

All India Aakash Test Series for NEET - 2020

OPEN MOCK TEST - 2 (Code-A)

Test Date : 16/02/2020

ANSWERS

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

HINTS & SOLUTIONS**[PHYSICS]**

1. Answer (2)

Hint. and Sol. : Abdus Salam was awarded Nobel prize for the unification of weak and electromagnetic interactions.

2. Answer (3)

Hint : Principle of homogeneity.

Sol. : Here $\frac{2\pi ct}{\lambda}$ as well as $\frac{2\pi x}{\lambda}$ are dimensionless.

Unit of ct is same as that of λ and

Unit of x is same as that of λ .

3. Answer (4)

Hint : $\vec{A} \cdot \vec{B} = AB \cos \theta$ and $|\vec{A} \times \vec{B}| = AB \sin \theta$

Sol. : $AB \cos \theta = \sqrt{3} AB \sin \theta$

$$\cot \theta = \sqrt{3} \Rightarrow \theta = 30^\circ$$

$$\text{Now, } |\vec{A} + \vec{B}| = \sqrt{A^2 + B^2 + 2AB \cos \theta}$$

$$= \sqrt{A^2 + B^2 + 2AB \cdot \frac{\sqrt{3}}{2}}$$

$$= [A^2 + B^2 + \sqrt{3}AB]^{\frac{1}{2}}$$

4. Answer (2)

Hint : Time taken to fall through a height h when released from rest is $\sqrt{\frac{2h}{g}}$

Sol. : Let height of each storey is h , then

$$25h = 0 + \frac{1}{2} \cdot 10t^2 = \frac{1}{2} \times 10 \times 5^2$$

$$h = 5 \text{ m}$$

In the first second, let stone passes through n

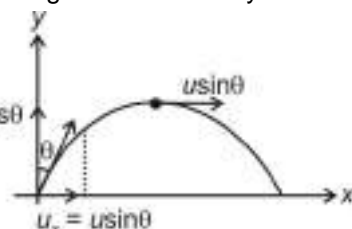
$$\text{storeys so } n \times 5 = \frac{1}{2} \times 10 \times 1^2$$

$$\Rightarrow n = 1$$

5. Answer (4)

Hint : Speed = magnitude of velocity.

Sol. : $u_y = u \cos \theta$



$$\text{Change in speed} \Rightarrow \Delta u = u \sin \theta - u$$

$$= u(\sin \theta - 1)$$

6. Answer (1)

Hint : Limiting friction is $f_{\max} = \mu N$

Sol. : Friction from both contact surfaces will opposes the motion of block Q

$$\therefore F \geq (f_{1,\max} + f_{2,\max})$$

$$F \geq (300 \times 0.4 + 100 \times 0.3)$$

$$F \geq 150 \text{ N}$$

$$\therefore F_{\min} = 150 \text{ N}$$

7. Answer (3)

Hint : Use impulse-momentum equation.

$$\text{Sol. : } \vec{p}_f = \vec{p}_i + \vec{F} \cdot \Delta t$$

$$\Rightarrow m \cdot \vec{v}_f = m \cdot \vec{v}_i + \vec{F} \Delta t = 2(2\hat{i} - 3\hat{j} + 4\hat{k}) + (2\hat{i} + \hat{j} - 5\hat{k}) \times 3$$

$$\Rightarrow 2 \cdot \vec{v}_f = 4\hat{i} - 6\hat{j} + 8\hat{k} + 6\hat{i} + 3\hat{j} - 15\hat{k}$$

$$\Rightarrow 2\vec{v}_f = 10\hat{i} - 3\hat{j} - 7\hat{k}$$

$$\therefore \vec{v}_f = \frac{10\hat{i} - 3\hat{j} - 7\hat{k}}{2}$$

$$\text{Speed } |\vec{v}_f| = \frac{\sqrt{158}}{2} \text{ m/s}$$

8. Answer (4)

Hint : Velocity becomes 'e' times after collision from surface.

$$\text{Sol. : From graph } e = \sqrt{\frac{16}{36}} = \frac{2}{3}$$

Kinetic energy of the ball just after second bounce

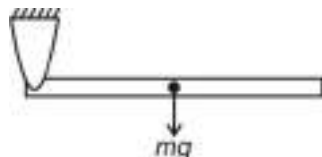
$$k = \frac{1}{2} m (e^2 u)^2 = \frac{1}{2} \times 4 \times [e^4 \times u^2]$$

$$= \frac{1}{2} \times 4 \times \left(\frac{2}{3}\right)^4 \times (2 \times 10 \times 162)$$

$$= \frac{1}{2} \times 4 \times \frac{16}{81} \times 3240$$

$$= 1280 \text{ J}$$

9. Answer (3)

Hint : Use dynamics of rigid body, $\tau = I\alpha$ 

$$\tau = I\alpha \text{ (about hinge)}$$

$$\Rightarrow mg \cdot \frac{l}{2} = \frac{ml^2}{3} \cdot \alpha$$

$$\Rightarrow \alpha = \frac{3g}{2l}$$

Acceleration of centre of mass

$$a = r\alpha$$

$$= \frac{l}{2} \cdot \frac{3g}{2l}$$

$$= \frac{3g}{4}$$

10. Answer (1)

Hint : Use conservation of energy.**Sol. :** Using energy conservation

$$mgh = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$$

$$= \frac{1}{2}mv^2 + \frac{1}{2}\left(\frac{2}{5}mR^2\right)\left(\frac{v^2}{R^2}\right)$$

$$\text{on solving } v = \sqrt{\frac{10gh}{7}}$$

11. Answer (2)

Hint : Conservation of energy

$$\text{Sol. : } \frac{1}{2}mv^2 - \frac{GMm}{R} = \frac{1}{2}mv'^2 + 0$$

$$\Rightarrow v' = \sqrt{v^2 - v_e^2}$$

$$= \sqrt{4gR - 2gR} = \sqrt{2gR}$$

12. Answer (1)

Hint : Use conservation of energy

$$\text{Sol. : } U_i + K_i = U_f + K_f$$

$$0 + 0 = -\frac{3GMm}{2R} + \frac{1}{2}mv^2$$

$$\Rightarrow v = \sqrt{\frac{3GM}{R}} \Rightarrow \sqrt{\frac{3}{2}}v_e$$

13. Answer (4)

$$\text{Hint : } Y = \frac{\text{stress}}{\text{strain}}$$

$$\text{Sol. : } \Delta L = 2L - L = L$$

$$\therefore Y = \frac{\text{stress}}{\text{strain}}$$

$$\Rightarrow \text{Stress} = Y \cdot \text{strain}$$

$$= Y \cdot \frac{\Delta L}{L} = Y$$

14. Answer (3)

Hint : Velocity of efflux $v = \sqrt{2gh}$ **Sol. :** Speed with which water strikes the ground

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{2gh + 2gh}$$

$$= 2\sqrt{gh} = 2\sqrt{10 \times 10}$$

$$= 20 \text{ m/s}$$

15. Answer (1)

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

$$\text{Sol. : } C = \frac{5}{9}[95 - 32] = 35^\circ\text{C}$$

16. Answer (1)

Hint : Coefficient of performance of refrigerator

$$\Rightarrow \beta = \frac{Q_2}{Q_1 - Q_2}$$

$$\text{Sol. : } \frac{1}{3} = \frac{Q_2}{300 - Q_2}$$

$$\Rightarrow 300 - Q_2 = 3Q_2$$

$$\Rightarrow Q_2 = 75 \text{ joule}$$

$$\therefore \text{Work done } W = Q_1 - Q_2 = 300 \text{ J} - 75 \text{ J} = 225 \text{ J}$$

17. Answer (3)

Hint : For adiabatic process $P_1V_1^\gamma = P_2V_2^\gamma$

$$\text{Sol. : } \text{Here } C_v = 3R \Rightarrow C_p = 4R \therefore \gamma = \frac{4}{3}$$

$$\text{Now } P_1V_1^\gamma = P_2V_2^\gamma$$

$$\Rightarrow \frac{P_2}{P_1} = \left(\frac{V_1}{V_2}\right)^\gamma = \left(\frac{V}{8V}\right)^{\frac{4}{3}}$$

$$\Rightarrow P_2 = \frac{P_1}{16}$$

18. Answer (1)

Hint : For polytropic process $PV^n = \text{constant}$

$$\text{Sol. : } 16P_0V_0^n = P_0(2V_0)^n \Rightarrow n = 4$$

$$\text{Work done } W = \frac{P_1V_1 - P_2V_2}{n-1} = \frac{16P_0V_0 - P_0 \cdot 2V_0}{4-1}$$

$$= \frac{14}{3} P_0 V_0$$

19. Answer (4)

Hint : Motion of block is not completely S.H.M.

Sol. : Time taken by block during its motion in

contact with spring is $t_1 = \frac{T}{2} = \pi \sqrt{\frac{m}{k}}$

Time taken by block during its motion without

contact with spring is $t_2 = \frac{2\ell}{v} = \frac{2\ell}{A\omega} = 4\sqrt{\frac{m}{k}}$

\therefore Time period of motion

$$T = t_1 + t_2 = (\pi + 4)\sqrt{\frac{m}{k}}$$

20. Answer (2)

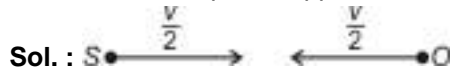
Hint : Frequency of fork B $f = (158 \pm 4)$ Hz.

Sol. : After filling the number of beats obtained = 5 beats per second.

Hence fork B has frequency 162 Hz.

21. Answer (2)

Hint : Use concept of Doppler's effect

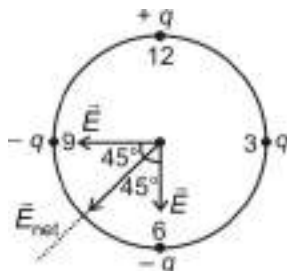
Sol. : 

$$f' = f \left[\frac{v + \frac{v}{2}}{v - \frac{v}{2}} \right] = f \left[\frac{3}{1} \right] = 3f$$

$$\% \text{ change} = \frac{\Delta f}{f} \times 100 = \frac{2f}{f} \times 100 = 200\%$$

22. Answer (2)

Hint. and Sol. :



\vec{E}_{net} is shown by time 7 : 30 by hour hand

23. Answer (3)

Hint : $|\vec{E}_P| = |\vec{V}_P|$

$$\text{Sol. : } \frac{kP}{r^3} \sqrt{1 + 3\cos^2 \theta} = \frac{kP\cos \theta}{r^2}$$

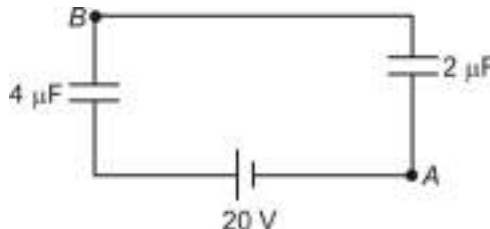
$$\Rightarrow 1 + 3\cos^2 \theta = 7\cos^2 \theta \Rightarrow 4\cos^2 \theta = 1$$

$$\Rightarrow \cos \theta = \pm \frac{1}{2} \Rightarrow \theta = 60^\circ \text{ (1st quadrant)}$$

$$\therefore \vec{r} = \frac{\sqrt{7}}{2} \hat{i} + \frac{\sqrt{7}\sqrt{3}}{2} \hat{j} = \frac{\sqrt{7}}{2} \hat{i} + \frac{\sqrt{21}}{2} \hat{j}$$

24. Answer (4)

Hint : Redraw the circuit. It becomes.



$$\text{Sol. : Charge on capacitors} = \frac{4}{3} \times 20 = \frac{80}{3} \mu\text{C}$$

$$\text{Now } V_B - V_A = \frac{40}{3} \text{ V} \Rightarrow V_B = \frac{40}{3} + 20 = \frac{100}{3} \text{ V}$$

25. Answer (1)

Hint : Apply Kirchhoff's laws.

Sol. : Current through branch SQR and SPR is

$$\frac{5}{3} \text{ A}$$

$$\text{Now } V_S - V_Q = \frac{5}{3} \times 8 = \frac{40}{3} \text{ V} \quad \dots(i)$$

$$V_S - V_P = \frac{5}{3} \times 4 = \frac{20}{3} \text{ V} \quad \dots(ii)$$

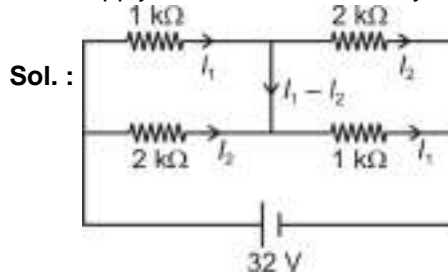
$$\text{Hence (i) - (ii), } V_S - V_Q - V_S + V_P = \frac{40}{3} - \frac{20}{3}$$

$$V_P - V_Q = \frac{20}{3} \text{ V}$$

$$\therefore V_Q - V_P = -\frac{20}{3} \text{ V}$$

26. Answer (4)

Hint : Apply Kirchhoff's laws and symmetry rule.



$$I_1 = 16 \text{ mA and } I_2 = 8 \text{ mA}$$

$$\therefore I_1 - I_2 = 8 \text{ mA}$$

Hence X = 4

27. Answer (3)

Hint and Sol. : $B_1 = B_2 = B_0$

$$\text{and } B_{\text{net}} = \sqrt{B_1^2 + B_2^2} = \sqrt{2} B_0$$

$$\frac{B_{\text{net}}}{B_0} = \sqrt{2}$$

$$B_{\text{net}} : B_0 = \sqrt{2} : 1$$

28. Answer (4)

$$\text{Hint : } \vec{F}_m = I(\vec{L}_{\text{eff}} \times \vec{B})$$

$$\text{Sol. : If } y = 0 \text{ } x = \pm 5$$

$$\therefore \ell_{\text{eff}} = 10 \text{ m}$$

$$\vec{F}_m = 4[10\hat{i} \times 5(-\hat{k})]$$

$$(200\hat{j}) \text{ N}$$

29. Answer (1)

$$\text{Hint : Electric field outside the region } E = \frac{R^2}{2r} \left| \frac{dB}{dt} \right|$$

$$\text{Sol. : } E_p = \frac{R^2}{2r} [6t^2 - 8t] \Rightarrow \text{at } t = 2 \text{ s, } E_p = \frac{8R^2}{2r}$$

$$F = eE$$

$$\Rightarrow F_{t=2\text{s}} = \frac{8 \times [2.5 \times 10^{-2}]^2 \times 1.6 \times 10^{-19}}{2 \times 2 \times 2.5 \times 10^{-2}} \\ = 8 \times 10^{-21} \text{ N}$$

30. Answer (3)

$$\text{Hint. and Sol. : } V_{\text{rms}} = \sqrt{\frac{\frac{T}{4} \int_0^T V^2 dt}{\int_0^T dt}} \\ = \sqrt{\frac{4V_0^2 \cdot \frac{T}{4}}{T}} = V_0$$

31. Answer (1)

Hint : LC oscillator

Sol. : For given condition.

$$q_0 = q_0 \cos \omega t \text{ and } i = -q_0 \omega \sin \omega t$$

For required situation

$$\frac{q^2}{2C} = \frac{1}{2} Li^2 \Rightarrow \frac{q_0^2 \cos^2 \omega t}{2C} = \frac{1}{2} L \cdot q_0^2 \omega^2 \sin^2 \omega t$$

$$\Rightarrow \omega t = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}, \dots$$

$$\Rightarrow t = \frac{\pi}{4\omega} \sqrt{LC}, \frac{3\pi}{4\omega} \sqrt{LC}, \frac{5\pi}{4\omega} \sqrt{LC}, \dots$$

32. Answer (2)

$$\text{Hint : } B = \frac{E}{C}$$

$$\text{Sol. : } B = \frac{3 \times 10^4}{3 \times 10^8} \\ = 10^{-4} \text{ T} = 100 \mu\text{T}$$

33. Answer (4)

$$\text{Hint : } L = f_0 + f_e \text{ and } m = \frac{f_0}{f_e}$$

$$\text{Sol. : } 40 = f_0 + f_e$$

$$9 = \frac{f_0}{f_e} \Rightarrow f_0 = 9f_e$$

$$40 = 10f_e$$

$$f_e = 4 \text{ cm}$$

$$f_0 = 40 - 4$$

$$= 36 \text{ cm}$$

34. Answer (3)

Hint and Sol. : Optical fibre communication, looming and mirage are due to total internal reflection while difference in apparent and real depth is due to refraction of light.

