

All India Aakash Test Series for NEET-2020

TEST - 6 (Code-E)

Test Date : 16/02/2020

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint & Sol. : Force acting on charged particle in magnetic field $\vec{F} = q(\vec{v} \times \vec{B})$

acceleration $\vec{a} = \frac{\vec{F}}{m} = \frac{q(\vec{v} \times \vec{B})}{m}$.

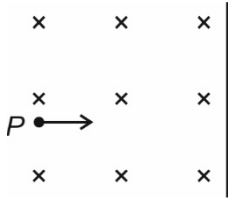
2. Answer (3)

Hint & Sol. : Work done by magnetic field on a charged particle is zero hence there is no change in K.E.

3. Answer (1)

Hint : $R \leq L$ (R : Radius = $\frac{mv}{qB}$)

Sol. : Particle moves in circular path with radius R .



To just miss the screen,

$R = L$

$\Rightarrow \frac{mv_0}{qB} = L$

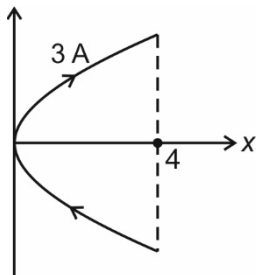
$\Rightarrow B = \frac{v_0}{L(q/m)} = \frac{v_0}{L\alpha}$

So, to not hit the screen

$B \leq \frac{v_0}{L\alpha}$

4. Answer (4)

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



At $x = 4$

$y^2 = 4x = 4^2$

$y = \pm 4$

$\Rightarrow \vec{L}_{\text{eff}} = 8\hat{j}$

Force on current carrying conductor

$\vec{F} = I\vec{L}_{\text{eff}} \times \vec{B}$

$= 3 \times 8\hat{j} \times 4(-\hat{k})$

$\vec{F} = 96(-\hat{i}) \text{ N}$

5. Answer (4)

Hint : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2$

Sol. : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2$
 $= \frac{\mu_0}{4\pi} \frac{I2\theta}{R} (-\hat{k}) + \frac{\mu_0}{4\pi} \frac{2l \cdot \theta}{R} \hat{k}$
 $= \text{Zero}$

6. Answer (4)

Hint : $B_{\text{centre}} = \frac{\mu_0 nI}{2R}$

Sol. : $\ell = 2\pi R \cdot n \Rightarrow R = \frac{\ell}{2\pi n}$

So $B = \frac{\mu_0 nI \cdot 2\pi n}{2 \cdot \ell} = \frac{\mu_0 \pi I n^2}{\ell}$

B is minimum if $n = 1$

7. Answer (4)

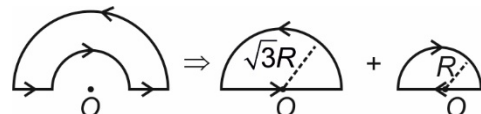
Hint & Sol. : If $\vec{E} \neq 0$ and $\vec{B} \neq 0$ then it is possible if $\vec{E} = -(\vec{v} \times \vec{B})$

If $\vec{E} = 0$, $\vec{B} \neq 0$ then it is possible if $\vec{v} \parallel \vec{B}$

8. Answer (1)

Hint : $\vec{M} = I\vec{A}$ and superposition.

Sol. : Given loop can be considered as the superposition of the two loops



$$M_{\text{net}} = \frac{\pi(\sqrt{3}R)^2}{2} I - \frac{\pi R^2 I}{2}$$

$$= \frac{\pi}{2} IR^2 (3-1) = \pi R^2 I$$

Hence $M_{\text{net}} = \pi R^2 I$

9. Answer (3)

Hint : Net magnetic field is due to both current loop and straight conductor.

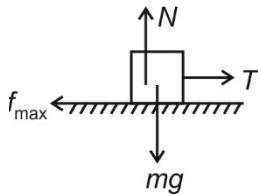
Sol. : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2$

$$0 = \frac{\mu_0}{4\pi} \frac{2I_2}{L} - \frac{\mu_0}{4\pi} \frac{2\pi I_1}{R}$$

$$\Rightarrow L = \frac{I_2 R}{\pi I_1}$$

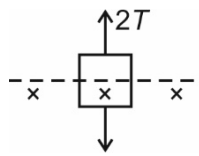
10. Answer (2)

Hint & Sol. :



$$T = f_{\text{max}}$$

$$= \mu mg \quad \dots(i)$$



$$f_m = ILB$$

$$2T = ILB \quad \dots(ii)$$

From (i) and (ii)

$$2\mu mg = ILB$$

$$m \geq \frac{ILB}{2\mu g}$$

11. Answer (1)

Hint : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2 + \vec{B}_3 + \vec{B}_4 + \dots\infty$

Sol. : $\vec{B} = \frac{\mu_0 I}{2R} + \frac{\mu_0 I}{2(2R)} + \frac{\mu_0 I}{2(4R)} + \dots\infty$

$$= \frac{\mu_0 I}{2R} \left[1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots\infty \right]$$

$$= \frac{\mu_0 I}{2R} \left[\frac{1}{1-1/2} \right] = \frac{\mu_0 I}{2R} \cdot 2$$

{Sum of infinite G.P}

$$= \frac{\mu_0 I}{R}$$

12. Answer (1)

Hint : $B_{\text{axis}} = \frac{\mu_0 i r^2}{2(r^2 + x^2)^{3/2}}$, $B_{\text{centre}} = \frac{\mu_0 i}{2r}$

Sol. : $B_{\text{centre}} = 5\sqrt{5} B_{\text{axis}}$

$$\Rightarrow \frac{\mu_0 i}{2r} = 5\sqrt{5} \frac{\mu_0 i r^2}{2(r^2 + x^2)^{3/2}}$$

$$\Rightarrow \frac{1}{r} = \frac{5\sqrt{5} r^2}{(r^2 + x^2)^{3/2}}$$

$$\Rightarrow (r^2 + x^2)^{3/2} = (\sqrt{5} r)^3$$

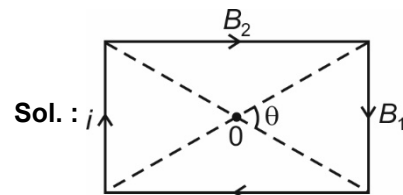
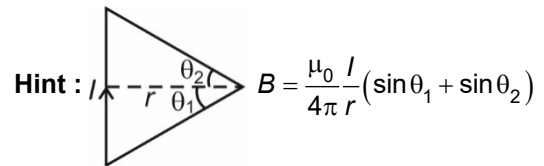
$$\Rightarrow (r^2 + x^2)^{1/2} = \sqrt{5} r$$

$$\Rightarrow r^2 + x^2 = 5r^2$$

$$\Rightarrow x = 2r$$

$$= 30 \text{ cm}$$

13. Answer (3)



$$\begin{aligned} \vec{B}_0 &= 2(\vec{B}_1 + \vec{B}_2) \\ &= 2 \left[\frac{\mu_0}{4\pi} \frac{2I \sin\left(\frac{\theta}{2}\right)}{\frac{d}{2} \cos\left(\frac{\theta}{2}\right)} + \frac{\mu_0 2I \cos\left(\frac{\theta}{2}\right)}{4\pi \frac{d}{2} \sin\left(\frac{\theta}{2}\right)} \right] \\ &= \frac{\mu_0 4I}{4\pi \frac{d}{2}} \left[\tan\left(\frac{\theta}{2}\right) + \cot\left(\frac{\theta}{2}\right) \right] \\ &= \frac{4\mu_0 I}{\pi d \sin\theta} \end{aligned}$$

14. Answer (2)

Hint : $T = 2\pi \sqrt{\frac{I}{MB}}$

Sol. : $T_1 = 2\pi \sqrt{\frac{I_1 + I_2}{(4M + 5M)B}}$

$T_2 = 2\pi \sqrt{\frac{I_1 + I_2}{(5M - 4M)B}}$

$\frac{T_1}{T_2} = \sqrt{\frac{M}{9M}} = \frac{1}{3}$

$\Rightarrow T_2 = 3T_1$

$\Rightarrow T_2 = 3 \times 1 = 3 \text{ second}$

15. Answer (1)

Hint & Sol. : Magnetic field line outside the bar magnet are from north to south pole while inside the bar magnet they are from south to north pole.

16. Answer (2)

Hint & Sol. : $W = MB(1 - \cos\theta)$

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

$W = \frac{MB}{2} \dots (i)$

$\tau = MB \sin\theta = MB \sin 30^\circ$

$= \frac{MB}{2}$

Hence $|\tau| = |W|$

17. Answer (1)

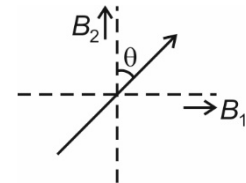
Hint : $I = \frac{M}{V} = \frac{\ell m}{\ell bh}$

Sol. : $I = \frac{\ell m}{\ell bh} = \frac{m}{bh}$
 $= \frac{200 \times 10^{-3}}{50 \times 10^{-4}}$
 $= 40 \text{ A/m}$

18. Answer (1)

Hint : Use tangent law.

Sol. : Magnetic needle will stay in the influence of magnetic field produced by both magnets.



In equilibrium $\tau_1 = \tau_2$

$MB_1 \sin(90 - \theta) = MB_2 \sin\theta$

$B_1 = B_2 \tan\theta$

$\Rightarrow \frac{\mu_0 2M}{4\pi d_1^3} = \frac{\mu_0 M}{4\pi d_2^3} \tan\theta$

$\Rightarrow \frac{d_1^3}{d_2^3} = \frac{2}{\tan\theta} = 2 \cot\theta$

$\Rightarrow \left(\frac{d_1}{d_2}\right)^3 = 2 \cot\theta$

$\Rightarrow \frac{d_1}{d_2} = (2 \cot\theta)^{1/3}$

19. Answer (4)

Hint : $T = 2\pi \sqrt{\frac{I}{MB}}$

Sol. : $T \propto \frac{1}{\sqrt{B}} \Rightarrow f \propto \sqrt{B}$

$\Rightarrow \frac{f_1^2}{f_2^2} = \frac{B_{net1} \cos\theta_1}{B_{net2} \cos\theta_2}$

$\Rightarrow \frac{20^2}{f_2^2} = \frac{0.8 \times \cos 60^\circ}{0.6 \times \cos 30^\circ} = \frac{4}{3} \frac{1}{\sqrt{3}}$

$\Rightarrow f_2 = 10\sqrt{3\sqrt{3}}$

20. Answer (4)

Hint : $I_{ind} = \frac{\epsilon_{ind}}{R} = \frac{1}{R} \left| \frac{d\phi}{dt} \right|$

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

$$\frac{d\phi}{dt} = \frac{dB}{dt} \cdot A = K \cdot \frac{1}{2} \cdot \frac{l\sqrt{3}l}{2}$$

$$= \frac{K\sqrt{3}l^2}{4}$$

$$I_{\text{ind}} = \frac{1}{3\rho l} \cdot \frac{K\sqrt{3}l^2}{4} = \frac{Kl}{4\sqrt{3}\rho}$$

21. Answer (2)

Hint : $E = \frac{1}{2} B\omega(L_f^2 - L_i^2)$

Sol. : $\epsilon_{AB} = \frac{1}{2} B\omega(2L)^2 = 400 \text{ V} \Rightarrow B\omega L^2 = 200 \text{ V}$

$$\epsilon_{AC} = \frac{1}{2} B\omega L^2 = 100 \text{ V}$$

$$\epsilon_{CB} = \epsilon_{AB} - \epsilon_{AC} = 400 - 100 = 300 \text{ V}$$

22. Answer (4)

Hint & Sol. : $\epsilon = |(\vec{v} \times \vec{B}) \cdot \vec{l}|$. Since, \vec{l} , \vec{B} and \vec{v} are coplanar hence no induced emf.

