



Aakash

Medical | IIT-JEE | Foundations

Corporate Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456



AIM - 720

(Advanced INTENSIVE Mastery for 720)

MM : 720

CST-5

Time : 3 Hrs. 20 Min.

Answers

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

09/04/2024



CODE-A



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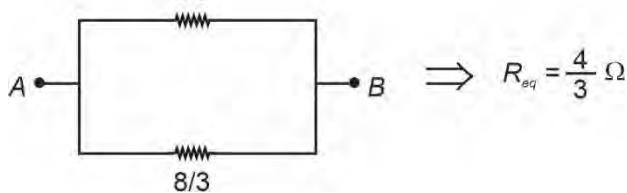
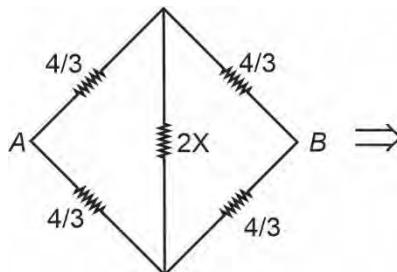
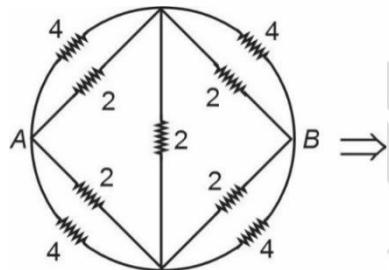
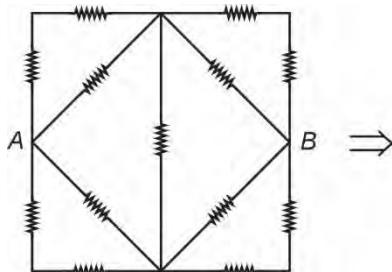
Time : 3 Hrs. 20 Min.

Answers & Solutions

PHYSICS

SECTION-A

1. Answer (1)



2. Answer (3)

$$V = \varepsilon - i r$$

$$i = \frac{\varepsilon}{R_{eq}} = \frac{3}{1+0.5} = 2 \text{ A}$$

$$\therefore V = 3 - (2 \times 0.5) = 2 \text{ V}$$

3. Answer (2)

$$\text{Force on a current wire } \vec{F} = \int i d\vec{l} \times \vec{B}$$

Since, magnetic field is uniform

$$\therefore \vec{F} = i (\Delta \vec{l} \times \vec{B})$$

$$\Delta \vec{l} = 3\hat{i} + 4\hat{j}$$

$$\therefore \vec{F} = 0.3 [(3\hat{i} + 4\hat{j}) \times 2(-\hat{k})]$$

$$\vec{F} = 0.3(6\hat{j} - 8\hat{i})$$

$$|\vec{F}| = 0.3\sqrt{6^2 + 8^2} = 3 \text{ N}$$

4. Answer (3)

In a moving coil galvanometer, the current flowing through it is directly proportional to the deflection.

$$\therefore i \propto \theta$$

5. Answer (1)

$$\text{We know } \chi_m = \frac{I}{H} = \frac{2000}{4} = 500$$

6. Answer (4)

$$V = \frac{ds}{dt} = 9t^2 + 14t$$

$$V \text{ at } t = 1 = 23 \text{ m/s}$$

7. Answer (3)

Using Galileo's ratio we can say that if displacement travelled by car in first two seconds is K then displacement covered in next two seconds will be $3K$. Hence, the ratio will be $1 : 3$.

8. Answer (1)

$x = 6t \Rightarrow v_x = 6 \text{ m/s}$ and $y = 8t - 5t^2 \Rightarrow v_y = 8 - 10t$
at, $t = 0$, $v_x = 6 \text{ m/s}$ and $v_y = 8 \text{ m/s}$

$$\Rightarrow \tan\theta = \frac{v_y}{v_x} = \frac{8}{6} = \frac{4}{3} \Rightarrow \theta = 53^\circ$$

9. Answer (2)

The force F is necessary to just hold a block,

$$\Rightarrow mg = (f)_{\max} = \mu F$$

\Rightarrow Weight of block = μF

10. Answer (2)

$$P_0 = \frac{1}{3} \times \frac{m'N}{V} \times (v_{rms})^2$$

$$P = \frac{1}{3} \times \frac{2m'N}{V} \times \frac{(v_{rms})^2}{4} = \frac{P_0}{2}$$

11. Answer (4)

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

$$\Rightarrow \Delta x = \frac{\lambda}{2\pi} \phi$$

12. Answer (2)

$$i = e = \frac{3}{4} A$$

$$\begin{aligned} \delta_{\min} &= i + e - A \\ &= 2i - A \\ &= 2 \times \frac{3}{4} A - A \\ &= \frac{A}{2} = \frac{60^\circ}{2} \\ &= 30^\circ \end{aligned}$$

13. Answer (4)

$$q = CV$$

$$\frac{dq}{dt} = C \frac{dV}{dt}$$

$$\begin{aligned} I_D &= 5 \times 10^{-6} \times 10^7 \\ &= 50 \text{ A} \end{aligned}$$

