

## **P** ANSWER KEY & SOLUTION KEY FINAL ROUND - 02 (PCB) Dt.03.04.2024

### **BOTANY**

#### **SECTION - A (35 Questions)**

01. (3) (NCERT XII, Pg118, Para-5 , Line-1)
02. (2) (NCERT XII, Page No. 109, Para 3, Line 5-6)
03. (4) (NCERT XII, Pg 102, Figure 6.5 The Hershey-Chase experiment)
04. (1) [NCERT XI, Page 248 (First paragraph), 249 (Last paragraph)]
05. (3) (11th, para 8.2, page no. 126 )
06. (3) (11th, para 8.4.1, 8.4.2, page no. 128,129)
07. (4) (NCERT XI added Family by NMC)
08. (3) (NCERT XI Pg.230, 14.3)
09. (4) [NCERT XI Pg. No. 222, 13.10]
10. (2) [ NCERT class XI, Page no. 93, Point no. 6.3.4]
11. (1) (NCERT XI Pg.236, 14.7)
12. (3) [NCERT XI Pg. No. 216, 13.7.1 and page no. 219 2<sup>nd</sup> paragraph]
13. (3) (NCERT XII, Pg 80, 5.3.1, based on Law of Independent Assortment)
14. (4) (NCERT XII, Pg 101, 6.2.1)
15. (2) (NCERT 12<sup>th</sup>, Page No-29, Paragraph- 2, Line No- 7 to 10)
16. (4) (NCERT 12<sup>th</sup>, Page No-21, Paragraph- 2, Line No- 9 to 11)
17. (3) (NCERT XII, Pg 89- 90. Based on sex linkage)
18. (4) (NCERT page no.38 gymno.concept )
19. (2) (11<sup>th</sup> NCERT Page no.28 to 29, conceptual)
20. (2) (NCERT page no. 34 ,3.2 concept)
21. (1) (11th, para10.4 ,page no. 167 )
22. (4) [NCERT XI, Page 248, Point 15.4.3.1]
23. (4) (NCERT XI Page No. 77, sub-topic 5.7.2)
24. (4) ( 12NCERT,Page no.246 fig.14.2)
25. (4) (12<sup>th</sup> NCERT old page no.243 3<sup>rd</sup> para)
26. (2) (NCERT 11<sup>th</sup>, Page No-11, Table-1.1)
27. (3) (NCERT XII, Pg 75, Para 1, Line 4)
28. (4) (NCERT XII, Pg 78, Dihybrid cross based)
29. (1) (11th, para 10.1.1, Figure 10.1, page no. 163 )
30. (4) (NCERT 11<sup>th</sup>, Page No-18, Figure 2.1)
31. (3) (NCERT 11<sup>th</sup>, Page No- 22, Paragraph-2, Line No- 4,5)

32. (1) (NCERT 11<sup>th</sup>, Page No-19, Paragraph-2.1.2, Line No-27,28)
33. (2) [NCERT Page no. 87 (Point 6.1.2.2), 88 (Line number- 01-20), 90 (Line no. 01-03)]
34. (1) (NCERT 12<sup>th</sup>, Page No-35, Paragraph-2.4.2, Line No- 13-15)
35. (3) (NCERT XI Page No. 75, sub-topic 5.5.1.3 & added family)

#### **SECTION - B (Attempt Any 10 Questions)**

36. (4) [ NCERT Page no. 89, Second paragraph]
37. (4) (NCERT XI Page No. 80, sub-topic 5.9.2)
38. (2) (NCERT XI Pg.233, Fig.14.4)
39. (4) (11th, para 8.3, page no. 127)
40. (3) [NCERT XI Pg. No.210, 13.4, fig 13.3a based]
41. (4) (NCERT XII, Pg.101, Para 5, Line 2)
42. (4) (11th, para 8.4.1,8.5.7, 8.5.6, 8.5.9, page no.126, 136,137)
43. (4) (NCERT 12<sup>th</sup>, Page No-23, Paragraph- 2, Line No- 15-17)
44. (3) (NCERT XII, Pg. 78 , Para 1, Line 4)
45. (3) (NCERT 11<sup>th</sup>, Page No-22, Last Paragraph, Line No-27,28)
46. (4) (NCERT XII, Pg 111, Para 2)
47. (1) (11th, para 10.2.1, page no. 164 ) (11th, para 8.5.1, page no. 131 )
48. (2) (NCERT XII, Pg 91, 5.8.3)
49. (4) NCERT page no.38 ,1<sup>st</sup> para, 1<sup>st</sup> line
50. (2) (NCERT 11<sup>th</sup>, Page No-9, Paragraph-1.3.3, Line No-31,32)

### **ZOOLOGY**

#### **SECTION - A (35 Questions)**

51. (3) (NCERT page no.260, fig.15.1)
52. (4) (NCERT XI Chapter chemical co-ordination conceptual)
53. (1) (NCERT 12<sup>th</sup>, Page No-130, 1st Paragraph, Line No- 7 to 9)
54. (3) NCERT 12<sup>th</sup>, Page No-135, 3<sup>rd</sup> Paragraph, Line No- 5,6
55. (3) (Old 12<sup>th</sup> NCERT page no.232 1<sup>st</sup> para.)
56. (3) (NCERT XI Page No. 47, 4.1.2)