23. Answer (3)

Hint & Sol. : Induced electric field at point P

$$E = \frac{R}{2} \frac{dB}{dt} \text{ towards right}$$

Acceleration of Helium proton

$$\Rightarrow a = \frac{qE}{m}$$

$$= \frac{eE}{m} = \frac{eR}{m} \frac{dB}{dt}$$

$$= \frac{e\alpha R}{2m} \text{ towards right}$$

24. Answer (1)

Hint : $|\text{emf}| = L \frac{dl}{dt}$

Sol. : $l = 2t^2 e^{-t}$

$$\frac{dl}{dt} = 2 \cdot 2t e^{-t} + 2t^2 \cdot e^{-t} \cdot (-1)$$

$$= 2te^{-t}(2-t)$$

$$|\text{emf}| = L \frac{dl}{dt} = 6 \times 10^{-3} t e^{-t} (2-t)$$

$$|\text{emf}| = 0 \text{ if,}$$

$$\Rightarrow t = 0 \text{ or } 2 \text{ sec}$$

25. Answer (2)

Hint : $\epsilon = -\frac{d\phi}{dt}$ and Heat $H = \int \frac{E^2}{R} dt$.

Sol. : Induced emf in the loop

$$\epsilon = -\frac{d\phi}{dt} = -\frac{d}{dt} [kt(\tau-t)]$$

$$= 2kt - k\tau$$

Amount of heat generated in small time dt

$$dQ = \frac{\epsilon^2}{R} dt = \frac{(2kt - k\tau)^2}{R} \cdot dt$$

Total heat generated is

$$Q = \int_0^\tau (4k^2t^2 + k^2\tau^2 - 4k^2\tau t) dt$$

On solving

$$Q = \frac{k^2\tau^3}{3R}$$

26. Answer (1)

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

Sol. : Energy stored in inductor

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

$$\Rightarrow 25 \times 10^{-6} = \frac{1}{2} L (10 \times 10^{-3})^2$$

$$\Rightarrow 50 \times 10^{-6} = L \cdot 100 \times 10^{-6}$$

$$\Rightarrow L = 0.5 \text{ H}$$

27. Answer (2)

Hint : Time constant of L-R circuit is $\frac{L}{R}$.

Sol. : $\tau = \frac{L}{R}$

$$\tau' = \frac{L'}{R'} = \frac{6L}{3R} = 2\tau$$

$\Rightarrow \tau'$ = double of initial value.

28. Answer (2)

Hint : $|\epsilon| = M \frac{dl}{dt}$

Sol. : $|\epsilon| = M \cdot \frac{dl}{dt} [4t^2 - 3t + 7]$

$$= 50 \times 10^{-3} [8t - 3]$$

$$\begin{aligned} \text{emf at } t = 2\text{s} \\ &= 650 \times 10^{-3} \text{ V} \\ &= 650 \text{ mV} \end{aligned}$$

29. Answer (3)

Hint & Sol. :

$$\left. \begin{aligned} I &= I_0 \sin \omega t \\ I &= 50 \sin 100\pi t \end{aligned} \right\} \text{On comparing}$$

$$\omega = 100\pi$$

$$\frac{2\pi}{T} = 100\pi$$

$$\Rightarrow T = \frac{1}{50} \text{ second}$$



Time taken to rise from zero to peak value

$$\Delta t = \frac{T}{4} = \frac{1}{200} \text{ second}$$

30. Answer (1)

Hint : $X_L = \omega L = 2\pi fL$.

$$\begin{aligned} \text{Sol. : } X_L &= 2 \times \pi \times 50 \times 50 \times 10^{-3} \\ &= 5000\pi \times 10^{-3} \\ &= 5\pi \Omega \end{aligned}$$

31. Answer (2)

Hint : Bulb having more current will glow brighter.

$$\text{Sol. : } X_C = \frac{1}{2\pi fC} = \frac{10^6}{2\pi \times 50 \times 500} = \frac{20}{\pi} \Omega$$

$$X_L = 2\pi fL = 2\pi \times 50 \times 10 \times 10^{-3} = \pi \Omega$$

Since $X_L < X_C$ i.e. inductive branch has less impedance so it has more current. Hence bulb B_2 will more brighter.

32. Answer (4)

$$\text{Hint : } Z = |X_L - X_C| \text{ and } I = \frac{V}{Z}.$$



$$\begin{aligned} I &= \frac{V}{|X_L - X_C|} \\ &= \frac{300}{|350 - 200|} \\ &= 2 \text{ A} \end{aligned}$$

33. Answer (1)

$$\text{Hint : } V_{\text{rms}} = \sqrt{\langle V^2 \rangle}.$$

Sol. : Equation of V from $t = 0$ to $t = \frac{T}{4}$

$$V = \frac{4V_0}{T} t$$

$$V_{\text{rms}} = \sqrt{\langle V^2 \rangle} = \frac{4V_0}{T} \sqrt{\langle t^2 \rangle}$$

$$= \frac{4V_0}{T} \left[\frac{\int_0^{T/4} t^2 \cdot dt}{\int_0^{T/4} dt} \right]^{1/2} = \frac{4V_0}{T} \cdot \frac{T}{4\sqrt{3}}$$

$$= \frac{V_0}{\sqrt{3}} = 3 \text{ Volt}$$

34. Answer (2)

Hint : For ideal transformer $P_P = P_S$ and $\frac{V_S}{V_P} = \frac{N_S}{N_P}$

Sol. : Here $N_P = 400$, $I_P = 8\text{A}$

Input power $P_I = V_P \cdot I_P = 1000 \text{ W}$

$$V_P = 125 \text{ V}$$

Now $V_S = 500 \text{ V}$

$$\text{Since } \frac{V_S}{V_P} = \frac{N_S}{N_P}$$

$$\Rightarrow N_S = \frac{V_S}{V_P} \times N_P = 400 \times \frac{500}{125} = 1600 \text{ turns}$$

35. Answer (4)

Hint & Sol. : Lamination is done in core of transformer to reduce eddy current loss.

36. Answer (4)

Hint : In resonance condition $\Rightarrow V_L = V_C$.

Sol. : Here $V_L - V_C = 0 \Rightarrow V_L = V_C$

The circuit is in resonance

$$\text{Hence } Z = R \text{ so } I = \frac{400}{100} = 4 \text{ A}$$

$$\begin{aligned} \text{and } V &= \sqrt{V_R^2 + (V_L - V_C)^2} \\ &= V_R = 400 \text{ V} \end{aligned}$$

37. Answer (4)

$$\text{Hint : } f = \frac{1}{2\pi\sqrt{LC}}$$

$$\text{Sol. : } f = \frac{1}{2\pi\sqrt{LC}} \Rightarrow f \propto \frac{1}{\sqrt{LC}}$$

$$\frac{f_1}{f_2} = \sqrt{\frac{L_2 C_2}{L_1 C_1}} \Rightarrow \frac{f_1}{f_2} = \sqrt{\frac{3L \times 4C}{L \times C}} = 2\sqrt{3}$$

$$f_2 = \frac{f_1}{2\sqrt{3}}$$

Hence new frequency becomes $\frac{1}{2\sqrt{3}}$ of initial frequency.

38. Answer (2)

$$\text{Hint : Efficiency } \eta = \frac{P_{\text{output}}}{P_{\text{input}}}$$

$$\text{Sol. : } \eta = \frac{V_S \cdot I_S}{V_P \cdot I_P}$$

$$\Rightarrow \frac{60}{100} = \frac{40 \times 200}{4000 \times I_P}$$

$$\Rightarrow I_P = \frac{200}{60} = \frac{10}{3} \text{ A}$$

39. Answer (3)

Hint & Sol. : Ampere maxwell's law is

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 \left(i_C + \epsilon_0 \frac{d\phi_E}{dt} \right)$$

40. Answer (3)

$$\text{Hint & Sol. : } I_d = \epsilon_0 \frac{d\phi_E}{dt} = \epsilon_0 \frac{d}{dt} \left[\frac{Q}{\epsilon_0} \right] = \frac{dQ}{dt}$$

Hence displacement current in capacitor is equal to conduction current and in same direction.

41. Answer (4)

$$\text{Hint & Sol. : } \frac{2E_0}{B_0} = c \Rightarrow B_0 = \frac{2E_0}{c}$$

42. Answer (3)

$$\text{Hint & Sol. : } k = \frac{2\pi}{\lambda}$$

$$\Rightarrow 0.5 \times 10^3 = \frac{2\pi}{\lambda}$$

$$\begin{aligned} \Rightarrow \lambda &= \frac{2\pi \times 10^{-3}}{0.5} \\ &= 12.56 \times 10^{-3} \text{ m} \end{aligned}$$

i.e., radio waves.

43. Answer (2)

$$\text{Hint : } I_d = \epsilon_0 A \left(\frac{dE}{dt} \right)$$

Sol. : Here area of plates $A = 25 \text{ cm}^2 = 25 \times 10^{-4} \text{ m}^2$

$$\text{and } \frac{dE}{dt} = 4 \times 10^{12} \frac{\text{V}}{\text{m} \cdot \text{s}}$$

Displacement current

$$\begin{aligned} I_d &= \epsilon_0 A \left[\frac{dE}{dt} \right] \\ &= \epsilon_0 \times 25 \times 10^{-4} \times 4 \times 10^{12} \\ &= \epsilon_0 \times 10^{10} \text{ A} \end{aligned}$$

44. Answer (2)

$$\text{Hint & Sol. : Force due to radiation } F = \frac{2IA}{c}$$

For a perfectly reflecting surface

$$\begin{aligned} F &= \frac{2IA}{c} = 2 \times \frac{125 \times 10^4 \times 24 \times 10^{-4}}{3 \times 10^8} \\ &= 16 \times 125 \times 10^{-8} \text{ N} \\ &= 20 \times 10^{-6} \text{ N} = 20 \mu\text{N} \end{aligned}$$

45. Answer (1)

$$\text{Hint : } I = \frac{P}{4\pi r^2}$$

$$\text{Sol. : } I = \frac{P}{4\pi r^2}$$

$$I = \frac{900\pi}{4\pi(3)^2} = 25 \text{ W/m}^2$$

[CHEMISTRY]

46. Answer (4)

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

n = number of unpaired electrons

Sol. : $[\text{FeF}_6]^{3-}$ has 5 unpaired electrons

$$\mu = \sqrt{5(5+2)} = 5.92 \text{ BM}$$

47. Answer (4)

Hint : Pt(II) usually forms square planar complex.

48. Answer (4)

Hint : High spin octahedral complex having five unpaired electrons will have zero CFSE value.

49. Answer (3)

Hint : Higher the negative charge on metal carbonyl, stronger is the back donation of electron from metal to ligand.**Sol. :** Back donation of electron from metal to the vacant π^* orbital of CO takes place hence bond order of CO decreases and bond length increases. More electron density on metal increases back donation.

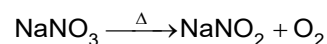
50. Answer (3)

Hint : Down the group basic nature of group II metal oxides increases.

51. Answer (4)

Hint : Smaller the size of ion greater is hydration.

52. Answer (3)

Hint : Lithium nitrate on heating gives NO_2 gas.**Sol. :** Nitrate of group II elements on heating give NO_2 gas. NaNO_3 on heating gives NaNO_2 and O_2 

53. Answer (2)

Hint : Higher the lattice energy, higher the melting point.

54. Answer (1)

Hint : Hydration enthalpy of Mg^{2+} ion is high.**Sol. :** Down the group the hydration enthalpy decreases hence solubility of alkaline earth metal sulphate decreases.

55. Answer (1)

Hint : Thermal stability of carbonate increases with increasing size of alkaline earth metal cation.

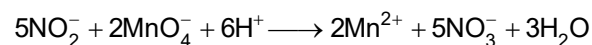
56. Answer (4)

Hint : Magnesium is bigger in size than beryllium.**Sol. :** Be Mg $IE_1(\text{kJ/mol})$ 899 737 $IE_2(\text{kJ/mol})$ 1757 1450

57. Answer (4)

Hint : Oxidation state of oxygen in peroxide is -1 .**Sol. :** Na_2O_2 and BaO_2 are peroxide.

58. Answer (3)

Hint : Permanganate ion oxidises nitrite to nitrate ion in acidic medium.**Sol. :**

59. Answer (4)

Hint : Outer electronic configuration of lanthanoids is $(n-2)f^{1-14}(n-1)d^{0-1}ns^2$.**Sol. : Ions** **Outer electronic configuration**Ce³⁺ 4f¹Nd³⁺ 4f³Sm²⁺ 4f⁶Yb²⁺ 4f¹⁴No unpaired electrons are present in Yb^{2+} , hence Yb^{2+} is a diamagnetic species.