14. Answer (3)

$$\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2}$$

$$\frac{1}{f_{eq}} = \frac{1}{20} + \frac{1}{40}$$

$$\frac{1}{f_{eq}} = \frac{3}{40}$$

$$\Rightarrow f_{eq} = \frac{40}{3} \text{ cm}$$

15. Answer (3)

$$P = \frac{E}{c}$$

$$P = \frac{9 \times 10^6}{3 \times 10^8} \text{ eV s m}^{-1}$$

$$P = 0.03 \text{ eV s m}^{-1}$$

16. Answer (2)

Alpha particle is basically helium nucleus (${}^4_2\text{He}$)

17. Answer (2)

The diode get reverse biased. No current flows through the upper branch

$$R_{AB} = 10 \Omega$$

18. Answer (3)

Zener diode are heavily doped p-n junction diodes which are used in reverse bias and can be used as voltage regulators

19. Answer (2)

$$w = \int_0^1 F \cdot dx$$

$$= \left[20x + 20 \frac{x^2}{2} \right]_0^1 \text{ J}$$

$$= [20x + 10x^2]_0^1 \text{ J}$$

$$= [20 + 10] \text{ J}$$

$$= 30 \text{ J}$$

20. Answer (3)

$$mv = 2mv'$$

$$v' = \frac{v}{2}$$

$$e = \frac{v/2}{v} = \frac{1}{2}$$

21. Answer (3)

$$\phi = BA \cos\theta$$

$$= BA \cos 60^\circ$$

$$\text{emf} = \frac{\Delta\phi}{\Delta t} = \frac{A}{2} \left[\frac{3B_0 - B_0}{t} \right] = \frac{AB_0}{t}$$

22. Answer (4)

The impedance is measured in ohm.

23. Answer (4)

0.205 has least number of digits after decimal and it is equal to 3 which is obtained in option (4).

24. Answer (3)

 v = volume of ice-berg outside sea water V = total volume of ice-berg

$$\therefore 0.91V = 2.03(V - v)$$

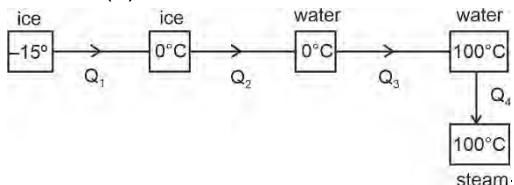
$$0.91V = 2.03V - 2.03v$$

$$2.03v = (2.03 - 0.91)V$$

$$\frac{v}{V} = \frac{1.12}{2.03}$$

$$\frac{v}{V} \times 100 = \frac{1.12}{2.03} \times 100 \approx 55\%$$

25. Answer (2)



$$Q_1 = mc_{\text{ice}}(T_f - T_i)$$

$$= 8 \times 0.5 [0 - (-15)] = 60 \text{ cal}$$

$$Q_2 = mL_f = 8 \times 80 = 640 \text{ cal}$$

$$Q_3 = mc_{\text{water}} \times (T_f - T_i) = 8 \times 1[100 - 0] = 800 \text{ cal}$$

$$Q_3 = mL_v = 8 \times 540 = 4320 \text{ cal}$$

$$\text{Net heat required } Q = Q_1 + Q_2 + Q_3 + Q_4 = 5820 \text{ cal}$$

26. Answer (4)

The value of specific heat capacity for isothermal process is infinity.

27. Answer (2)

$$W = 200 \times 10^3 (100 - 300) \times 10^{-6} = -40 \text{ J}$$

28. Answer (4)

$$\text{We know, } F = \frac{YA\Delta I}{l}$$

$$\frac{F_1}{F_2} = \frac{A_1 l_2}{A_2 l_1} = \frac{r_1^2}{r_2^2} \left(\frac{l_2}{l_1} \right)$$

$$\therefore \frac{F_1}{F_2} = \left(\frac{4}{1} \right) \times \left(\frac{1}{4} \right) = 1 : 1$$

29. Answer (1)

Newton's law of gravitation in vector form is given by

$$\vec{F} = \frac{-Gm_1 m_2 \hat{r}}{r^2} \text{ or } \vec{F} = \frac{-Gm_1 m_2 \vec{r}}{r^3}$$

30. Answer (1)

By definition, COM of two particles lies on the line joining them and is located somewhere between them.

31. Answer (1)

$$(I)_{\text{Ring}} = MR^2$$

$$(I)_{\text{Disk}} = \frac{MR^2}{2}$$

$$(I)_{\text{sphere}} = \frac{2}{5} MR^2$$

$$(I)_{\text{shell}} = \frac{2}{3} MR^2$$

32. Answer (1)

$$F = qE$$

$$E = \frac{40}{4}$$

$$= 10 \text{ N/C}$$

Force on negative charges will be opposite to electric field.

33. Answer (4)

$$C = 4\pi\epsilon_0 R$$

$$C \propto R$$

34. Answer (3)

$$2x = v \times t_1$$

$$x = \frac{340 \times 2}{2} = 340 \text{ m}$$

$$2(d - x) = v \times t_2$$

$$2(d - 340) = 340 \times 3$$

$$d = 850 \text{ m}$$

35. Answer (1)

Potential energy of a body executing SHM

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

SECTION-B

36. Answer (4)

Bernoulli's equation is valid for steady, non-viscous and incompressible fluids.