57. (1) (NCERT XI Page No. 51, 4.2.4)  
 58. (1) (NCERT XI Page No. 55, table 4.1)  
 59. (3) (NCERT 11<sup>th</sup>, Page No- 143, Table- 9.1)  
 60. (1) (NCERT 11<sup>th</sup>, Page No- 151, 1<sup>st</sup> Paragraph, Line No-1 to 12)  
 61. (2) (NCERT 11<sup>th</sup> page 119, para3, line)  
 62. (3) (NCERT Pg.No.284- Cardiac cycle)  
 63. (1) (NCERT XI Page No. 294, 6th paragraph)  
 64. (4) (NCERT 12<sup>th</sup>, p.no. 52, para 1)  
 65. (2) (NCERT 12<sup>th</sup>, p.no. 53, para 1, line 1)  
 66. (1) (NCERT 12<sup>th</sup>, p.no. 43, para 3)  
 67. (1) (NCERT 12<sup>th</sup> p.no. 59)  
 68. (3) (NCERT 11<sup>th</sup> page no 112, para 1, line 6)  
 69. (3) (NCERT Pg.No.153 - Immune system)  
 70. (4) (NCERT Pg.No.156 - Cancer)  
 71. (3) (NCERT Pg. No.-146)  
 72. (3) [NCERT P. No.309 3<sup>rd</sup> line below Diagram ]  
 73. (2) [NCERT P. No.321 1<sup>st</sup> para last 3 lines]  
 74. (1) [NCERT P. No.318 Para Below Diagram]  
 75. (4) [NCERT P. No.212 3<sup>rd</sup> para]  
 76. (1) (NCERT Pg.No.-274)  
 77. (1) (NCERT Pg. No.-161)  
 78. (2) [NCERT P. No.311 Last line of Pelvic Girdle para ]  
 79. (1) [NCERT P. No. 213- 3<sup>rd</sup> Point, P No 201-2<sup>nd</sup> para , 11.3 & 11.3.1, ]  
 80. (4) [NCERT P. No. 213- 2<sup>nd</sup>, 3<sup>rd</sup> & 4<sup>th</sup> Point]  
 81. (1) [NCERT P. No.311 1<sup>st</sup> Para]  
 82. (2) (12<sup>th</sup>, para 10.4 , page no.185/zoology.)  
 83. (1) (12<sup>th</sup>, para10.2.3 , page no.183/zoology.)  
 84. (2) (12<sup>th</sup> ncert 10.1 BIOTECHNOLOGICAL APPLICATIONS IN AGRICULTURE)  
 85. (2) (NCERT Pg.No. 272- Lung Volumes)

### SECTION - B (Attempt Any 10 Questions)

86. (4) (12<sup>th</sup> NCERT, Page no.230 to 231)  
 87. (1) [NCERT P. No.317 1<sup>st</sup> para first 4 lines]  
 88. (1) NCERT 12<sup>th</sup>, Page No-140, 2<sup>nd</sup> Paragraph, Line No- 5 to 8  
 89. (3) (NCERT 11<sup>th</sup>, page 101, para3, line 2)  
 90. (3) (NCERT Pg. No.158)  
 91. (2) [NCERT P. No.198 3<sup>rd</sup> para]  
 92. (4) (NCERT Pg.No.284- Cardiac cycle)  
 93. (4) [NCERT Practical Syllabus P. No.125 4<sup>th</sup> Point and last Para]  
 94. (4) (NCERT XI Page No. 293, 2nd paragraph)  
 95. (3) (NCERT XI Page No. 340, first paragraph)  
 96. (4) (NCERT 12<sup>th</sup> p.no.64, para 3, LINE 5)  
 97. (2) (NCERT 12<sup>th</sup> p.no. 57, para 2, line4)  
 98. (1) (NCERT 11<sup>th</sup>, Page No-148, Figure- 9.2, Conceptual )  
 99. (4) (NCERT 12<sup>th</sup>, Page No-127, Last Paragraph, Line No- 1,2 and 3 )  
 100. (3) (NCERT page no.259; 2<sup>nd</sup> para)

## PHYSICS

### SECTION - A (35 Questions)

101. (1)  
 102. (3) Two particles will meet at their centre of mass  
 $\therefore$  Distance of the centre of mass from 8 kg mass  

$$= \frac{8 \times 0 + 4 \times 12}{8 + 4} = 4m.$$
  
 103. (2) Zero error is positive because CS division is ahead of pitch scale making.  
 Least count =  

$$\frac{\text{Pitch}}{\text{No. of divisions on circular scale}}$$

$$= \frac{0.5mm}{50} = 1 \times 10^{-5} m$$

$$= 10 \mu m.$$
  
 104. (2) When a child sits on a rotating disc, no external torque is introduced. Hence the angular momentum of the system is conserved. But the moment of inertia of the system will increase and as a result, the angular speed of the disc will decrease to maintain constant angular momentum.(2)  
 105. (2)  $[\tau] = [ML^2 T^{-2}]$   