35. Answer (1)

Hint and So. : Use Snell's law.

$$\mu_1 \sin i = \mu_2 \sin r$$

$$\Rightarrow \frac{3}{2} \sin 60^\circ = 2 \sin(r)$$

$$\Rightarrow r = \sin^{-1} \left(\frac{3\sqrt{3}}{8} \right)$$

36. Answer (3)

Hint : Use concept of optical path.

Sol. : Let x is the distance through which central fringe will shift.

$$\text{Given } x = \frac{\lambda D}{d}$$

$$\therefore (\mu - 1)t = \frac{xd}{D} = \frac{\lambda D}{d} \cdot \frac{d}{D} = \lambda$$

$$\Rightarrow (\mu - 1)t = \lambda$$

$$\Rightarrow (1.5 - 1)t = \lambda$$

$$\Rightarrow t = 2\lambda$$

37. Answer (1)

Hint : $k_{\max} = h\nu - \phi$ and $V_0 = \frac{k_{\max}}{e}$

Sol. : Let threshold wavelength is λ_0 , then $\phi = \frac{hc}{\lambda_0}$

Now $\frac{hc}{e\lambda} - \frac{hc}{e\lambda_0} = x \quad \dots(i)$

and $\frac{hc}{n\lambda e} - \frac{hc}{\lambda_0 e} = \frac{x}{n+1} \quad \dots(ii)$

on solving (i) and (ii)

$$\frac{hc}{\lambda} - \frac{hc}{\lambda_0} = \frac{(n+1)hc}{n\lambda} - \frac{(n+1)hc}{\lambda_0}$$

$$\lambda_0 = n^2\lambda$$

38. Answer (2)

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

Sol. : $\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2mK}} = \frac{h}{\sqrt{2mqV}}$

$$\therefore \frac{\lambda_\alpha}{\lambda_P} = \sqrt{\frac{m_P q_P}{m_\alpha q_\alpha}} = \frac{1}{2\sqrt{2}}$$

39. Answer (3)

Hint and Sol. : $E_n = -\frac{RhcZ^2}{n^2}$

$$E_\infty = 0, E_1 = -9hcR$$

$$\text{Ionisation energy} = 9hcR$$

40. Answer (3)

Hint : Time period $T \propto n^3$

Sol. : Given $T_1 = 8T_2$

$$\Rightarrow n_1^3 = 8n_2^3$$

$$\Rightarrow n_1 = 2n_2$$

41. Answer (2)

Hint : Use $\frac{R}{R_0} = \left(\frac{1}{2}\right)^{\frac{t}{T_1}}$

Sol. : $\left(\frac{1250}{5000}\right) = \left(\frac{1}{2}\right)^{\frac{5}{T_1}}$

$$T_1 = \frac{5}{2} = 2.5 \text{ minute}$$

$$\lambda = \frac{\log_e(2)}{T_1}$$

$$\lambda = 0.4 \log_e(2)$$

42. Answer (4)

Hint : $\lambda_{eq} = \lambda_\alpha + \lambda_\beta$

Sol. : $\lambda_\alpha = \frac{1}{1620}$ per year and $\lambda_\beta = \frac{1}{405}$ per year

Equivalent decay constant $\lambda_{eq} = \lambda_\alpha + \lambda_\beta$

$$= \frac{1}{1620} + \frac{1}{405}$$

$$= \frac{1}{324} \text{ per year}$$

Now $N = N_0 e^{-\lambda t}$

$$\Rightarrow \frac{N_0}{4} = N_0 e^{-\lambda t}$$

$$\Rightarrow e^{\lambda t} = 4 \Rightarrow t = \frac{\ln 4}{\lambda}$$

$$= \ln 4 \times 324$$

$$\approx 449 \text{ years}$$

43. Answer (2)

Hint and Sol. : Reverse current in a photodiode increases with increases in intensity. Hence $I_1 < I_2 < I_3 < I_4$.

44. Answer (4)

Hint. and Sol. :

$$P = (\bar{x} + \bar{y}) \cdot z$$

$$= (\bar{x} \cdot \bar{y}) \cdot z \text{ (From De-Morgan's law)}$$

45. Answer (4)

Hint : Power gain $= \beta^2 \left(\frac{R_0}{R_i}\right)$

Sol. : Voltage gain $= \beta \cdot \left(\frac{R_0}{R_i}\right)$

$$50 = \beta \cdot \frac{R_0}{R_i} \Rightarrow \beta = \frac{50 \times R_i}{R_0}$$

$$= \frac{50 \times 200}{400} = 25$$

$$\text{Now, power gain} = \beta^2 \left(\frac{R_0}{R_i} \right)$$

$$= (25^2) \cdot \frac{400}{200} = 625 \times 2$$

$$= 1250$$

[CHEMISTRY]

46. Answer (2)

Hint : $E_n \propto \frac{Z^2}{n^2}$

Sol. : $E_n = -k \frac{Z^2}{n^2}$

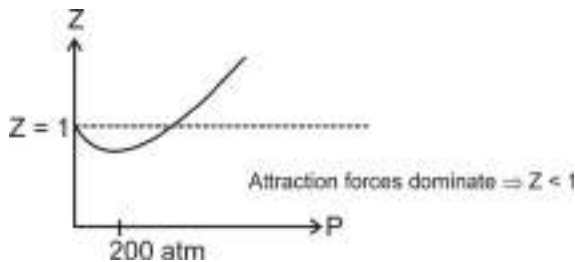
$$\frac{E_2}{E_3} = \frac{\frac{1^2}{2^2}}{\frac{1^2}{3^2}} = \frac{9}{4}$$

$$\Rightarrow E_2 = -(145.7 \text{ kJ/mol}) \times \frac{9}{4}$$

$$\Rightarrow E_2 = -327.8 \text{ kJ mol}^{-1}$$

47. Answer (2)

Hint :

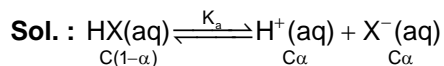


48. Answer (2)

Hint : $[X^-] = [H^+]$ and $\text{pH} = -\log[H^+]$

$$\Rightarrow [H^+] = 10^{-5}$$

$$\Rightarrow C\alpha = 10^{-5}$$



$$\text{At equilibrium } K_a = Q = \frac{[H^+][X^-]}{[HX]} = \frac{C\alpha \cdot C\alpha}{C(1-\alpha)}$$

$$\Rightarrow K_a = \frac{(10^{-5})^2}{0.005 \times 1} (\alpha \ll 1, \alpha = 2 \times 10^{-3})$$

$$\Rightarrow K_a = 2 \times 10^{-8}$$

49. Answer (4)

Hint : These are optical isomers.

Sol. : These optical isomers are not mirror images hence, diastereomers.

50. Answer (1)

Hint : Arrhenius equation.

$$k = Ae^{\frac{E_a}{RT}}$$

Sol. : $\frac{k_{\text{new}}}{k_{\text{old}}} = e^{\frac{(E_{\text{new}} - E_{\text{old}})}{RT}}$

$$\frac{R_{\text{new}}}{R_{\text{old}}} = e^{\frac{(E_{\text{old}} - E_{\text{new}})}{RT}} \quad (\because R \propto k)$$

$$\Rightarrow e^{3.33} = e^{\frac{\Delta E}{2 \times 300}}$$

$$\text{Comparing, } 3.33 = \frac{\Delta E}{2 \times 300}$$

$$\Rightarrow \Delta E = \frac{10}{3} \times 2 \times 300 = 2 \text{ kcal}$$

51. Answer (4)

Hint : $\Delta T_f = iK_f m$

Sol. : $0.00372 = i \times 1.86 \times 0.0010$

$$\Rightarrow i = \frac{3.72}{1.86} = 2$$

1 mol 'Y' gives 2 mole ions

\Rightarrow 2 mol 'Y' gives 4 mole ions

52. Answer (3)

Hint : Zone refining method is used for the refining of semi-conducting metals.

53. Answer (2)

Hint : Ni(DMG)_2 is red in colour.

Sol. : $\text{Ti}^{4+}(\text{TiO}_2)$, $\text{Cu}^+(\text{CuCl})$, $\text{Zn}^{2+}(\text{ZnS})$

have either d^0 or d^{10} configuration.

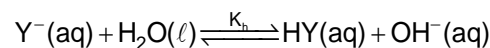
Hence, no $d-d$ transition.

54. Answer (2)

Hint : For a conjugate acid-base pair,

$$\text{p}K_a + \text{p}K_b = \text{p}K_w = 14 \text{ at } 298 \text{ K}$$

Sol. : $K_b = K_h = 10^{-9}$ because



$$\text{p}K_a + \text{p}K_b = 14$$

$$\Rightarrow \text{p}K_a + 9 = 14$$

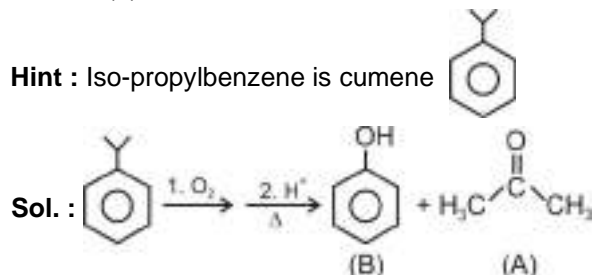
$$\Rightarrow pK_a = 5$$

For acidic buffer solution :

$$pH = pK_a + \log\left(\frac{[Y^-]}{[HY]}\right) = 5 + \log 1 = 5$$

55. Answer (4)

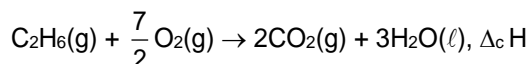
Hint : Iso-propylbenzene is cumene



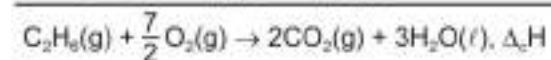
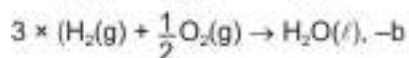
A gives a positive iodoform test.

56. Answer (3)

Hint : Ethane is C_2H_6 . Hence, standard heat of combustion of ethane is given by



Sol. :



$$\Delta_c H = 2(-a) + 3(-b) - 1(-d) = -2a - 3b + d$$

57. Answer (2)

Hint : In BCC, number of effective atoms = 2 and $\sqrt{3}a = 4r$

Sol. :

$$\text{Packing fraction} = \frac{\text{volume occupied by atoms}}{\text{Volume of atoms}}$$

$$= \frac{2 \times \frac{4}{3} \pi r^3}{a^3}$$

$$= \frac{\sqrt{3}\pi}{8}$$

58. Answer (3)

Hint : 1 mol contains 6.022×10^{23} particles.

Sol. : Let gas has molecular formula Y_n

$$0.1 \text{ mol contains : } 0.1 \text{ mol} \times 6.022 \times 10^{23} \frac{\text{atoms}}{\text{mol}} \times n$$

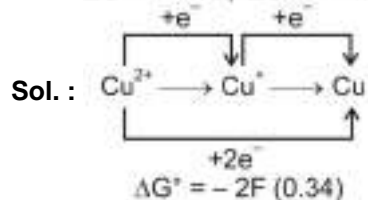
$$\Rightarrow 1.806 \times 10^{23} = 0.1 \times 6.022 \times 10^{23} \times n$$

$$\Rightarrow n = \frac{1.806}{0.6022} = 3$$

59. Answer (1)

Hint : $Cu^{2+} \rightarrow Cu^+ \rightarrow Cu$

$$\Delta G^\circ = -1F_x, \Delta G^\circ = -1F (0.52)$$



$$-1F(x) - 1F(0.52) = -2F(0.34)$$

$$\Rightarrow x = 0.68 - 0.52 = 0.16 \text{ V}$$

60. Answer (1)

Hint : An electron withdrawing group decreases the rate of electrophilic substitution.

Sol. : $-Cl$ is effective electron withdrawing group, thereby, decreases the reactivity towards electrophilic substitution.

61. Answer (2)

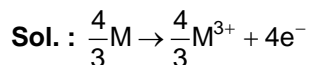
Hint : An electron deficient molecule is the one which contains an atom with incomplete octet of electrons.

Sol. : Electron deficient molecules : BF_3 , BH_3 , $AlCl_3$

Electron precise molecule : SiH_4

62. Answer (3)

$$\text{Hint : } \Delta_r G = -nFE_{\text{cell}}$$



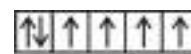
Hence, $n = 4$

$$\Delta_r G = -4FE_{\text{cell}} = -4 \times F \times 2 = -8F$$

63. Answer (2)

Hint : The species with no unpaired electrons are diamagnetic in nature

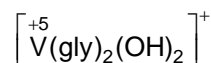
Sol. :



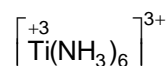
$$n = 4$$

Similarly, $[FeF_6]^{3-}$

$$\Rightarrow n = 5$$



$$\Rightarrow V^{5+} : [Ar]3d^0$$



$$\Rightarrow Ti^{3+} : [Ar]3d^1$$



64. Answer (4)

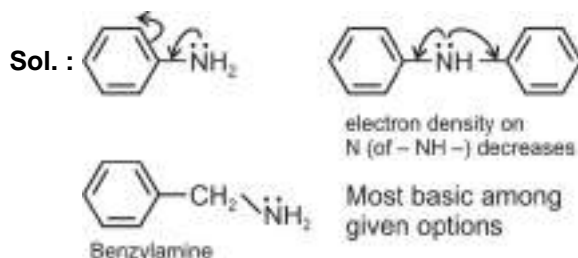
Hint : Reducing monosaccharides and disaccharides undergo mutarotation in aqueous solutions.