37. Answer (2)

$$K_P = \frac{K_1 A_1 + K_2 A_2 + K_3 A_3}{A_1 + A_2 + A_3}$$

$$\text{if } A_1 = A_2 = A_3$$

$$\Rightarrow K_P = \frac{K_1 + K_2 + K_3}{3}$$

38. Answer (3)

$$r = r_0 \frac{n^2}{z}$$

$$r = 53 \frac{(2)^2}{3}$$

$$= 70.7 \text{ pm}$$

39. Answer (1)

Si diode is forward biased and Ge diode is reverse biased

$$V_0 = 15 - 0.7 = 14.3 \text{ V}$$

$$I = \frac{14.3}{8 \times 10^3} = 1.8 \text{ mA}$$

40. Answer (4)

$$|\Delta p| = 2mu \text{ and } N \times 2mu = Mg \Rightarrow M = \frac{2Nmu}{g}$$

41. Answer (4)

$$R = R_0 (1 + \alpha \Delta T)$$

Since the two wires are joined in series, then

$$R = R_0' (1 + \alpha_{\text{eff}} \Delta T) = R_1' + R_2'$$

$$(R_1 + R_2)(1 + \alpha_{\text{eff}} \Delta T) = R_1 (1 + \alpha_{\text{eff}} \Delta T) + R_2 (1 + \alpha_2 \Delta T)$$

$$(R_1 + R_2)(\alpha_{\text{eff}} \Delta T) = R_1 \alpha_1 \Delta T + R_2 \alpha_2 \Delta T$$

$$\alpha_{\text{eff}} = \frac{R_1 \alpha_1 + R_2 \alpha_2}{R_1 + R_2}$$

42. Answer (1)

$$\text{Pressure} = [ML^{-1}T^{-2}]$$

$$\text{Velocity} = [M^0 L^1 T^{-1}]$$

$$\text{Acceleration} = [M^0 L^1 T^{-2}]$$

$$\text{Force} = [M^1 L^1 T^{-2}]$$

43. Answer (1)

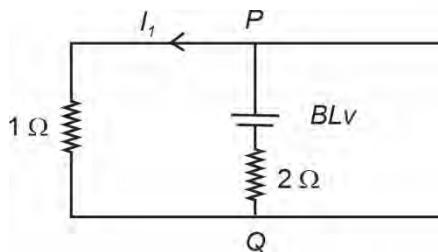
$$\tan \phi = \frac{V_L - V_C}{V_R}$$

$$= \frac{150 - 50}{100\sqrt{3}}$$

$$\tan \phi = \frac{100}{100\sqrt{3}} = \frac{1}{\sqrt{3}}$$

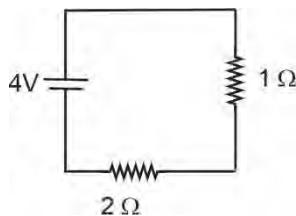
$$\phi = \tan^{-1} \left(\frac{1}{\sqrt{3}} \right) = 30^\circ$$

44. Answer (4)



$$\epsilon = 2 \times 1 \times 2$$

$$= 4 \text{ V}$$



$$i = \frac{4}{3} \text{ A}$$

$$P = V \cdot i = 4 \cdot \frac{4}{3} = \frac{16}{3} \text{ W}$$

45. Answer (3)

$$\text{Width of central maxima} = \frac{2\lambda D}{a}$$

$$= \frac{2 \times 500 \times 10^{-9} \times 2}{10^{-3}}$$

$$= 2 \times 10^{-3} \text{ m}$$

$$= 2 \text{ mm}$$

46. Answer (1)

$$P_{\text{eq}} = +5 \text{ D}$$

$$f_{\text{eq}} = \frac{1}{P_{\text{eq}}} = \frac{100}{5} \text{ cm}$$

$$f_{\text{eq}} = 20 \text{ cm}$$

$$\text{Magnifying power} = \frac{D}{f_{\text{eq}}} = \frac{25}{20} = 1.25$$

47. Answer (4)

COM of a rod with increasing density never lies at mid-point of rod

48. Answer (2)

For an orbiting satellite

K.E. is always positive

Total energy and potential energy are negative

49. Answer (2)

$$E = \frac{dV}{dx}$$

$$= \frac{20}{2 \times 10^{-2}}$$

$$= 1000 \text{ V/m}$$

50. Answer (3)

$$E_A = \frac{9 \times 10^9 \times (48 \times 10^{-12})}{(0.04)^2} = 270 \text{ N/C}$$

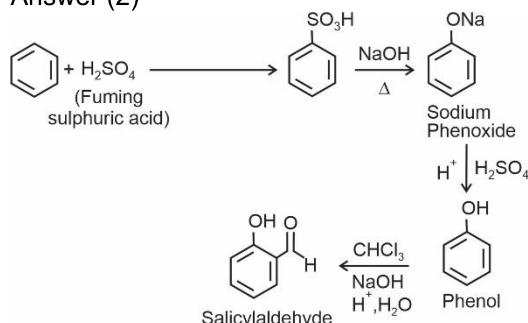
$$E_R = \frac{9 \times 10^9 \times (36 \times 10^{-12})}{(0.03)^2} = 360 \text{ N/C}$$

$$E = \sqrt{E_A^2 + E_B^2}$$

$$E = \sqrt{(270)^2 + (360)^2}$$

$$= 450 \text{ N/C}$$

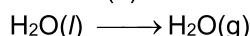
61. Answer (2)



