03/05/2024

CODE-A

Aakash
Medical | IIT-JEE | Foundations

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

Pre-NEET Test for NEET-2024

MM : 720 **Time : 3 Hrs. 20 Min.**

Answers

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

03/05/2024

CODE-A

Aakash
Medical | IIT-JEE | Foundations

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

Pre-NEET Test for NEET-2024

MM : 720 **Time : 3 Hrs. 20 Min.**

Answers & Solutions

PHYSICS

SECTION-A

1. Answer (3)

Moment of inertia $I = Mk^2$, where k is the radius of gyration

For solid sphere:

$$\frac{2}{5}MR^2 = Mk_1^2 \Rightarrow k_1 = \sqrt{\frac{2}{5}}R \quad \ldots(i)$$

For solid cylinder:

$$\frac{MR^2}{2} = Mk_2^2 \Rightarrow k_2 = \sqrt{\frac{1}{2}}R \quad \ldots(ii)$$

$$\frac{k_1}{k_2} = \sqrt{\frac{2}{5}} \times \sqrt{\frac{2}{1}} = \frac{2}{\sqrt{5}}$$

2. Answer (3)

$\Delta U = S\Delta A$

$$\Delta A = 2\left[4\pi (4)^2 - 4\pi(2)^2\right] \times 10^{-4}$$

$= 2 \times 10^{-4} \times 4\ \pi\ [16 - 4]$

$\Delta A = 8\ \pi \times 12 \times 10^{-4}\ m^2$

Now, $\Delta U = 0.035 \times 8 \times \frac{22}{7} \times 12 \times 10^{-4}$ J

$= 0.005 \times 8 \times 22 \times 12 \times 10^{-4}$ J

$= 10.56 \times 10^{-4}$ J

3. Answer (2)

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

$$x = \frac{2F}{k}$$

4. Answer (1)

$$v_{avg} = \frac{d + d}{\frac{d}{v_1} + \frac{d}{v_2}}$$

$$v_{avg} = \frac{2v_1v_2}{v_1 + v_2}$$

$$\therefore v_{avg} = \frac{2 \times 10 \times 20}{10 + 20} = \frac{40}{3}\ m/s$$

5. Answer (1)

$$i_C = \frac{CdV_C}{dt}$$

$$\frac{dV_C}{dt} = \frac{i_C}{C} = \frac{4}{2 \times 10^{-6}}\ V\ s^{-1}$$

$$\frac{dV_C}{dt} = 2 \times 10^6\ V\ s^{-1}$$

6. Answer (1)

Volume of the wire remains constant on stretching

$\therefore \quad R = \rho\frac{l^2}{V}$, where V is volume

$\therefore \quad R \propto l^2$

$$\frac{R_0}{R'} = \frac{l^2}{(nl)^2}$$

$\Rightarrow \quad R' = n^2R_0$

7. Answer (2)

$w < 0$ and $\Delta U < 0$ in the process ABC. So, $\Delta Q < 0$ i.e., heat is released.

8. Answer (4)

Bernoulli's principle can explain all the given phenomena.

9. Answer (2)

$$P = \frac{ab^2}{c}$$

$$\Rightarrow \frac{\Delta P}{P}\times 100 = \frac{\Delta a}{a}\times 100 + 2\frac{\Delta b}{b}\times 100 + \frac{\Delta c}{c}\times 100$$

$$\frac{\Delta P}{P}\times 100 = 1\% + 2\times(2\%) + 3\% = 8\%$$

10. Answer (2)

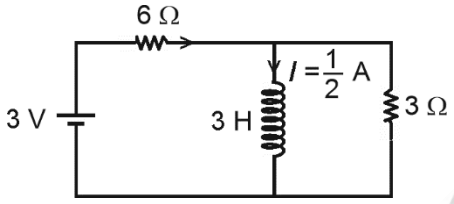
$$\sin\theta = \frac{1}{\mu}$$

$\mu_R < \mu_Y < \mu_V$

$\theta_1 > \theta_3 > \theta_2$

11. Answer (2)

In steady state, there will be no current through 3 Ω.



$$I = \frac{3\text{ V}}{6\ \Omega} = \frac{1}{2}\text{A}$$

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

$$= \frac{1}{2}\times 3\times\frac{1}{4}$$

$$= \frac{3}{8}\text{ J}$$

12. Answer (3)

When a convex lens is dipped in water, then focal length of the lens is more than its focal length in air.

13. Answer (4)

Solar cell converts light energy into electrical energy and LED operate under forward bias condition.