60. Answer (2)

Hint : Symmetrically filled t_{2g} and e_g orbitals do not show Jahn-Teller effect.

61. Answer (4)

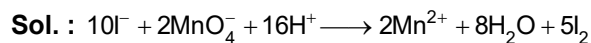
Hint : Higher the charge density of ion, higher is hydration enthalpy.**Sol. : Ions** **Hydration enthalpy (kJ mol⁻¹)**Mn²⁺ -1862Fe²⁺ -1998Co²⁺ -2079Ni²⁺ -2121

62. Answer (4)

Hint : Standard reduction potential of (Cu^{2+}/Cu) redox couple is positive.**Sol. :** Mn²⁺/Mn Ti²⁺/Ti Ni²⁺/Ni Cu²⁺/Cu E° (in volts) -1.18 -1.63 -0.25 +0.34

63. Answer (4)

Hint : Acidified permanganate solution oxidises iodide to iodine.



64. Answer (1)

Hint : Mn shows highest number of oxidation state.

65. Answer (3)

Hint : More the number of unpaired electrons, more will be the value of spin only magnetic moment.

Sol. : Ions	Number of unpaired electrons
Mn^{2+}	5
Fe^{2+}	4
Co^{2+}	3
Ni^{2+}	2

66. Answer (3)

Hint : Transition metal ions which contain unpaired d-electrons are coloured.

Sol. : Ions	Number of unpaired electron
Sc^{3+}	0
Ti^{3+}	1
V^{3+}	2
Zn^{2+}	0
Mn^{2+}	5
Ti^{4+}	0
Ni^{2+}	2

67. Answer (3)

Hint : Higher the effective nuclear charge of lanthanoid ions lower is the basic nature of their hydroxide.

Sol. : Basic nature order : $\text{Ce}(\text{OH})_3 > \text{Gd}(\text{OH})_3 > \text{Tb}(\text{OH})_3 > \text{Er}(\text{OH})_3$.

68. Answer (4)

Hint : Interstitial compounds conduct electricity.

69. Answer (2)

Hint : Thorium (Th) exhibits only +4 oxidation state.

70. Answer (4)

Hint : Lower the value of Δ_0 , higher will the wavelength absorbed.

Sol. : Correct order of ligand field strength $\bar{\text{CN}} > \text{en} > \text{H}_2\text{O}$.

$\therefore \Delta_0$ will be highest for $\bar{\text{CN}}$ and lowest for H_2O .

71. Answer (2)

Hint : CO , $\bar{\text{CN}}$ and NO^+ are π -acid ligands.

72. Answer (3)

Hint : IUPAC name of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is hexaamminecobalt(III) chloride.

73. Answer (2)

Hint : $\bar{\text{CN}}$ is a powerful trans director while H_2O shows poor trans effect.

74. Answer (1)

Hint : Wilkinson catalyst is $[(\text{Ph}_3\text{P})_3\text{RhCl}]$.

75. Answer (3)

Hint : Octahedral complex of cobalt will contain six ligands in the complex.

Sol. : Octahedral complex of $\text{CoCl}_3 \cdot 5\text{NH}_3$ will be $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ which has two ionizable chloride ions.

76. Answer (1)

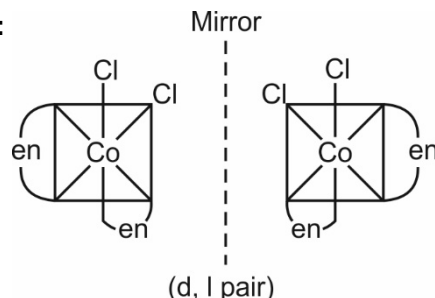
Hint : In outer orbital complex 4d-orbitals are used for bonding.

Sol. : Low charge on metal and weak field ligand leads to the formation of outer orbital complex.

$\therefore [\text{Fe}(\text{H}_2\text{O})_6]^{2+} : sp^3d^2$ hybridised.

77. Answer (1)

Hint : Centre of symmetry and plane of symmetry are absent in $\text{cis-}[\text{Co}(\text{en})_2\text{Cl}_2]^+$.

Sol. :

78. Answer (3)
Hint : Stable metal carbonyls follow 18 electron rule in outermost shell.
Sol. : $V(CO)_6$ will accept an electron from sodium and will form $[V(CO)_6]^-$, an 18 electron species
 $Na + V(CO)_6 \longrightarrow Na^+ + [V(CO)_6]^-$
79. Answer (4)
Hint : Complex of type (MX_5Y) will not show stereoisomerism.
80. Answer (3)
Hint : In ionisation isomerism the counter ion in a complex salt is itself a ligand and can displace a ligand which can then become a counter ion.
81. Answer (1)
Hint : Monodentate ligand which can donate electrons through two different atoms is called ambidentate ligand.
82. Answer (1)
Hint : $NaNO_3$ is Chile saltpetre.
83. Answer (4)
Hint : Down the group metallic radius increases.
84. Answer (4)
Hint : Maximum coordination number of beryllium is four.
85. Answer (2)
Hint : All enzymes that utilise ATP in phosphate transfer require magnesium as cofactor.
86. Answer (1)
Hint : Li^+ has maximum hydration enthalpy among alkali metal ions.
87. Answer (3)
Hint : Higher the charge density of cation higher the polarising power.
88. Answer (3)
Hint : Metal oxides in highest oxidation state are generally acidic.
Sol. :

Oxide :	V_2O_3	Cr_2O_3	Mn_2O_7	CrO
Nature :	basic	amphoteric	acidic	basic
89. Answer (2)
Hint : Greater the standard reduction potential greater is the oxidising power.
Sol. : Oxidising power order :
 $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$
90. Answer (1)
Hint : Higher the effective nuclear charge, higher is the enthalpy of atomization.
Sol. :

Element	Mn	Fe	Co	Ni
ΔH_a (kJ/mol)	279	418	427	431

[BIOLOGY]

91. Answer (2)
Hint : In double helix structure of DNA, bases in two strands are paired through hydrogen bonds.
Sol. : A nitrogenous base is linked to the OH of 1'C of pentose sugar through a N-glycosidic linkage. This linkage does not confer stability to the helical structure of DNA.
92. Answer (2)
Sol. : Avery, Macleod and McCarty by an experiment concluded that DNA is the hereditary material.
93. Answer (3)
Sol. : Griffith performed experiment on bacterium *Streptococcus pneumoniae* (*Pneumococcus*)
94. Answer (4)
Sol. : Statin – Obtained from a yeast (*Monascus purpureus*)
 Cyclosporin A – Produced by the fungus *Trichoderma polysporum*
 Clot buster – Streptokinase, obtained from bacterium *Streptococcus*
95. Answer (1)
Sol. : • Ladybird is useful in controlling aphids.
 • Baculoviruses has species specific, narrow spectrum insecticidal application
96. Answer (4)
Sol. : Mutational variety of mung bean is resistant to yellow mosaic virus and powdery mildew.

97. Answer (3)

Hint : *Azotobacter* is a free living N_2 fixing bacteria.

- Sol. :** – BGA are able to fix atmospheric N_2 , hence increase soil fertility.
- IPM is an integration of tactics for economic control of pests.
 - VAM (Endomycorrhizae) helps in phosphorus nutrition in plants.

98. Answer (2)

Hint : In a triplet codon, each base can be replaced by three other bases.

Sol. : Each triplet codon thus have nine replacement probabilities then $61 \times 9 = 549$ substitutions are possible.

99. Answer (3)

Hint : During translation, the rate of peptide bond formation is enhanced by a catalyst known as peptidyl transferase, which is a ribozyme.

Sol. : In prokaryotes, this ribozyme is 23S rRNA and in eukaryotes it is 28S rRNA.

100. Answer (1)

Hint : Replication begins at a particular region of DNA which is called origin of replication (Ori).

Sol. : For propagation of a piece of DNA during recombinant DNA procedure, vector is required because it provides 'Ori'.

101. Answer (4)

Hint : A molecule which acts as genetic material should provide the scope of slow mutation.

Sol. : A molecule that acts as genetic material should be chemically and structurally stable. It should also have capacity of replication and controlling cell structure and function.

102. Answer (2)

Hint : Split gene arrangement is characteristic of eukaryotes. Promotor has RNA polymerase recognition sequences.

Sol. : In prokaryotes structural gene is polycistronic which synthesises different polypeptides.

103. Answer (2)

Hint : Nucleus is present in eukaryotic cell.

Sol. : In eukaryotes, transcribing enzyme i.e., RNA polymerase is of three types.

104. Answer (4)

Sol. : All rRNA synthesis is catalyzed by RNA polymerase I in eukaryotes but exceptionally 5S rRNA synthesis is catalyzed by RNA polymerase III.

105. Answer (4)

Sol. : Ratna is better yielding semi dwarf variety of rice. Rest of the varieties are biofortified.

106. Answer (4)

Hint : Naked protoplasts are fused either by electrofusion or chemofusion for the formation of somatic hybrid.

Sol. : Electrofusion is done by using high frequency alternating electric field with short current pulse. For chemofusion sodium nitrate and polyethylene glycol (PEG) are used.

107. Answer (2)

Sol. : IR-24 is a variety of rice.

108. Answer (2)

Sol. : Himgiri, a wheat variety is resistant to hill bunt disease.

109. Answer (3)

Hint : *Fusarium*, *Agaricus* and *Candida utilis* are fungi.

Sol. : *Methylophilus methylotrophus* is a bacterial source of single cell protein (SCP).

110. Answer (2)

Hint : Biogas production is carried out by some microbes in anaerobic condition.

Sol. : During sewage treatment in anaerobic sludge digester, methanogenic bacteria produce biogas. This is known as biological treatment of sewage.

111. Answer (1)

Sol. : Removal of small and large particles and floating debris from sewage is done under primary treatment by filtration and sedimentation.

112. Answer (4)

Sol. :	Products
<i>Aspergillus niger</i>	– Citric acid and pectinase
<i>Clostridium butylicum</i>	– Butyric acid
<i>Acetobacter aceti</i>	– Acetic acid

113. Answer (3)

Hint : It is a fungus, which is very common in root ecosystems and effective against pathogens.

Sol. : This fungus is *Trichoderma polysporum*.

114. Answer (2)

Sol. : Penicillin as an effective antibiotic was first established by Ernst Chain and Howard Florey.

115. Answer (2)

Sol. : Statin is a blood cholesterol lowering agent. BOD is a measure of polluting potential of waste water hence greater the BOD of waste water, more is its polluting potential.

During primary treatment of waste water, suspended solids are removed by sedimentation process.

Streptokinase is used as 'clot buster'.

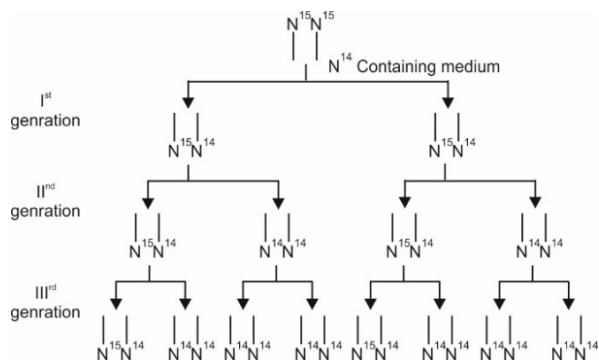
116. Answer (2)

Hint : In biogas, major percent is of marsh gas.

Sol. : Biogas predominantly contains methane (Marsh gas).

117. Answer (1)

Sol. :



$N^{15}N^{14}$ -hybrid, $N^{14}N^{14}$ -light, $N^{15}N^{15}$ -heavy

Total 8 molecules

$$2 \text{ hybrid} = \frac{2}{8} \times 100 = 25\%$$

$$6 \text{ light} = \frac{6}{8} \times 100 = 75\%$$

$$0 \text{ heavy} = 0\%$$

118. Answer (3)

Hint : In DNA molecule $\frac{A + G}{C + T} = 1$ (Chargaff's rule)

Sol. : In DNA, $C = G$ and $A = T$

If $C = 30\%$ then G will be 30%

$$C + G = 60\%$$

$$\text{Hence, } A + T = 40\%$$

$$\text{Then } A = \frac{40}{2} = 20\%$$

119. Answer (1)

Sol. : Genetic code may degenerate i.e. one amino acid may be coded by more than one codons.