Sol. : Reducing sugars : (+) maltose, (+) lactose, (+) glucose

Hence, all of these sugars show mutarotation

65. Answer (3)

Hint : Electron withdrawing groups such as $-\text{NO}_2$ decrease electron density on N (of $-\text{NH}_2$), thereby, reducing the basic character.



66. Answer (4)

Hint : Solutions are isotonic $\Rightarrow \pi_{\text{urea}} = \pi_{\text{unknown}}$

Sol. : $\Rightarrow C_{\text{urea}} = C_{\text{unknown}}$ (at same T)

$$\Rightarrow \frac{20}{60} \frac{\text{mol}}{1\text{L}} = \frac{5}{x} \frac{\text{mol}}{\frac{100}{1000}\text{L}} \quad \left(\because 5\% = \frac{5\text{ g}}{100\text{ mL}} \right)$$

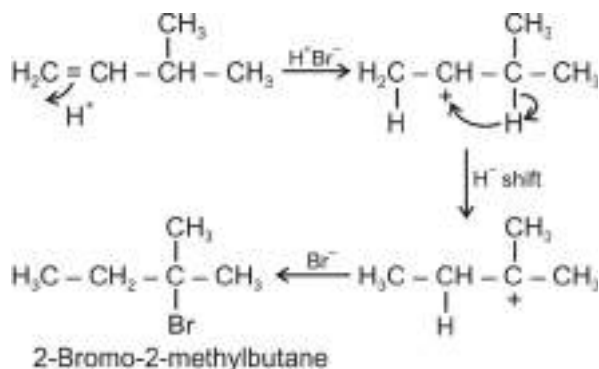
$$\Rightarrow \frac{2}{6} = \frac{50}{x}$$

$$\Rightarrow x = 150\text{ g mol}^{-1}$$

67. Answer (1)

Hint : Hydride shift takes place in order to form more stable carbocation.

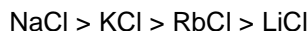
Sol. :



68. Answer (1)

Hint : LiCl shows highest covalent character (Fajan's rule).

Sol. : Order of melting point



69. Answer (4)

Hint : Argentite is Ag_2S

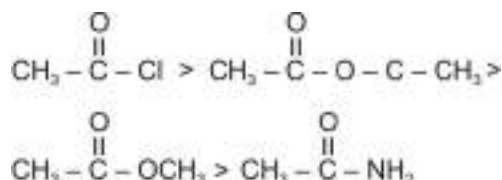
Sol. : It is concentrated by leaching. All other ores are concentrated by froth floatation process.

70. Answer (3)

Hint : Weak bases are better leaving groups.

Sol. : k is highest when rate of reaction is highest

Relative rates :



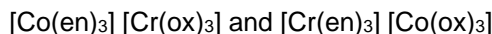
71. Answer (4)

Hint : Tetracycline is an antibiotic.

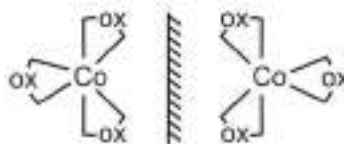
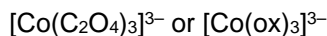
72. Answer (2)

Hint : $[\text{PtCl}_2(\text{NH}_3)_2]$ shows geometrical isomerism.

Sol. : Coordination isomerism :



Optical isomerism :



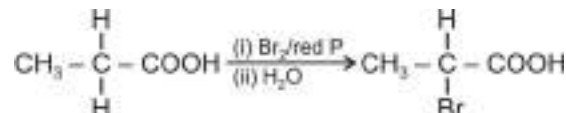
Ionisation isomerism



73. Answer (3)

Hint : In such a reaction, hydrogen atom of $\alpha - \text{C}$ with respect to carboxylic acid group is substituted by Br.

Sol. :



This is Hell-Volhard-Zelinsky reaction

74. Answer (1)

Hint :

Group Nos.

3 4 5

Sc Ti V

Y Zr Nb

La Hf Ta

Sol. : Lanthanoid contraction leads to almost no change in atomic size of 4d and 5d elements such as Zr and Hf or Nb and Ta. These are known as 'Chemical Twins'.

75. Answer (4)

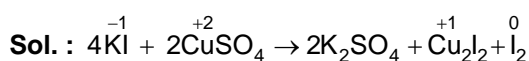
Hint : Liebig's method : conversion of C and H into CO₂ and H₂O respectively.

Sol. : Duma's method as well as Kjeldahl's method is used for nitrogen estimation.

Halogens : Carius method.

76. Answer (3)

Hint : In a redox reaction, oxidation numbers of elements change.

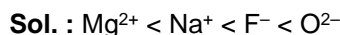


77. Answer (4)

Hint : Decomposition of ozone is exothermic. Hence, formation of ozone must be endothermic.

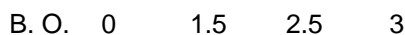
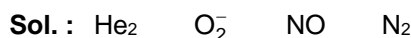
78. Answer (2)

Hint : For isoelectronic species, with increase in number of protons, size of ion decreases.



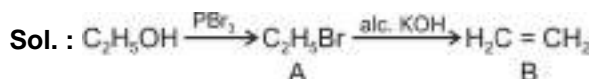
79. Answer (2)

$$\text{Hint : Bond order (B. O.)} = \frac{N_B - N_A}{2}$$



80. Answer (1)

Hint : KOH leads to dehydrohalogenation through elimination.



81. Answer (3)

Hint : Amylose is a long unbranched chain.

Sol. : It consists of α-D-glucose units held by C1-C4 glycosidic linkage.

82. Answer (1)

Hint : Thermal stability of HF is highest.

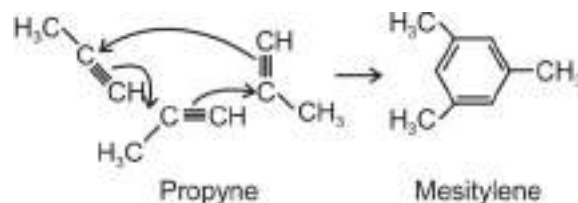
Sol. : It decreases down the group



83. Answer (2)

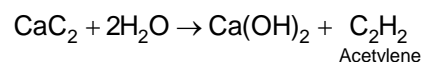
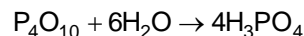
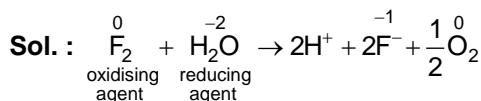
Hint : Cyclic polymerization of propyne takes place.

Sol. :



84. Answer (4)

Hint : Water acts as a base towards acids stronger than it.



85. Answer (2)

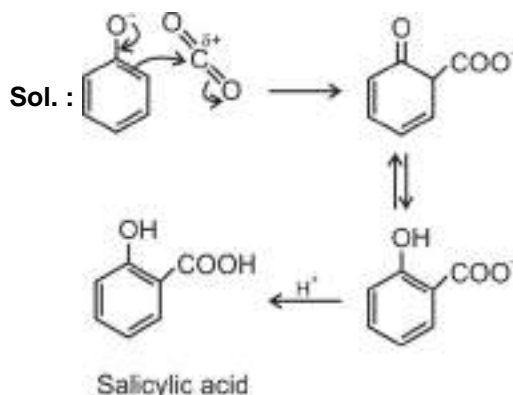
Hint : The common components of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN)

86. Answer (1)

Hint : Ultrapure forms of silicon is used as semiconductor.

87. Answer (3)

Hint : CO₂ contains C^{δ+}



88. Answer (4)

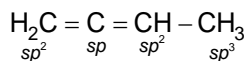
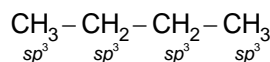
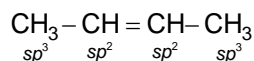
Hint : Cationic detergents such as cetyltrimethyl bromide have molecules, which form micelles around the oil droplets. This is responsible for the cleansing action of soap.

89. Answer (4)

Hint : Cheilosis is fissuring at corners of mouth and lips

90. Answer (4)

Hint : $\text{HC} \equiv \underset{\text{sp}}{\text{C}} - \underset{\text{sp}}{\text{C}} \equiv \underset{\text{sp}}{\text{CH}}$



[BIOLOGY]

91. Answer (3)

Hint : Both mitochondria and chloroplast have their own DNA and ribosomes.

Sol. : Both cell organelles are semiautonomous and contain 70S ribosomes. Mitochondrial inner membrane forms cristae.

92. Answer (1)

Hint : In plants, the cell division is anastral.

Sol. : Higher plants lack centrioles. Centrioles are present in animal cells and in lower plant cells.

93. Answer (3)

Hint : β -oxidation of fats takes place in mitochondria.

Sol. : Synthesis of lipids takes place in smooth ER.

94. Answer (3)

Hint : A bivalent has two homologous chromosomes.

Sol. : If, $2n = 24$

Total pair of homologous chromosomes will be 12.
Hence, number of bivalents = 12.

95. Answer (3)

Hint : Meiosis II is equational division.

Sol. : Before mitosis DNA replication takes place but not before meiosis II. Separation of chromatids takes place in both mitosis as well as meiosis.

96. Answer (2)

Hint : Defining feature should be present in all living organisms without exception.

Sol. : Some organisms do not reproduce hence it cannot be considered as defining feature.

97. Answer (3)

Hint : Cyanobacteria are photosynthetic and can fix atmospheric N_2 also.

Sol. : Cyanobacteria can fix CO_2 thus can synthesize their food.

98. Answer (4)

Hint : Bacterial photosynthesis is anoxygenic.

Sol. : No oxygen is evolved as they do not involve splitting of water. H_2O is not the source of electron, instead it is H_2S

99. Answer (2)

Sol. : Members of basidiomycetes reproduce sexually by somatogamy as they lack sex organs.

100. Answer (2)

Hint : Prions are infectious protein particles.

Sol. : Prions lack genetic material. They cause many diseases such as Kuru disease, scrapie disease in sheep etc.

101. Answer (3)

Sol. : Adventitious roots of sweet potato get swollen and store food.

102. Answer (2)

Sol. : Pea leaves modify to form tendrils.

In cucumber, axillary buds modify to form tendrils. Tendrils are sensitive structures, coil around the nearby support and help the plant in climbing.

103. Answer (2)

Hint : Vascular cambium is developed at the time of secondary growth in dicot roots

Sol. : In dicot roots, vascular cambium is completely secondary in origin. Whereas in dicot stem it is partly primary and partly secondary in origin.

104. Answer (2)

Hint : At the time of insufficient water supply, bulliform cells lose the water and become flaccid.

Sol. : To prevent water loss, the bulliform cells make the leaves curl inwards so that leaf surface is not exposed.

105. Answer (4)

Hint : *Polysiphonia* is a red alga.

Sol. : Red algae lack motile stages and motile gametes.

106. Answer (4)

Hint : In algae life cycle pattern can be diplontic, haplontic or haplo-diplontic.

Sol. : Majority of the green algae are haploid. *Fucus* is diploid and show diplontic life cycle.

107. Answer (2)

Hint : Water moves from high to low ψ_w .

Sol. : Cell A Cell B

$$\psi_w = -4 \qquad \psi_w = -7$$

Cell A has higher ψ_w than cell B. Hence water will move from cell A to cell B. Osmotic potential is solute potential which is always negative.

108. Answer (3)

Hint : Gridling experiment identifies the tissues through which food is translocated.

Sol. : This experiment demonstrates, that phloem translocation is unidirectional. When phloem is removed then initially the upward movement of water was not affected.

109. Answer (2)

Hint : *Thiobacillus* is a group of bacteria which are chemoautotroph.

Sol. : *Thiobacillus* can reduce soil nitrates to gaseous nitrogen.

110. Answer (3)

Sol. : Boron is involved in functioning of cell membrane and pollen germination.

111. Answer (2)

Hint : Phosphoenolpyruvate (PEP) is primary CO_2 acceptor in C_4 plants.

Sol. : PEP is a three carbon molecule and present in mesophyll cells. RUBP, primary CO_2 acceptor is a five carbon molecule and found in mesophyll cells of C_3 plants.

112. Answer (3)

Hint : RuBisCO when shows its oxygenase activity then shows photorespiration.

Sol. : C_4 plants lack photorespiration and hence show greater productivity than C_3 plants.

113. Answer (2)

Hint : To fix a CO_2 molecule, a C_4 plant requires 2 more ATP than a C_3 plant.

Sol. : To form a hexose sugar (6C)

$$\text{C}_3 \text{ plant} = 6 \times 3 = 18 \text{ ATP}$$

$$\text{C}_4 \text{ plant} = 6 \times 5 = 30 \text{ ATP}$$

$$\text{Difference} = 12 \text{ ATP}$$

114. Answer (1)

Hint : Lactic acid fermentation does not release any CO_2

Sol. : As long as NAD^+ is provided, glycolysis can operate.

115. Answer (4)

Sol. : Glycolysis is common to both anaerobic and aerobic respiration. It takes place in cytoplasm which leads to partial oxidation of glucose to pyruvic acid.

116. Answer (3)

Hint : Auxin shows apical dominance by which it inhibits growth of lateral buds.

Sol. : Auxin inhibits abscission of young leaves, fruits and flowers. Ethylene is the only gaseous hormone. Auxin promotes root growth in tissue culture and was first isolated from human urine.

117. Answer (4)

Hint : In epigeal germination, the hypocotyl grows first.

Sol. : Onion shows epigeal germination, maize, mango and gram show hypogeal germination.

118. Answer (2)

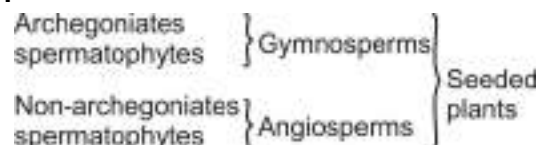
Hint : During stress condition the concentration of ABA increases.

Sol. : Its synthesis is stimulated by various types of stress. It promotes dormancy of seeds.

119. Answer (2)

Hint : In all seed plants pollen grains are the carrier of male gametes.

Sol. :



120. Answer (3)

Hint : China rose has male and female sex organs in the same flower.

Sol. : China rose has bisexual flowers.

121. Answer (4)

Hint : Nucellar cells can directly form the embryo.

Sol. : Zygotic embryo can be formed by mitotic division in zygote only. Zygote is formed by fusion of male and female gametes.

122. Answer (4)

Hint : Double fertilization involves syngamy and triple fusion

Sol. : Egg cell + one male gamete = Syngamy

Secondary nucleus + another male gamete = PEN

123. Answer (2)

Hint : Cucurbits have unisexual flowers.

Sol. : Autogamy is shown by bisexual flowers cucurbits can show geitonogamy as well as xenogamy.

124. Answer (4)

Hint : Emasculation is removal of anther from the female plant.

Sol. : It prevents self pollination in female plant.

125. Answer (2)

Hint : This pedigree shows inheritance of X linked recessive disorder.

Sol. : Female I(R) is heterozygous for the disorder.