14. Answer (2)

$$v_{rms} = \sqrt{\frac{3RT}{m}}$$

$$v_{rms} \propto \sqrt{T}$$

$$3 = \sqrt{\frac{T_2}{T_1}}$$

$9T_1 = T_2$

$T_2 = 9\ (273 - 33)$ K

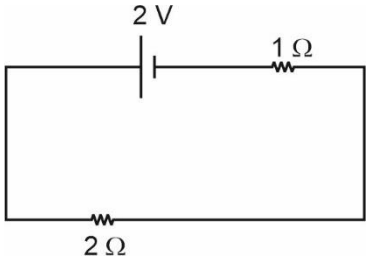
$T_2 = 2160$ K

$T_2 = 1887$ °C

15. Answer (3)

$$\varepsilon_{eq} = \frac{\frac{8}{2} - \frac{4}{2}}{\frac{1}{2} + \frac{1}{2}} = \frac{4-2}{1} = 2\text{ V}$$

$r_{eq} = 1\ \Omega$



$$V_A - V_B = \left(\frac{2}{2+1}\right)2 = \frac{4}{3}\text{ V}$$

16. Answer (1)

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$$

$$\frac{1}{f_1} = \frac{\left(\frac{3}{2} - 1\right)}{1}\left(\frac{2}{R}\right)$$

$R = f_1 = 20$ cm

$f_1 = f_3 = 20$ cm

$$\frac{1}{f_2} = \left(\frac{\frac{4}{3} - 1}{1}\right)\left(-\frac{2}{R}\right)$$

$$= \left(\frac{1}{3}\right)\left(\frac{-2}{20}\right) = -\frac{2}{60} = \frac{-1}{30}\text{ cm}$$

$$\frac{1}{f} = \frac{2}{20} - \frac{1}{30}$$

$$\frac{1}{f} = \frac{6-2}{60}$$

$$\frac{1}{f} = \frac{4}{60}$$

$f = 15$ cm

17. Answer (3)

$U = -PE\cos\theta$

$4 = q\,(l)\,E\cos\theta$

$$l = \frac{4}{4\times 10^{-3}\times 2\times 10^5\times\frac{1}{2}}$$

$$l = \frac{1}{10^2}\text{m} = 10^{-2}\text{m}$$

$= 1$ cm

18. Answer (2)

In closed organ pipe, only odd harmonics are generated. Pressure antinode is formed at closed end of organ pipe.

19. Answer (3)

The transfer of kinetic energy is maximum when both the blocks are of same mass in case of $e = 1$.

20. Answer (1)

$${}_1^2H + {}_1^2H \rightarrow {}_2^4He + \Delta Q$$

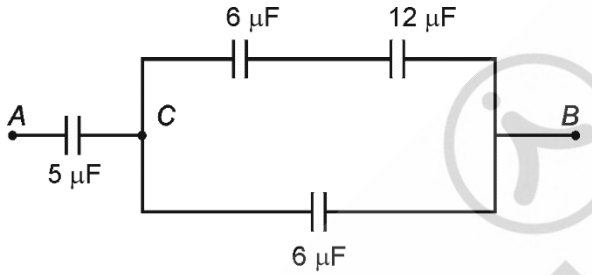
$\Delta Q = BE_{He} - 4 \times$ BE per nucleon of ${}_1^2H$

$BE_{He} = \Delta Q + 4 \times$ BE per nucleon of ${}_1^2H$

$= (23.6 + 4 \times 1.1)$ MeV

$= 28$ MeV

21. Answer (4)



$$C_{AB} = \frac{10 \times 5}{10 + 5}\mu F = \frac{10}{3}\mu F$$

22. Answer (1)

For largest wavelength in Balmer Series

$$\frac{1}{\lambda} = R\left[\frac{1}{4} - \frac{1}{9}\right]$$

$$\frac{1}{\lambda} = R\left[\frac{5}{36}\right]$$

$$R = \frac{36}{5\lambda}$$

For shortest wavelength in Pachen Series

$$\frac{1}{\lambda'} = R\left[\frac{1}{3^2} - \frac{1}{\infty}\right]$$

$$\frac{1}{\lambda'} = \frac{R}{9}$$

$$\frac{1}{\lambda'} = \frac{1}{9} \times \frac{36}{5\lambda}$$

$$\lambda' = \frac{5}{4}\lambda$$

23. Answer (2)

At constant pressure

$n C_p \Delta T = 200$ J

$2 C_p \times 10 = 200$ J

$C_p = 10$ J mol^{-1} °C^{-1}

$C_v = 10 - 8.314$

Now, at constant volume

$\Delta Q = nC_v\Delta T$

$\Delta Q = 2 \times 1.686 \times 10$ J

$\Delta Q = 33.72$ J

24. Answer (1)

$0.8 \times V_p I_p = 121$ W

$0.8 \times 440 \times I_p = 121$ W

$$I_p = \frac{121}{0.8 \times 440}\text{A}$$

$$I_p = \frac{11}{32}\text{A} \approx 0.34\,\text{A}$$

25. Answer (2)

$$R = \frac{u^2 \sin 2\theta}{g} = \frac{1200 \times \sqrt{3}}{20}$$

$$R = 60\sqrt{3}\text{ m}$$

26. Answer (4)

Photoelectric current is directly proportional to intensity of light.