120. Answer (2)

Sol. : 3D structure of tRNA is inverted L-shaped.

121. Answer (4)

Hints : In eukaryotes, structural genes have interrupted coding sequences. Expressed sequences are exons.

Sol. : In eukaryotes, structural genes synthesise one type of polypeptide, hence it is monocistronic.

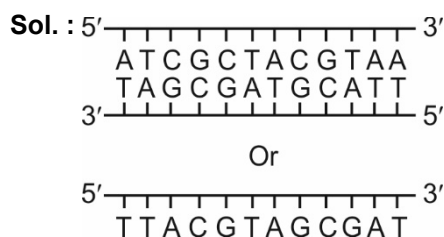
122. Answer (2)

Hint : Some amino acids are coded by one codon only. Such codons are non-degenerate codons.

Sol. : UAA does not specify any amino acids and it is a stop codon. It is also called nonsense codon.

123. Answer (1)

Hint : Coding strand is complementary of template strand.



124. Answer (3)

Hint : In prokaryotes, structural gene is not a split gene.

Sol. : In bacteria, post transcriptional modification is not required.

125. Answer (2)

Hint : In *lac* operon, lactose itself stimulates the production of required enzymes thus it is inducible system. In *lac* operon regulator gene is functional all the time.

Sol. : The gene which is functional all the time is called constitutive gene.

126. Answer (3)

Sol. : The size of VNTR varies from 0.1 to 20 kb.

127. Answer (3)

Sol. : In human genome, repeated sequence make up very large portion.

128. Answer (4)

Hint : Severo Ochoa enzyme is helpful in polymerising RNA with defined sequences in a template independent manner.

Sol. : Severo Ochoa enzyme is functionally a polynucleotide phosphorylase.

129. Answer (1)

Sol. : The fungi which form ectomycorrhizae usually belongs to Basidiomycetes.

130. Answer (4)

Sol. : Conversion of milk into curd is not an aerobic process. Fermentation is an anaerobic process.

131. Answer (2)

Sol. : 'Toddy' is a fermented sap obtained from palm plant.

132. Answer (1)

Sol. : 'Roquefort cheese' is ripened by growing a fungi on it i.e. *Penicillium roquefortii*.

133. Answer (2)

Sol. : Three steps required for the formation of biogas are solubilisation, acidogenesis and methanogenesis.

134. Answer (2)

Hint : The genes which always express themselves are known as constitutive genes.

Sol. : Luxury genes are non-constitutive genes. These are not always expressing genes.

135. Answer (2)

Sol. : In translation process, chain elongation requires energy in the form of GTP.

136. Answer (2)

Hint : This concept was proposed by Fritz Muller.

Sol. : When two or more inedible or unpalatable species resemble each other the mimicry is termed Mullerian mimicry. A form of mimicry in which an edible species resembles an inedible one is Batesian mimicry.

137. Answer (2)

Hint : Vaccine provides artificial active immunity.

Sol. : Toxoid are neutralised toxins. They provide artificial active immunity by triggering the B- lymphocytes to produce antibodies.

138. Answer (3)

Hint : Each antibody monomer has two antigen binding sites.

Sol. : IgM is a pentamer made up of five antibody monomers. Therefore it has a total of ten antigen binding sites called paratopes.

139. Answer (4)

Hint : Tasmanian wolf and wolf exhibit convergent evolution.

Sol. :	MARSUPIALS	PLACENTAL
	Marsupial mouse	Mouse
	Flying phalanger	Flying squirrel
	Numbat	Anteater
	Tasmanian wolf	Wolf

140. Answer (3)

Hint : It shows similar effects as charas.

Sol. : *Datura* is a flowering plant that contains psychedelic compounds including atropine.

141. Answer (2)

Hint : Isolation that relates to reproduction.

Sol. : Geographical isolation leads to Allopatric speciation. Sympatric speciation occurs when species develop due to members of a population occupying different ecological zones in the same geographical area.

142. Answer (3)

Hint : This is also called progressive selection.

Sol. : In directional change more individuals acquire value other than mean character value. Directional type of natural selection supports an advantageous phenotype over the others and causes a shift from the mean character value towards one extreme.

143. Answer (2)

Hint : Tail is non-functional in humans.

Sol. : Atavism or reversion refers to the sudden reappearance of some ancestral features or non-functional organs.

144. Answer (3)

Hint : Analogous structures perform the same function.

Sol. : Both malpighian tubules and flame cells perform the function of excretion.

145. Answer (3)

Hint : Analogy is based on convergent evolution.

Sol. : Homology is based on divergent evolution and Analogy is based on convergent evolution.

146. Answer (3)

Hint : It is caused by deficiency of enzyme protects RBCs from damage.

Sol. : Glucose-6-phosphate dehydrogenase deficiency in an individual causes RBC destruction which provides protection against infection by *Plasmodium*. This is a form of balancing selection.

147. Answer (2)

Hint : It is a protein based technique.

Sol. : ELISA is enzyme linked immunosorbent assay for diagnosis of AIDS by detecting and measuring antibodies in blood. Western blot is confirmatory test for AIDS.

148. Answer (1)

Hint : *Ascariasis* is caused by faeco-oral route.

Sol. : *Ascariasis* occurs by consumption of contaminated food and water containing embryonated eggs of *Ascaris*.

149. Answer (1)

Hint : In karyotyping chromosomes are arranged by their size and appearance.

Sol. : Mitochondrial DNA and Y chromosome are being used extensively by molecular paleoanthropologists to reconstruct human lineages.

150. Answer (4)

Hint : Competitive exclusion principle.

Sol. : Gause's Law is also called competitive exclusion principle as it states that no two organisms can indefinitely occupy the same habitat if they have similar ecological requirements like food, shelter etc.

151. Answer (3)

Hint : Crossing over.

Sol. : Genetic diversity is most commonly caused by recombination in which pieces of DNA are broken and recombined to produce a new combination of alleles.

152. Answer (3)

Hint : This type of competition occurs between the species.

Sol. : Interspecific competition can result in divergent evolution which leads to organic evolution.

153. Answer (4)

Hint : This is the most important cause of variations.

Sol. : Hugo de Vries believed that single step large mutations caused evolution and termed them as saltation. Mutations are random and non-directional.

154. Answer (2)

Hint : Phenotype of an organism is selected.

Sol. : The unit of evolution is now recognised as population. Most species are subdivided into local populations with varying degrees of reproductive isolation.

155. Answer (2)

Hint : This technique measures the amount of unpaired electrons in crystalline structures.

Sol. : Electron spin resonance method is one of the most accurate methods of dating fossils. The age of substance can be determined by measuring the dosage of radiation since the time of its formation.

156. Answer (2)

Hint : Mutations lead to speciation

Sol. : Zero evolution occurs if disturbing factors such as selective mating and mutations are absent.

157. Answer (3)

Hint : This era is also called 'Age of conifers'

Sol. : Mesozoic era is that interval of geological time scale that occurred about 252 to 66 million years ago. It is also called age of reptiles and age of conifers. Jurassic is a period of geological time scale.

158. Answer (3)

Hint : Electric discharge produced high temperature.

Sol. : A temperature of 800°C was produced in Miller's experiment.

159. Answer (2)
Hint : They were probably not taller than 4 feet but walked upright.
Sol. : Diet of *Australopithecus* was mainly fruits and they sometimes used stones as weapons. Few of their fossils were found in Ethiopia and Tanzania.
160. Answer (3)
Hint : A connecting link has features belonging to members of two taxa.
Sol. : *Chimaera* is a cartilaginous fish with several bony fish characters such as presence of operculum.
161. Answer (3)
Hint : Embryological evidence of evolution.
Sol. : Biogenetic law states that "Ontogeny recapitulates Phylogeny" and it was proposed by Ernst Haeckel.
162. Answer (3)
Hint : Its acetylation produces heroin.
Sol. : Morphine is obtained from latex of poppy plant and is an effective sedative and pain killer.
163. Answer (3)
Hint : Select the filarial worm.
Sol. : *Wuchereria* causes a chronic inflammation of lymphatic vessels called Elephantiasis or filariasis. Ringworm is a fungal disease.
164. Answer (2)
Hint : The primitive earth's atmosphere was reducing in nature.
Sol. : According to Oparin, oxygen was absent in primitive atmosphere of earth in free form. It was reducing in nature which favoured conditions for origin of life.
165. Answer (1)
Hint : These cells have CD₄ receptors.
Sol. : HIV causing AIDS first destroys helper T-cells by infection macrophages act like HIV factory which survive after infection while viruses being replicated are released.
166. Answer (2)
Hint : Malaria is transmitted by female *Anopheles* mosquito.
Sol. : Japanese encephalitis and filariasis are transmitted by bite of infected *Culex* mosquito. *Anopheles* and *Aedes* transmit malaria and dengue respectively.
167. Answer (1)
Hint : Histamine causes vasodilatation.
Sol. : Inflammation due to insect bite is triggered by histamine and kinins. Dopamine is a neurotransmitter.
168. Answer (3)
Hint : SARS-CoV causes SARS.
Sol. : SARS is caused by a virus related to corona virus. It is characterized by fever, muscle pain and headache.
169. Answer (2)
Hint : None of the finches are scavengers.
Sol. : The Finch species of Galapagos islands are grouped according to their food source. Seeds, insects and tree buds are categorized as Finch foods, however detritus is not a Finch food source.
170. Answer (1)
Hint : Ganja can also be obtained from this source.
Sol. : Heroin is an acetylated form of Morphine. Cocaine is extracted from *Erythroxylum coca*.
171. Answer (3)
Hint : It is a function of B-cells.
Sol. : Production of antibodies is carried out by B-lymphocytes and plasma cells. Activation of B-lymphocytes is carried out by antigen as well as by lymphokines secreted by T-helper cells.
172. Answer (1)
Hint : Missing links include extinct organisms.
Sol. : *Archaeopteryx* is a missing link which displays both avian and reptilian characteristics.
173. Answer (3)
Hint : Silurian and Devonian periods are included in Paleozoic era.
Sol. : *Zosterophyllum* diverged from tracheophyte ancestors in the silurian period. Angiosperms are the dominating land plants in the present era.
174. Answer (1)
Hint : This antibody is smallest in size.
Sol. : IgG antibodies can cross the placental barrier. IgA is present in colostrum.

175. Answer (3)

Hint : Type of genetic drift.

Sol. : Genetic drift is a non directional factor that causes a change in gene frequency by chance in a small population. It has two ramification-neck effect and founder's effect.

Bottle neck effect decreases genetic variability in a population.

176. Answer (2)

Hint : Select a carnivorous dinosaur

Sol. : *Triceratops* – 3 horned
Herbivore

Stegosaurus – Plate backed and
spikes at end of tail
Herbivore

Brachiosaurus – Quadraped with long tail
Herbivore

Tyrannosaurus – Bipedal
Carnivore

177. Answer (2)

Hint : This bacteria affects the lungs.

Sol. : Bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for the disease pneumonia in humans.

178. Answer (4)

Hint : Leukemia is commonly called blood cancer.

Sol. : Lymphoma is a cancer of the lymphatic system. The main types of lymphoma are Hodgkin's and Non-Hodgkin's lymphoma.

179. Answer (2)

Hint : Losses of contact inhibition is seen

Sol. : Vinblastine and cisplatin are anticancer drugs used in the treatment of cancer.

180. Answer (1)

Hint : It is sexually transmitted.

Sol. : Hepatitis B is a viral disease caused by HBV whose primary symptom is inflammation of liver.



