

Sol.: Persons inflicted with Turner's syndrome have genotype 44 + XO. They have one less chromosome.

113. Answer (2)

Hint: Filiform apparatus is present inside the synergids.

Sol.: Synergids are present inside the embryo sac. Filiform apparatus guides the entry of pollen tube into the synergid.

114. Answer (4)

Hint: The alleles for starch grain size in pea plant show incomplete dominance.

Sol.: Dominance is not an autonomous feature of a gene or the product that it has information for. It depends as much on the gene product and production of a particular phenotype from this product as it does on the particular phenotype that we choose to examine, in case more than one phenotype is influenced by the same gene.

115. Answer (4)

Hint: The internode elongation of stem just prior to flowering is known as bolting.

Sol.: Gibberellins induce bolting in rosette habit plants.

116. Answer (3)

Hint.: Oxygen is the terminal hydrogen acceptor.

Sol: Oxaloacetic acid is the first member of TCA cycle.

117. Answer (1)

Hint: RuBisCO catalyses carboxylation of RuBP.

Sol.: Primary CO_2 acceptor in C_3 plants is RuBP. RuBisCO catalyses the reaction:

$CO_2 + RuBP \rightarrow 3PGA$

118. Answer (2)

Hint: In non-cyclic photophosphorylation, PS II is involved where evolution of O_2 occurs.

Sol: Cyclic photophosphorylation does not involve PS II.

119. Answer (1)

Hint: *Porphyra* is a red alga.

Sol.: The red algae usually reproduce vegetatively by fragmentation. They reproduce asexually by non-motile spores and sexually by non-motile gametes.

120. Answer (3)

Hint: Pollination by water is quite rare in flowering plants and is limited to about 30 genera.

Sol.: Wind pollinated flowers often have a single ovule in each ovary and numerous flowers packed into an inflorescence.

121. Answer (2)

Hint: Light energy is utilised for the creation of proton gradient for photophosphorylation.

Sol.: In respiration, energy of oxidation-reduction is utilised for the production of proton gradient. In light reaction of photosynthesis splitting of H_2O molecules takes place and the protons get accumulated within the lumen of thylakoids.

122. Answer (3)

Hint: Sugarcane stores carbohydrate as sugar in their stems

Sol.: Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield.

123. Answer (3)

Hint: Medullary rays are seen in stems.

Sol.: Conjunctive tissues are seen in root.

124. Answer (1)

Hint: Heartwood is central region of wood.

Sol.: Heartwood does not conduct water and minerals. Sapwood conducts water.

125. Answer (1)

Hint: Stem tendrils are seen in gourds.

Sol.: Cucumber has stem tendrils.

126. Answer (2)

Hint: Mutually associated organisms may show co-extinction.

Sol.: When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct.

127. Answer (1)

Hint: During catabolism, inorganic substances are formed.

Sol.: Catabolism is breakdown of detritus into simpler inorganic substances.

128. Answer (2)

Hint: Steller's sea cow was used for food

Sol.: Steller's sea cow became extinct due to over exploitation by humans.

129. Answer (2)

Hint: In pond ecosystem, biomass of zooplanktons is more than that of phytoplanktons

Sol.: In pond ecosystem, the pyramid of biomass is usually inverted.

130. Answer (3)

Hint: Intrinsic rate of natural increase is represented by r.

Sol.: The value of 'r' for Norway rat is 0.015.

131. Answer (2)

Hint: Epiphytes get benefit from mango tree in the form of shelter but mango tree remains unharmed.

Sol.: This interaction is commensalism.

132. Answer (1)

Hint: Cyclosporin A an immunosuppressive agent is commercially produced by a fungus.

Sol.: Cyclosporin A is produced by *Trichoderma*.

133. Answer (4)

Hint: Euchromatin is lightly stained region of chromatin.

Sol.: Features of heterochromatin are as follows:

- It is darkly stained region.
- Chromatin is densely packed.
- It is transcriptionally inactive.

134. Answer (4)

Hint: In lac operon, there are three structural genes.

Sol.: One of the structural gene, *Lac z* gene codes for β galactosidase.

135. Answer (1)

Hint & Sol.: N-glycosidic linkage joins a nitrogenous base to a sugar.

SECTION - B

136. Answer (1)

Hint: Kaziranga National Park in Assam is known for the Great Indian one-horned rhinoceros.