27. Answer (1)

$$T = 2\pi\sqrt{\frac{l}{g}} \quad \Rightarrow \quad \frac{\Delta T}{T} \times 100 = \frac{1}{2}\frac{\Delta l}{l} \times 100$$

$$\frac{\Delta T}{T} \times 100 = \frac{1}{2} \times 2 \qquad \Rightarrow \qquad \frac{\Delta T}{T} \times 100 = 1\%$$

28. Answer (2)

$$\vec{a} = \frac{\frac{v}{2}\hat{j} - v\hat{i}}{\Delta t}$$

$$\tan\theta = \frac{v}{\frac{v}{2}} = 2$$

Where θ is the angle with north

29. Answer (4)

Instantaneous power

$$P = \vec{F}.\vec{V} = \left(5\hat{i} + 5\hat{j} + 8\hat{k}\right).\left(2\hat{i} - 3\hat{j} + 5\hat{k}\right)$$

$P = 10 - 15 + 40 = 35$ W

30. Answer (2)

$\lambda_e = \frac{12.27}{\sqrt{V}}$ Å $\Rightarrow \lambda_e = \frac{12.27}{\sqrt{100}}$

$\lambda_e = 1.227$ Å

31. Answer (1)

$C' = \frac{A\varepsilon_0}{d'}$

$\because d' < d \Rightarrow C' > C$

32. Answer (2)

$\omega_1^2 A_1 = \omega_2^2 A_2$

$\frac{k_1 A_1}{m} = \frac{k_2 A_2}{m}$

$\frac{A_1}{A_2} = \frac{k_2}{k_1}$

33. Answer (4)

For a conducting charged sphere

$V = \frac{KQ}{R}$ when $r \le R$

$V = \frac{KQ}{r}$ when $r \ge R$

34. Answer (4)

$M = NiA \Rightarrow M = i \times a^2 \times 2 = 2ia^2$

35. Answer (1)

$C_o = \frac{A\varepsilon_0}{d}$ ...(i)

$C = \frac{A\varepsilon_0 k}{d} = \frac{A \times \varepsilon_0 \times 4}{2d} = \frac{2A\varepsilon_0}{d} = 2C_o$

SECTION-B

36. Answer (2)

$TE = -\frac{13.6}{n^2}$ eV

$PE = 2TE = -\frac{2 \times 13.6}{(4)^2}$ eV

$= -1.7$ eV

37. Answer (2)

$v^2 - u^2 = 2as$

$v^2 - 20 \times 20 = 2(-10)(-25)$

$v^2 = 500 + 400$

$v^2 = 900$

$v = 30$ m s^{-1}

38. Answer (4)

$P = (i_1)^2 (5R) = \left(\frac{\varepsilon}{6R}\right)^2 5R = \frac{5\varepsilon^2}{36R}$

$P' = (i_2)^2 \left(\frac{R}{5}\right) = \left(\frac{\varepsilon}{R + \frac{R}{5}}\right)^2 \left(\frac{R}{5}\right)$

$= \left(\frac{5\varepsilon}{6R}\right)^2 \left(\frac{R}{5}\right) = \frac{5\varepsilon^2}{36R}$

$\therefore \quad P = P'$

39. Answer (2)

L.C. = 1 M.S.D. – 1 V.S.D.

= 1 M.S.D. – $\frac{8}{10}$ M.S.D.

= $\frac{2}{10}$ M.S.D.

= $\frac{1}{5}$ × 1 mm

= 0.2 mm

40. Answer (4)

The net flux can be positive, negative or zero. It depends on the charge enclosed within the surface.

41. Answer (1)

$\vec{F}_m = I\left(\vec{L}_{eff} \times \vec{B}\right)$

$= I\left[4\hat{i} \times (5\hat{i} + 3\hat{j} - 4\hat{k})\right]$

$\vec{F}_m = 4I[3\hat{k} + 4\hat{j}]$ N

$\left|\vec{F}_m\right| = 4I\sqrt{3^2 + 4^2}$ N

$= 4I \times 5$ N

$= 20I = 40$ N

42. Answer (3)

$-\frac{GMm}{R} + \frac{1}{2}m\left(\frac{v_e}{2}\right)^2 = -\frac{GMm}{R+h}$

$-\frac{GMm}{R} + \frac{1}{2}m\frac{2gR}{4} = -\frac{GMm}{R+h}$

$-\frac{GMm}{R} + \frac{1}{2}m\frac{2GM}{4R} = -\frac{GMm}{R+h}$

$-\frac{1}{R} + \frac{1}{4R} = \frac{-1}{R+h}$

$\frac{-4+1}{4R} = \frac{-1}{R+h}$

$3R + 3h = 4R$

$R = 3h$

$h = R/3$

43. Answer (4)

For uniform circular motion, angular speed remains constant. So, angular acceleration is zero.