All India Aakash Test Series for NEET-2020

TEST - 6 (Code-F)

Test Date : 16/02/2020

ANSWERS

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

HINTS & SOLUTIONS**[PHYSICS]**

1. Answer (1)

$$\text{Hint : } I = \frac{P}{4\pi r^2}$$

$$\text{Sol. : } I = \frac{P}{4\pi r^2}$$

$$I = \frac{900\pi}{4\pi(3)^2} = 25 \text{ W/m}^2$$

2. Answer (2)

$$\text{Hint \& Sol. : Force due to radiation } F = \frac{2IA}{c}$$

For a perfectly reflecting surface

$$\begin{aligned} F &= \frac{2IA}{c} = 2 \times \frac{125 \times 10^4 \times 24 \times 10^{-4}}{3 \times 10^8} \\ &= 16 \times 125 \times 10^{-8} \text{ N} \\ &= 20 \times 10^{-6} \text{ N} = 20 \mu\text{N} \end{aligned}$$

3. Answer (2)

$$\text{Hint : } I_d = \epsilon_0 A \left(\frac{dE}{dt} \right)$$

Sol. : Here area of plates $A = 25 \text{ cm}^2 = 25 \times 10^{-4} \text{ m}^2$

$$\text{and } \frac{dE}{dt} = 4 \times 10^{12} \frac{\text{V}}{\text{m} \cdot \text{s}}$$

Displacement current

$$\begin{aligned} I_d &= \epsilon_0 A \left[\frac{dE}{dt} \right] \\ &= \epsilon_0 \times 25 \times 10^{-4} \times 4 \times 10^{12} \\ &= \epsilon_0 \times 10^{10} \text{ A} \end{aligned}$$

4. Answer (3)

$$\text{Hint \& Sol. : } k = \frac{2\pi}{\lambda}$$

$$\Rightarrow 0.5 \times 10^3 = \frac{2\pi}{\lambda}$$

$$\begin{aligned} \Rightarrow \lambda &= \frac{2\pi \times 10^{-3}}{0.5} \\ &= 12.56 \times 10^{-3} \text{ m} \end{aligned}$$

i.e., radio waves.

5. Answer (4)

$$\text{Hint \& Sol. : } \frac{2E_0}{B_0} = c \Rightarrow B_0 = \frac{2E_0}{c}$$

6. Answer (3)

$$\text{Hint \& Sol. : } I_d = \epsilon_0 \frac{d\phi_E}{dt} = \epsilon_0 \frac{d}{dt} \left[\frac{Q}{\epsilon_0} \right] = \frac{dQ}{dt}$$

Hence displacement current in capacitor is equal to conduction current and in same direction.

7. Answer (3)

Hint & Sol. : Ampere maxwell's law is

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 \left(i_C + \epsilon_0 \frac{d\phi_E}{dt} \right)$$

8. Answer (2)

$$\text{Hint : Efficiency } \eta = \frac{P_{\text{output}}}{P_{\text{input}}}$$

$$\text{Sol. : } \eta = \frac{V_S \cdot I_S}{V_P \cdot I_P}$$

$$\Rightarrow \frac{60}{100} = \frac{40 \times 200}{4000 \times I_P}$$

$$\Rightarrow I_P = \frac{200}{60} = \frac{10}{3} \text{ A}$$

9. Answer (4)

$$\text{Hint : } f = \frac{1}{2\pi\sqrt{LC}}$$

$$\text{Sol. : } f = \frac{1}{2\pi\sqrt{LC}} \Rightarrow f \propto \frac{1}{\sqrt{LC}}$$

$$\frac{f_1}{f_2} = \sqrt{\frac{L_2 C_2}{L_1 C_1}} \Rightarrow \frac{f_1}{f_2} = \sqrt{\frac{3L \times 4C}{L \times C}} = 2\sqrt{3}$$

$$f_2 = \frac{f_1}{2\sqrt{3}}$$

Hence new frequency becomes $\frac{1}{2\sqrt{3}}$ of initial frequency.

10. Answer (4)

Hint : In resonance condition $\Rightarrow V_L = V_C$.

Sol. : Here $V_L - V_C = 0 \Rightarrow V_L = V_C$

The circuit is in resonance

Hence $Z = R$ so $I = \frac{400}{100} = 4 \text{ A}$

$$\text{and } V = \sqrt{V_R^2 + (V_L - V_C)^2}$$

$$= V_R = 400 \text{ V}$$

11. Answer (4)

Hint & Sol. : Lamination is done in core of transformer to reduce eddy current loss.

12. Answer (2)

Hint : For ideal transformer $P_P = P_S$ and $\frac{V_S}{V_P} = \frac{N_S}{N_P}$

Sol. : Here $N_P = 400, I_P = 8 \text{ A}$

Input power $P_I = V_P \cdot I_P = 1000 \text{ W}$

$V_P = 125 \text{ V}$

Now $V_S = 500 \text{ V}$

Since $\frac{V_S}{V_P} = \frac{N_S}{N_P}$

$$\Rightarrow N_S = \frac{V_S}{V_P} \times N_P = 400 \times \frac{500}{125} = 1600 \text{ turns}$$

13. Answer (1)

Hint : $V_{\text{rms}} = \sqrt{\langle V^2 \rangle}$.

Sol. : Equation of V from $t = 0$ to $t = \frac{T}{4}$

$$V = \frac{4V_0}{T} t$$

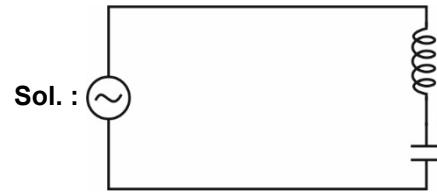
$$V_{\text{rms}} = \sqrt{\langle V^2 \rangle} = \frac{4V_0}{T} \sqrt{\langle t \rangle}$$

$$= \frac{4V_0}{T} \left\{ \frac{\int_0^{T/4} t^2 \cdot dt}{\int_0^{T/4} dt} \right\}^{\frac{1}{2}} = \frac{4V_0}{T} \cdot \frac{T}{4\sqrt{3}}$$

$$= \frac{V_0}{\sqrt{3}} = 3 \text{ Volt}$$

14. Answer (4)

Hint : $Z = |X_L - X_C|$ and $I = \frac{V}{Z}$.



Sol. :

$$I = \frac{V}{|X_L - X_C|}$$

$$= \frac{300}{|350 - 200|}$$

$$= 2 \text{ A}$$

15. Answer (2)

Hint : Bulb having more current will glow brighter.

Sol. : $X_C = \frac{1}{2\pi fC} = \frac{10^6}{2\pi \times 50 \times 500} = \frac{20}{\pi} \Omega$

$X_L = 2\pi fL = 2\pi \times 50 \times 10 \times 10^{-3} = \pi \Omega$

Since $X_L < X_C$ i.e. inductive branch has less impedance so it has more current. Hence bulb B_2 will glow brighter.

16. Answer (1)

Hint : $X_L = \omega L = 2\pi fL$.

Sol. : $X_L = 2 \times \pi \times 50 \times 50 \times 10^{-3}$

$$= 5000\pi \times 10^{-3}$$

$$= 5\pi \Omega$$

17. Answer (3)

Hint & Sol. :

$$\left. \begin{aligned} I &= I_0 \sin \omega t \\ I &= 50 \sin 100\pi t \end{aligned} \right\} \text{On comparing}$$

$\omega = 100\pi$

$\frac{2\pi}{T} = 100\pi$

$\Rightarrow T = \frac{1}{50} \text{ second}$



Time taken to rise from zero to peak value

$\Delta t = \frac{T}{4} = \frac{1}{200} \text{ second}$

18. Answer (2)

$$\text{Hint : } |\varepsilon| = M \frac{dl}{dt}$$

$$\text{Sol. : } |\varepsilon| = M \cdot \frac{dl}{dt} [4t^2 - 3t + 7]$$

$$= 50 \times 10^{-3} [8t - 3]$$

emf at $t = 2\text{s}$

$$= 650 \times 10^{-3} \text{ V}$$

$$= 650 \text{ mV}$$

19. Answer (2)

Hint : Time constant of L-R circuit is $\frac{L}{R}$.

$$\text{Sol. : } \tau = \frac{L}{R}$$

$$\tau' = \frac{L'}{R'} = \frac{6L}{3R} = 2\tau$$

$\Rightarrow \tau' = \text{double of initial value.}$

20. Answer (1)

$$\text{Hint : } U = \frac{1}{2} LI^2$$

Sol. : Energy stored in inductor

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

$$\Rightarrow 25 \times 10^{-6} = \frac{1}{2} L (10 \times 10^{-3})^2$$

$$\Rightarrow 50 \times 10^{-6} = L \cdot 100 \times 10^{-6}$$

$$\Rightarrow L = 0.5 \text{ H}$$

21. Answer (2)

$$\text{Hint : } \varepsilon = -\frac{d\phi}{dt} \text{ and Heat } H = \int \frac{E^2}{R} dt.$$

Sol. : Induced emf in the loop

$$\varepsilon = -\frac{d\phi}{dt} = -\frac{d}{dt} [kt(\tau - t)]$$

$$= 2kt - k\tau$$

Amount of heat generated in small time dt

$$dQ = \frac{\varepsilon^2}{R} dt = \frac{(2kt - k\tau)^2}{R} \cdot dt$$

Total heat generated is

$$Q = \int_0^\tau (4k^2t^2 + k^2\tau^2 - 4k^2t\tau) dt$$

On solving

$$Q = \frac{k^2\tau^3}{3R}$$

22. Answer (1)

$$\text{Hint : } |\text{emf}| = L \frac{dl}{dt}$$

$$\text{Sol. : } l = 2t^2 e^{-t}$$

$$\frac{dl}{dt} = 2 \cdot 2t e^{-t} + 2t^2 \cdot e^{-t} \cdot (-1)$$

$$= 2t e^{-t} (2 - t)$$

$$|\text{emf}| = L \frac{dl}{dt} = 6 \times 10^{-3} t e^{-t} (2 - t)$$

$$|\text{emf}| = 0 \text{ if,}$$

$$\Rightarrow t = 0 \text{ or } 2 \text{ sec}$$

23. Answer (3)

Hint & Sol. : Induced electric field at point P

$$E = \frac{R}{2} \frac{dB}{dt} \text{ towards right}$$

Acceleration of Helium proton

$$\Rightarrow a = \frac{qE}{m}$$

$$= \frac{eE}{m} = \frac{eR}{m} \alpha$$

$$= \frac{e\alpha R}{2m} \text{ towards right}$$

24. Answer (4)

Hint & Sol. : $\varepsilon = |(\vec{v} \times \vec{B}) \cdot \vec{l}|$. Since, \vec{l} , \vec{B} and \vec{v} are coplanar hence no induced emf.

25. Answer (2)

$$\text{Hint : } E = \frac{1}{2} B\omega (L_f^2 - L_i^2)$$

$$\text{Sol. : } \varepsilon_{AB} = \frac{1}{2} B\omega (2L)^2 = 400 \text{ V} \Rightarrow B\omega L^2 = 200 \text{ V}$$

$$\varepsilon_{AC} = \frac{1}{2} B\omega L^2 = 100 \text{ V}$$

$$\varepsilon_{CB} = \varepsilon_{AB} - \varepsilon_{AC} = 400 - 100 = 300 \text{ V}$$

26. Answer (4)

Hint : $I_{ind} = \frac{\epsilon_{ind}}{R} = \frac{1}{R} \left| \frac{d\phi}{dt} \right|$

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

$$\frac{d\phi}{dt} = \frac{dB}{dt} \cdot A = K \cdot \frac{1}{2} \cdot \frac{l\sqrt{3}l}{2}$$

$$= \frac{K\sqrt{3}l^2}{4}$$

$$I_{ind} = \frac{1}{3\rho l} \cdot \frac{K\sqrt{3}l^2}{4} = \frac{Kl}{4\sqrt{3}\rho}$$

27. Answer (4)

Hint : $T = 2\pi\sqrt{\frac{I}{MB}}$

Sol. : $T \propto \frac{1}{\sqrt{B}} \Rightarrow f \propto \sqrt{B}$

$$\Rightarrow \frac{f_1^2}{f_2^2} = \frac{B_{net1} \cos \theta_1}{B_{net2} \cos \theta_2}$$

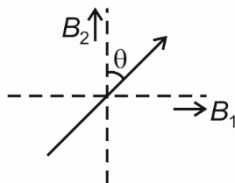
$$\Rightarrow \frac{20^2}{f_2^2} = \frac{0.8 \times \cos 60^\circ}{0.6 \times \cos 30^\circ} = \frac{4}{3} \cdot \frac{1}{2} \cdot \frac{2}{\sqrt{3}}$$

$$\Rightarrow f_2 = 10\sqrt{3\sqrt{3}}$$

28. Answer (1)

Hint : Use tangent law.