Sol.: Dachigam National Park in Jammu and Kashmir is home to the famous musk deer or hangul.

137. Answer (2)

Hint: Genetically fixed adaptations pass on from generation to generation.

Sol.: The ability of kangaroo rat to concentrate urine is genetically fixed adaptation.

138. Answer (2)

Hint: BOD is biochemical oxygen demand. More the BOD of waste water, more is its polluting potential.

Sol.: If BOD is more, then it has high organic matter.

139. Answer (2)

Hint: Small subunits of protein coat in viruses are called capsomeres.

Sol.: The protein coat called capsid is made up of small subunits called capsomeres. They protect the nucleic acid. These capsomeres are arranged in helical or polyhedral geometric forms.

140. Answer (1)

Hint: During aminoacylation of tRNA, amino acids are activated.

Sol.: After activation of amino acids, the activated amino acids are linked to their cognate tRNA.

141. Answer (2)

Hint: Thalassemia can be alpha or beta.

Sol.: Thalassemia is controlled by two closely linked genes HBA1 and HBA2 on chromosome 16. β thalassemia is controlled by a single gene HBB on chromosome 11.

142. Answer (2)

Hint: Egg apparatus has an egg cell and two synergids.

Sol.: All cells of egg apparatus are haploid.

Egg apparatus is situated at micropylar end of the embryo sac.

143. Answer (3)

Hint: The specialised cells around the vascular bundles in the leaves of C_4 plants are called bundle sheath cells.

Sol.: Maize is a C_4 plant. Bundle sheath cells are characterised by having a large number of chloroplasts, thick walls impervious to gaseous exchange and no intercellular spaces.

144. Answer (4)

Hint: It is a gaseous phytohormone.

Sol.: Ethylene hastens the thinning in cherry and walnut.

145. Answer (4)

Hint: Carbohydrates are most preferred respiratory substrates.

Sol.: Glucose is a carbohydrate.

146. Answer (2)

Hint: *Selaginella* is a pteridophyte.

Sol.: *Selaginella* has vascular tissues. Seeds are seen in gymnosperms and angiosperms.

147. Answer (1)

Hint: Wheat is a member of family Gramineae. Cotton and china rose are the members of family Malvaceae. Tulip is a member of family Liliaceae.

Sol.: Perianth represented by membranous scales called lodicules are found in family Gramineae.

148. Answer (2)

Hint: Autotrophs fix atmospheric CO_2.

Sol.: Heterotrophic bacteria depend on other organisms for their food.

149. Answer (1)

Hint: Homologous chromosomes are aligned at two equatorial plates in this phase.

Sol.: In metaphase I, two metaphasic plates are formed.

150. Answer (2)

Hint: Satellite is a region beyond secondary constriction in SAT chromosome.

Sol.: It is a non staining region of SAT chromosome.

[ZOOLOGY]

SECTION - A

151. Answer (3)

Hint: Fluid connective tissue

Sol.: In all connective tissues except blood, the cells secrete fibres of structural proteins called collagen or elastin. Cartilage, bone and blood are various types of specialised connective tissues.

152. Answer (3)

Hint: Protection against chemical stresses

Sol.: Compound epithelium covers the moist surface of buccal cavity. Compound epithelium is multi-layered. Some of the columnar or cuboidal cells get specialised for secretion and are called glandular epithelium.

153. Answer (2)

Hint: Part of hindbrain

Sol.: Pons region in hindbrain contains pneumotaxic centre that can moderate the functions of respiratory rhythm centre. Neural signals from this centre can reduce the duration of inspiration resulting in the alteration of respiratory rate.

154. Answer (4)

Hint: Body cavity is absent in platyhelminths.

Sol.: In some animals, the body cavity is not lined by mesoderm, instead the mesoderm is present as scattered pouches in between the ectoderm and endoderm, such body cavity is called pseudocoelom and the animals possessing them are called pseudocoelomates. *E.g.*, aschelminths. The animals in which the body cavity is absent are called acoelomates. The members of phylum Platyhelminthes are acoelomates.

155. Answer (1)

Hint: Exclude a platyhelminth

Sol.: *Ctenoplana* belongs to the phylum Ctenophora. They exhibit bioluminescence. *Fasciola* and *Ancylostoma* are triploblastic animals. *Sycon* is a sponge that belongs to the phylum Porifera.