Genotype of II(P) can be XX or XX^C whereas genotype of II(Q) will be X^CX.

126. Answer (3)

Hint : In incomplete dominance, dominant trait is not completely expressed in F₁ generation.

Sol. : Genotypic and phenotypic ratios are same in incomplete dominance i.e. 1 : 2 : 1

127. Answer (2)

Hint : 5-methyl uracil is a thymine.

Sol. : Thymine is a pyrimidine base found in DNA not in RNA. It is 6 membered single ring structure.

128. Answer (3)

Hint : Primase synthesizes primer strand.

Sol. : Primase is RNA polymerase. It synthesizes short RNA strand called primer.

Primers are required on both the strands and they are removed from DNA enzymatically.

129. Answer (2)

Sol. : Spinach is vitamin A enriched crop, bathua, tomato and mustard are vitamin C enriched crops developed by IARI.

130. Answer (3)

Sol. : Biofertilizers are living organisms that enrich the nutrient quality of soil.

131. Answer (3)

Hint : *Penicillium* secreting penicillin inhibits the growth of other bacteria.

Sol. : It shows amensalism i.e. (–, 0) interaction.

132. Answer (3)

Hint : In grassland ecosystem the pyramid of biomass is upright.

Sol. : The biomass of grassland is maximum followed by herbivores and secondary consumers.

133. Answer (2)

Hint : Nile perch is a large predator fish which was introduced into Lake Victoria of East Africa.

Sol. : Biodiversity plays a major role in many ecosystem services that nature provides such as pollination and oxygen.

134. Answer (1)

Hint : Green house gases are CO₂, CH₄, N₂O, and CFCs.

Sol. : $\left. \begin{array}{l} \text{CO}_2 - 60\% \\ \text{CH}_4 - 20\% \\ \text{CFCs} - 14\% \\ \text{N}_2\text{O} - 6\% \end{array} \right\} \text{Major green house gases}$

135. Answer (3)

Sol. : COP 24 took place in Katowice, Poland in year 2018.

COP 18 : Doha, Qatar

COP 20 : Lima, Peru

COP 23 : Bonn, Germany

136. Answer (3)

Hint : Chondrichthyes are cold blooded (poikilothermous) fish

Sol. : *Trygon* or sting ray possesses a poison sting and *Torpedo* has an electric organ. *Hippocampus* is a bony fish with prehensile tail while *Scoliodon* (Dog fish) is a cartilaginous fish with placoid scales.

137. Answer (2)

Hint : It is sold under brand name 'Saheli'.

Sol. : Centchroman (Saheli, SERM) is a nonsteroidal drug, taken orally once a week. It is a potent contraceptive which prevents implantation but does not inhibit ovulation in majority of cases. It was developed by CDRI, Lucknow. Gossypol is a non-hormonal male contraceptive. LNG-20 is a hormonal IUCD. Mala-D is an oral contraceptive that inhibits ovulation.

138. Answer (2)

Hint : Lymph nodes are spread throughout the body.

Sol. : Peyer's patches are clusters of lymphatic tissue found along the ileum and involved in production of lymphocytes. They monitor intestinal bacteria populations. Tonsils are located at the rear of throat (pharynx). Spleen is a large bean shaped organ that acts as filter of the blood.

139. Answer (3)

Hint : Analogous structures exhibit convergent evolution.

Sol. : According to Osborn, 'law of adaptive radiation' states that if a given region is large and varies in its soil, vegetation and climatic conditions, it may give rise to diverse organisms.

140. Answer (4)

Hint : Tears and saliva contain the enzyme lysozyme.

Sol. : Lysozyme cleaves the covalent linkage between sugars in peptidoglycans which helps kill gram-positive bacteria. It is considered as a physiological barrier under innate immunity. Physical barriers include skin and mucus coating of epithelium lining the respiratory, gastrointestinal, urinogenital tract. Cytokine barrier includes interferons.

141. Answer (1)

Hint : Identify a viral disease.

Sol. : ELISA is a preliminary test used for diagnosing HIV. Widal test is a serological test used for diagnosing typhoid fever. Western blot separates and detects specific HIV antibodies. Conventional microscopic examination of blood smear is the gold standard for malaria diagnosis. Fasting plasma glucose (FPG) or oral glucose tolerance test (OGTT) confirm the diagnosis of diabetes mellitus.

142. Answer (1)

Hint : Its single alphabet code is M.

Sol. : Glutamic acid is a non-essential acidic amino acid and acts as excitatory neuro transmitter in brain and spinal cord. Cysteine is a sulfur containing amino acid that forms disulphide bonds. Serine is an alcoholic amino acid.

143. Answer (3)

Hint : Agarose gel allows smaller fragments of DNA to travel more quickly.

Sol. : Gel electrophoresis is a technique used to separate molecules based on both size and charge but separates DNA fragments on the basis of size and conformation.

144. Answer (3)

Hint : AIDS and genital warts are viral diseases.

Sol. :

STI	CAUSATIVE AGENT
Gonorrhoea	<i>Neisseria gonorrhoeae</i>
Syphilis	<i>Treponema pallidum</i>
Genital warts	Human papilloma virus
AIDS	Human immunodeficiency virus

145. Answer (4)

Hint : It causes 'Lock jaw'

Sol. : A single muscle twitch refers to typical contractile response of a skeletal muscle fibre to the single stimulus. Tetanus is a bacterial infection caused by *Clostridium tetani* which affects the nervous system, leading to painful sustained contractions particularly of jaw and neck muscles.

Tetany is a medical sign which results from low blood calcium level. Tonus or muscle tone is the continuous and passive partial contraction of the muscle.

146. Answer (1)

Hint : This duct is formed by union of common bile duct and pancreatic duct.

Sol. : The passage of pancreatic juice and bile through the hepatopancreatic duct into small intestine is regulated by a ring of smooth muscle known as the Sphincter of Oddi.

147. Answer (3)

Hint : Succus entericus is called intestinal juice.

Sol. : Intestinal juice or succus entericus is formed by the secretions of goblet as well as brush border cells. Intestinal lipase, disaccharidases and nucleosidases are present in intestinal juice. Pancreatic juice contains nucleases.

148. Answer (2)

Hint : Shahtoosh and pashmina are varieties of fine wool.

Sol. : The underfur of Kashmiri goats is 'Pashmina' which yields a fine and soft wool which is used for making Kashmiri shawls. Shahtoosh is a fine wool made from hair of tibetan antelope called chiru.

149. Answer (3)

Hint : Sedatives and hypnotics reduce activity of brain.

Sol. : Psychotropic depressants act as sedatives by reducing the activity of brain and producing a feeling of calmness, relaxation or drowsiness. Sleeping pills such as valium or calmpose and antianxiety medication such as diazepam fall in the category of benzodiazepines.

150. Answer (3)

Hint : Neurotransmitter of NMJ is usually acetylcholine.

Sol. : Anticholinesterases are drugs which reduce breakdown of acetylcholine and can be used to delay exhaustion of the neurotransmitters at the synaptic cleft. This helps in delaying synaptic fatigue.

151. Answer (3)

Hint : Cusps of tricuspid and bicuspid valves are connected to tendon-like cords.

Sol. : The chordae tendineae are tendon like cords which in turn are connected to cone-shaped trabeculae carneae called papillary muscles.

152. Answer (3)

Hint : Identify the mesodermal structure.

Sol. : Hair, nails, enamel of teeth, sweat glands and salivary glands are all ectodermal in origin and are therefore likely to be affected by a disorder originating from the ectodermal germ layer. Heart is mesodermal in origin.

153. Answer (4)

Hint : Long bone of the upper arm.

Sol. : Glenoid cavity articulates head of humerus with scapula or shoulder blade.

154. Answer (4)

Hint : Gap junctions may be found in neural tissue.

Sol. : The cell junctions are specialized junctions present in the epithelial tissue.

155. Answer (2)

Hint : Cockroach is uricotelic.

Sol. : Nitrogenous waste formed in the tissues enter the hemolymph in form of soluble potassium urate after which they enter the lumen of the distal end of the malpighian tubule.

156. Answer (3)

Hint : It is commonly called table-sugar.

Sol. : Sucrose is a non-reducing sugar made up of glucose and fructose. Disaccharides are reducing sugars except sucrose.

157. Answer (2)

Hint : This structure represents the sequence of amino acids in a protein.

Sol. : Primary structure of a protein is formed by peptide bonds between respective amino acids, therefore the bonding remains intact.

158. Answer (3)

Hint : Holoenzyme = Apoenzyme + cofactor.

Sol. : Coenzyme is a non-protein organic molecule often derived from vitamins, is bound loosely to an enzyme and essential for its activity. Isoenzymes are enzymes that differ in structure but have identical function. Apoenzyme is the protein portion of holoenzyme.

159. Answer (3)

Hint : Identify the first hormone to be discovered.

Sol. : Cholecystokinin stimulates secretion of pancreatic juice rich in digestive enzymes. Gastrin promotes secretion of gastric juice. Insulin is a hypoglycemic hormone.

160. Answer (2)

Hint : Amygdala is a part of this structure.

Sol. : Medulla oblongata contains respiratory centre, centre for cardiovascular reflexes and gastric secretions. Limbic system is sometimes called the emotional brain because it plays a primary role in a range of emotion (excitement, pleasure, rage and fear). Corpus callosum connects cerebral hemispheres. Cerebellum is a part of hindbrain.

161. Answer (4)

Hint : Identify a marine animal.

Sol. : In the fishery industry, marine edible fish include *Hilsa*, Sardines and pomfrets. Fresh water fish include *Catla*, *Rohu* and common carp.

162. Answer (2)

Hint : Vasa efferentia are ducts which carry the sperms from rete testis to vas deferens.

Sol. : If vasa efferentia is blocked or ligated the gametes from testes will not enter epididymis and their path of transport is obstructed.

Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → urethra

163. Answer (4)

Hint : It is a derivative of glucose.

Sol. : Exoskeleton of arthropods is composed of protein and flexible chitin. Chitin is a homopolymer of N-acetyl glucosamine which is a derivative of glucose.

164. Answer (3)

Hint : In pentamerous symmetry, star like appearance is observed.

Sol. : In phylum Echinodermata, the organisms exhibit bilateral symmetry during larval stage and pentamerous radial symmetry during adult stage. Molluscs, pisces and tunicates are usually bilaterally symmetrical.

165. Answer (4)

Hint : It is a horseshoe shaped bone.

Sol. : Hyoid is present between the lower jaw and larynx. Some muscles of the tongue and neck extend attachment to it. However, no bone articulates with hyoid.

166. Answer (4)

Hint : Sexually transmitted infection is spread through semen.

Sol. : Chikungunya virus is not transmitted through semen and is spread through the bite of an infected mosquito. Ebola virus spreads through close direct physical contact and exchange of bodily fluids like blood, semen, vomit etc.

167. Answer (2)

Hint : This enzyme is considered as molecular glue.

Sol. : Restriction endonucleases act as molecular scissors but DNA ligases help in linking foreign DNA to plasmids. DNA polymerases catalyse polymerization of a DNA strand.

168. Answer (3)

Hint : GM brinjal is Bt brinjal.

Sol. : Genetically modified brinjal is Bt brinjal with *cry* gene for the production of Bt toxins. It has been developed for insect resistance. *cry/Ab* gene encodes for protein that provide resistance against corn borer.

169. Answer (1)

Hint : Blood is a specialized connective tissue.

Sol. : White fibrous tissue primarily forms tendons and ligaments. The arrangement of fibres show a compact and regular pattern. Dermis of skin is the example of dense irregular connective tissue.

170. Answer (2)

Hint : It is a 3-C dicarboxylic acid.

Sol. : Malonate competes with succinate for active sites of succinate dehydrogenase. The inhibitor closely resembles the substrate in its molecular structure and inhibits activity of the enzyme.

171. Answer (4)

Hint : Pepsinogen $\xrightarrow{\text{HCl}}$ Pepsin

Sol. : Function of parietal cells is to secrete HCl and Castle's Intrinsic Factor. HCl helps convert pepsinogen to pepsin. The medication used blocks the formation of HCl by blocking the proton pumps.

172. Answer (3)

Hint : Increased CO_2 decreases the affinity of haemoglobin for O_2 .

Sol. : If the CO_2 concentration in blood increases, the breathing becomes faster and deeper.

173. Answer (2)

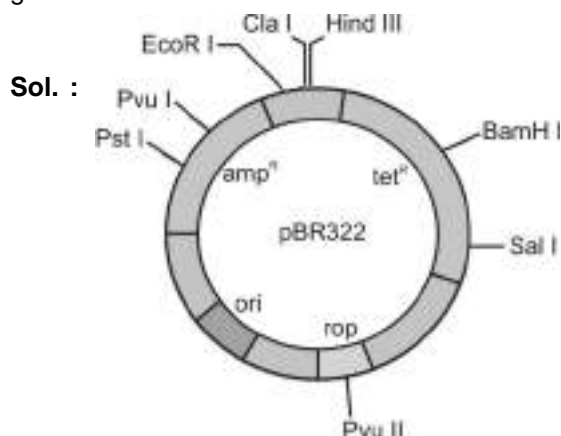
Hint : Glucose-6-phosphate dehydrogenase is an enzyme in pentose phosphate pathway.

Sol. : Glucose 6 phosphate dehydrogenase deficiency i.e. G-6PD deficiency is associated with haemolysis of RBCs.

It is particularly aggravated when body is exposed to stressors like infections or powerful medications.

174. Answer (2)

Hint : pBR322 has two antibiotic resistance genes.



175. Answer (3)

Hint : Adenine and guanine are purines.

Sol. : Acetabulum and femoral head form the hip joint of pelvic girdle. Rhodopsin is a pigment found in the eye. Malleus, incus and stapes are the ear ossicles.

176. Answer (2)

Hint : Structure related to sphincter of Oddi.

Sol. : Brunner's glands are mucus secreting glands found in the submucosa of the small intestine. Mucus secreting glands are required to protect the intestinal epithelium.

177. Answer (1)

Hint : Identify "love hormone" or 'milk let down' hormone.

Sol. : Oxytocin is a hormone released by posterior lobe of pituitary gland. It is an important hormone and also plays a role in lactation. Oxytocin release is also known to play a role in social bonding.

178. Answer (2)

Hint : The fluid from this accessory gland constitutes the main part of the ejaculate.

Sol. : Presence of fructose in the vagina indicates that sexual intercourse has occurred as it is not produced anywhere else in the body. Bulbourethral or Cowpers' gland secrete viscous mucus which acts as a lubricant. Bartholin's glands are paired female accessory glands.

179. Answer (1)

Hint : Zygote upto 8 blastomeres is transferred in a woman's fallopian tube.

Sol. : If an embryo has more than 8 blastomeres it is transferred to the uterus by a process known

as intra-uterine transfer (IUT). This is done as the embryo is close to implantation.

180. Answer (3)

Hint : Oophorectomy is surgical removal of ovaries.