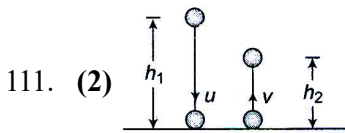
$$\frac{\Delta\tau}{\tau} \times 100 = \frac{\Delta M}{M} \times 100 + 2 \frac{\Delta L}{L} \times 100 + 2 \frac{\Delta T}{T} \times 100$$

$$= 5\% + 2 \times 5\% + 2 + 5\%$$

$$= 25\%$$
  
 106. (1)  
 107. (2)  $\vec{r} = at^2\hat{i} + bt\hat{j} \quad \dots(i)$   
 $x = at^2 \quad \dots(ii)$   
 and  $y = bt$   
 From Eq. (ii) put value of  $t$  in Eq. (i)  

$$x = \frac{a}{b^2} y^2$$
  
 108. (4)  
 109. (1) As we know, momentum,  $\vec{p} = mv$   
 Change in P can be brought by changing force  $\vec{F}$  i.e.  
 As,  $\vec{F} = \frac{dp}{dt}$  rate of change of momentum with time.  
 $\Rightarrow$  as  $\Delta p = F \Delta t = \text{impulse}$  so for same F and  $\Delta t$ ,  $\Delta p$  will be same even for different bodies.  
 110. (4) Work done,  $W = \int F \cdot dy = \int_0^1 (20 + 10y) dy$   

$$= \left[ 20y + \frac{10}{2} y^2 \right] = 20 + \frac{10}{2} = 25 J$$



111. (2)

$$u = \sqrt{2gh_1}, v = \sqrt{2gh_2}$$

$$\Delta p = m(v + u)$$

$$= m(\sqrt{2gh_2} + \sqrt{2gh_1}).$$

112. (3) As  $CD = 2AB$ , latent heat of vaporization is twice the latent heat of fusion.  
 $\therefore$  Statement (3) is false. All other statements are correct.

113. (4)  $X = 3YZ^2$

$$\therefore [Y] = \frac{[X]}{[Z^2]} = \frac{[M^{-1}L^{-2}T^4A^2]}{[MT^{-2}A^{-1}]^2} = [M^{-3}L^{-2}T^8A^4]$$

114. (1) According to Wien's displacement law

$$\lambda_m \propto \frac{1}{T} \Rightarrow \lambda_{m_2} < \lambda_{m_1} \quad (\because T_1 < T_2)$$

Therefore,  $I - \lambda$  graph for  $T_2$  have lesser wavelength ( $\lambda_m$ ) and so curve for  $T_2$  will shift towards left side.

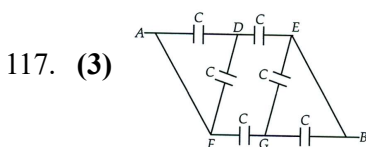
115. (3)  $U = nC_V T$

$$\Rightarrow U = n_1 C_{V1} T + n_2 C_{V2} T$$

$$= 8 \times \frac{3R}{2} \times T + 6 \times \frac{5R}{2} \times T$$

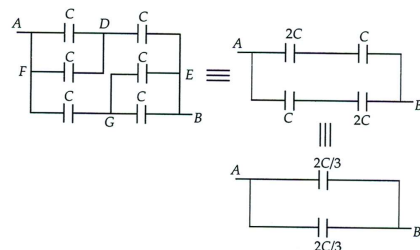
$$= 27RT.$$

116. (2)  $h = R \cos \theta = 12 \times \frac{2}{3} \text{ cm}$



117. (3)

The equivalent circuit diagrams are as shown in the figure below.



The equivalent capacitance between  $A$  and  $B$  is

$$C_{AB} = \frac{2C}{3} + \frac{2C}{3} = \frac{4C}{3}$$

118. (2) When cube is of side  $a$  and point charge  $Q$  is

at the center of the cube then the total electric flux due to this charge will pass evenly through the six faces of the cube. So, the electric flux through one face will be equal to  $1/6$  of the total electric flux due to this charge.

$$\text{Flux through 6 faces} = \frac{Q}{\epsilon_0}$$

$$\therefore \text{Flux through 1 face} = \frac{Q}{6\epsilon_0}$$

119. (1)  $v_d = \frac{e}{m} \times \frac{V}{l} \tau$  or  $v_d = \frac{e}{m} \cdot \frac{El}{l} \tau$  (since  $V = El$ )

$$\therefore v_d \propto E$$

120. (1)  $B = \frac{E}{v}$

$$= \frac{600V}{3 \times 10^{-3} m} \times \frac{1}{2 \times 10^6 \text{ ms}^{-1}}$$

$$= 10^{-1} \text{ T} = 0.1 \text{ T}$$

121. (1) Magnetic field inside the hollow metallic cylinder

$$B_{in} = 0, \text{ and magnetic field outside it } B_{out} \propto \frac{1}{r}$$

122. (2) Eddy currents may be reduced by using laminated core of soft iron.