62. Answer (2)

Oxygen donor like H_2O , $\text{C}_2\text{O}_4^{2-}$ are strong field ligand with Co^{3+}

63. Answer (2)



$$36 \text{ g} \quad 36 \text{ g}$$

$$\text{Moles of water} = \frac{36}{18} = 2 \text{ moles}$$

Heat supplied to evaporate 2 moles of water

$$\begin{aligned} &= n \times \Delta_{\text{vap}}\text{H}^\circ \\ &= 2 \text{ mol} \times 44.01 \text{ kJ mol}^{-1} \\ &= 88.02 \text{ kJ mol}^{-1} \end{aligned}$$

64. Answer (1)

$$K_p = K_c (\text{RT})^{\Delta n_g}$$

$$\frac{K_p}{K_c} = (\text{RT})^{\Delta n_g}$$

Lower the value of Δn_g , lower is the (K_p/K_c) ratio

$$\therefore \text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) \text{ has lowest } \frac{K_p}{K_c} \text{ value.}$$

65. Answer (3)

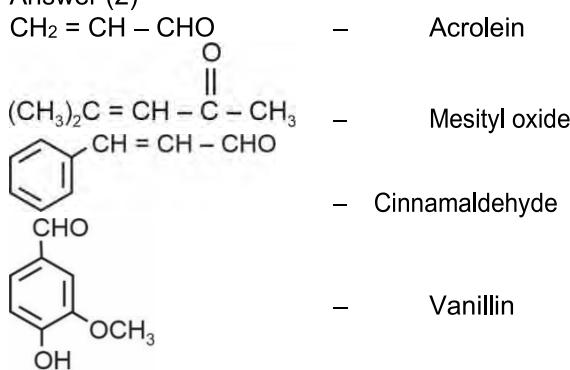
Concentration of each reactant and product

$$\begin{aligned} &= \frac{0.1 \text{ mole}}{0.5 \text{ L}} \\ &= 0.2 \text{ M} \end{aligned}$$

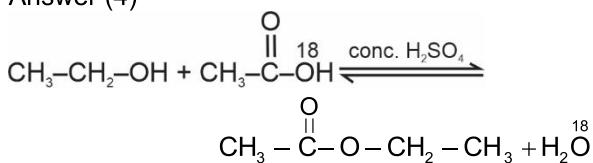
$$Q_c = \frac{[\text{C}]}{[\text{A}]^2 [\text{B}]} = \frac{[0.2]}{[0.2]^2 [0.2]} = \frac{0.2}{0.008} = 25$$

$Q_c < K_c$, equilibrium will shift to the forward direction.

66. Answer (2)



67. Answer (4)



68. Answer (1)

IUPAC official name of element with atomic number 104 is Rutherfordium.

69. Answer (2)

The correct order of affinity is
 $\text{S} > \text{Te} > \text{Po} > \text{O}$

70. Answer (4)

At cathode H^+ is reduced to H_2

At anode H_2O is oxidised to O_2

71. Answer (1)

Larger the size of anion, greater is the polarizability of anion which has greater covalent character.

72. Answer (4)

Due to lp-lp repulsion, bond angle of $\text{NH}_3 < \text{NH}_4^+$.

73. Answer (1)

$$\text{Relative lowering of vapour pressure} = \frac{p^\circ - p}{p^\circ}$$

$$\frac{p^\circ - p}{p^\circ} = \chi_{\text{solute}}$$

$$\text{Number of mole of solute} = \frac{3}{60} = 0.05$$

$$\text{Number of mole of solvent (water)} = \frac{45}{18} = 2.5$$

$$\frac{p^\circ - p}{p^\circ} = \frac{0.05}{0.05 + 2.5} = 0.02$$

74. Answer (2)

Molecular mass of ethanoic acid = 60 g mol^{-1}

$$\text{Number of moles} = \frac{15}{60} = 0.25$$

$$\Delta T_f = K_f \times m$$

$$\Delta T_f = \frac{K_f \times w_2 \times 1000}{M_2 \times w_1}$$

$$\Delta T_f = \frac{1.86 \times 15 \times 1000}{60 \times 500} = 0.93$$

$$i = \frac{\text{Observed colligative property}}{\text{Calculated colligative property}}$$

$$= \frac{1}{0.93} = 1.0753$$

75. Answer (4)

$$\text{Radius of } n^{\text{th}} \text{ orbit} (r_n) = r_0 \times \frac{n^2}{Z}$$

$$\text{Radius of Li}^{2+} \text{ in second orbit} = r_0 \times \frac{(2)^2}{3} = \frac{4r_0}{3}$$