Sol. : Magnetic needle will stay in the influence of magnetic field produced by both magnets.



In equilibrium $\tau_1 = \tau_2$

$$MB_1 \sin(90 - \theta) = MB_2 \sin \theta$$

$$B_1 = B_2 \tan \theta$$

$$\Rightarrow \frac{\mu_0 2M}{4\pi d_1^3} = \frac{\mu_0 M}{4\pi d_2^3} \tan \theta$$

$$\Rightarrow \frac{d_1^3}{d_2^3} = \frac{2}{\tan \theta} = 2 \cot \theta$$

$$\Rightarrow \left(\frac{d_1}{d_2} \right)^3 = 2 \cot \theta$$

$$\Rightarrow \frac{d_1}{d_2} = (2 \cot \theta)^{1/3}$$

29. Answer (1)

Hint : $l = \frac{M}{V} = \frac{\ell m}{\ell b h}$

Sol. : $l = \frac{\ell m}{\ell b h} = \frac{m}{bh}$

$$= \frac{200 \times 10^{-3}}{50 \times 10^{-4}}$$

$$= 40 \text{ A/m}$$

30. Answer (2)

Hint & Sol. : $W = MB(1 - \cos \theta)$

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

$$W = \frac{MB}{2} \quad \dots(i)$$

$$\tau = MB \sin \theta = MB \sin 30^\circ$$

$$= \frac{MB}{2}$$

Hence $|\tau| = |W|$

31. Answer (1)

Hint & Sol. : Magnetic field line outside the bar magnet are from north to south pole while inside the bar magnet they are from south to north pole.

32. Answer (2)

Hint : $T = 2\pi\sqrt{\frac{I}{MB}}$

Sol. : $T_1 = 2\pi\sqrt{\frac{I_1 + I_2}{(4M + 5M)B}}$

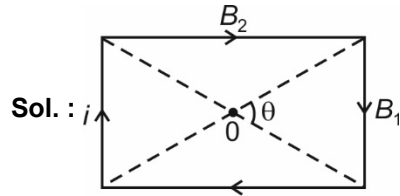
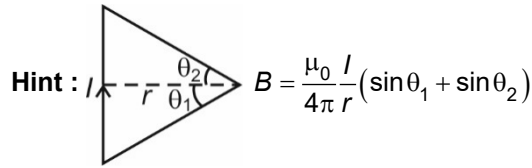
$$T_2 = 2\pi\sqrt{\frac{I_1 + I_2}{(5M - 4M)B}}$$

$$\frac{T_1}{T_2} = \sqrt{\frac{M}{9M}} = \frac{1}{3}$$

$$\Rightarrow T_2 = 3T_1$$

$$\Rightarrow T_2 = 3 \times 1 = 3 \text{ second}$$

33. Answer (3)



$$\vec{B}_0 = 2(\vec{B}_1 + \vec{B}_2)$$

$$= 2 \left[\frac{\mu_0}{4\pi} \frac{2l \sin\left(\frac{\theta}{2}\right)}{\frac{d}{2} \cos\left(\frac{\theta}{2}\right)} + \frac{\mu_0 2l \cos\left(\frac{\theta}{2}\right)}{4\pi \frac{d}{2} \sin\left(\frac{\theta}{2}\right)} \right]$$

$$= \frac{\mu_0}{4\pi} \frac{4l}{d} \left[\tan\left(\frac{\theta}{2}\right) + \cot\left(\frac{\theta}{2}\right) \right]$$

$$= \frac{4\mu_0 l}{\pi d \sin \theta}$$

34. Answer (1)

Hint : $B_{\text{axis}} = \frac{\mu_0 i r^2}{2(r^2 + x^2)^{3/2}}$, $B_{\text{centre}} = \frac{\mu_0 i}{2r}$

Sol. : $B_{\text{centre}} = 5\sqrt{5} B_{\text{axis}}$

$$\Rightarrow \frac{\mu_0 i}{2r} = 5\sqrt{5} \frac{\mu_0 i r^2}{2(r^2 + x^2)^{3/2}}$$

$$\Rightarrow \frac{1}{r} = \frac{5\sqrt{5} r^2}{(r^2 + x^2)^{3/2}}$$

$$\Rightarrow (r^2 + x^2)^{3/2} = (\sqrt{5} r)^3$$

$$\Rightarrow (r^2 + x^2)^{1/2} = \sqrt{5} r$$

$$\Rightarrow r^2 + x^2 = 5r^2$$

$$\Rightarrow x = 2r$$

$$= 30 \text{ cm}$$

35. Answer (1)

Hint : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2 + \vec{B}_3 + \vec{B}_4 + \dots \infty$

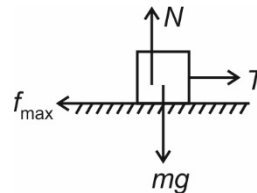
Sol. : $\vec{B} = \frac{\mu_0 I}{2R} + \frac{\mu_0 I}{2(2R)} + \frac{\mu_0 I}{2(4R)} + \dots \infty$
 $= \frac{\mu_0 I}{2R} \left[1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \infty \right]$
 $= \frac{\mu_0 I}{2R} \left[\frac{1}{1 - 1/2} \right] = \frac{\mu_0 I}{2R} \cdot 2$

{Sum of infinite G.P}

$$= \frac{\mu_0 I}{R}$$

36. Answer (2)

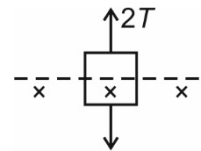
Hint & Sol. :



$$T = f_{\text{max}}$$

$$= \mu mg$$

... (i)



$$f_m = ILB$$

$$2T = ILB$$

... (ii)

From (i) and (ii)

$$2\mu mg = ILB$$

$$m \geq \frac{ILB}{2\mu g}$$

37. Answer (3)

Hint : Net magnetic field is due to both current loop and straight conductor.

Sol. : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2$

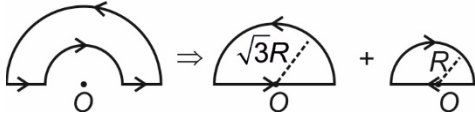
$$0 = \frac{\mu_0}{4\pi} \frac{2I_2}{L} - \frac{\mu_0}{4\pi} \frac{2\pi I_1}{R}$$

$$\Rightarrow L = \frac{I_2 R}{\pi I_1}$$

38. Answer (1)

Hint : $\vec{M} = I\vec{A}$ and superposition.

Sol. : Given loop can be considered as the superposition of the two loops



$$M_{\text{net}} = \frac{\pi(\sqrt{3}R)^2}{2} I - \frac{\pi R^2 I}{2}$$

$$= \frac{\pi}{2} IR^2 (3 - 1) = \pi R^2 I$$

Hence $M_{\text{net}} = \pi R^2 I$

39. Answer (4)

Hint & Sol. : If $\vec{E} \neq 0$ and $\vec{B} \neq 0$ then it is possible if $\vec{E} = -(\vec{v} \times \vec{B})$

If $\vec{E} = 0$, $\vec{B} \neq 0$ then it is possible if $\vec{v} \parallel \vec{B}$

40. Answer (4)

Hint : $B_{\text{centre}} = \frac{\mu_0 n I}{2R}$

Sol. : $\ell = 2\pi R \cdot n \Rightarrow R = \frac{\ell}{2\pi n}$

So $B = \frac{\mu_0 n I \cdot 2\pi n}{2 \cdot \ell} = \frac{\mu_0 \pi I n^2}{\ell}$

B is minimum if $n = 1$

41. Answer (4)

Hint : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2$

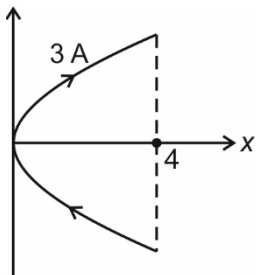
Sol. : $\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2$

$$= \frac{\mu_0}{4\pi} \frac{I 2\theta}{R} (-\hat{k}) + \frac{\mu_0}{4\pi} \frac{2I \cdot \theta}{R} \hat{k}$$

= Zero

42. Answer (4)

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



At $x = 4$

$$y^2 = 4x = 4^2$$

$$y = \pm 4$$

$$\Rightarrow \vec{L}_{\text{eff}} = 8\hat{j}$$

Force on current carrying conductor

$$\vec{F} = I \vec{L}_{\text{eff}} \times \vec{B}$$

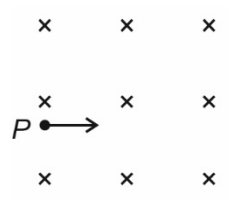
$$= 3 \times 8\hat{j} \times 4(-\hat{k})$$

$$\vec{F} = 96(-\hat{i}) \text{ N}$$

43. Answer (1)

Hint : $R \leq L$ (R : Radius = $\frac{mv}{qB}$)

Sol. : Particle moves in circular path with radius R .



To just miss the screen,

$$R = L$$

$$\Rightarrow \frac{mv_0}{qB} = L$$

$$\Rightarrow B = \frac{v_0}{L(q/m)} = \frac{v_0}{L\alpha}$$

So, to not hit the screen

$$B \leq \frac{v_0}{L\alpha}$$

44. Answer (3)

Hint & Sol. : Work done by magnetic field on a charged particle is zero hence there is no change in K.E.

45. Answer (2)

Hint & Sol. : Force acting on charged particle in magnetic field $\vec{F} = q(\vec{v} \times \vec{B})$

acceleration $\vec{a} = \frac{\vec{F}}{m} = \frac{q(\vec{v} \times \vec{B})}{m}$

[CHEMISTRY]

46. Answer (1)

Hint : Higher the effective nuclear charge, higher is the enthalpy of atomization.

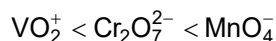
Sol. :

Element	Mn	Fe	Co	Ni
$\Delta H_a(\text{kJ/mol})$	279	418	427	431

47. Answer (2)

Hint : Greater the standard reduction potential greater is the oxidising power.

Sol. : Oxidising power order :



48. Answer (3)

Hint : Metal oxides in highest oxidation state are generally acidic.

Sol. :

Oxide :	V_2O_3	Cr_2O_3	Mn_2O_7	CrO
Nature :	basic	amphoteric	acidic	basic

49. Answer (3)

Hint : Higher the charge density of cation higher the polarising power.

50. Answer (1)

Hint : Li^+ has maximum hydration enthalpy among alkali metal ions.

51. Answer (2)

Hint : All enzymes that utilise ATP in phosphate transfer require magnesium as cofactor.

52. Answer (4)

Hint : Maximum coordination number of beryllium is four.

53. Answer (4)

Hint : Down the group metallic radius increases.

54. Answer (1)

Hint : NaNO_3 is Chile saltpetre.

55. Answer (1)

Hint : Monodentate ligand which can donate electrons through two different atoms is called ambidentate ligand.

56. Answer (3)

Hint : In ionisation isomerism the counter ion in a complex salt is itself a ligand and can displace a ligand which can then become a counter ion.

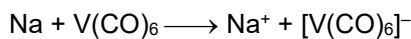
57. Answer (4)

Hint : Complex of type (MX_5Y) will not show stereoisomerism.

58. Answer (3)

Hint : Stable metal carbonyls follow 18 electron rule in outermost shell.

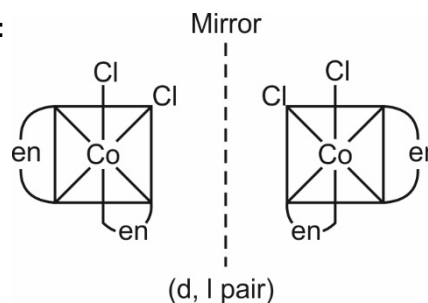
Sol. : $\text{V}(\text{CO})_6$ will accept an electron from sodium and will form $[\text{V}(\text{CO})_6]^-$, an 18 electron species



59. Answer (1)

Hint : Centre of symmetry and plane of symmetry are absent in $\text{cis}[\text{Co}(\text{en})_2\text{Cl}_2]^+$.