123. (3)  $I = \frac{V}{X_C}$  in Pure Capacitor

$$= \frac{V}{\frac{1}{2\pi f C}} = V 2\pi f C \Rightarrow I \propto f$$

124. (4) (A)  $\rightarrow$  (2); (B)  $\rightarrow$  (1); (C)  $\rightarrow$  (4); (D)  $\rightarrow$  (3)

125. (1)

126. (3)

127. (4) Mass defect =  $\frac{B.E.}{c^2}$

Mass of nucleus = Mass of proton + mass of neutron - mass defect.

128. (1)

129. (2)

130. (2) As current is flowing from  $A$  to  $B$ , therefore, moving from  $A$  to  $B$ ,

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

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

131. (1) Wave function should be in the form  $y = f(x, t)$   
 For travelling wave  $y$  should be linear function of  $x$  and  $t$  and they must exist as  $(x \pm vt)$ .

$$y = A \sin(15x - 2t)$$

132. (4) Speed of light does not depend on the motion

of source as well as intensity.

133. (4) For telescope

$$\text{Tube length } (L) = f_o + f_e = 60$$

$$\text{and magnification } (m) = \frac{f_o}{f_e} = 5 \Rightarrow f_o = 5f_e$$

$$\therefore f_o = 50 \text{ cm and } f_e = 10 \text{ cm}$$

Hence focal length of eye-piece,  $f_e = 10 \text{ cm}$ .

134. (4) Let  $\mu_0$  = Mass of body in vacuum

Weight of body in air

= Weight of standard weights in air

$$\therefore \mu_0 g - \left(\frac{\mu_0}{d_1}\right) dg = Mg - \frac{M}{d_2} dg$$

$$\text{or } \mu_0 = \frac{M \left(1 - \frac{d}{d_2}\right)}{\left(1 - \frac{d}{d_1}\right)}$$

Hence, the correct answer is option (4)

135. (2)  $\lambda_{med} = \frac{\lambda_{vacuum}}{\mu}$

and we know that fringe width  $\beta = \frac{\lambda D}{d}$

$$\text{Therefore, } \beta_{med} = \frac{\beta_{vacuum}}{\mu} = \frac{12}{4/3} = 9 \text{ mm}$$

**SECTION - B (Attempt Any 10 Questions)**

136. (2)

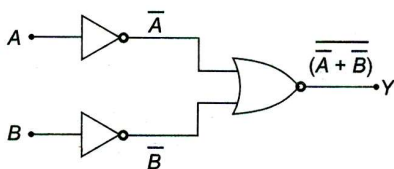
137. (3)  $i = \frac{E_{eq}}{r_{eq}} = \frac{8 \times 5}{8 \times 0.2}$

$$I = 25 \text{ A}$$

$$V = E - ir$$

$$= 5 - 0.2 \times 25 = 0 \text{ V}$$

138. (1)



A	B	$\bar{A}$	$\bar{B}$	$\bar{A + B}$	$\overline{\bar{A + B}}$
0	0	1	1	1	0
0	1	1	0	1	0
1	0	0	1	1	0
1	1	0	0	0	1

139. (2) As,  $U = kx^4; F = -\frac{dU}{dx} = -4kx^3 \dots\dots(i)$

In SHM,  $x = r \sin \omega t$  and  $\frac{d^2x}{dt^2} + \omega^2 x = 0$

$$\text{Acceleration } A = \frac{d^2x}{dt^2} = -\omega^2 x$$

$$\therefore F = mA = -m\omega^2 x \dots\dots(ii)$$

From (i) and (ii);

$$4kx^3 = m\omega^2 x$$

$$T = \frac{2\pi}{\omega} = \frac{2\pi}{2x} \sqrt{\frac{m}{k}} = \frac{\pi}{(r \sin \omega t)} \sqrt{\frac{m}{k}} \text{ or } T \propto \frac{1}{r}$$

140. (1) Common potential,  $V = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$

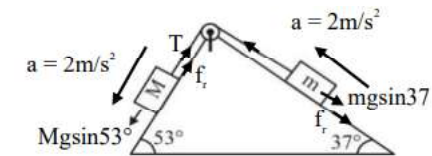
$$= \frac{(4 \times 10^{-6}) \times 80 + (6 \times 10^{-6}) \times 30}{4 \times 10^{-6} + 6 \times 10^{-6}} = 50 \text{ V}$$

$\therefore$  Energy lost by a 4  $\mu\text{F}$  capacitor is

$$= \frac{1}{2} C_1 V_1^2 - \frac{1}{2} C_1 V^2 = \frac{1}{2} C_1 (V_1^2 - V^2)$$

$$= \frac{1}{2} \times (4 \times 10^{-6}) \times \{(80)^2 - (50)^2\} = 7.8 \times 10^{-3} \text{ J} = 7.8 \text{ mJ}$$

141. (2)