156. Answer (3)

Hint: Helps in locomotion and respiration

Sol.: In echinoderms, water vascular system helps in locomotion, capture and transport of food and respiration. Water canal system is present in sponges. Fertilisation is usually external in echinoderms. The adult echinoderms are radially symmetrical but larvae are bilaterally symmetrical.

157. Answer (4)

Hint: Cranium is cartilaginous

Sol.: The body of cyclostomes is devoid of scales and paired fins. Cranium and vertebral column are cartilaginous.

158. Answer (4)

Hint: Molecular weight is not more than 800 Da.

Sol.: The acid-insoluble fraction, has only four types of organic compounds, *i.e.*, proteins, nucleic acids, polysaccharides and lipids. The acid-soluble pool represents roughly the cytoplasmic composition. Glucose is a monosaccharide which is present in acid-soluble fraction.

159. Answer (2)

Hint: Glucose transport

Sol.:

Protein	Functions
Collagen	Intercellular ground substance
Trypsin	Enzyme
Insulin	Hormone
Antibody	Fights infectious agents
Receptor	Sensory reception (smell, taste, hormone, etc.)
GLUT-4	Enables glucose transport into cells

160. Answer (4)

Hint: Bile is released from gall bladder.

Sol.: In frogs, digestion of food takes place by the action of HCl and gastric juices secreted from the walls of the stomach. Partially digested food in stomach is called chyme. Liver secretes bile that is stored in the gall bladder. Pancreas secretes pancreatic juice, containing digestive enzymes.

161. Answer (1)

Hint: Erectile structure

Sol.: Mons pubis is a cushion of fatty tissue covered by skin and pubic hair. Ovary is primary sex organ in females. Fallopian tube is a female accessory duct.

162. Answer (4)

Hint: Required for metabolic changes

Sol.: During pregnancy, increased levels of hormones like estrogen, progesterone, cortisol, thyroxine, *etc.*, are essential for supporting the foetal growth, metabolic changes in the mother and maintenance of pregnancy.

163. Answer (3)

Hint: Sperms are produced in seminiferous tubules.

Sol.: Sperms transport pathway in human males: Seminiferous tubules $\rightarrow$ rete testis $\rightarrow$ vasa efferentia $\rightarrow$ epididymis $\rightarrow$ vas deferens $\rightarrow$ ejaculatory duct $\rightarrow$ urethra.

164. Answer (3)

Hint: Exclude the components of pectoral girdle

Sol.: At the point of fusion of ilium, ischium and pubis is a cavity called acetabulum to which the thigh bone articulates. Glenoid cavity and acromion are associated with pectoral girdle. The two halves of the pelvic girdle meet ventrally to form the pubic symphysis containing fibrous cartilage.

165. Answer (1)

Hint: Exclude thyroid related diseases

Sol.: Addison's disease is caused due to under production of adrenal cortex hormones. Hypothyroidism during pregnancy causes defective development and maturation of the growing baby leading to stunted growth, called cretinism. Graves' disease is a form of hyperthyroidism.

166. Answer (4)

Hint: Secreted by the tissues which are not organised endocrine glands

Sol.: GIP (Gastric inhibitory peptide) inhibits gastric secretion and motility.

Hormones which interact with membrane bound receptors do not enter the target cells, but generate second messengers.

167. Answer (3)

Hint: Catecholamines are emergency hormones.

Sol.: Catecholamines increase heart beat, strength of heart contraction and the rate of respiration. They are also responsible for pupillary dilation and piloerection.

Catecholamines also stimulate the breakdown of glycogen resulting in an increased concentration of glucose in blood. In addition, they also stimulate lipolysis and proteolysis.

168. Answer (3)

Hint: Human protein-enriched milk

Sol.: The milk of transgenic cow, 'Rosie' was nutritionally more balanced due to the presence of human α-lactalbumin. Human ADA is responsible for maturation of lymphocytes. Its deficiency causes SCID.

Human α-1-antitrypsin is present in the milk of transgenic sheep, 'Tracy'.

169. Answer (4)

Hint: Hypothalamus lies at the base of it.

Sol.: Thalamus is a major coordinating centre for sensory and motor signaling. Corpus callosum is a tract of nerve fibres which connects left and right cerebral hemispheres. Hypothalamus lies at the base of the thalamus. Pons is a part of hindbrain.

170. Answer (2)

Hint: Caused due to accumulation of uric acid crystals

Sol.: Gout is inflammation of joints due to accumulation of uric acid crystals. Tetany is characterised by wild contractions in muscles due to low Ca^{++} in body fluids.