44. Answer (2)

$a = -\omega^2 x$

$T = \frac{2\pi}{\omega} \Rightarrow \omega = \frac{2\pi}{4}$

$\omega = \frac{\pi}{2}$

$a = -\left(\frac{\pi}{4}\right)^2 \times 2 = -\frac{\pi^2}{2}$

45. Answer (2)

Least count of screw gauge is given by

$\text{L.C.} = \frac{\text{Pitch}}{\text{Number of divisions on circular scale}}$

$= \frac{2}{4 \times 100}$

$= \frac{1}{200}$ mm

= 0.005 mm

46. Answer (3)

In resonance tube experiment,

End correction (e) = $\frac{l_2 - 3l_1}{2}$

$= \frac{62 - 3(20)}{2}$

$= \frac{2}{2}$

= 1 cm

47. Answer (4)

$\overline{\overline{A} + \overline{B}} = Y$

$Y = \overline{\overline{A}} \cdot \overline{\overline{B}} = AB$

The logic is AND gate

48. Answer (3)

$X_L = \omega L = 100 \times \frac{1}{2} = 50\ \Omega$

$X_C = \frac{1}{\omega C} = \frac{1}{100 \times 100 \times 10^{-6}}\ \Omega = 100\ \Omega$

$\cos\phi = \frac{R}{Z} = \frac{50}{\sqrt{R^2 + (X_L - X_C)^2}}$

$= \frac{50}{\sqrt{(50)^2 + (50)^2}}$

$\cos\phi = \frac{1}{\sqrt{1+1}}$

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

49. Answer (1)

$v^2 = u^2 + 2as$

$\Rightarrow (40)^2 = (80)^2 + 2a \times 16$

$\Rightarrow a = \frac{1600 - 6400}{32}$

$\Rightarrow a = -150\ \text{m/s}^2$

50. Answer (4)

$\left[\frac{d\phi_B}{dt}\right] = \left[\frac{w}{q}\right]$

$\frac{[\phi_B]}{T} = \frac{ML^2T^{-2}}{AT}$

$[\phi_B] = [ML^2T^{-2}A^{-1}]$

CHEMISTRY

SECTION - A

51. Answer (3)

Rate (r) = $k[A]^2[B]^{\frac{1}{2}}$

When concentration of A is tripled

$[A'] = 3A$

New rate, r' = $k[A']^2[B]^{\frac{1}{2}}$

= $k\left[3A^2\right][B]^{\frac{1}{2}}$

= $9k\left[A^2\right][B]^{\frac{1}{2}}$

= 9r

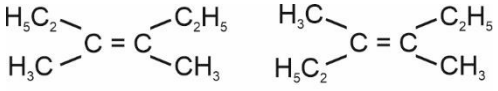
52. Answer (2)

k = GG*

$G^* = kR = 0.03 \times 90 = 2.7\ \text{cm}^{-1}$

53. Answer (4)

3, 4-Dimethylhex-2-ene will show geometrical isomerism.



cis form trans form

54. Answer (1)

CCl_4 cannot be hydrolysed due to non-availability of d-orbitals.

55. Answer (2)

$-OCH_3$ group is ring activating for electrophilic substitution reaction.

56. Answer (3)

Among isoelectronic species, ionic radii increases with increase in negative charge which decreases with increase in positive charge.

57. Answer (1)

The stability of $Cu^{2+}(aq)$ is more than $Cu^{+}(aq)$ due to more negative $\Delta_{hyd}H°$ of $Cu^{2+}(aq)$ than $Cu^{+}(aq)$, which compensates more than second IE of Cu.

58. Answer (1)

Activation energy is defined as the minimum amount of extra energy absorbed by reactants to form activated complex.

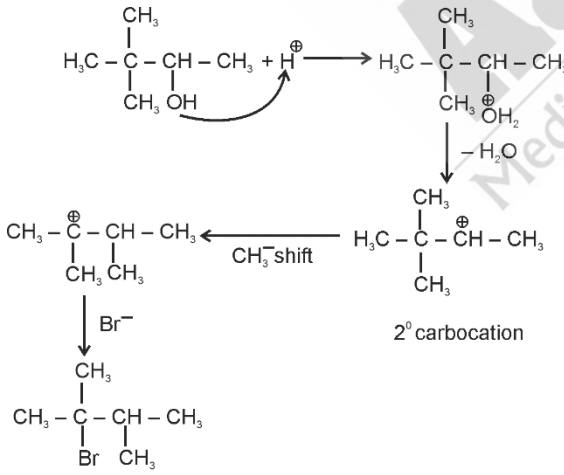
59. Answer (3)

In case, nitrogen and sulphur both are present in organic compound, sodium thiocyanate is formed and it combines with Fe^{3+} to give blood red colour.

$Na + C + N + S \rightarrow NaSCN$

$Fe^{3+} + SCN^{-} \rightarrow [Fe(SCN)]^{2+}$

60. Answer (2)



61. Answer (3)

As we move down the group, due to poor shielding effect of intervening *d* and *f* orbitals, the increased effective nuclear charge holds n*s* electrons tightly and therefore restricting their participation in bonding. So $Tl^{+1} > Tl^{3+}$ in stability.