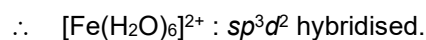
Sol. :



60. Answer (1)

Hint : In outer orbital complex $4d$ -orbitals are used for bonding.

Sol. : Low charge on metal and weak field ligand leads to the formation of outer orbital complex.



61. Answer (3)

Hint : Octahedral complex of cobalt will contain six ligands in the complex.

Sol. : Octahedral complex of $\text{CoCl}_3 \cdot 5\text{NH}_3$ will be $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ which has two ionizable chloride ions.

62. Answer (1)

Hint : Wilkinson catalyst is $[(\text{Ph}_3\text{P})_3\text{RhCl}]$.

63. Answer (2)

Hint : $\bar{\text{C}}\text{N}$ is a powerful trans director while H_2O shows poor trans effect.

64. Answer (3)

Hint : IUPAC name of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is hexaamminecobalt(III) chloride.

65. Answer (2)

Hint : CO , $\bar{\text{C}}\text{N}$ and NO^+ are π -acid ligands.

66. Answer (4)

Hint : Lower the value of Δ_0 , higher will the wavelength absorbed.

Sol. : Correct order of ligand field strength $\bar{\text{CN}} > \text{en} > \text{H}_2\text{O}$.

$\therefore \Delta_0$ will be highest for $\bar{\text{CN}}$ and lowest for H_2O .

67. Answer (2)

Hint : Thorium (Th) exhibits only +4 oxidation state.

68. Answer (4)

Hint : Interstitial compounds conduct electricity.

69. Answer (3)

Hint : Higher the effective nuclear charge of lanthanoid ions lower is the basic nature of their hydroxide.

Sol. : Basic nature order : $\text{Ce}(\text{OH})_3 > \text{Gd}(\text{OH})_3 > \text{Tb}(\text{OH})_3 > \text{Er}(\text{OH})_3$.

70. Answer (3)

Hint : Transition metal ions which contain unpaired d-electrons are coloured.

Sol. : Ions	Number of unpaired electron
Sc^{3+}	0
Ti^{3+}	1
V^{3+}	2
Zn^{2+}	0
Mn^{2+}	5
Ti^{4+}	0
Ni^{2+}	2

71. Answer (3)

Hint : More the number of unpaired electrons, more will be the value of spin only magnetic moment.

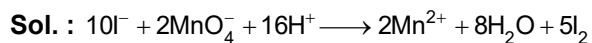
Sol. : Ions	Number of unpaired electrons
Mn^{2+}	5
Fe^{2+}	4
Co^{2+}	3
Ni^{2+}	2

72. Answer (1)

Hint : Mn shows highest number of oxidation state.

73. Answer (4)

Hint : Acidified permanganate solution oxidises iodide to iodine.



74. Answer (4)

Hint : Standard reduction potential of $(\text{Cu}^{2+}/\text{Cu})$ redox couple is positive.

Sol. :	Mn^{2+}/Mn	Ti^{2+}/Ti	Ni^{2+}/Ni	Cu^{2+}/Cu
E° (in volts)	-1.18	-1.63	-0.25	+0.34

75. Answer (4)

Hint : Higher the charge density of ion, higher is hydration enthalpy.

Sol. : Ions	Hydration enthalpy (kJ mol⁻¹)
Mn^{2+}	-1862
Fe^{2+}	-1998
Co^{2+}	-2079
Ni^{2+}	-2121

76. Answer (2)

Hint : Symmetrically filled t_{2g} and e_g orbitals do not show Jahn-Teller effect.

77. Answer (4)

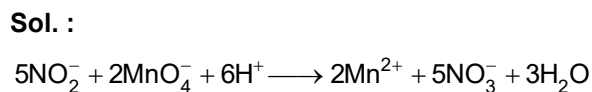
Hint : Outer electronic configuration of lanthanoids is $(n-2)f^{1-14}(n-1)d^{0-1}ns^2$.

Sol. : Ions	Outer electronic configuration
Ce^{3+}	$4f^1$
Nd^{3+}	$4f^3$
Sm^{2+}	$4f^6$
Yb^{2+}	$4f^{14}$

No unpaired electrons are present in Yb^{2+} , hence Yb^{2+} is a diamagnetic species.

78. Answer (3)

Hint : Permanganate ion oxidises nitrite to nitrate ion in acidic medium.



79. Answer (4)

Hint : Oxidation state of oxygen in peroxide is -1.

Sol. : Na_2O_2 and BaO_2 are peroxide.

80. Answer (4)

Hint : Magnesium is bigger in size than beryllium.

Sol. :	Be	Mg
IE ₁ (kJ/mol)	899	737
IE ₂ (kJ/mol)	1757	1450

81. Answer (1)

Hint : Thermal stability of carbonate increases with increasing size of alkaline earth metal cation.

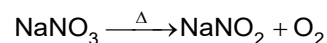
82. Answer (1)

Hint : Hydration enthalpy of Mg²⁺ ion is high.**Sol. :** Down the group the hydration enthalpy decreases hence solubility of alkaline earth metal sulphate decreases.

83. Answer (2)

Hint : Higher the lattice energy, higher the melting point.

84. Answer (3)

Hint : Lithium nitrate on heating gives NO₂ gas.**Sol. :** Nitrate of group II elements on heating give NO₂ gas. NaNO₃ on heating gives NaNO₂ and O₂

85. Answer (4)

Hint : Smaller the size of ion greater is hydration.

86. Answer (3)

Hint : Down the group basic nature of group II metal oxides increases.

87. Answer (3)

Hint : Higher the negative charge on metal carbonyl, stronger is the back donation of electron from metal to ligand.**Sol. :** Back donation of electron from metal to the vacant π^* orbital of CO takes place hence bond order of CO decreases and bond length increases. More electron density on metal increases back donation.

88. Answer (4)

Hint : High spin octahedral complex having five unpaired electrons will have zero CFSE value.

89. Answer (4)

Hint : Pt(II) usually forms square planar complex.

90. Answer (4)

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

n = number of unpaired electrons

Sol. : [FeF₆]³⁻ has 5 unpaired electrons

$$\mu = \sqrt{5(5+2)} = 5.92 \text{ BM}$$

[BIOLOGY]

91. Answer (2)

Sol. : In translation process, chain elongation requires energy in the form of GTP.

92. Answer (2)

Hint : The genes which always express themselves are known as constitutive genes.**Sol. :** Luxury genes are non-constitutive genes. These are not always expressing genes.

93. Answer (2)

Sol. : Three steps required for the formation of biogas are solubilisation, acidogenesis and methanogenesis.

94. Answer (1)

Sol. : 'Roquefort cheese' is ripened by growing a fungi on it i.e. *Penicillium roquefortii*.

95. Answer (2)

Sol. : 'Toddy' is a fermented sap obtained from palm plant.

96. Answer (4)

Sol. : Conversion of milk into curd is not an aerobic process. Fermentation is an anaerobic process.

97. Answer (1)

Sol. : The fungi which form ectomycorrhizae usually belongs to Basidiomycetes.

98. Answer (4)

Hint : Severo Ochoa enzyme is helpful in polymerising RNA with defined sequences in a template independent manner.**Sol. :** Severo Ochoa enzyme is functionally a polynucleotide phosphorylase.

99. Answer (3)

Sol. : In human genome, repeated sequence make up very large portion.

100. Answer (3)

Sol. : The size of VNTR varies from 0.1 to 20 kb.

101. Answer (2)

Hint : In *lac* operon, lactose itself stimulates the production of required enzymes thus it is inducible system. In *lac* operon regulator gene is functional all the time.

Sol. : The gene which is functional all the time is called constitutive gene.

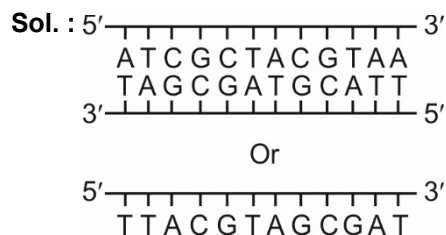
102. Answer (3)

Hint : In prokaryotes, structural gene is not a split gene.

Sol. : In bacteria, post transcriptional modification is not required.

103. Answer (1)

Hint : Coding strand is complementary of template strand.



104. Answer (2)

Hint : Some amino acids are coded by one codon only. Such codons are non-degenerate codons.

Sol. : UAA does not specify any amino acids and it is a stop codon. It is also called nonsense codon.

105. Answer (4)

Hints : In eukaryotes, structural genes have interrupted coding sequences. Expressed sequences are exons.

Sol. : In eukaryotes, structural genes synthesise one type of polypeptide, hence it is monocistronic.

106. Answer (2)

Sol. : 3D structure of tRNA is inverted L-shaped.

107. Answer (1)

Sol. : Genetic code may degenerate i.e. one amino acid may be coded by more than one codons.

108. Answer (3)

Hint : In DNA molecule $\frac{A + G}{C + T} = 1$ (Chargaff's rule)

Sol. : In DNA, C = G and A = T

If C = 30% then G will be 30%

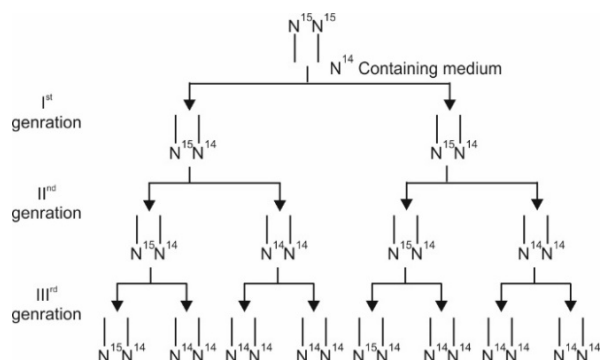
C + G = 60%

Hence, A + T = 40%

Then $A = \frac{40}{2} = 20\%$

109. Answer (1)

Sol. :



$N^{15}N^{14}$ -hybrid, $N^{14}N^{14}$ -light, $N^{15}N^{15}$ -heavy

Total 8 molecules

2 hybrid = $\frac{2}{8} \times 100 = 25\%$

6 light = $\frac{6}{8} \times 100 = 75\%$

0 heavy = 0%

110. Answer (2)

Hint : In biogas, major percent is of marsh gas.

Sol. : Biogas predominantly contains methane (Marsh gas).

111. Answer (2)

Sol. : Statin is a blood cholesterol lowering agent. BOD is a measure of polluting potential of waste water hence greater the BOD of waste water, more is its polluting potential.

During primary treatment of waste water, suspended solids are removed by sedimentation process.

Streptokinase is used as 'clot buster'.

112. Answer (2)

Sol. : Penicillin as an effective antibiotic was first established by Ernst Chain and Howard Florey.

113. Answer (3)

Hint : It is a fungus, which is very common in root ecosystems and effective against pathogens.

Sol. : This fungus is *Trichoderma polysporum*.

114. Answer (4)

Sol. :

Aspergillus niger – Citric acid and pectinase

Clostridium butylicum – Butyric acid

Acetobacter aceti – Acetic acid

115. Answer (1)

Sol. : Removal of small and large particles and floating debris from sewage is done under primary treatment by filtration and sedimentation.

116. Answer (2)

Hint : Biogas production is carried out by some microbes in anaerobic condition.

Sol. : During sewage treatment in anaerobic sludge digester, methanogenic bacteria produce biogas. This is known as biological treatment of sewage.

117. Answer (3)

Hint : *Fusarium*, *Agaricus* and *Candida utilis* are fungi.

Sol. : *Methylophilus methylotrophus* is a bacterial source of single cell protein (SCP).

118. Answer (2)

Sol. : Himgiri, a wheat variety is resistant to hill bunt disease.

119. Answer (2)

Sol. : IR-24 is a variety of rice.