Sol. : Tubectomy only involves ligation or cauterization of the fallopian tubes to prevent fertilization. Hysterectomy is surgical removal of the uterus. Vasectomy is a surgical procedure for male sterilization.



All India Aakash Test Series for NEET - 2020

OPEN MOCK TEST - 2 (Code-B)

Test Date : 16/02/2020

ANSWERS

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

HINTS & SOLUTIONS**[PHYSICS]**

1. Answer (4)

Hint : Power gain $= \beta^2 \left(\frac{R_0}{R_i} \right)$

Sol. : Voltage gain $= \beta \cdot \left(\frac{R_0}{R_i} \right)$

$$50 = \beta \cdot \frac{R_0}{R_i} \Rightarrow \beta = \frac{50 \times R_i}{R_0}$$

$$= \frac{50 \times 200}{400} = 25$$

Now, power gain $= \beta^2 \left(\frac{R_0}{R_i} \right)$

$$= (25^2) \cdot \frac{400}{200} = 625 \times 2$$

$$= 1250$$

2. Answer (4)

Hint. and Sol. :

$$P = (\bar{x} + \bar{y}) \cdot z$$

$$= (\overline{x \cdot y}) \cdot z \text{ (From De-Morgan's law)}$$

3. Answer (2)

Hint and Sol. : Reverse current in a photodiode increases with increases in intensity. Hence $I_1 < I_2 < I_3 < I_4$.

4. Answer (4)

Hint : $\lambda_{eq} = \lambda_\alpha + \lambda_\beta$

Sol. : $\lambda_\alpha = \frac{1}{1620}$ per year and $\lambda_\beta = \frac{1}{405}$ per year

Equivalent decay constant $\lambda_{eq} = \lambda_\alpha + \lambda_\beta$

$$= \frac{1}{1620} + \frac{1}{405}$$

$$= \frac{1}{324} \text{ per year}$$

Now $N = N_0 e^{-\lambda t}$

$$\Rightarrow \frac{N_0}{4} = N_0 e^{-\lambda t}$$

$$\Rightarrow e^{\lambda t} = 4 \Rightarrow t = \frac{\ln 4}{\lambda}$$

$$= \ln 4 \times 324$$

$$\approx 449 \text{ years}$$

5. Answer (2)

Hint : Use $\frac{R}{R_0} = \left(\frac{1}{2} \right)^{\frac{t}{T_1}}$

Sol. : $\left(\frac{1250}{5000} \right) = \left(\frac{1}{2} \right)^{\frac{5}{T_1}}$

$$\frac{T_1}{2} = \frac{5}{2} = 2.5 \text{ minute}$$

$$\lambda = \frac{\log_e(2)}{\frac{T_1}{2}}$$

$$\lambda = 0.4 \log_e(2)$$

6. Answer (3)

Hint : Time period $T \propto n^3$

Sol. : Given $T_1 = 8T_2$

$$\Rightarrow n_1^3 = 8n_2^3$$

$$\Rightarrow n_1 = 2n_2$$

7. Answer (3)

Hint and Sol. : $E_n = -\frac{RhcZ^2}{n^2}$

$$E_\infty = 0, E_1 = -9hcR$$

Ionisation energy $= 9hcR$

8. Answer (2)

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

Sol. : $\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2mK}} = \frac{h}{\sqrt{2mqV}}$

$$\therefore \frac{\lambda_\alpha}{\lambda_P} = \sqrt{\frac{m_P q_P}{m_\alpha q_\alpha}} = \frac{1}{2\sqrt{2}}$$

9. Answer (1)

Hint : $k_{\max} = h\nu - \phi$ and $V_0 = \frac{k_{\max}}{e}$

Sol. : Let threshold wavelength is λ_0 , then $\phi = \frac{hc}{\lambda_0}$

Now $\frac{hc}{e\lambda} - \frac{hc}{e\lambda_0} = x \quad \dots(i)$

$$\text{and } \frac{hc}{n\lambda_e} - \frac{hc}{\lambda_0 e} = \frac{x}{n+1} \quad \dots(ii)$$

on solving (i) and (ii)

$$\frac{hc}{\lambda} - \frac{hc}{\lambda_0} = \frac{(n+1)hc}{n\lambda} - \frac{(n+1)hc}{\lambda_0}$$

$$\lambda_0 = n^2 \lambda$$

10. Answer (3)

Hint : Use concept of optical path.

Sol. : Let x is the distance through which central fringe will shift.

$$\text{Given } x = \frac{\lambda D}{d}$$

$$\therefore (\mu - 1)t = \frac{xd}{D} = \frac{\lambda D}{d} \cdot \frac{d}{D} = \lambda$$

$$\Rightarrow (\mu - 1)t = \lambda$$

$$\Rightarrow (1.5 - 1)t = \lambda$$

$$\Rightarrow t = 2\lambda$$

11. Answer (1)

Hint and Sol. : Use Snell's law.

$$\mu_1 \sin i = \mu_2 \sin r$$

$$\Rightarrow \frac{3}{2} \sin 60^\circ = 2 \sin(r)$$

$$\Rightarrow r = \sin^{-1}\left(\frac{3\sqrt{3}}{8}\right)$$

12. Answer (3)

Hint and Sol. : Optical fibre communication, looming and mirage are due to total internal reflection while difference in apparent and real depth is due to refraction of light.

13. Answer (4)

$$\text{Hint : } L = f_0 + f_e \text{ and } m = \frac{f_0}{f_e}$$

$$\text{Sol. : } 40 = f_0 + f_e$$

$$9 = \frac{f_0}{f_e} \Rightarrow f_0 = 9f_e$$

$$40 = 10f_e$$

$$f_e = 4 \text{ cm}$$

$$f_0 = 40 - 4$$

$$= 36 \text{ cm}$$

14. Answer (2)

$$\text{Hint : } B = \frac{E}{C}$$

$$\text{Sol. : } B = \frac{3 \times 10^4}{3 \times 10^8}$$

$$= 10^{-4} \text{ T} = 100 \mu\text{T}$$

15. Answer (1)

Hint : LC oscillator

Sol. : For given condition.

$$q_0 = q_0 \cos \omega t \text{ and } i = -q_0 \omega \sin \omega t$$

For required situation

$$\frac{q^2}{2C} = \frac{1}{2} Li^2 \Rightarrow \frac{q_0^2 \cos^2 \omega t}{2C} = \frac{1}{2} L \cdot q_0^2 \omega^2 \sin^2 \omega t$$

$$\Rightarrow \omega t = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}, \dots$$

$$\Rightarrow t = \frac{\pi}{4} \sqrt{LC}, \frac{3\pi}{4} \sqrt{LC}, \frac{5\pi}{4} \sqrt{LC}, \dots$$

16. Answer (3)

$$\text{Hint. and Sol. : } V_{\text{rms}} = \sqrt{\frac{\frac{1}{T} \int_0^T V^2 dt}{\int_0^T dt}}$$

$$= \sqrt{\frac{4V_0^2 \cdot \frac{T}{4}}{T}} = V_0$$

17. Answer (1)

Hint : Electric field outside the region $E = \frac{R^2}{2r} \left| \frac{dB}{dt} \right|$

$$\text{Sol. : } E_p = \frac{R^2}{2r} [6t^2 - 8t] \Rightarrow \text{at } t = 2 \text{ s, } E_p = \frac{8R^2}{2r}$$

$$F = eE$$

$$\Rightarrow F_{t=2\text{s}} = \frac{8 \times [2.5 \times 10^{-2}]^2 \times 1.6 \times 10^{-19}}{2 \times 2 \times 2.5 \times 10^{-2}}$$

$$= 8 \times 10^{-21} \text{ N}$$

18. Answer (4)

$$\text{Hint : } \vec{F}_m = I(\vec{L}_{\text{eff}} \times \vec{B})$$

Sol. : If $y = 0$ $x = \pm 5$

$$\therefore \ell_{\text{eff}} = 10 \text{ m}$$

$$\vec{F}_m = 4[10\hat{i} \times 5(-\hat{k})]$$

$$(200\hat{j}) \text{ N}$$

19. Answer (3)

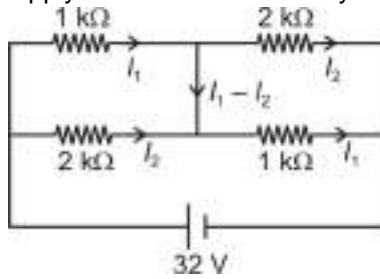
Hint and Sol. : $B_1 = B_2 = B_0$

$$\text{and } B_{\text{net}} = \sqrt{B_1^2 + B_2^2} = \sqrt{2} B_0$$

$$\frac{B_{\text{net}}}{B_0} = \sqrt{2}$$

$$B_{\text{net}} : B_0 = \sqrt{2} : 1$$

20. Answer (4)

Hint : Apply Kirchhoff's laws and symmetry rule.**Sol. :**

$$I_1 = 16 \text{ mA and } I_2 = 8 \text{ mA}$$

$$\therefore I_1 - I_2 = 8 \text{ mA}$$

Hence $X = 4$

21. Answer (1)

Hint : Apply Kirchhoff's laws.**Sol. :** Current through branch SQR and SPR is

$$\frac{5}{3} \text{ A}$$

$$\text{Now } V_S - V_Q = \frac{5}{3} \times 8 = \frac{40}{3} \text{ V} \quad \dots(i)$$

$$V_S - V_P = \frac{5}{3} \times 4 = \frac{20}{3} \text{ V} \quad \dots(ii)$$

$$\text{Hence (i) - (ii), } V_S - V_Q - V_S + V_P = \frac{40}{3} - \frac{20}{3}$$

$$V_P - V_Q = \frac{20}{3} \text{ V}$$

$$\therefore V_Q - V_P = -\frac{20}{3} \text{ V}$$

22. Answer (4)

Hint : Redraw the circuit. It becomes.

$$\text{Sol. : Charge on capacitors} = \frac{4}{3} \times 20 = \frac{80}{3} \mu\text{C}$$

$$\text{Now } V_B - V_A = \frac{40}{3} \text{ V} \Rightarrow V_B = \frac{40}{3} + 20 = \frac{100}{3} \text{ V}$$

23. Answer (3)

Hint : $|\vec{E}_P| = |\vec{V}_P|$

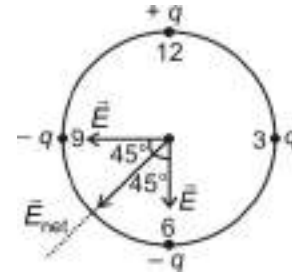
$$\text{Sol. : } \frac{kP}{r^3} \sqrt{1+3\cos^2\theta} = \frac{kP\cos\theta}{r^2}$$

$$\Rightarrow 1+3\cos^2\theta = 7\cos^2\theta \Rightarrow 4\cos^2\theta = 1$$

$$\Rightarrow \cos\theta = \pm \frac{1}{2} \Rightarrow \theta = 60^\circ \text{ (1st quadrant)}$$

$$\therefore \vec{r} = \frac{\sqrt{7}}{2} \hat{i} + \frac{\sqrt{7}\sqrt{3}}{2} \hat{j} = \frac{\sqrt{7}}{2} \hat{i} + \frac{\sqrt{21}}{2} \hat{j}$$

24. Answer (2)

Hint. and Sol. : \vec{E}_{net} is shown by time 7 : 30 by hour hand

25. Answer (2)

Hint : Use concept of Doppler's effect

$$\text{Sol. : } S \xrightarrow{\frac{v}{2}} \quad \xleftarrow{\frac{v}{2}} O$$

$$f' = f \left[\frac{v + \frac{v}{2}}{v - \frac{v}{2}} \right] = f \left[\frac{3\frac{v}{2}}{\frac{1}{2}v} \right] = 3f$$

$$\% \text{ change} = \frac{\Delta f}{f} \times 100 = \frac{2f}{f} \times 100 = 200\%$$

26. Answer (2)

Hint : Frequency of fork B $f = (158 \pm 4) \text{ Hz}$.**Sol. :** After filling the number of beats obtained = 5 beats per second.Hence fork B has frequency 162 Hz.

27. Answer (4)

Hint : Motion of block is not completely S.H.M.**Sol. :** Time taken by block during its motion in

$$\text{contact with spring is } t_1 = \frac{T}{2} = \pi \sqrt{\frac{m}{k}}$$

Time taken by block during its motion without

$$\text{contact with spring is } t_2 = \frac{2\ell}{v} = \frac{2\ell}{A\omega} = 4\sqrt{\frac{m}{k}}$$

 \therefore Time period of motion

$$T = t_1 + t_2 = (\pi + 4)\sqrt{\frac{m}{k}}$$

28. Answer (1)

Hint : For polytropic process $PV^n = \text{constant}$

$$\text{Sol. : } 16P_0V_0^n = P_0(2V_0)^n \Rightarrow n = 4$$

$$\text{Work done } W = \frac{P_1V_1 - P_2V_2}{n-1} = \frac{16P_0V_0 - P_0 \cdot 2V_0}{4-1}$$

$$= \frac{14}{3} P_0V_0$$

29. Answer (3)

Hint : For adiabatic process $P_1 V_1^\gamma = P_2 V_2^\gamma$ **Sol. :** Here $C_v = 3R \Rightarrow C_p = 4R \therefore \gamma = \frac{4}{3}$ Now $P_1 V_1^\gamma = P_2 V_2^\gamma$

$$\Rightarrow \frac{P_2}{P_1} = \left(\frac{V_1}{V_2} \right)^\gamma = \left(\frac{V}{8V} \right)^{\frac{4}{3}}$$

$$\Rightarrow P_2 = \frac{P_1}{16}$$

30. Answer (1)

Hint : Coefficient of performance of refrigerator

$$\Rightarrow \beta = \frac{Q_2}{Q_1 - Q_2}$$

$$\text{Sol. : } \frac{1}{3} = \frac{Q_2}{300 - Q_2}$$

$$\Rightarrow 300 - Q_2 = 3Q_2$$

$$\Rightarrow Q_2 = 75 \text{ joule}$$

$$\therefore \text{Work done } W = Q_1 - Q_2 = 300 \text{ J} - 75 \text{ J} = 225 \text{ J}$$

31. Answer (1)

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

$$\text{Sol. : } C = \frac{5}{9}[95 - 32] = 35^\circ\text{C}$$

32. Answer (3)

Hint : Velocity of efflux $v = \sqrt{2gh}$ **Sol. :** Speed with which water strikes the ground

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{2gh + 2gh}$$

$$= 2\sqrt{gh} = 2\sqrt{10 \times 10}$$

$$= 20 \text{ m/s}$$

33. Answer (4)

$$\text{Hint : } Y = \frac{\text{stress}}{\text{strain}}$$

$$\text{Sol. : } \Delta L = 2L - L = L$$

$$\therefore Y = \frac{\text{stress}}{\text{strain}}$$

$$\Rightarrow \text{Stress} = Y \cdot \text{strain}$$

$$= Y \cdot \frac{\Delta L}{L} = Y$$

34. Answer (1)

Hint : Use conservation of energy

$$\text{Sol. : } U_i + K_i = U_f + K_f$$

$$0 + 0 = -\frac{3GMm}{2R} + \frac{1}{2}mv^2$$

$$\Rightarrow v = \sqrt{\frac{3GM}{R}} \Rightarrow \sqrt{\frac{3}{2}}v_e$$

35. Answer (2)

Hint : Conservation of energy

$$\text{Sol. : } \frac{1}{2}mv^2 - \frac{GMm}{R} = \frac{1}{2}mv'^2 + 0$$

$$\Rightarrow v' = \sqrt{v^2 - v_e^2}$$

$$= \sqrt{4gR - 2gR} = \sqrt{2gR}$$

36. Answer (1)

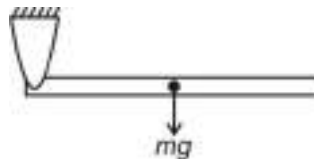
Hint : Use conservation of energy.**Sol. :** Using energy conservation

$$mgh = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$$

$$= \frac{1}{2}mv^2 + \frac{1}{2}\left(\frac{2}{5}mR^2\right)\left(\frac{v^2}{R^2}\right)$$

$$\text{on solving } v = \sqrt{\frac{10gh}{7}}$$

37. Answer (3)

Hint : Use dynamics of rigid body, $\tau = I\alpha$ 

$$\tau = I\alpha \text{ (about hinge)}$$

$$\Rightarrow mg \cdot \frac{\ell}{2} = \frac{m\ell^2}{3} \cdot \alpha$$

$$\Rightarrow \alpha = \frac{3g}{2\ell}$$

Acceleration of centre of mass

$$a = r\alpha$$

$$= \frac{\ell}{2} \cdot \frac{3g}{2\ell}$$

$$= \frac{3g}{4}$$

38. Answer (4)

Hint : Velocity becomes 'e' times after collision from surface.