62. Answer (4)

For molecules like B_2, C_2, N_2 etc., the increasing order of energies of various molecular orbitals is

$\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y)$

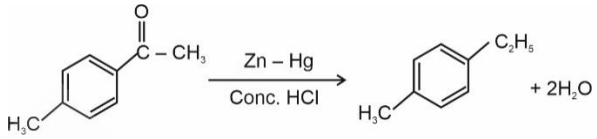
$< \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$

63. Answer (1)

Primary alkyl halides are those in which C containing X is attached to one C only.

64. Answer (4)

This is Clemmensen Reduction



65. Answer (1)

A unit formed by the attachment of a base to 1′ position of sugar is known as nucleoside when nucleoside is linked to phosphoric acid at 5′ position of sugar moiety we get a nucleotide.

66. Answer (2)

- E_{cell} is an intensive property.
- Electrical work done W = q × V

67. Answer (2)

(1) $CH_3CN \xrightarrow[(ii)H_3O^+]{(i)\ LiAlH_4} CH_3CH_2NH_2$

(2) $CH_3NC \xrightarrow[(ii)H_3O^+]{(i)\ LiAlH_4} H_3C-NH-CH_3$

68. Answer (1)

$CaCO_3 \xrightarrow{1200\ K} CaO + CO_2$

100 g $CaCO_3$ produces 44 g CO_2.

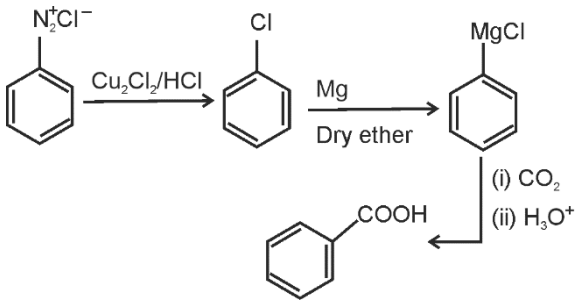
As $CaCO_3$ is 10% pure.

Mass of pure $CaCO_3 = \frac{40 \times 10}{100} = 4$ g

4 g $CaCO_3$ produces

$$CO_2 = \frac{44}{100} \times 4 = 1.76\,g\ CO_2$$

69. Answer (3)



70. Answer (4)

$\wedge_m = \wedge_m^o - A\sqrt{C}$

– The equation is application for strong electrolytes.

– All electrolytes of particular type have same value for 'A'.

– $BaCl_2$ and $CaCl_2$ are 2-1 electrolytes, So they have same value for 'A'.

71. Answer (4)

Due to an increase in nuclear charge which accompanies the filling of inner d orbitals, there is an increase in ionisation enthalpy along each series of the transition elements, from left to right. However, very small variations occurs.

72. Answer (2)

$$CH_3CH_2COOH \xrightarrow[(ii)H_2O/HCl]{(i)\ B_2H_6} CH_3CH_2CH_2OH$$

73. Answer (3)

$Mn_2O_7 \rightarrow$ Acidic oxides

$CO \rightarrow$ Neutral oxides

$BeO \rightarrow$ Amphoteric oxides

$K_2O \rightarrow$ Basic oxides

74. Answer (3)

$$m = \frac{1000M}{1000 \times d - M \times M_{solute}}$$

$$= \frac{1000 \times 1}{(1000 \times 1.5) - (1 \times 100)}$$

$$= \frac{1000}{1500 - 100} = \frac{1000}{1400} = 0.714\ m$$

75. Answer (2)

For any value of l, m_ℓ value will be from $-l \ldots 0 \ldots +l$.

So for n = 2, l = 0,1

m_ℓ = –1, 0, +1

76. Answer (3)

$K_a = C\alpha^2$

$= 0.1 \times (0.001)^2$

$= 0.1 \times 10^{-6}$

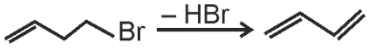
$= 10^{-7}$

77. Answer (1)

Basic buffer is mixture of weak base and its conjugate acid or salt of that weak base with another strong acid.

78. Answer (4)

More is the stability of alkene formed, more will be the rate of α-β dehydrohalogenation.



Conjugated diene is most stable.

79. Answer (2)

$$\frac{1}{2}H_2O(g) \rightarrow \frac{1}{2}H_2 + \frac{1}{4}O_2$$

Δ_rH = 120.91

For decomposition of 1 mole H_2O

$\Delta_rH = 2 \times 120.91$

= 241.82 kJ

80. Answer (1)

$$AgNO_3 + \underset{(excess)}{KI} \rightarrow AgI + KNO_3$$

As I^- is in excess it is adsorbed or AgI/I^- hence –ve charge develops.

81. Answer (2)

$BeCl_2 \rightarrow 180°$

$BF_3 \rightarrow 120°$

$CH_4 \rightarrow 109.5°$

$NH_3 \rightarrow 107°$

82. Answer (2)

$[Ni(CN)_4]^{2-}$ forms low spin complex, So its hybridisation is dsp^2 and shape is square planer.

83. Answer (3)

$$Cr_2O_7^{2-} + 6I^- + 14H^+ \rightarrow 2Cr^{3+} + 3I_2 + 7H_2O$$

1 mole of $Cr_2O_7^{2-}$ can oxidise 6 moles of I^- to I_2.