$$\text{XeO}_3 = \frac{1}{2} \times [8 + 0 - 0 + 0] \\ = 4$$

V = number of valence electrons

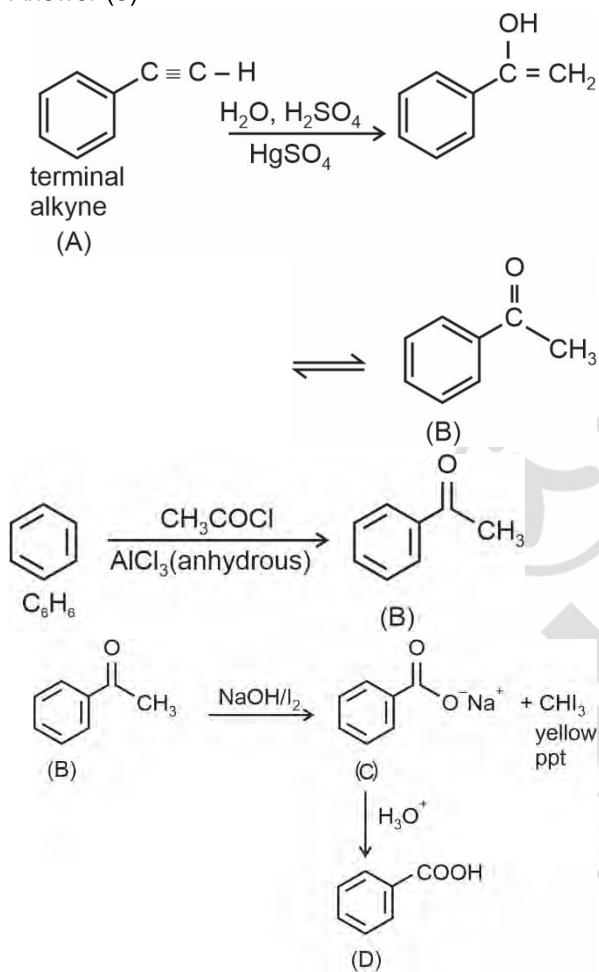
M = monovalent atoms

C = positive charge

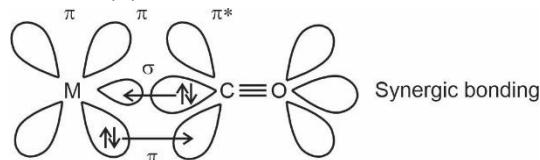
A = negative charge

\therefore The hybridization of XeO_3 is sp^3

90. Answer (3)



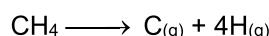
91. Answer (3)



Synergic bond is present between CO and metal in the complex

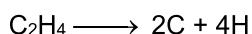
But in $M - C$, π bond is formed by donation of electrons from a filled d orbital of metal into vacant antibonding π^* orbital of carbon monoxide

92. Answer (4)



$$\Delta H_{\text{atom}} = x \text{ kcal mol}^{-1}$$

$$\Delta H_{1(\text{B.E})} = 4 \times \text{B.E}_{(\text{C}-\text{H})} \quad \dots \dots (1)$$



$$\Delta_{\text{atom}}\text{H} = y \text{ kcal mol}^{-1}$$

$$\Delta H_{2(\text{B.E})} = 4 \times \text{B.E}_{(\text{C}-\text{H})} + \text{B.E}_{(\text{C}=\text{C})} \quad \dots \dots (2)$$

From (1),

$$\text{B.E}_{(\text{C}-\text{H})} = \frac{x}{4}$$

Putting value of $\text{B.E}_{(\text{C}-\text{H})}$ in (2)

$$y = 4 \times \frac{x}{4} + \text{B.E}_{(\text{C}=\text{C})}$$

$$\text{B.E}_{(\text{C}=\text{C})} = (y - x) \text{ kcal mol}^{-1}$$

$$\text{B.E}_{(\text{C}=\text{C})} = (y - x) \times 4.18 \text{ kJ mol}^{-1}$$

93. Answer (4)



$$\text{moles of CH}_3\text{COONa} = [0.04 \text{ M}] \times [0.5 \text{ L}]$$

$$= 0.02 \text{ Moles}$$



$$\text{moles of CH}_3\text{COOH} = 0.02 \text{ moles}$$

$$\text{Concentration of CH}_3\text{COOH} = \frac{0.02 \text{ moles}}{1 \text{ L}}$$

$$= 0.02 \text{ M}$$

$$\text{Now } [\text{H}^+] = \sqrt{K_a \times C} = \sqrt{1.8 \times 10^{-5} \times 0.02}$$

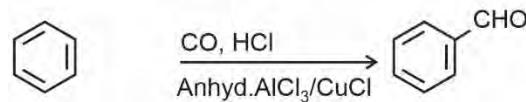
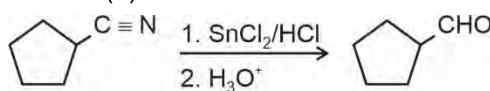
$$[\text{H}^+] = 6 \times 10^{-4}$$

$$\text{pH} = -\log (\text{H}^+)$$

$$\text{pH} = -\log [6 \times 10^{-4}]$$

$$= 3.22$$

94. Answer (1)



Aromatic aldehyde does not give positive Fehling test.

95. Answer (3)

$$m = zit$$

$$= \frac{63.5 \times 9.65 \times 50 \times 60}{2 \times 96500} = 9.525 \text{ g}$$

96. Answer (2)

According to MOT, $\text{O}_2, \text{O}_2^+, \text{O}_2^-, \text{N}_2^+$ has unpaired electron so they are paramagnetic

97. Answer (3)

$$\begin{aligned}\text{Energy of 1 photon} &= \frac{hc}{\lambda} \\ &= \frac{6.6 \times 10^{-34} \text{ Js} \times 3 \times 10^8 \text{ ms}}{795 \times 10^{-9} \text{ m}} \\ &= \frac{19.8 \times 10^{-17} \text{ J}}{795}\end{aligned}$$