For M block

$$10 g \sin 53^\circ - \mu (10g) \cos 53^\circ - T = 10 \times 2$$

$$T = 80 - 15 - 20$$

$$T = 45 \text{ N}$$

For m block

$$T - mg \sin 37^\circ - \mu mg \cos 37^\circ = m \times 2$$

$$45 = 10 m$$

$$m = 4.5 \text{ kg}$$

142. (3)  $f = kx = Mg$

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

$$\Rightarrow kx = 2mg$$

$$\Rightarrow Mg = 2mg \Rightarrow m = \frac{M}{2}$$

143. (4) According to Einstein's photoelectric equation

$$K_{\max} = h\nu - \phi$$

$$eV_s = \frac{hc}{\lambda} - \phi_0 \Rightarrow V_s = \frac{hc}{\lambda e} - \frac{\phi_0}{e}$$

where,  $\lambda$  - Wavelength of incident light

$\phi_0$  - Work function

$V_s$  - Stopping potential

According to given problem,

$$V_1 = \frac{hc}{\lambda e} - \frac{\phi_0}{e} \dots\dots(i)$$

$$V_2 = \frac{hc}{(\lambda/2)e} - \frac{\phi_0}{e}$$

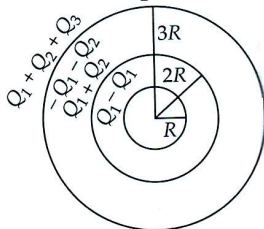
$$V_2 = \frac{2hc}{\lambda e} - \frac{\phi_0}{e} = \frac{2hc}{\lambda e} - \frac{2\phi_0}{e} + \frac{2\phi_0}{e} - \frac{\phi_0}{e}$$

$$= 2\left(\frac{hc}{\lambda e} - \frac{\phi_0}{e}\right) + \frac{\phi_0}{e}$$

$$V_2 = 2V_1 + f_e \quad [\text{Using eqn. (i)}]$$

$$\therefore V_2 > 2V_1.$$

144. (2) The charge distribution in the surfaces of the concentric spherical shells is shown in the figure.



$$\text{Charge density, } \sigma = \frac{\text{Charge}}{\text{Area}}$$

Since the surface charge densities are equal

$$\therefore \frac{Q_1}{4\pi R^2} = \frac{Q_1 + Q_2}{4\pi(4R^2)} = \frac{Q_1 + Q_2 + Q_3}{4\pi(9R^2)}$$

$$Q_1 = \frac{Q_1 + Q_2}{4} \dots(i)$$

$$\text{and } Q_1 = \frac{Q_1 + Q_2 + Q_3}{9} \dots(ii)$$

$$\text{From (i), we get } 3Q_1 = Q_2 \dots(iii)$$

From (ii) we get

$$8Q_1 - Q_2 = Q_3$$

$$8Q_1 - 3Q_1 = Q_3 \quad \text{Using (iii)}$$

$$5Q_1 = Q_3$$

$$\therefore \frac{Q_1}{1} = \frac{Q_2}{3} = \frac{Q_3}{5} \quad \text{or } Q_1 : Q_2 : Q_3 = 1 : 3 : 5$$

145. (3) The gravitational field due to the ring at a distance  $\sqrt{3}r$  is given by

$$E = \frac{Gm(\sqrt{3}r)}{[r^2 + (\sqrt{3}r)^2]^{3/2}} \Rightarrow E = \frac{\sqrt{3}Gm}{8r^2}$$

$$\text{Attractive force} = \sqrt{3} \frac{GMm}{8r^2}.$$

146. (2) Max. KE of a particle in SHM

$$= \frac{1}{2}kr^2 = \frac{1}{2} \times 200 \times 1^2 = 100\text{J}$$

As total energy = Max. KE + Minimum PE

$$\therefore 150 = 100 + \text{minimum PE}$$

$$\text{or Minimum PE} = 150 - 100 = 50\text{ J}$$

Thus, both, Statement I and Statement II are false.

147. (4) Let  $h$  be the height of liquid surface in the vessel. The velocity of efflux is given by

$$v_{\text{eff}} = \sqrt{2gh}$$

If  $H$  be the height of table, then

$$H = \frac{1}{2}gt^2 \quad \text{or } t = \sqrt{2H/g}$$

$$\therefore R = v_{\text{eff}} \times t = \sqrt{2gh} \sqrt{2H/g}$$

$$R^2 = 4hH \quad \text{or } h = \frac{R^2}{4H}$$

Hence, the correct answer is option (4)

148. (1)  $x = -3t^3 + 18t^2 + 16t$

$$v = -9t^2 + 36t + 16$$

$$a = -18t + 36$$

$$a = 0 \text{ at } t = 2\text{s}$$

$$v = -9(2)^2 + 36 \times 2 + 16$$

$$v = 52 \text{ m/s}$$

149. (1)  $y = 2 \sin(\omega t - kx)$

Maximum particle velocity  $A\omega$

$$\text{Wave velocity} = \frac{\omega}{k}$$

$$\frac{\omega}{k} = A\omega$$

$$k = \frac{1}{A} = \frac{2\pi}{\lambda}$$

$$\lambda = 2\pi A = 4\pi \text{ cm}$$

150. (1) As refractive index,  $\mu = \frac{\sin\left(\frac{A + D_{\text{max}}}{2}\right)}{\sin\frac{A}{2}}$