84. Answer (2)

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

$= \frac{1}{2}(9-4) = 2.5$

85. Answer (3)

Total number of nodes = n –1

= 3 – 1 = 2

SECTION-B

86. Answer (2)

$[Cr(NH_3)_6][Co(CN)_6]$ and $[Co(NH_3)_6][Cr(NH_3)_6]$ are coordination isomerism.

Coordination number of Cr and Co is 6.

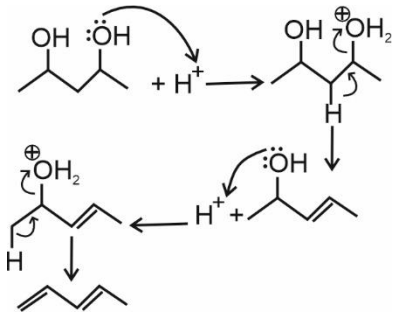
87. Answer (3)

Hyperconjugation is a permanent effect.

88. Answer (3)

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

89. Answer (2)



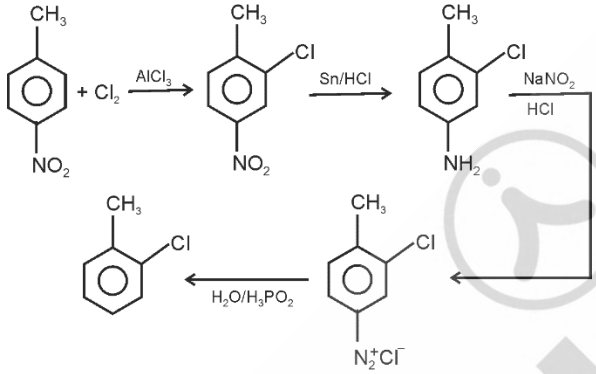
90. Answer (3)

CrO is basic but Cr_2O_3 is amphoteric.

91. Answer (3)

Tollen's reagent can be used to distinguish aldehyde and ketone. Tollen's reagent oxidises aldehyde to carboxylate ion.

92. Answer (2)



93. Answer (3)

Lesser the number of particles, higher is the freezing point.

0.1 M $MgSO_4$ → 0.2 moles/L particles

1 M NaCl →1 mole/L particles

0.05 M NaCl→ 0.1 mole/L particles

0.1 KCl → 0.2 moles/L particles

94. Answer (4)

Dimethyl glyoxime test is used to detect Ni.

95. Answer (1)

Balanced equation is

$$5C_2O_4^{2-} + 2MnO_4^- + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 10CO_2$$

96. Answer (2)

Isothermal reversible change

$$\rightarrow q = -w = 2.303nRT\log\frac{V_f}{V_i}$$

Isothermal irreversible change → q = – w = p(ΔV)

Adiabatic irreversible change → q = 0, w_{ad} = ΔU

Free expansion; *q* = ΔU as w = 0

97. Answer (4)

As we go down the group H – A bond enthalpy decreases. Hence H_2S is more acidic than H_2O, HI is more acidic than HCl.

98. Answer (4)

Pyrophosphoric acid $H_4P_2O_7$ has four P – OH bonds so its basicity is 4.

99. Answer (3)

Vitamins A, D, E and K are fat soluble vitamins. Vitamin B and C are water soluble.

100. Answer (3)

Significant amount of meta Nitroaniline is produced due to formation of anilinium ion.

BOTANY

SECTION - A

101. Answer (2)

Ethylene promotes apical hook formation in dicot seedlings.

102. Answer (3)

Rhizobium is heterotroph and rest all are autotrophs.

103. Answer (4)

Water pollinated flowers have unwettable pollens.

Flowers pollinated by abiotic agents produce large number of pollen grains.

104. Answer (4)

Prions are protein particles, without any genetic material.

105. Answer (4)

Earth Summit was held in Brazil in 1992 whereas World Summit was held in Johannesburg, South Africa in 2002.

106. Answer (3)

During isolation of DNA from the source cells, different types of enzymes are used to digest their cell walls. Other molecules can be removed by appropriate treatments and purified DNA ultimately precipitates out after the addition of chilled ethanol.

107. Answer (1)

Sorghum is a C_4 plant. Thus, it requires 30 ATP and 12 NADPH to synthesise one molecule of hexose sugar.

108. Answer (2)

Gross primary productivity is the rate of formation of organic matter by producers during photosynthesis.

109. Answer (3)

Biolistics or gene gun is a direct method used to introduce alien DNA into plant cells in which, cells are bombarded with high velocity micro-particles of gold or tungsten, coated with DNA.

110. Answer (2)

The gene controlling starch synthesis in garden pea controls starch grain size and seed shape, thus exhibits pleiotropism.

111. Answer (3)

Defined annual rings are observed in case of temperate plants as in winter the cambium is less active but in summers it is more active. In tropical region as the environmental conditions are constant, thus distinct annual rings are not formed.