Number of photons emitted per second

$$\begin{aligned}&= \frac{50 \text{ J/s} \times 795}{19.8 \times 10^{-17} \text{ J}} \\ &= 1.998 \times 10^{20} \\ &\approx 2 \times 10^{20} \text{ photons per second}\end{aligned}$$

98. Answer (4)

Sol. Cu^{2+} (aq) is more stable than Cu^+ (aq) due to much more negative $\Delta_{\text{hyd}} H^\circ$ of Cu^{2+} (aq) than Cu^+ (aq)

99. Answer (1)

0.1 M of 10 mL of $\text{H}_2\text{SO}_4 \equiv 0.1 \text{ M}$ of 20 mL of NH_3

As 1000 mL of 1M $\text{NH}_3 \equiv 14 \text{ g}$ of N

$$\therefore 20 \text{ mL of } 0.1 \text{ M } \text{NH}_3 \equiv \left(\frac{14 \times 20}{1000} \times 0.1 \right) \text{ g} = 0.028$$

$$\text{So, \% of N} = \frac{0.028}{0.4} \times 100 = 7\%$$

100. Answer (4)

Since half-life of first order reaction does not depend on concentration of reactant, its successive half-lives will be constant.

For first order reaction,

$$t_{\frac{1}{2}} = \frac{0.693}{k}$$

BOTANY

SECTION-A

101. Answer (1)

- DNA – 3'-TACGGCTACGCAACTCAT-5'
RNA – 5' – AUG CCG AUG CGU UGA – 3'
Protein – Met Pro Met Arg Stop → 4 amino acids
- DNA – 3'-TAC GCA GCC ATT ATT GTA – 5'
RNA – 5' – AUG CGU CGG UAA – 3'
Protein – Met Arg Arg Stop → 3 amino acids
- DNA 3'- CCC GCAACGGATATTAAA – 5' does not form translational unit
- DNA – 3'- TACATCGACACG GCA GGG – 5'
RNA – 5' – AUG UAG – 3'
Protein – Met Stop → 1 amino acid

102. Answer (1)

Length of DNA = Number of base pairs × distance between two base pairs

$$\therefore 2.2 = X \times 0.34 \times 10^{-9}$$

$$X = \frac{2.2}{0.34 \times 10^{-9}} = 6.5 \times 10^9 \text{ bp}$$

103. Answer (1)

During replication, unwinding of double helical parental molecule is brought about by enzyme helicase, which is ATP dependent.

104. Answer (2)

According to Chargaff's rule, for dsDNA

$$A + G = T + C$$

$$\frac{A + G}{T + C} = 1, \text{ this value is constant for all species}$$

105. Answer (1)

The hydrogen ions that are produced by the splitting of water accumulate within the lumen of the thylakoids.

106. Answer (4)

OAA (oxaloacetic acid) is the first stable product of CO_2 fixation in C_4 plants, e.g; maize

107. Answer (2)

In human beings, the membrane of the erythrocyte has approximately 52 percent protein and 40 percent lipids.

108. Answer (1)

All cells arise from pre-existing cells, not de novo.

109. Answer (2)

Anton Von Leeuwenhoek first saw and described a live cell. Robert Brown discovered nucleus. Robert Hooke studied and discovered the cell from a thin slice of cork. Rudolf Virchow explained *Omnis cellula-e cellula*.

110. Answer (2)

The phenomenon of bringing the chromosomes on the equator of spindle is called Congression. This happens in metaphase stage.

111. Answer (4)

Cells at the end of prophase, when viewed under the microscope, do not show Golgi complex, ER, nuclear membrane and nucleolus.

112. Answer (2)

In interphase, cell is metabolically active. Double membrane bound organelles like mitochondria and chloroplast duplicate in G₂ phase. Membrane bound organelles duplicate in G₁ & G₂ phase.

113. Answer (3)

Hydrocolloids have water holding capacity and obtained from brown and red algae.

Iodine is obtained from Brown algae.

114. Answer (1)

Chlorophyll a and b are major pigments present in green algae. Stored food of green algae is starch.

115. Answer (4)

Primary treatment is a physical process. Flocs are masses of bacteria associated with fungal filaments. Greater the BOD of waste water, more is its polluting potential.

116. Answer (3)

During suspended stage, different organism produces different types of perennating structures to overcome unfavourable condition.

117. Answer (4)

Standing crop is the amount of living material present in different trophic levels at a given time.

118. Answer (3)

Glycerol would enter the respiratory pathway after being converted to phosphoglyceraldehyde (PGAL).

119. Answer (2)

Pleiotropy means that a single gene affects two or more characters. An example of this, is the disease Phenylketonuria.

120. Answer (4)

Mendel studied 7 pairs of contrasting traits in pea plant.

121. Answer (2)

Tropical regions have more biological diversity than the temperate regions because tropical environment unlike temperate ones are less seasonal, relatively more constant and predictable.

Temperate regions are subjected to frequent glaciations in the past.

122. Answer (1)

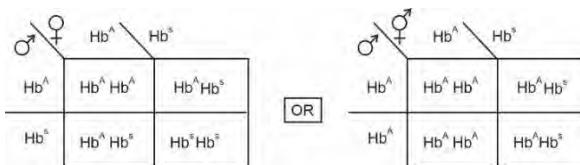
Thylacine got recently extinct from Australia.

123. Answer (2)

Sickle cell anaemia is an autosome linked recessive trait

Carrier women ____ Hb^A Hb^s.