As angles of prism is constant,  $D_{\text{min}} \propto \mu$

$$\therefore \mu_b > \mu_r, \text{ hence } D_2 > D_1.$$

## CHEMISTRY

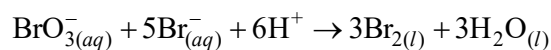
### SECTION - A (35 Questions)

151. (1)

TTT

152. (4)

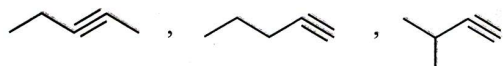
For the given reaction,



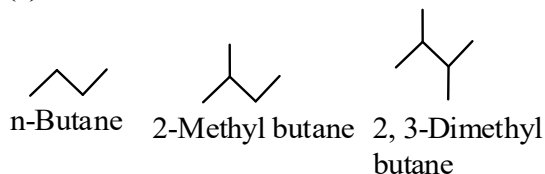
$$\text{rate} = \frac{1}{3} \frac{d[\text{Br}_2]}{dt} = -\frac{1}{5} \frac{d[\text{Br}^-]}{dt}$$

$$\therefore \frac{d[\text{Br}_2]}{dt} = -\frac{3}{5} \frac{d[\text{Br}^-]}{dt}$$

153. (2)



154. (4)



155. (3)

Triads of group VIII (groups 8, 9 and 10) have approximately the same size e.g.

Ist triad, Fe, Co, Ni

IInd triad, Ru, Rh, Pd

IIIrd triad, Os, Ir, Pt

156. (2)

There is a high jump from  $\text{IE}_3$  to  $\text{IE}_4$ . Therefore, it is difficult to remove the 4th valence electron. So, electronic configuration of element must have three valence electrons. Hence, the answer is (2).

157. (1)

The smaller the reduction potential of a substance, the more is its reducing power.

( $Y > Z > X$ )

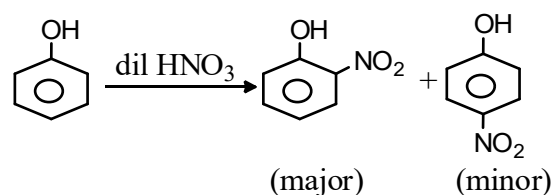
158. (3)

$$G^* = \frac{l}{a} = \frac{1.5 \text{ cm}}{0.75 \text{ cm}^2} = 2.0 \text{ cm}^{-1}$$

159. (3)

$\text{NaBH}_4$  does not reduce  $\text{C}=\text{C}$  bond.

160. (2)



161. (1)

$\text{F}_2$  has lower bond dissociation energy than  $\text{Cl}_2$  due to strong inter-electronic repulsions.

162. (2)

Only Xe reacts with  $\text{F}_2$  because it has the lowest ionisation enthalpy  $\text{HNO}_3$ .

163. (1)

A-B interaction is stronger than A-A and B-B

164. (4)

(1)-(iii); (2)-(iv); (3)-(ii); (4)-(i)

165. (1)

The order of boiling points of the isomeric amines is as follows.

Primary amines > secondary amines > tertiary amines.

Boiling point  $\propto$  surface area of the molecule.

166. (2)

$\text{H}_2\text{C}=\text{CH}_2$  Hofmann's product is the major product.

167. (4)

A-4, B-3, C-2, D-1

168. (3)

C.N. of E in complex is 6 and oxidation state is  $x + 0 - 2 - 1 = 0$ ;  $x = 3$

169. (1)

Condition for precipitation is

$$K_{\text{IP}} > K_{\text{sp}}$$

When equal volume mixed concentration become half also, for ppt,

$$[\text{Ag}^+][\text{Cl}^-] > K_{\text{sp}}$$

170. (1)

Conc. of  $\text{HCl} = 0.25$  mole

Conc. of  $\text{NaOH} = 0.25$  mole

Heat of neutralization of strong acid by strong base =  $-57.1$  kJ



1 mole of  $\text{HCl}$  neutralise 1 mole of  $\text{NaOH}$ , heat evolved =  $57.1$  kJ

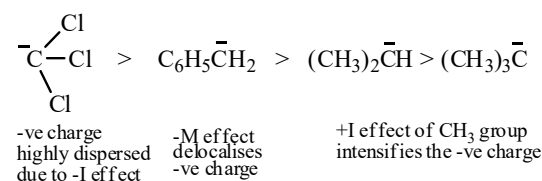
$\therefore 0.25$  mole of  $\text{HCl}$  neutralise  $0.25$  mole of  $\text{NaOH}$

$\therefore$  Heat evolved =  $57.1 \times 0.25 = 14.275$  kJ

171. (4)

Since aniline gets protonated in strongly acidic medium, the lone pair of electrons are not available to produce mesomeric or electrometric effect. Thus, aniline becomes less reactive.

172. (2)



173. (4)

(1)  $[\text{Co}(\text{NH}_3)_6]^{3+}$ : The cobalt ion is in +3 oxidation state with  $3d^6$  configuration and thus is diamagnetic octahedral complex,  $[\text{Co}(\text{NH}_3)_6]^{3+}$  and has the electronic configuration represented as shown below.