112. Answer (1)

In animal cells, during the S phase, DNA replication begins in the nucleus and the centriole duplicates in the cytoplasm.

113. Answer (2)

Fabaceae $\rightarrow$ Diadelphous and dithecous anther

Solanaceae $\rightarrow$ Polyandrous, epipetalous and dithecous anther

Liliaceae $\rightarrow$ Polyandrous, epiphyllous and dithecous anther

Malvaceae $\rightarrow$ Monoadelphous and monothecous anther

114. Answer (3)

	China rose	Tomato
Aestivation of corolla	Twisted	Valvate
Ovary	Pentacarpellary	Bicarpellary
Placentation	Axile	Axile
Leaves	Stipulate	Ex-Stipulate

115. Answer (1)

Heterosporous pteridophytes (e.g., *Selaginella*) exhibit the event that is a precursor to seed habit. *Psilotum*, *Lycopodium* and *Equisetum* are homosporous pteridophytes.

116. Answer (2)

According to the analogy used by Paul Ehrlich, the rivets on the wings represent key species.

117. Answer (1)

Wind pollination requires that the pollen grains are light and non-sticky so that they can be transported in wind currents.

118. Answer (1)

In mosses, antheridia and archegonia are produced at the apex of same leafy shoots. They are homosporous in nature as they produce single kind of spores.

119. Answer (1)

Endemic species are confined to a particular area and not found anywhere else.

120. Answer (1)

Gibberellins promote bolting (internode elongation just prior to flowering) in beet, cabbages and many plants with rosette habit.

121. Answer (4)

Chromosomal theory of inheritance was experimentally verified by Thomas Hunt Morgan.

122. Answer (3)

The blind approach of simply sequencing the whole set of genome that contained all the coding and non-coding sequence and later assigning different regions in the sequence with functions is referred to as sequence annotation.

123. Answer (2)

DNA stained with ethidium bromide will show bright orange colour upon exposure to UV radiations. UV radiations are non-ionising radiations whereas X-rays and γ-rays are ionising radiations.

124. Answer (3)

The direct synthesis of ATP from glycolysis of one glucose molecule is 4.

125. Answer (1)

Alfred Hershey and Martha Chase worked on bacteriophage and *E. coli* to give unequivocal proof that DNA is the genetic material.

126. Answer (4)

No energy that is trapped into an organism remains in it forever. The energy trapped by the producer, hence, is either passed on to a consumer or the organism dies. Molluscs are primary consumers in aquatic ecosystems.

127. Answer (4)

PS II can be localised in grana of chloroplast.

128. Answer (2)

Egg apparatus is the three celled structure present at the micropylar end of embryo sac. Egg cell present in the apparatus participates in syngamy.

129. Answer (3)

mRNA –

5′– AUG GAU CAG UCG AUG GAU UAG AUC – 3′

Polypeptide - Met - Asp - Gln - Ser - Met - Asp - Stop

130. Answer (2)

Separation of homologous chromosomes occurs during anaphase I.

131. Answer (1)

Cellulose does not form blue colour with iodine because it does not contain complex helices and hence cannot hold iodine molecules.

132. Answer (4)

Many species extinctions in the last 500 years (Steller's sea cow, passenger pigeon) were due to over-exploitation by humans.

133. Answer (2)

The RNA polymerase II transcribes precursor of mRNA, the heterogenous nuclear RNA (hnRNA).

134. Answer (2)

Crossing over occurs between non-sister chromatids of homologous chromosomes.

135. Answer (1)

Endarch condition is commonly observed in stems of angiosperms.

SECTION-B

136. Answer (2)

Unlike bryophytes and pteridophytes, in gymnosperms the male and the female gametophytes do not have an independent free - living existence.

137. Answer (2)

The formation of haploid microspore from diploid microspore mother cell inside pollen sac by meiotic division is called microsporogenesis. The haploid microspores formed from a single microspore mother cell are arranged in the form of four cells called microspore tetrad. As the anthers mature and dehydrate, the microspores dissociate from each other and develop into pollen grains.

138. Answer (4)

Chemiosmotic hypothesis was explained by P. Mitchell. This mechanism explains how ATP is synthesised in the chloroplast. The synthesis is linked to the development of a proton gradient across the membrane of the thylakoid and the proton accumulation is towards the inner side of the thylakoid membrane *i.e.*, in the lumen.

139. Answer (2)

In telophase, reformation of nucleolus, Golgi complex and ER occurs. In metaphase, spindle fibres attach to kinetochores of chromosomes. Centrosome which had undergone duplication in interphase, begins to move towards opposite poles of the cell in prophase. Centromere split and chromatids separate during anaphase.

140. Answer (1)

Interaction	Species A and B	Examples
Parasitism	+ –	*Cuscuta* on hedge plant
Amensalism	– 0	*Penicillium* and Gram positive bacteria
Commensalism	+ 0	Sea anemone and clown fish
Mutualism	+ +	Fig and wasp

141. Answer (2)

Competition is best defined as a process in which the fitness of one species (measured in terms of its 'r' the intrinsic rate of increase) is significantly lower in the presence of another species.