Sol. : From graph $e = \sqrt{\frac{16}{36}} = \frac{2}{3}$

Kinetic energy of the ball just after second bounce

$$K = \frac{1}{2} m(e^2 u)^2 = \frac{1}{2} \times 4 \times [e^4 \times u^2]$$

$$= \frac{1}{2} \times 4 \times \left(\frac{2}{3}\right)^4 \times (2 \times 10 \times 162)$$

$$= \frac{1}{2} \times 4 \times \frac{16}{81} \times 3240$$

$$= 1280 \text{ J}$$

39. Answer (3)

Hint : Use impulse-momentum equation.

Sol. : $\vec{p}_f = \vec{p}_i + \vec{F} \cdot \Delta t$

$$\Rightarrow m \cdot \vec{v}_f = m \cdot \vec{v}_i + \vec{F} \Delta t = 2(2\hat{i} - 3\hat{j} + 4\hat{k}) + (2\hat{i} + \hat{j} - 5\hat{k}) \times 3$$

$$\Rightarrow 2 \cdot \vec{v}_f = 4\hat{i} - 6\hat{j} + 8\hat{k} + 6\hat{i} + 3\hat{j} - 15\hat{k}$$

$$\Rightarrow 2\vec{v}_f = 10\hat{i} - 3\hat{j} - 7\hat{k}$$

$$\therefore \vec{v}_f = \frac{10\hat{i} - 3\hat{j} - 7\hat{k}}{2}$$

Speed $|\vec{v}_f| = \frac{\sqrt{158}}{2} \text{ m/s}$

40. Answer (1)

Hint : Limiting friction is $f_{\max} = \mu N$

Sol. : Friction from both contact surfaces will oppose the motion of block Q

$$\therefore F \geq (f_{1,\max} + f_{2,\max})$$

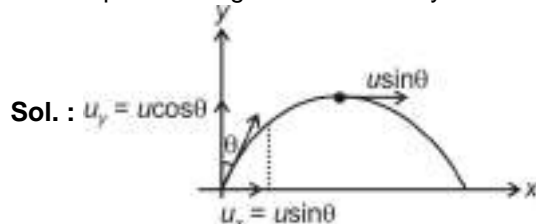
$$F \geq (300 \times 0.4 + 100 \times 0.3)$$

$$F \geq 150 \text{ N}$$

$$\therefore F_{\min} = 150 \text{ N}$$

41. Answer (4)

Hint : Speed = magnitude of velocity.



Change in speed $\Rightarrow \Delta u = u \sin \theta - u$

$$= u(\sin \theta - 1)$$

42. Answer (2)

Hint : Time taken to fall through a height h when released from rest is $\sqrt{\frac{2h}{g}}$

Sol. : Let height of each storey is h , then

$$25h = 0 + \frac{1}{2} \cdot 10t^2 = \frac{1}{2} \times 10 \times 5^2$$

$$h = 5 \text{ m}$$

In the first second, let stone passes through n storeys so $n \times 5 = \frac{1}{2} \times 10 \times 1^2$

$$\Rightarrow n = 1$$

43. Answer (4)

Hint : $\vec{A} \cdot \vec{B} = AB \cos \theta$ and $|\vec{A} \times \vec{B}| = AB \sin \theta$

Sol. : $AB \cos \theta = \sqrt{3} AB \sin \theta$

$$\cot \theta = \sqrt{3} \Rightarrow \theta = 30^\circ$$

Now, $|\vec{A} + \vec{B}| = \sqrt{A^2 + B^2 + 2AB \cos \theta}$

$$= \sqrt{A^2 + B^2 + 2AB \cdot \frac{\sqrt{3}}{2}}$$

$$= [A^2 + B^2 + \sqrt{3}AB]^{\frac{1}{2}}$$

44. Answer (3)

Hint : Principle of homogeneity.

Sol. : Here $\frac{2\pi ct}{\lambda}$ as well as $\frac{2\pi x}{\lambda}$ are dimensionless.

Unit of ct is same as that of λ and

Unit of x is same as that of λ .

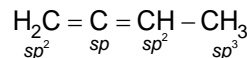
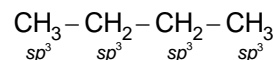
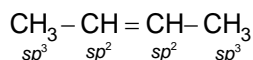
45. Answer (2)

Hint. and Sol. : Abdus Salam was awarded Nobel prize for the unification of weak and electromagnetic interactions.

[CHEMISTRY]

46. Answer (4)

Hint : $\text{HC} \equiv \underset{sp}{\text{C}} - \underset{sp}{\text{C}} \equiv \underset{sp}{\text{CH}}$



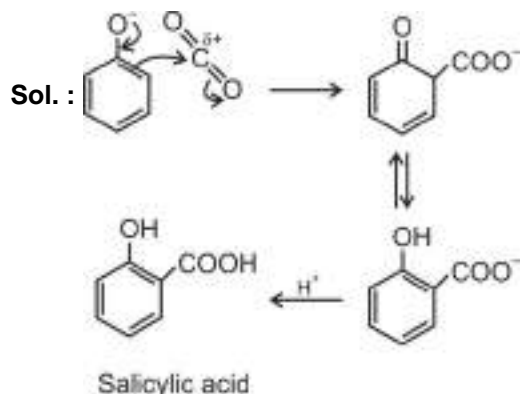
47. Answer (4)

Hint : Cheilosis is fissuring at corners of mouth and lips

48. Answer (4)

Hint : Cationic detergents such as cetyltrimethyl bromide have molecules, which form micelles around the oil droplets. This is responsible for the cleansing action of soap.

49. Answer (3)

Hint : CO_2 contains $\text{C}^{\delta+}$ 

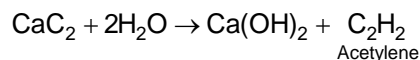
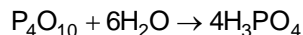
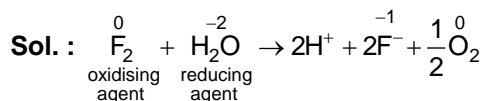
50. Answer (1)

Hint : Ultrapure forms of silicon is used as semiconductor.

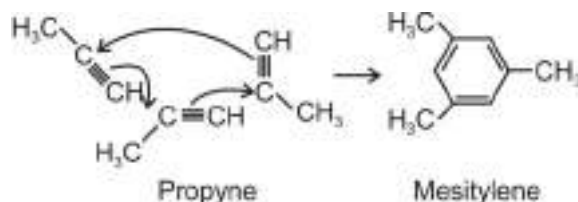
51. Answer (2)

Hint : The common components of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN)

52. Answer (4)

Hint : Water acts as a base towards acids stronger than it.

53. Answer (2)

Hint : Cyclic polymerization of propyne takes place.**Sol. :**

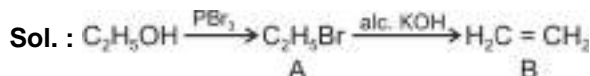
54. Answer (1)

Hint : Thermal stability of HF is highest.**Sol. :** It decreases down the groupOrder : $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$

55. Answer (3)

Hint : Amylose is a long unbranched chain.**Sol. :** It consists of α -D-glucose units held by C1-C4 glycosidic linkage.

56. Answer (1)

Hint : KOH leads to dehydrohalogenation through elimination.

57. Answer (2)

Hint : Bond order (B. O.) = $\frac{N_B - N_A}{2}$

Sol. :	He_2	O_2^-	NO	N_2
B. O.	0	1.5	2.5	3

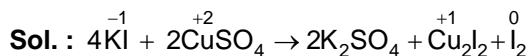
58. Answer (2)

Hint : For isoelectronic species, with increase in number of protons, size of ion decreases.**Sol. :** $\text{Mg}^{2+} < \text{Na}^+ < \text{F}^- < \text{O}^{2-}$

59. Answer (4)

Hint : Decomposition of ozone is exothermic. Hence, formation of ozone must be endothermic.

60. Answer (3)

Hint : In a redox reaction, oxidation numbers of elements change.

61. Answer (4)

Hint : Liebig's method : conversion of C and H into CO_2 and H_2O respectively.**Sol. :** Duma's method as well as Kjeldahl's method is used for nitrogen estimation.

Halogens : Carius method.

62. Answer (1)

Hint :

Group Nos.

3 4 5

Sc Ti V

Y Zr Nb

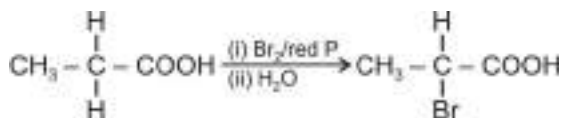
La Hf Ta

Sol. : Lanthanoid contraction leads to almost no change in atomic size of 4d and 5d elements such as Zr and Hf or Nb and Ta. These are known as 'Chemical Twins'.

63. Answer (3)

Hint : In such a reaction, hydrogen atom of α - C with respect to carboxylic acid group is substituted by Br.

Sol. :



This is Hell-Volhard-Zelinsky reaction

64. Answer (2)

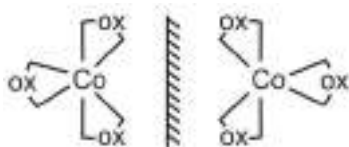
Hint : $[\text{PtCl}_2(\text{NH}_3)_2]$ shows geometrical isomerism.

Sol. : Coordination isomerism :

$[\text{Co}(\text{en})_3] [\text{Cr}(\text{ox})_3]$ and $[\text{Cr}(\text{en})_3] [\text{Co}(\text{ox})_3]$

Optical isomerism :

$[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$ or $[\text{Co}(\text{ox})_3]^{3-}$



Ionisation isomerism

$[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{Br}$ and $[\text{Cr}(\text{NH}_3)_5\text{Br}]\text{Cl}$

65. Answer (4)

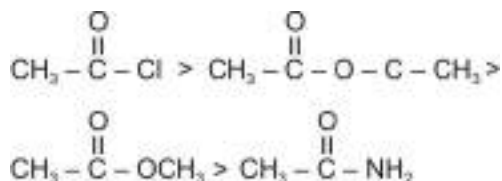
Hint : Tetracycline is an antibiotic.

66. Answer (3)

Hint : Weak bases are better leaving groups.

Sol. : k is highest when rate of reaction is highest

Relative rates :



67. Answer (4)

Hint : Argentite is Ag_2S

Sol. : It is concentrated by leaching. All other ores are concentrated by froth floatation process.

68. Answer (1)

Hint : LiCl shows highest covalent character (Fajan's rule).

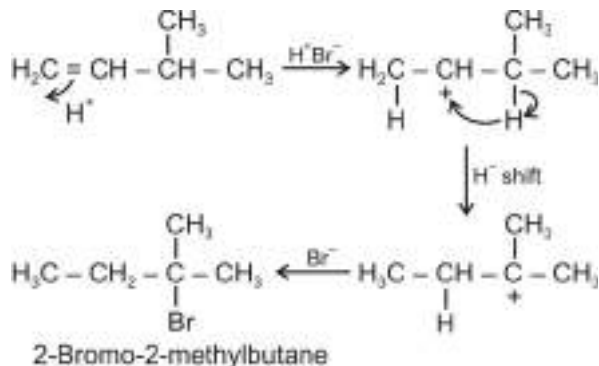
Sol. : Order of melting point

$\text{NaCl} > \text{KCl} > \text{RbCl} > \text{LiCl}$

69. Answer (1)

Hint : Hydride shift takes place in order to form more stable carbocation.

Sol. :



70. Answer (4)

Hint : Solutions are isotonic $\Rightarrow \pi_{\text{urea}} = \pi_{\text{unknown}}$

Sol. : $\Rightarrow C_{\text{urea}} = C_{\text{unknown}}$ (at same T)

$$\Rightarrow \frac{20}{60} \text{ mol} = \frac{5}{x} \text{ mol} \quad \left(\because 5\% = \frac{5 \text{ g}}{100 \text{ mL}} \right)$$

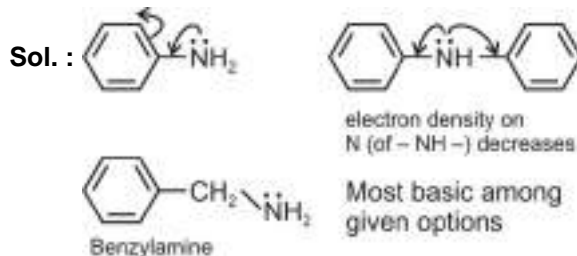
$$\Rightarrow \frac{20}{1 \text{ L}} = \frac{x}{1000 \text{ L}}$$

$$\Rightarrow \frac{2}{6} = \frac{50}{x}$$

$$\Rightarrow x = 150 \text{ g mol}^{-1}$$

71. Answer (3)

Hint : Electron withdrawing groups such as $-\text{NO}_2$ decrease electron density on N (of $-\text{NH}_2$), thereby, reducing the basic character.



72. Answer (4)

Hint : Reducing monosaccharides and disaccharides undergo mutarotation in aqueous solutions.