Men can have genotype – Hb^AHb^s or Hb^A Hb^A



25% of their children will be affected with this trait.

50% of their children will be carrier for this trait

124. Answer (3)

Birds show female heterogamety.

125. Answer (3)

Water containing cavities which are schizolysigenous in origin found in monocot stem.

126. Answer (3)

Phloem fibres are sclerenchymatous, having pointed needle like apices. They do not have branches i.e. unbranched and at maturity, they become dead. Phloem fibres are generally absent in primary phloem.

127. Answer (2)

In cotton, coriander and larkspur, different forms of leaves appears on the same plant. Juvenile plants have leaves which differ in shape from mature plants.

128. Answer (2)

Exine is the hard outer layer of pollen grain , made up of the most resistant organic material i.e. sporopollenin which can withstand high temperature, strong acid and alkali.

129. Answer (3)

Oxalis and *Commelina* produce both types of flowers i.e. chasmogamous and cleistogamous flowers.

Castor and maize are monoecious plants prevents autogamy but not geitonogamy.

130. Answer (4)

Solanum is a generic name, that starts with capital letter *melongena* is specific epithet starts with small letter, Linn is Author's name who first described it.

131. Answer (3)

Aristotle was the earliest to attempt a more scientific basis for classification. He used simple morphological characters to classify plants into trees, shrubs and herbs.

132. Answer (3)

Heterocysts are large, specialized cells where nitrogen fixation under anaerobic condition takes place as in *Nostoc* and are also covered by mucilaginous sheath.

They have thickened cell wall which is impermeable to oxygen, which creates anaerobic environment. Oxygen is not evolved due to absence of PSII system.

133. Answer (3)

In basal placentation, the placenta develops at base of ovary and a single ovule is attached to it, as in sunflower, marigold. While Primrose has free central placentation.

134. Answer (3)

Roots are negatively phototropic i.e move against the direction of light.

135. Answer (3)

Asteraceae is the largest dicot family and considered to be the most advanced family amongst angiosperms.

SECTION-B

136. Answer (4)

Claviceps is the causative agent of Ergot disease

137. Answer (2)

The floral formula of China rose is
 $Epi_{5-7} \oplus K_{(5)} C_5 A_{(5)} G_{(5)}$

138. Answer (1)

- Cambium is more active in spring and wood produced have more number of xylary elements with wider lumens having lower density.
- In winter, cambium is less active forming less number of xylary elements with narrow lumens. So autumn wood (late wood) is darker in colour, having high density.

139. Answer (2)

'r' represents growth rate/elongation per unit time. Linear curve is obtained in this growth curve.

140. Answer (3)

Undifferentiated sheath enclosing radical and root cap is called coleorhiza.

141. Answer (1)

Aminoacylation of tRNA represents first phase of translation.

142. Answer (3)

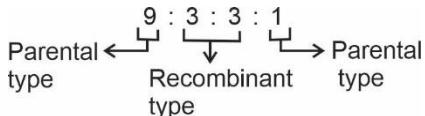
DNA as an acidic substance present in nucleus was first identified by Friedrich Miescher in 1869.

143. Answer (3)

During the conversion of succinyl CoA to succinic acid, a molecule of GTP is formed from GDP. This is a substrate level phosphorylation reaction of Krebs cycle.

144. Answer (2)

The phenotypic ratio of Mendelian dihybrid cross.



145. Answer (4)

Plasmids are small circular DNA outside the genomic DNA.

146. Answer (2)

Splitting of centromere of each chromosomes occurs during anaphase-II of meiosis-II.

147. Answer (2)

Bryophytes are the first embryophytes.

148. Answer (3)

Cyclosporin A is obtained from fungi, and used in organ transplant patients.

149. Answer (2)

In parasitism only one species benefits (parasite) and the interaction is detrimental to the other species (host).

150. Answer (4)

Primary succession takes place naturally from several hundred to several thousand years to produce fertile soil on bare.

ZOOLOGY

SECTION-A

151. Answer (3)

Transfer of sperms into the female genital tract is called insemination.

After spermiogenesis, sperms head become embedded in the Sertoli cells, and are finally released from the seminiferous tubules by the process called spermiation.

152. Answer (4)

The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory nor motor in function. These regions

called the association areas are responsible for complex functions like intersensory associations, memory and communication.

153. Answer (4)

The columnar epithelium is composed of a single layer of tall and slender cells. Their nuclei are located at the base. Free surface may have microvilli. It is found in the lining of stomach and intestine and help in secretion and absorption.

Squamous epithelium is found in the walls of blood vessels.

154. Answer (4)

The smooth muscle fibres taper at both ends (fusiform) and do not show striations thus, light and dark bands are not seen. Cell junctions hold them together and they are bundled together in a connective tissue sheath. The wall of internal organs such as the blood vessels, stomach and intestine contains this type of muscle fibres.

155. Answer (2)

Genetically modified plants have been useful in many ways. Genetic modification has increased crop yields, reduced post-harvest losses and made crops more tolerant to abiotic stresses (cold, heat, drought, salt). They also enhance nutritional value of food and reduce the reliance on chemical pesticides.

156. Answer (4)

Bone marrow transplantation and enzyme replacement therapy is not completely curative. Lymphocytes are not immortal thus, the patient requires periodic infusion of the genetically engineered lymphocytes. Whereas, if the gene isolated from marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure.