171. Answer (3)

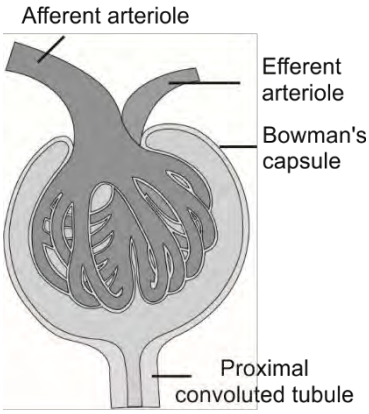
Hint: ANF is antagonistic to RAAS.

Sol.: An increase in blood flow to the atria of the heart can cause the release of ANF that causes vasodilation (dilation of blood vessels) and thereby decreases the blood pressure. ANF acts as a check on the renin-angiotensin mechanism.

172. Answer (3)

Hint: Bowman's capsule encloses glomerulus

Sol.:



173. Answer (2)

Hint: Carries O_2 and CO_2

Sol.: Erythrocytes or RBCs are devoid of nucleus in most of the mammals including humans. Monocytes, lymphocytes and basophils are types of leucocyte. They are nucleated.

174. Answer (4)

Hint: Position of heart and sternum in humans

Sol.: The thoracic chamber is formed dorsally by the vertebral column, ventrally by the sternum, laterally by the ribs and on the lower side by the dome-shaped diaphragm.

175. Answer (3)

Hint: Receives blood through vena cava

Sol.: A triangular structure called sinus venosus joins the right atrium in the heart of frog. It receives blood through the major veins called vena cava. The ventricle opens into a sac-like structure called conus arteriosus on the ventral side of the heart.

176. Answer (2)

Hint: Exclude methods for females only

Sol.: Use of condoms has increased in recent years due to its additional benefit of protecting user from contracting STIs and AIDS. Diaphragm, vaults, cervical caps are barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus.

177. Answer (1)

Hint: Use of anti-sense RNA

Sol.: RNAi involves silencing of mRNA due to the formation of ds-RNA formed by binding of antisense RNA and sense RNA.

178. Answer (4)

Hint: Isolated from a bacterium

Sol.: *Hin*d II is a restriction endonuclease. It was isolated from *Haemophilus influenzae*.

Protease digests proteins and **RNase** digests RNA. DNA polymerase participates in the replication of DNA.

179. Answer (2)

Hint: Store house of calcium ions.

Sol.: White muscle fibres have few mitochondria. They depend on anaerobic process for energy.

Red muscle fibres contain plenty of mitochondria which can utilise the large amounts of oxygen stored in them for ATP production.

The amount of sarcoplasmic reticulum is high in white muscle fibres

180. Answer (4)

Hint: Identify a helminth.

Sol.: *Wuchereria* is transmitted by female *Culex* and causes filariasis. *Ascaris* causes ascariasis. Amoebiasis is caused by *Entamoeba*. *Salmonella typhi* causes typhoid. *Salmonella* and *Entamoeba* are transmitted through contaminated food and water.

181. Answer (1)

Hint: Several antibodies are present in colostrum.

Sol.: Colostrum is an effective way of immunity transfer from mother to newborns because it has abundant IgA, which protects the baby from the infections.

182. Answer (2)

Hint: Helps in grinding of food particles

Sol.: Gizzard is also called proventriculus. Crop is used for storing of food.

A ring of 6 to 8 blind tubules present at the junction of foregut and midgut is called hepatic caeca, which secrete digestive juice.

183. Answer (2)

Hint: Potato is a stem modification.

Sol.: Sweet potato and potato are the examples of analogous structures as sweet potato is a modified root while potato is a modified stem. Homology indicates the common ancestry.

184. Answer (2)

Hint: Exclude the theory given by Hugo de Vries

Sol.: Natural selection and branching descent are the two key concepts of Darwinian theory of evolution. Single step large mutation is called saltation. Hugo de Vries proposed the mutation theory. Genetic drift causes the change in gene frequency by chance in a small population.

185. Answer (2)

Hint: Vasectomy is a terminal method of contraception.