(inner orbital or low spin complex)  $d^2sp^3$  hybrid orbital  
Six pairs of electrons from six  $\text{NH}_3$  molecules.

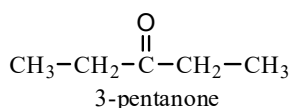
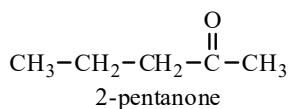
- (2)  $[\text{Zn}(\text{NH}_3)_6]^{2+}$ : Because of  $3d^{10}$  configuration no  $(n-1)$  orbital is available for  $d^2sp^3$  hybridisation and thus forms outer orbital complex. The complex is diamagnetic.
- (3)  $[\text{Ti}(\text{NH}_3)_6]^{3+}$ :  $3d^1$  configuration and thus has one unpaired electron.
- (4)  $[\text{Cr}(\text{NH}_3)_6]^{3+}$ : The complex is inner orbital complex but  $3d^3$  configuration has three unpaired electrons with weak as well as with strong field ligand.

174. (2) Zr and Hf have nearly same atomic radius as well as ionic radius. They have similar physical and chemical properties.

175. (3) It may involve increase or decrease in temperature of the system. Systems in which such processes occur, are thermally insulated from the surroundings.

176. (4)
- (1) O.N. of Cl in  $\text{Cl}^- = -1$
- (2) O.N. of Cl in  $\text{ClO}^- = x - 2 = -1$  or  $x = +1$
- (3) O.N. of Cl in  $\text{ClO}_2^- = x + 2 \times (-2) = -1$  or  $x = +3$
- (4) O.N. of Cl in  $\text{ClO}_3^- = x + 3 \times (-2) = -1$  or  $x = +5$

177. (3) Iodoform test is given by compounds which have  $\text{CH}_3\text{CO}$  group.



$\therefore$  2-pentanone has  $\text{CH}_3\text{CO}$  group, so it gives iodoform test, while 3-pentanone does not have  $\text{CH}_3\text{CO}$  group, so it does not give iodoform test.

178. (4) 2-ethyl pent-3-en-1-al

179. (3) When alkaline  $\text{KMnO}_4$  (oxidising agent) is treated with KI, iodide ion is oxidised to  $2\text{IO}_3^- + 2\text{KMnO}_4 + \text{H}_2\text{O} + \text{KI} \longrightarrow 2\text{MnO}_2 + 2\text{KOH} + \text{KIO}_3$

180. (3)

$$\text{H}_2^+ = \sigma_{1s}^1 \quad \text{B.O.} = \frac{1}{2}(1-0) = \frac{1}{2}$$

$$\text{H}_2^- = \sigma_{1s}^2 \sigma_{1s}^{*1} \quad \text{B.O.} = \frac{1}{2}(2-1) = \frac{1}{2}$$

Though both have same bond order,  $\text{H}_2^-$  is less stable because it has one electron in the higher energy and antibonding molecular orbital.

181. (2) Wavelength of yellow light = 240 nm  
=  $240 \times 10^{-9}$  m

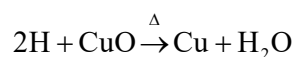
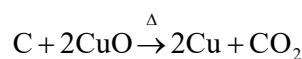
Wave number

$$\bar{\nu} = \frac{1}{\lambda} = \frac{1}{240 \times 10^{-9} \text{ m}} = 4.16 \times 10^6 \text{ m}^{-1}$$

182. (3) In case of Hydrogenic species is:  
 $1s < 2s = 2p < 3s = 3p = 3d$   
Hence 2s and 2p have same energy for Hydrogenic species.

183. (1) Aldol reaction involves an aldehyde or ketone having an  $\alpha$ -hydrogen atom. This type of reaction occurs in presence of dilute base (i.e., dil NaOH). Only  $\text{CH}_3\text{COCH}_3$  will give aldol reaction (Both HCHO and  $\text{C}_6\text{H}_5\text{CHO}$  lack  $\alpha$ -hydrogen).

184. (3) Carbon and hydrogen are estimated in organic compounds by Liebig's method

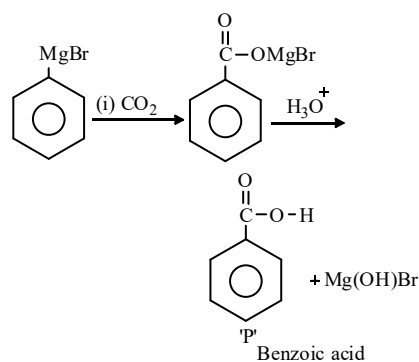


Percentage of carbon and hydrogen is calculated from the weight of  $\text{CO}_2$  and  $\text{H}_2$  produced.

185. (1)  $\text{NO}^\oplus > \text{NO} > \text{NO}^\ominus$

### SECTION - B (Attempt Any 10 Questions)

186. (2) Grignard reagent forms addition product with bubbled carbon dioxide which on hydrolysis with HCl yields benzoic acid.