120. Answer (4)

Hint : Naked protoplasts are fused either by electrofusion or chemofusion for the formation of somatic hybrid.

Sol. : Electrofusion is done by using high frequency alternating electric field with short current pulse. For chemofusion sodium nitrate and polyethylene glycol (PEG) are used.

121. Answer (4)

Sol. : Ratna is better yielding semi dwarf variety of rice. Rest of the varieties are biofortified.

122. Answer (4)

Sol. : All rRNA synthesis is catalyzed by RNA polymerase I in eukaryotes but exceptionally 5S rRNA synthesis is catalyzed by RNA polymerase III.

123. Answer (2)

Hint : Nucleus is present in eukaryotic cell.

Sol. : In eukaryotes, transcribing enzyme i.e., RNA polymerase is of three types.

124. Answer (2)

Hint : Split gene arrangement is characteristic of eukaryotes. Promotor has RNA polymerase recognition sequences.

Sol. : In prokaryotes structural gene is polycistronic which synthesises different polypeptides.

125. Answer (4)

Hint : A molecule which acts as genetic material should provide the scope of slow mutation.

Sol. : A molecule that acts as genetic material should be chemically and structurally stable. It should also have capacity of replication and controlling cell structure and function.

126. Answer (1)

Hint : Replication begins at a particular region of DNA which is called origin of replication (Ori).

Sol. : For propagation of a piece of DNA during recombinant DNA procedure, vector is required because it provides 'Ori'.

127. Answer (3)

Hint : During translation, the rate of peptide bond formation is enhanced by a catalyst known as peptidyl transferase, which is a ribozyme.

Sol. : In prokaryotes, this ribozyme is 23S rRNA and in eukaryotes it is 28S rRNA.

128. Answer (2)

Hint : In a triplet codon, each base can be replaced by three other bases.

Sol. : Each triplet codon thus have nine replacement probabilities then $3^3 = 27$ substitutions are possible.

129. Answer (3)

Hint : *Azotobacter* is a free living N_2 fixing bacteria.

Sol. : – BGA are able to fix atmospheric N_2 , hence increase soil fertility.

– IPM is an integration of tactics for economic control of pests.

– VAM (Endomycorrhizae) helps in phosphorus nutrition in plants.

130. Answer (4)

Sol. : Mutational variety of mung bean is resistant to yellow mosaic virus and powdery mildew.

131. Answer (1)

Sol. :

- Ladybird is useful in controlling aphids.
- Baculovirus has species specific, narrow spectrum insecticidal application

132. Answer (4)

Sol. : Statin – Obtained from a yeast (*Monascus purpureus*)

Cyclosporin A – Produced by the fungus *Trichoderma polysporum*

Clot buster – Streptokinase, obtained from bacterium *Streptococcus*

133. Answer (3)

Sol. : Griffith performed experiment on bacterium *Streptococcus pneumoniae* (*Pneumococcus*)

134. Answer (2)

Sol. : Avery, Macleod and McCarty by an experiment concluded that DNA is the hereditary material.

135. Answer (2)

Hint : In double helix structure of DNA, bases in two strands are paired through hydrogen bonds.

Sol. : A nitrogenous base is linked to the OH of 1'C of pentose sugar through a N-glycosidic linkage. This linkage does not confer stability to the helical structure of DNA.

136. Answer (1)

Hint : It is sexually transmitted.

Sol. : Hepatitis B is a viral disease caused by HBV whose primary symptom is inflammation of liver.

137. Answer (2)

Hint : Loss of contact inhibition is seen

Sol. : Vinblastine and cisplatin are anticancer drugs used in the treatment of cancer.

138. Answer (4)

Hint : Leukemia is commonly called blood cancer.

Sol. : Lymphoma is a cancer of the lymphatic system. The main types of lymphoma are Hodgkin's and Non-Hodgkin's lymphoma.

139. Answer (2)

Hint : This bacteria affects the lungs.

Sol. : Bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for the disease pneumonia in humans.

140. Answer (2)

Hint : Select a carnivorous dinosaur

Sol. : *Triceratops* – 3 horned
Herbivore

Stegosaurus – Plate backed and spikes at end of tail
Herbivore

Brachiosaurus – Quadruped with long tail
Herbivore

Tyrannosaurus – Bipedal
Carnivore

141. Answer (3)

Hint : Type of genetic drift.

Sol. : Genetic drift is a non directional factor that causes a change in gene frequency by chance in a small population. It has two ramifications-neck effect and founder's effect.

Bottle neck effect decreases genetic variability in a population.

142. Answer (1)

Hint : This antibody is smallest in size.

Sol. : IgG antibodies can cross the placental barrier. IgA is present in colostrum.

143. Answer (3)

Hint : Silurian and Devonian periods are included in Paleozoic era.

Sol. : *Zosterophyllum* diverged from tracheophyte ancestors in the silurian period. Angiosperms are the dominating land plants in the present era.

144. Answer (1)

Hint : Missing links include extinct organisms.

Sol. : *Archaeopteryx* is a missing link which displays both avian and reptilian characteristics.

145. Answer (3)

Hint : It is a function of B-cells.

Sol. : Production of antibodies is carried out by B-lymphocytes and plasma cells. Activation of B-lymphocytes is carried out by antigen as well as by lymphokines secreted by T-helper cells.

146. Answer (1)
Hint : Ganja can also be obtained from this source.
Sol. : Heroin is an acetylated form of Morphine. Cocaine is extracted from *Erythroxylum coca*.
147. Answer (2)
Hint : None of the finches are scavengers.
Sol. : The Finch species of Galapagos islands are grouped according to their food source. Seeds, insects and tree buds are categorized as Finch foods, however detritus is not a Finch food source.
148. Answer (3)
Hint : SARS-CoV causes SARS.
Sol. : SARS is caused by a virus related to corona virus. It is characterized by fever, muscle pain and headache.
149. Answer (1)
Hint : Histamine causes vasodilatation.
Sol. : Inflammation due to insect bite is triggered by histamine and kinins. Dopamine is a neurotransmitter.
150. Answer (2)
Hint : Malaria is transmitted by female *Anopheles* mosquito.
Sol. : Japanese encephalitis and filariasis are transmitted by bite of infected *Culex* mosquito. *Anopheles* and *Aedes* transmit malaria and dengue respectively.
151. Answer (1)
Hint : These cells have CD₄ receptors.
Sol. : HIV causing AIDS first destroys helper T-cells by infection macrophages act like HIV factory which survive after infection while viruses being replicated are released.
152. Answer (2)
Hint : The primitive earth's atmosphere was reducing in nature.
Sol. : According to Oparin, oxygen was absent in primitive atmosphere of earth in free form. It was reducing in nature which favoured conditions for origin of life.
153. Answer (3)
Hint : Select the filarial worm.
Sol. : *Wuchereria* causes a chronic inflammation of lymphatic vessels called Elephantiasis or filariasis. Ringworm is a fungal disease.
154. Answer (3)
Hint : Its acetylation produces heroin.
Sol. : Morphine is obtained from latex of poppy plant and is an effective sedative and pain killer.
155. Answer (3)
Hint : Embryological evidence of evolution.
Sol. : Biogenetic law states that "Ontogeny recapitulates Phylogeny" and it was proposed by Ernst Haeckel.
156. Answer (3)
Hint : A connecting link has features belonging to members of two taxa.
Sol. : *Chimaera* is a cartilaginous fish with several bony fish characters such as presence of operculum.
157. Answer (2)
Hint : They were probably not taller than 4 feet but walked upright.
Sol. : Diet of *Australopithecus* was mainly fruits and they sometimes used stones as weapons. Few of their fossils were found in Ethiopia and Tanzania.
158. Answer (3)
Hint : Electric discharge produced high temperature.
Sol. : A temperature of 800°C was produced in Miller's experiment.
159. Answer (3)
Hint : This era is also called 'Age of conifers'
Sol. : Mesozoic era is that interval of geological time scale that occurred about 252 to 66 million years ago. It is also called age of reptiles and age of conifers. Jurassic is a period of geological time scale.
160. Answer (2)
Hint : Mutations lead to speciation
Sol. : Zero evolution occurs if disturbing factors such as selective mating and mutations are absent.

161. Answer (2)
Hint : This technique measures the amount of unpaired electrons in crystalline structures.
Sol. : Electron spin resonance method is one of the most accurate methods of dating fossils. The age of substance can be determined by measuring the dosage of radiation since the time of its formation.
162. Answer (2)
Hint : Phenotype of an organism is selected.
Sol. : The unit of evolution is now recognised as population. Most species are subdivided into local populations with varying degrees of reproductive isolation.
163. Answer (4)
Hint : This is the most important cause of variations.
Sol. : Hugo de Vries believed that single step large mutations caused evolution and termed them as saltation. Mutations are random and non-directional.
164. Answer (3)
Hint : This type of competition occurs between the species.
Sol. : Interspecific competition can result in divergent evolution which leads to organic evolution.
165. Answer (3)
Hint : Crossing over.
Sol. : Genetic diversity is most commonly caused by recombination in which pieces of DNA are broken and recombined to produce a new combination of alleles.
166. Answer (4)
Hint : Competitive exclusion principle.
Sol. : Gause's Law is also called competitive exclusion principle as it states that no two organisms can indefinitely occupy the same habitat if they have similar ecological requirements like food, shelter etc.
167. Answer (1)
Hint : In karyotyping chromosomes are arranged by their size and appearance.
Sol. : Mitochondrial DNA and Y chromosome are being used extensively by molecular paleoanthropologists to reconstruct human lineages.
168. Answer (1)
Hint : *Ascariasis* is caused by faeco-oral route.
Sol. : *Ascariasis* occurs by consumption of contaminated food and water containing embryonated eggs of *Ascaris*.
169. Answer (2)
Hint : It is a protein based technique.
Sol. : ELISA is enzyme linked immunosorbent assay for diagnosis of AIDS by detecting and measuring antibodies in blood. Western blot is confirmatory test for AIDS.
170. Answer (3)
Hint : It is caused by deficiency of enzyme protects RBCs from damage.
Sol. : Glucose-6-phosphate dehydrogenase deficiency in an individual causes RBC destruction which provides protection against infection by *Plasmodium*. This is a form of balancing selection.
171. Answer (3)
Hint : Analogy is based on convergent evolution.
Sol. : Homology is based on divergent evolution and Analogy is based on convergent evolution.
172. Answer (3)
Hint : Analogous structures perform the same function.
Sol. : Both malpighian tubules and flame cells perform the function of excretion.
173. Answer (2)
Hint : Tail is non-functional in humans.
Sol. : Atavism or reversion refers to the sudden reappearance of some ancestral features or non-functional organs.
174. Answer (3)
Hint : This is also called progressive selection.
Sol. : In directional change more individuals acquire value other than mean character value. Directional type of natural selection supports an advantageous phenotype over the others and causes a shift from the mean character value towards one extreme.

175. Answer (2)

Hint : Isolation that relates to reproduction.

Sol. : Geographical isolation leads to Allopatric speciation. Sympatric speciation occurs when species develop due to members of a population occupying different ecological zones in the same geographical area.

176. Answer (3)

Hint : It shows similar effects as charas.

Sol. : *Datura* is a flowering plant that contains psychedelic compounds including atropine.

177. Answer (4)

Hint : Tasmanian wolf and wolf exhibit convergent evolution.

Sol. :

MARSUPIALS	PLACENTAL
Marsupial mouse	Mouse
Flying phalanger	Flying squirrel
Numbat	Anteater
Tasmanian wolf	Wolf

178. Answer (3)

Hint : Each antibody monomer has two antigen binding sites.

Sol. : IgM is a pentamer made up of five antibody monomers. Therefore it has a total of ten antigen binding sites called paratopes.

179. Answer (2)

Hint : Vaccine provides artificial active immunity.

Sol. : Toxoid are neutralised toxins. They provide artificial active immunity by triggering the B- lymphocytes to produce antibodies.

180. Answer (2)

Hint : This concept was proposed by Fritz Muller.

Sol. : When two or more inedible or unpalatable species resemble each other the mimicry is termed Mullerian mimicry. A form of mimicry in which an edible species resembles an inedible one is Batesian mimicry.