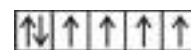
Sol. : Reducing sugars : (+) maltose, (+) lactose, (+) glucose

Hence, all of these sugars show mutarotation

73. Answer (2)

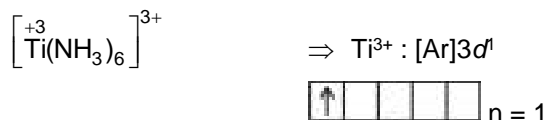
Hint : The species with no unpaired electrons are diamagnetic in nature

Sol. :

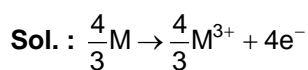


$n = 4$

Similarly, $[\text{FeF}_6]^{3-} \Rightarrow n = 5$



74. Answer (3)

Hint : $\Delta_r G = -nFE_{\text{cell}}$ Hence, $n = 4$

$$\Delta_r G = -4FE_{\text{cell}} = -4 \times F \times 2 = -8F$$

75. Answer (2)

Hint : An electron deficient molecule is the one which contains an atom with incomplete octet of electrons.**Sol. :** Electron deficient molecules : BF_3 , BH_3 , AlCl_3 Electron precise molecule : SiH_4

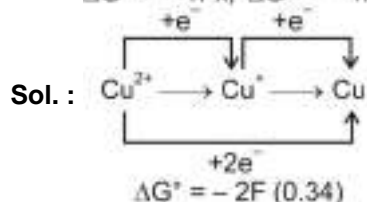
76. Answer (1)

Hint : An electron withdrawing group decreases the rate of electrophilic substitution.**Sol. :** $-\text{Cl}$ is effective electron withdrawing group, thereby, decreases the reactivity towards electrophilic substitution.

77. Answer (1)

Hint : $\text{Cu}^{2+} \rightarrow \text{Cu}^+ \rightarrow \text{Cu}$

$$\Delta G^\circ = -1F_x, \Delta G^\circ = -1F (0.52)$$



$$-1F(x) - 1F(0.52) = -2F(0.34)$$

$$\Rightarrow x = 0.68 - 0.52 = 0.16 \text{ V}$$

78. Answer (3)

Hint : 1 mol contains 6.022×10^{23} particles.**Sol. :** Let gas has molecular formula Y_n

$$0.1 \text{ mol contains : } 0.1 \text{ mol} \times 6.022 \times 10^{23} \frac{\text{atoms}}{\text{mol}} \times n$$

$$\Rightarrow 1.806 \times 10^{23} = 0.1 \times 6.022 \times 10^{23} \times n$$

$$\Rightarrow n = \frac{1.806}{0.6022} = 3$$

79. Answer (2)

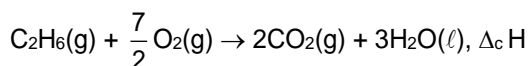
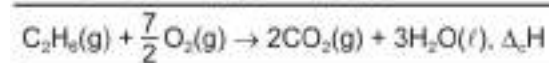
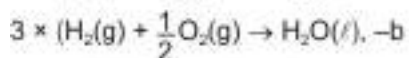
Hint : In BCC, number of effective atoms = 2 and $\sqrt{3}a = 4r$ **Sol. :**

$$\text{Packing fraction} = \frac{\text{volume occupied by atoms}}{\text{Volume of atoms}}$$

$$= \frac{2 \times \frac{4}{3} \pi r^3}{a^3}$$

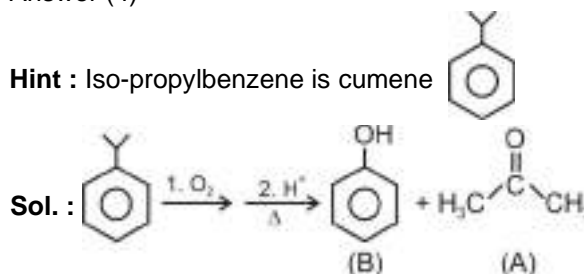
$$= \frac{\sqrt{3}\pi}{8}$$

80. Answer (3)

Hint : Ethane is C_2H_6 . Hence, standard heat of combustion of ethane is given by**Sol. :**

$$\Delta_c H = 2(-a) + 3(-b) - 1(-d) = -2a - 3b + d$$

81. Answer (4)

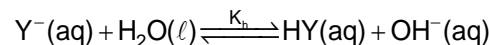
Hint : Iso-propylbenzene is cumene

A gives a positive iodoform test.

82. Answer (2)

Hint : For a conjugate acid-base pair,

$$\text{pK}_a + \text{pK}_b = \text{pK}_w = 14 \text{ at } 298 \text{ K}$$

Sol. : $\text{K}_b = \text{K}_h = 10^{-9}$ because

$$\text{pK}_a + \text{pK}_b = 14$$

$$\Rightarrow \text{pK}_a + 9 = 14$$

$$\Rightarrow \text{pK}_a = 5$$

For acidic buffer solution :

$$\text{pH} = \text{pK}_a + \log \left(\frac{[\text{Y}^-]}{[\text{HY}]} \right) = 5 + \log 1 = 5$$

83. Answer (2)

Hint : $\text{Ni}(\text{DMG})_2$ is red in colour.**Sol. :** $\text{Ti}^{4+}(\text{TiO}_2)$, $\text{Cu}^+(\text{CuCl})$, $\text{Zn}^{2+}(\text{ZnS})$ have either d^0 or d^{10} configuration.Hence, no $d-d$ transition.

84. Answer (3)

Hint : Zone refining method is used for the refining of semi-conducting metals.

85. Answer (4)

Hint : $\Delta T_f = iK_f m$ **Sol. :** $0.00372 = i \times 1.86 \times 0.0010$

$$\Rightarrow i = \frac{3.72}{1.86} = 2$$

1 mol 'Y' gives 2 mole ions

 \Rightarrow 2 mol 'Y' gives 4 mole ions

86. Answer (1)

Hint : Arrhenius equation.

$$k = Ae^{\frac{E_a}{RT}}$$

$$\text{Sol. : } \frac{k_{\text{new}}}{k_{\text{old}}} = e^{\frac{(E_{\text{new}} - E_{\text{old}})}{RT}}$$

$$\frac{R_{\text{new}}}{R_{\text{old}}} = e^{\frac{(E_{\text{old}} - E_{\text{new}})}{RT}} \quad (\because R \propto k)$$

$$\Rightarrow e^{3.33} = e^{\frac{\Delta E}{2 \times 300}}$$

$$\text{Comparing, } 3.33 = \frac{\Delta E}{2 \times 300}$$

$$\Rightarrow \Delta E = \frac{10}{3} \times 2 \times 300 = 2 \text{ kcal}$$

87. Answer (4)

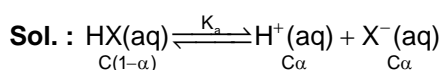
Hint : These are optical isomers.**Sol. :** These optical isomers are not mirror images hence, diastereomers.

88. Answer (2)

Hint : $[X^-] = [H^+]$ and $\text{pH} = -\log[H^+]$

$$\Rightarrow [H^+] = 10^{-5}$$

$$\Rightarrow C\alpha = 10^{-5}$$

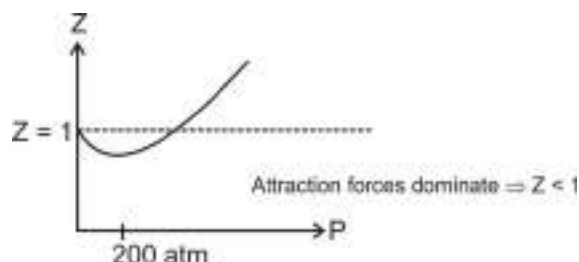


$$\text{At equilibrium } K_a = Q = \frac{[H^+][X^-]}{[HX]} = \frac{C\alpha \cdot C\alpha}{C(1-\alpha)}$$

$$\Rightarrow K_a = \frac{(10^{-5})^2}{0.005 \times 1} (\alpha \ll 1, \alpha = 2 \times 10^{-3})$$

$$\Rightarrow K_a = 2 \times 10^{-8}$$

89. Answer (2)

Hint :

90. Answer (2)

$$\text{Hint : } E_n \propto \frac{Z^2}{n^2}$$

$$\text{Sol. : } E_n = -k \frac{Z^2}{n^2}$$

$$\frac{E_2}{E_3} = \frac{\frac{1^2}{2^2}}{\frac{1^2}{3^2}} = \frac{9}{4}$$

$$\Rightarrow E_2 = -(145.7 \text{ kJ/mol}) \times \frac{9}{4}$$

$$\Rightarrow E_2 = -327.8 \text{ kJ mol}^{-1}$$

[BIOLOGY]

91. Answer (3)

Sol. : COP 24 took place in Katowice, Poland in year 2018.

COP 18 : Doha, Qatar

COP 20 : Lima, Peru

COP 23 : Bonn, Germany

92. Answer (1)

Hint : Green house gases are CO_2 , CH_4 , N_2O , and CFCs.

$$\text{Sol. : } \begin{array}{l} \text{CO}_2 - 60\% \\ \text{CH}_4 - 20\% \\ \text{CFCs} - 14\% \\ \text{N}_2\text{O} - 6\% \end{array} \quad \text{Major green house gases}$$

93. Answer (2)

Hint : Nile perch is a large predator fish which was introduced into Lake Victoria of East Africa.**Sol. :** Biodiversity plays a major role in many ecosystem services that nature provides such as pollination and oxygen.

94. Answer (3)

Hint : In grassland ecosystem the pyramid of biomass is upright.**Sol. :** The biomass of grassland is maximum followed by herbivores and secondary consumers.

95. Answer (3)

Hint : *Penicillium* secreting penicillin inhibits the growth of other bacteria.**Sol. :** It shows amensalism i.e. $(-, 0)$ interaction.

96. Answer (3)

Sol. : Biofertilizers are living organisms that enrich the nutrient quality of soil.

97. Answer (2)

Sol. : Spinach is vitamin A enriched crop, bathua, tomato and mustard are vitamin C enriched crops developed by IARI.

98. Answer (3)

Hint : Primase synthesizes primer strand.

Sol. : Primase is RNA polymerase. It synthesizes short RNA strand called primer.

Primers are required on both the strands and they are removed from DNA enzymatically.

99. Answer (2)

Hint : 5-methyl uracil is a thymine.

Sol. : Thymine is a pyrimidine base found in DNA not in RNA. It is 6 membered single ring structure.

100. Answer (3)

Hint : In incomplete dominance, dominant trait is not completely expressed in F_1 generation.

Sol. : Genotypic and phenotypic ratios are same in incomplete dominance i.e. 1 : 2 : 1

101. Answer (2)

Hint : This pedigree shows inheritance of X linked recessive disorder.

Sol. : Female I(R) is heterozygous for the disorder.

Genotype of II(P) can be XX or XX^c whereas genotype of II(Q) will be X^cX .

102. Answer (4)

Hint : Emasculation is removal of anther from the female plant.

Sol. : It prevents self pollination in female plant.

103. Answer (2)

Hint : Cucurbits have unisexual flowers.

Sol. : Autogamy is shown by bisexual flowers cucurbits can show geitonogamy as well as xenogamy.

104. Answer (4)

Hint : Double fertilization involves syngamy and triple fusion

Sol. : Egg cell + one male gamete = Syngamy
Secondary nucleus + another male gamete = PEN

105. Answer (4)

Hint : Nucellar cells can directly form the embryo.

Sol. : Zygotic embryo can be formed by mitotic division in zygote only. Zygote is formed by fusion of male and female gametes.

106. Answer (3)

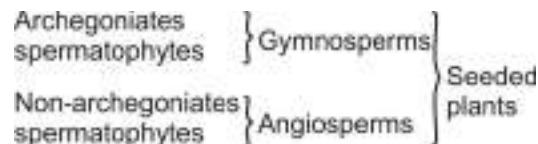
Hint : China rose has male and female sex organs in the same flower.

Sol. : China rose has bisexual flowers.

107. Answer (2)

Hint : In all seed plants pollen grains are the carrier of male gametes.

Sol. :



108. Answer (2)

Hint : During stress condition the concentration of ABA increases.

Sol. : Its synthesis is stimulated by various types of stress. It promotes dormancy of seeds.

109. Answer (4)

Hint : In epigeal germination, the hypocotyl grows first.

Sol. : Onion shows epigeal germination, maize, mango and gram show hypogeal germination.

110. Answer (3)

Hint : Auxin shows apical dominance by which it inhibits growth of lateral buds.

Sol. : Auxin inhibits abscission of young leaves, fruits and flowers. Ethylene is the only gaseous hormone. Auxin promotes root growth in tissue culture and was first isolated from human urine.

111. Answer (4)

Sol. : Glycolysis is common to both anaerobic and aerobic respiration. It takes place in cytoplasm which leads to partial oxidation of glucose to pyruvic acid.

112. Answer (1)

Hint : Lactic acid fermentation does not release any CO_2

Sol. : As long as NAD^+ is provided, glycolysis can operate.

113. Answer (2)

Hint : To fix a CO_2 molecule, a C_4 plant requires 2 more ATP than a C_3 plant.

Sol. : To form a hexose sugar (6C)

C_3 plant = $6 \times 3 = 18$ ATP

C_4 plant = $6 \times 5 = 30$ ATP

Difference = 12 ATP

114. Answer (3)

Hint : RuBisCO when shows its oxygenase activity then shows photorespiration.

Sol. : C_4 plants lack photorespiration and hence show greater productivity than C_3 plants.

115. Answer (2)

Hint : Phosphoenolpyruvate (PEP) is primary CO_2 acceptor in C_4 plants.

Sol. : PEP is a three carbon molecule and present in mesophyll cells. RUBP, primary CO_2 acceptor is a five carbon molecule and found in mesophyll cells of C_3 plants.

116. Answer (3)

Sol. : Boron is involved in functioning of cell membrane and pollen germination.

117. Answer (2)

Hint : *Thiobacillus* is a group of bacteria which are chemoautotroph.

Sol. : *Thiobacillus* can reduce soil nitrates to gaseous nitrogen.

118. Answer (3)

Hint : Gridling experiment identifies the tissues through which food is translocated.

Sol. : This experiment demonstrates, that phloem translocation is unidirectional. When phloem is removed then initially the upward movement of water was not affected.

119. Answer (2)

Hint : Water moves from high to low ψ_w .

Sol. : Cell A Cell B
 $\psi_w = -4$ $\psi_w = -7$

Cell A has higher ψ_w than cell B. Hence water will move from cell A to cell B. Osmotic potential is solute potential which is always negative.

120. Answer (4)

Hint : In algae life cycle pattern can be diplontic, haplontic or haplo-diplontic.

Sol. : Majority of the green algae are haploid. *Fucus* is diploid and show diplontic life cycle.

121. Answer (4)

Hint : *Polysiphonia* is a red alga.

Sol. : Red algae lack motile stages and motile gametes.

122. Answer (2)

Hint : At the time of insufficient water supply, bulliform cells lose the water and become flaccid.

Sol. : To prevent water loss, the bulliform cells make the leaves curl inwards so that leaf surface is not exposed.

123. Answer (2)

Hint : Vascular cambium is developed at the time of secondary growth in dicot roots

Sol. : In dicot roots, vascular cambium is completely secondary in origin. Whereas in dicot stem it is partly primary and partly secondary in origin.

124. Answer (2)

Sol. : Pea leaves modify to form tendrils.