Sol.:

(i) Condoms - Prevent the entry of semen into female reproductive tract

(ii) CuT - Suppresses sperm motility

(iii) Saheli - Non-steroidal OCP (oral contraceptive pill)

(iv) Tubectomy - Terminal method of contraception

SECTION-B

186. Answer (2)

Hint: Sensory in function

Sol.: Olfactory bulbs are extensions of the brain's limbic system. The tongue detects tastes through taste buds. Ciliary body is present in the eyes. Stapes is the smallest bone present in the middle ear.

187. Answer (2)

Hint: One of the most common antibiotic.

Sol.: Ampicillin resistance gene and tetracycline resistance gene act as selectable marker which help in selecting transformants and recombinants from non-transformants and non-recombinants respectively.

188. Answer (3)

Hint: Identify the fungal infection.

Sol.: Typhoid is a bacterial disease caused by *Salmonella typhi*. Fungi like *Trichophyton*, *Microsporum, etc*. cause ringworm. HIV infections, mumps, genital herpes and dengue are viral diseases.

189. Answer (3)

Hint: Birds usually eat grains.

Sol.: Seed eating finch was common ancestor of Darwin's finches present on Galapagos islands. According to the needs of different environment, finches developed different shapes of beaks and feeding habits like insect eating, fruit eating, cactus eating, *etc*.

190. Answer (4)

Hint: Gamete Intra Fallopian Transfer

Sol.: GIFT is transfer of an ovum collected from donor into the fallopian tube of another female who cannot produce ova but provides suitable environment for fertilisation and further development.

ZIFT involves transfer of zygote or early embryo (upto 8 blastomeres) into fallopian tube.

191. Answer (3)

Hint: First movements observed during 5th month

Sol.: By the end of second trimester (24 weeks), the body of foetus is covered with fine hair, eyelids separate and eyelashes are formed.

192. Answer (3)

Hint: Caused due hyposecretion of insulin

Sol.: ADH/Vasopressin synthesised by hypothalamus and released by posterior pituitary, acts on kidneys and stimulates reabsorption of water and electrolytes. Its hyposecretion leads to diabetes insipidus. Diabetes mellitus is due to hyposecretion of insulin. Hyposecretion of thyroxine causes simple goitre. Hypersecretion of GH in adults causes acromegaly.

193. Answer (1)

Hint: Continues to form pigmented and opaque structure

Sol.: Thick anterior part of choroid is ciliary body. The ciliary body continues forward to form a pigmented and opaque structure called iris. In front of lens, the aperture surrounded by iris is called pupil. Cornea is the anterior part of sclera.

194. Answer (3)

Hint: True ribs

Sol.: First 7 pairs of ribs are vertebrosternal. 8^{th}, 9^{th} and 10^{th} pairs of ribs do not articulate directly with the sternum, they join with 7^{th} pair of rib by hyaline cartilage and are called vertebrochondral ribs. Last 2 pairs of ribs are called floating ribs.

195. Answer (2)

Hint: Symptoms of diabetes

Sol.: Renal calculi = Mass of crystallised salts within the kidney

Glomerulonephritis = Inflammation of glomeruli

Glycosuria = Presence of glucose in urine

196. Answer (1)

Hint: Urea synthesis occurs in liver.

Sol.: Hepatic vein carries largest amount of urea. Renal vein carries least amount of urea. Hepatic portal vein drains blood from intestine to liver.

197. Answer (2)

Hint: Stored in salivary gland of infected mosquito

Sol.: Sporozoites are the infective stage of *Plasmodium* that enter into human body. Gametocytes produce gametes. Sporozoites in liver cells develop into cryptozoites, which later divides into cryptomerozoites.

198. Answer (1)

Hint: Cytosine is a nitrogenous base.

Sol.: Cytosine - Pyrimidine

Codeine - Alkaloid

Glycogen - Polysaccharide

Anthocyanin - Pigment

199. Answer (2)

Hint: Subphylum Vertebrata

Sol.: Phylum Chordata is divided into three subphyla : Urochordata, Cephalochordata and Vertebrata. In urochordates, notochord is present only in larval tail while in cephalochordates, it extends from head to tail region and is persistent throughout their life. Notochord is persistent throughout the life of cyclostomes and members of class Chondrichthyes.

200. Answer (4)

Hint: Blood and bone are specialised connective tissues.

Sol.: Areolar connective tissue is the most widely distributed loose connective tissue in the body of complex animals. Ligaments are dense regular connective tissue that connect bone to bone. Adipose is a fat storing tissue.

❑ ❑ ❑