157. Answer (3)

1. Green glands – Prawn
2. Malpighian tubules – Cockroach
3. Nephridia – Earthworm
4. Flame cells – *Planaria*

158. Answer (3)

Branchiostoma belongs to the phylum Chordata and the subphylum Cephalochordata.

Urochordates are also called tunicates

159. Answer (2)

In the alveoli, where there is high pO₂, low pCO₂, lesser H⁺ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin.

160. Answer (2)

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

161. Answer (3)

In blood group 'B' individuals, antigens present on the surface of RBCs are antigen 'B' and antibodies in their plasma are 'anti-A'. Donor groups for them are blood group 'B' and 'O' individuals.

162. Answer (3)

Platelets also called thrombocytes, are cell fragments produced from megakaryocytes (special cells in the bone marrow).

163. Answer (4)

Condoms, vaults, diaphragms and cervical caps are the devices used in barrier methods of contraception. Nirodh is a popular brand of condom for males in India. Diaphragms, cervical caps and vaults are used by females only.

164. Answer (1)

Use of condoms has increased in recent years due to its additional benefit of protecting the user from contracting STIs and AIDS. Diaphragm is included under barrier methods of contraception. CuT and Cu7 are copper releasing IUDs but these contraceptives do not protect the users from contracting STIs and AIDS.

165. Answer (3)

Progestogens alone or in combination with estrogen can also be used by females as injections or implants under the skin. Vaults are barriers made of rubbers. IUDs are devices inserted by doctors or expert nurses in the uterus through vagina.

166. Answer (1)

When ready-made antibodies are directly given to protect the body against foreign agents, it is called passive immunity.

The yellowish fluid colostrum secreted by mother during the initial days of lactation has abundant antibodies (IgA) to protect the infant.

167. Answer (4)

Several genes called cellular oncogenes or proto-oncogenes have been identified in normal cells which when activated under certain conditions, could lead to oncogenic transformation of the cells.

168. Answer (4)

The elimination of nitrogenous wastes in frogs is carried out by a well developed excretory system. The excretory system consists of a pair of kidneys, ureters, a single cloaca and urinary bladder.

169. Answer (3)

In cockroaches, the mouth opens into a short tubular pharynx, leading to a narrow tubular passage called oesophagus. This in turn opens into a sac-like structure called crop used for storing of food. The crop is followed by gizzard or proventriculus.

170. Answer (3)

Protein is the polymer of amino acids. The molecules found in the acid-insoluble fraction with the exception of lipids are polymeric substances.

Filarial worms cause filariasis.	194. Answer (2) Bt toxin proteins exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystals.
Chikungunya is a viral disease, not a bacterial disease.	
188. Answer (1) Forelimbs of horse are homologous to the wings of bat.	
189. Answer (2) Total number of phalanges in one hindlimb of man = 14 Total number of ear ossicles in both ears of man = 6 Total number of bones in each limb of man = 30 Total number of ribs in man = 12 pairs = 24 Total number of skull bones of man = 29	195. Answer (3) Stimulation of parasympathetic neural signals (a component of ANS) decrease the rate of heart beat, speed of conduction of action potential and thereby the cardiac output.
190. Answer (3) The adrenal medulla secretes two hormones called adrenaline or epinephrine and noradrenaline or norepinephrine. They are secreted in response to stress of any kind and during emergency situations. These hormones increase alertness, pupillary dilation, piloerection (raising of hairs) and sweating, etc.	196. Answer (3) IUDs increase phagocytosis of sperms within the uterus. The hormone releasing IUDs (Progestasert, LNG-20) make the uterus unsuitable for implantation and the cervix hostile to the sperms. Cu7 is a copper releasing IUD which suppress sperm motility and the fertilising capacity of sperms.
191. Answer (1) With the increase in substrate concentration, the velocity of the enzymatic reaction increases at first and after reaching V_{max} , it will not increase further even if more substrate is added. This is because the enzyme molecules are fewer than the substrate molecules and after saturation of these molecules there are no free enzymes to bind with the additional substrate molecules.	197. Answer (4) Total lung capacity of humans includes RV, ERV, TV and IRV or vital capacity + residual volume.
192. Answer (2) In the year 1963, the two enzymes responsible for restricting the growth of bacteriophage in <i>E.coli</i> were isolated. One of these added methyl groups to DNA, while the other cut DNA.	198. Answer (2) In humans, on an average, 1100-1200 mL of blood is filtered by the kidneys per minute which constitute roughly 1/5 th of the blood pumped out by each ventricle of the heart in a minute.
193. Answer (4) The air bubbles dramatically increase the oxygen transfer area in sparged stirred-tank bioreactor.	199. Answer (3) First movement of the foetus occurs during fifth month of pregnancy. By the end of 2 nd month of pregnancy, foetus develops limbs and digits. By the end of first trimester, most of the major organ systems are formed. First movements of foetus and appearance of hair on head is observed during the 5 th month of pregnancy. By the end of 2 nd trimester, the body is covered with fine hairs, eye-lids separate and eyelashes are formed. 200. Answer (2) Ionic gradients across the resting membrane are maintained by the active transport of ions by the sodium-potassium pump which transports 3 Na ⁺ outwards for 2 K ⁺ into the cell.