In cucumber, axillary buds modify to form tendrils. Tendrils are sensitive structures, coil around the nearby support and help the plant in climbing.

125. Answer (3)

Sol. : Adventitious roots of sweet potato get swollen and store food.

126. Answer (2)

Hint : Prions are infectious protein particles.

Sol. : Prions lack genetic material. They cause many diseases such as Kuru disease, scrapie disease in sheep etc.

127. Answer (2)

Sol. : Members of basidiomycetes reproduce sexually by somatogamy as they lack sex organs.

128. Answer (4)

Hint : Bacterial photosynthesis is anoxygenic.

Sol. : No oxygen is evolved as they do not involve splitting of water. H_2O is not the source of electron, instead it is H_2S

129. Answer (3)

Hint : Cyanobacteria are photosynthetic and can fix atmospheric N_2 also.

Sol. : Cyanobacteria can fix CO_2 thus can synthesize their food.

130. Answer (2)

Hint : Defining feature should be present in all living organisms without exception.

Sol. : Some organisms do not reproduce hence it cannot be considered as defining feature.

131. Answer (3)

Hint : Meiosis II is equational division.

Sol. : Before mitosis DNA replication takes place but not before meiosis II. Separation of chromatids takes place in both mitosis as well as meiosis.

132. Answer (3)

Hint : A bivalent has two homologous chromosomes.

Sol. : If, $2n = 24$

Total pair of homologous chromosomes will be 12.

Hence, number of bivalents = 12.

133. Answer (3)

Hint : β -oxidation of fats takes place in mitochondria.

Sol. : Synthesis of lipids takes place in smooth ER.

134. Answer (1)

Hint : In plants, the cell division is anastral.

Sol. : Higher plants lack centrioles. Centrioles are present in animal cells and in lower plant cells.

135. Answer (3)

Hint : Both mitochondria and chloroplast have their own DNA and ribosomes.

Sol. : Both cell organelles are semiautonomous and contain 70S ribosomes. Mitochondrial inner membrane forms cristae.

136. Answer (3)

Hint : Oophorectomy is surgical removal of ovaries.

Sol. : Tubectomy only involves ligation or cauterization of the fallopian tubes to prevent fertilization. Hysterectomy is surgical removal of the uterus. Vasectomy is a surgical procedure for male sterilization.

137. Answer (1)

Hint : Zygote upto 8 blastomeres is transferred in a woman's fallopian tube.

Sol. : If an embryo has more than 8 blastomeres it is transferred to the uterus by a process known as intra-uterine transfer (IUT). This is done as the embryo is close to implantation.

138. Answer (2)

Hint : The fluid from this accessory gland constitutes the main part of the ejaculate.

Sol. : Presence of fructose in the vagina indicates that sexual intercourse has occurred as it is not produced anywhere else in the body. Bulbourethral or Cowpers' gland secrete viscous mucus which acts as a lubricant. Bartholin's glands are paired female accessory glands.

139. Answer (1)

Hint : Identify "love hormone" or 'milk let down' hormone.

Sol. : Oxytocin is a hormone released by posterior lobe of pituitary gland. It is an important hormone and also plays a role in lactation. Oxytocin release is also known to play a role in social bonding.

140. Answer (2)

Hint : Structure related to sphincter of Oddi.

Sol. : Brunner's glands are mucus secreting glands found in the submucosa of the small intestine. Mucus secreting glands are required to protect the intestinal epithelium.

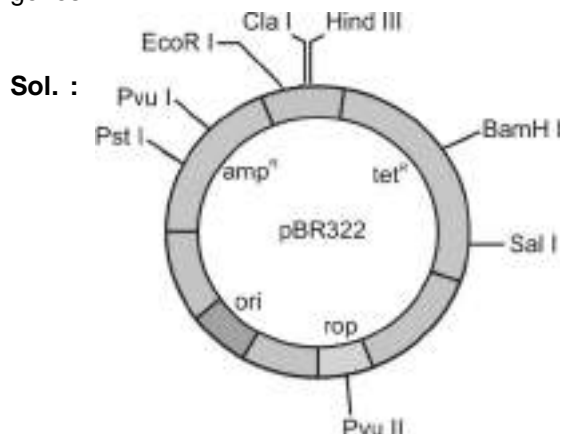
141. Answer (3)

Hint : Adenine and guanine are purines.

Sol. : Acetabulum and femoral head form the hip joint of pelvic girdle. Rhodopsin is a pigment found in the eye. Malleus, incus and stapes are the ear ossicles.

142. Answer (2)

Hint : pBR322 has two antibiotic resistance genes.



143. Answer (2)

Hint : Glucose-6-phosphate dehydrogenase is an enzyme in pentose phosphate pathway.

Sol. : Glucose 6 phosphate dehydrogenase deficiency i.e. G-6PD deficiency is associated with haemolysis of RBCs.

It is particularly aggravated when body is exposed to stressors like infections or powerful medications.

144. Answer (3)

Hint : Increased CO_2 decreases the affinity of haemoglobin for O_2 .

Sol. : If the CO_2 concentration in blood increases, the breathing becomes faster and deeper.

145. Answer (4)

Hint : Pepsinogen $\xrightarrow{\text{HCl}}$ Pepsin

Sol. : Function of parietal cells is to secrete HCl and Castle's Intrinsic Factor. HCl helps convert pepsinogen to pepsin. The medication used blocks the formation of HCl by blocking the proton pumps.

146. Answer (2)

Hint : It is a 3-C dicarboxylic acid.

Sol. : Malonate competes with succinate for active sites of succinate dehydrogenase. The inhibitor closely resembles the substrate in its molecular structure and inhibits activity of the enzyme.

147. Answer (1)

Hint : Blood is a specialized connective tissue.

Sol. : White fibrous tissue primarily forms tendons and ligaments. The arrangement of fibres show a compact and regular pattern. Dermis of skin is the example of dense irregular connective tissue.

148. Answer (3)

Hint : GM brinjal is Bt brinjal.

Sol. : Genetically modified brinjal is Bt brinjal with *cry* gene for the production of Bt toxins. It has been developed for insect resistance. *cryIAb* gene encodes for protein that provide resistance against corn borer.

149. Answer (2)

Hint : This enzyme is considered as molecular glue.

Sol. : Restriction endonucleases act as molecular scissors but DNA ligases help in linking foreign DNA to plasmids. DNA polymerases catalyse polymerization of a DNA strand.

150. Answer (4)

Hint : Sexually transmitted infection is spread through semen.

Sol. : Chikungunya virus is not transmitted through semen and is spread through the bite of an infected mosquito. Ebola virus spreads through close direct physical contact and exchange of bodily fluids like blood, semen, vomit etc.

151. Answer (4)

Hint : It is a horseshoe shaped bone.

Sol. : Hyoid is present between the lower jaw and larynx. Some muscles of the tongue and neck extend attachment to it. However, no bone articulates with hyoid.

152. Answer (3)

Hint : In pentamerous symmetry, star like appearance is observed.

Sol. : In phylum Echinodermata, the organisms exhibit bilateral symmetry during larval stage and pentamerous radial symmetry during adult stage. Molluscs, pisces and tunicates are usually bilaterally symmetrical.

153. Answer (4)

Hint : It is a derivative of glucose.

Sol. : Exoskeleton of arthropods is composed of protein and flexible chitin. Chitin is a homopolymer of N-acetyl glucosamine which is a derivative of glucose.

154. Answer (2)

Hint : Vasa efferentia are ducts which carry the sperms from rete testis to vas deferens.

Sol. : If vasa efferentia is blocked or ligated the gametes from testes will not enter epididymis and their path of transport is obstructed.

Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → urethra

155. Answer (4)

Hint : Identify a marine animal.

Sol. : In the fishery industry, marine edible fish include *Hilsa*, Sardines and pomfrets. Fresh water fish include *Catla*, *Rohu* and common carp.

156. Answer (2)

Hint : Amygdala is a part of this structure.

Sol. : Medulla oblongata contains respiratory centre, centre for cardiovascular reflexes and gastric secretions. Limbic system is sometimes called the emotional brain because it plays a primary role in a range of emotion (excitement, pleasure, rage and fear). Corpus callosum connects cerebral hemispheres. Cerebellum is a part of hindbrain.

157. Answer (3)

Hint : Identify the first hormone to be discovered.

Sol. : Cholecystokinin stimulates secretion of pancreatic juice rich in digestive enzymes. Gastrin promotes secretion of gastric juice. Insulin is a hypoglycemic hormone.

158. Answer (3)

Hint : Holoenzyme = Apoenzyme + cofactor.

Sol. : Coenzyme is a non-protein organic molecule often derived from vitamins, is bound loosely to an enzyme and essential for its activity. Isoenzymes are enzymes that differ in structure but have identical function. Apoenzyme is the protein portion of holoenzyme.

159. Answer (2)

Hint : This structure represents the sequence of amino acids in a protein.

Sol. : Primary structure of a protein is formed by peptide bonds between respective amino acids, therefore the bonding remains intact.

160. Answer (3)

Hint : It is commonly called table-sugar.

Sol. : Sucrose is a non-reducing sugar made up of glucose and fructose. Disaccharides are reducing sugars except sucrose.

161. Answer (2)

Hint : Cockroach is uricotelic.

Sol. : Nitrogenous waste formed in the tissues enter the hemolymph in form of soluble potassium urate after which they enter the lumen of the distal end of the malpighian tubule.

162. Answer (4)

Hint : Gap junctions may be found in neural tissue.

Sol. : The cell junctions are specialized junctions present in the epithelial tissue.

163. Answer (4)

Hint : Long bone of the upper arm.

Sol. : Glenoid cavity articulates head of humerus with scapula or shoulder blade.

164. Answer (3)

Hint : Identify the mesodermal structure.

Sol. : Hair, nails, enamel of teeth, sweat glands and salivary glands are all ectodermal in origin and are therefore likely to be affected by a disorder originating from the ectodermal germ layer. Heart is mesodermal in origin.

165. Answer (3)

Hint : Cusps of tricuspid and bicuspid valves are connected to tendon-like cords.

Sol. : The chordae tendineae are tendon like cords which in turn are connected to cone-shaped trabeculae carneae called papillary muscles.

166. Answer (3)

Hint : Neurotransmitter of NMJ is usually acetylcholine.

Sol. : Anticholinesterases are drugs which reduce breakdown of acetylcholine and can be used to delay exhaustion of the neurotransmitters at the synaptic cleft. This helps in delaying synaptic fatigue.

167. Answer (3)

Hint : Sedatives and hypnotics reduce activity of brain.

Sol. : Psychotropic depressants act as sedatives by reducing the activity of brain and producing a feeling of calmness, relaxation or drowsiness. Sleeping pills such as valium or calmpose and antianxiety medication such as diazepam fall in the category of benzodiazepines.

168. Answer (2)

Hint : Shahtoosh and pashmina are varieties of fine wool.

Sol. : The underfur of Kashmiri goats is 'Pashmina' which yields a fine and soft wool which is used for making Kashmiri shawls. Shahtoosh is a fine wool made from hair of tibetan antelope called chiru.

169. Answer (3)

Hint : Succus entericus is called intestinal juice.

Sol. : Intestinal juice or succus entericus is formed by the secretions of goblet as well as brush border cells. Intestinal lipase, disaccharidases and nucleosidases are present in intestinal juice. Pancreatic juice contains nucleases.

170. Answer (1)

Hint : This duct is formed by union of common bile duct and pancreatic duct.

Sol. : The passage of pancreatic juice and bile through the hepatopancreatic duct into small intestine is regulated by a ring of smooth muscle known as the Sphincter of Oddi.

171. Answer (4)

Hint : It causes 'Lock jaw'

Sol. : A single muscle twitch refers to typical contractile response of a skeletal muscle fibre to the single stimulus. Tetanus is a bacterial infection caused by *Clostridium tetani* which affects the nervous system, leading to painful sustained contractions particularly of jaw and neck muscles. Tetany is a medical sign which results from low blood calcium level. Tonus or muscle tone is the continuous and passive partial contraction of the muscle.

172. Answer (3)

Hint : AIDS and genital warts are viral diseases.

Sol. :

STI	CAUSATIVE AGENT
Gonorrhoea	<i>Neisseria gonorrhoeae</i>
Syphilis	<i>Treponema pallidum</i>
Genital warts	Human papilloma virus
AIDS	Human immunodeficiency virus

173. Answer (3)

Hint : Agarose gel allows smaller fragments of DNA to travel more quickly.

Sol. : Gel electrophoresis is a technique used to separate molecules based on both size and charge but separates DNA fragments on the basis of size and conformation.

174. Answer (1)

Hint : Its single alphabet code is M.

Sol. : Glutamic acid is a non-essential acidic amino acid and acts as excitatory neuro transmitter in brain and spinal cord. Cysteine is a sulfur containing amino acid that forms disulphide bonds. Serine is an alcoholic amino acid.

175. Answer (1)

Hint : Identify a viral disease.

Sol. : ELISA is a preliminary test used for diagnosing HIV. Widal test is a serological test used for diagnosing typhoid fever. Western blot separates and detects specific HIV antibodies. Conventional microscopic examination of blood smear is the gold standard for malaria diagnosis. Fasting plasma glucose (FPG) or oral glucose tolerance test (OGTT) confirm the diagnosis of diabetes mellitus.

176. Answer (4)

Hint : Tears and saliva contain the enzyme lysozyme.

Sol. : Lysozyme cleaves the covalent linkage between sugars in peptidoglycans which helps kill gram-positive bacteria. It is considered as a physiological barrier under innate immunity. Physical barriers include skin and mucus coating of epithelium lining the respiratory, gastrointestinal, urinogenital tract. Cytokine barrier includes interferons.

177. Answer (3)

Hint : Analogous structures exhibit convergent evolution.

Sol. : According to Osborn, 'law of adaptive radiation' states that if a given region is large and varies in its soil, vegetation and climatic conditions, it may give rise to diverse organisms.

178. Answer (2)

Hint : Lymph nodes are spread throughout the body.

Sol. : Peyer's patches are clusters of lymphatic tissue found along the ileum and involved in production of lymphocytes. They monitor intestinal bacteria populations. Tonsils are located at the rear of throat (pharynx). Spleen is a large bean shaped organ that acts as filter of the blood.

179. Answer (2)

Hint : It is sold under brand name 'Saheli'.

Sol. : Centchroman (Saheli, SERM) is a nonsteroidal drug, taken orally once a week. It is a potent contraceptive which prevents implantation but does not inhibit ovulation in majority of cases. It was developed by CDRI, Lucknow. Gossypol is a non-hormonal male contraceptive. LNG-20 is a hormonal IUCD. Mala-D is an oral contraceptive that inhibits ovulation.

180. Answer (3)

Hint : Chondrichthyes are cold blooded (poikilothermous) fish

Sol. : *Trygon* or sting ray possesses a poison sting and *Torpedo* has an electric organ. *Hippocampus* is a bony fish with prehensile tail while *Scoliodon* (Dog fish) is a cartilaginous fish with placoid scales.