187. (2)

For 1 mole  $\text{Na}_2\text{CO}_3 \rightarrow 1$  mole  $\text{CO}_2$  required.

$$n_{\text{Na}_2\text{CO}_3} \Rightarrow \frac{21200}{106} = 200 \text{ moles. } [M_{\text{Na}_2\text{CO}_3=106\text{g/mole}}]$$

$\therefore$  For 200 moles  $\text{Na}_2\text{CO}_3 \rightarrow 200$  moles of  $\text{CO}_2$  required & for 1 mole  $\text{CO}_2 \rightarrow 1$  mole  $\text{CaCO}_3$  required.

$\therefore$  For 200 mole  $\text{CO}_2 \rightarrow 200$  mole  $\text{CaCO}_3$  req.

i.e.  $\Rightarrow 200 \times (100) \text{ g CaCO}_3 \text{ req. } \{m_{\text{CaCO}_3=100\text{g}}\}$

$\Rightarrow 20 \text{ Kg}$

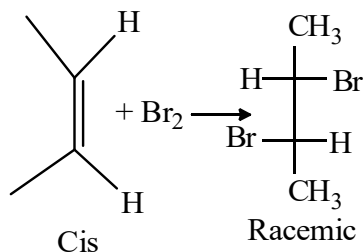
188. (2)

$$\text{Rate} = k[\text{A}][\text{B}_2]$$

$$\text{But } K = \frac{[\text{A}]^2}{[\text{A}_2]} \text{ or } [\text{A}] = \sqrt{K \cdot [\text{A}_2]}$$

$$\text{Rate} = k \cdot \sqrt{K} \cdot \sqrt{[\text{A}_2]} [\text{B}_2] = k' [\text{A}_2]^{1/2} [\text{B}_2]$$

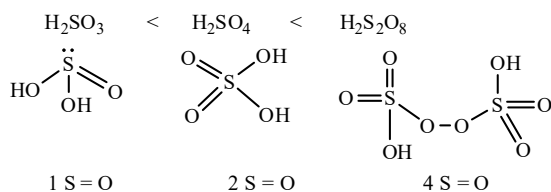
189. (3)



190. (1)

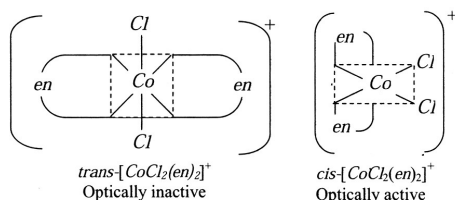
If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion

191. (2)



192. (1)

Complex of the type  $[\text{M}(\text{AA})_2\text{X}_2]$  or  $[\text{M}(\text{AA})_2\text{XY}]$  exhibit optical activity.  $[\text{CoCl}_2(\text{en})_2]^+$  forms geometrical isomers (cis and trans form). It is interesting to note that trans form does not show optical isomerism, i.e. it cannot be resolved into optical isomers. The reason is that the molecule has plane of symmetry. On the other hand, the cis-isomer is unsymmetrical and can be resolved into optical isomers.



193. (4)

$$\Delta^\circ_{\text{m}(\text{NH}_4\text{Cl})} + \Delta^\circ_{\text{m}(\text{NaOH})} - \Delta^\circ_{\text{m}(\text{NaCl})}$$

194. (1)

The value of  $K_{\text{eq}}$  is the measure of extent of reaction. For most stable oxide  $\Rightarrow K_{\text{eq}}$  should be minimum.

195. (2)



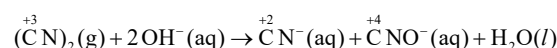
196. (3)

Vitamin	Deficiency disease
A. Vitamin-B <sub>12</sub>	1. Pernicious anaemia
B. Vitamin-B <sub>6</sub>	2. Convulsions
C. Vitamin-E	3. Sterility
D. Vitamin-K	4. Haemorrhagic condition

197. (3)

Conceptual fact.

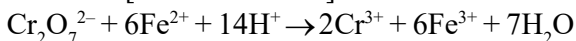
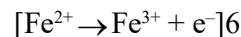
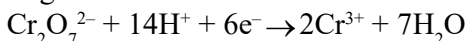
198. (4)



Here, O.N. of C decreases from +3 in  $(\text{CN})_2$  to +2 in  $\text{CN}^-$  ion and increases from +3 in  $(\text{CN})_2$  to +4 in  $\text{CNO}^-$  ion. Thus, cyanogen is simultaneously reduced to cyanide ion and oxidised to cyanate ion. It is an example of a disproportionation reaction.

199. (1)

The balanced equation involved in the titration may be given as :



$$n_1 = 1 \quad n_2 = 6$$

$$\frac{M_1 V_1}{n_1} (\text{Cr}_2\text{O}_7^{2-}) = \frac{M_2 V_2}{n_2} (\text{Fe}^{2+})$$

$$\frac{0.03 \times 20}{1} = \frac{M_2 \times 15}{6}$$

$$M_2 = \frac{0.03 \times 20 \times 6}{15} = 0.24$$

$$= 24 \times 10^{-2}$$

200. (1)

All ketones in (i), (iii) and (iv) contain abstractable alpha-proton while all aldehydes do not contain alpha-hydrogen.