142. Answer (2)

Polysiphonia (red algae) shows the predominance of phycoerythrin.

Polytrichum (Moss) shows the presence of dependent sporophyte.

Psilotum (Pteridophyte) have prothallus which represent thalloid gametophyte.

Pinus (Gymnosperms) shows the presence of branched stem.

143. Answer (2)

In individual affected with Down's syndrome, broad palm with characteristic palm crease is observed. This disorder is caused due to the trisomy of chromosome 21. Individuals affected with Turner's syndrome are sterile as ovaries are rudimentary. They also lack other secondary sexual characters.

144. Answer (1)

The cells of secondary cortex are parenchymatous. Phellem (cork) is impervious to water due to suberin deposition in the cell wall. Phellogen (cork cambium), phellem (cork) and phelloderm (secondary cortex) are collectively known as periderm.

145. Answer (4)

23S rRNA in bacteria acts as an enzyme during translation.

146. Answer (2)

Due to its close structural similarity with the succinate, the malonate competes with the succinate for the active site of the succinic dehydrogenase. Succinate is the substrate for enzyme succinic dehydrogenase. Dinitrogenase catalyses the reduction of nitrogen to ammonia.

147. Answer (4)

Phytoplanktons are the pioneer species in hydrarch succession, while lichens are the pioneer species in xerarch succession. Forest represents the climax community in xerarch succession. Shrubs is one of the seral community during xerarch succession.

148. Answer (3)

Pyruvate kinase participates in the process of glycolysis.

Pyruvate dehydrogenase participates in the process of link reaction.

Succinate dehydrogenase participates in the process of electron transport system.

Pyruvate decarboxylase participates in the alcoholic fermentation.

149. Answer (4)

In epigynous flowers, the margin of thalamus grows upward enclosing the ovary completely and getting fused with it, the other parts of flower arise above the ovary. Hence, the ovary is said to be inferior as in flowers of guava and cucumber and the ray florets of sunflower.

150. Answer (2)

The main steps in the formation of recombinant DNA are as follows :-

(B) Isolation of DNA in pure form

(D) Cutting of DNA at specific location by restriction enzyme

(A) Isolation of desired DNA fragment

(E) Amplification of gene of interest using PCR

(C) Ligation of DNA fragment into a vector

So step 'E' comes in between steps 'A' and 'C'.

ZOOLOGY

SECTION - A

151. Answer (4)

First menstruation in human females begins at puberty and is called menarche. Lack of menstruation may be indicative of pregnancy. However, it may be caused due to some other underlying causes like stress, poor health, *etc*. One ovum is released during the middle of each normal menstrual cycle of 28 days.

152. Answer (2)

Amniocentesis for sex determination is not a strategy under Reproductive and Child Health Care programmes. It is banned in India to legally check increasing menace of female foeticide. It is used to test for the presence of certain genetic disorders such as haemophilia, sickle-cell anaemia and also to determine the survivability of the foetus.

153. Answer (4)

Cuckoo and crow – brood parasitism.

Ticks and dog – ectoparasitism.

Plasmodium and humans – endoparasitism.

Lion and deer – predation.

154. Answer (2)

Expiratory capacity is the total volume of air expired by a human after normal inspiration. This includes TV + ERV.

FRC = TLC – IC

TLC = IRV + TV + ERV + RV

= IC + FRC = VC + RV

ERV + IRV + TV = VC

155. Answer (3)

Except for hepatitis-B, genital herpes and HIV infections, other sexually transmitted diseases are completely curable if detected early and treated properly.

156. Answer (2)

Erythropoietin stimulates erythropoiesis. Secretin acts on exocrine part of pancreas and stimulates secretion of water and bicarbonate ions. ANF causes vasodilation and thus decreases blood pressure. Gastrin acts on gastric glands and stimulates secretion of HCl and pepsinogen.

157. Answer (3)

Plasmodium falciparum is the causative agent of malignant malaria. Filariasis or elephantiasis is caused by *Wuchereria malayi* and *Wuchereria bancrofti*. Ringworms are caused by *Microsporum*, *Trichophyton* and *Epidermophyton*. *Salmonella typhi* is the causative agent of typhoid.

158. Answer (3)

The P-wave represents electrical excitation (depolarisation) of the atria. The contraction starts slightly after Q-wave and marks the beginning of the ventricular systole. QRS complexes that occur in a given time period are helpful in determining heart beat rate of an individual. End of T-wave marks the end of ventricular systole.

159. Answer (2)

After getting into the body of a person, the HIV enters into macrophages where RNA genome of the virus replicates to form viral DNA with the help of the enzyme reverse transcriptase. The macrophages continue to produce virus and in this way act like a HIV factory.

160. Answer (2)

Due to close structural similarity of a competitive inhibitor with the substrate, the inhibitor competes with the substrate for the substrate binding site of the enzyme. Consequently, the substrate cannot bind and as a result, the enzyme activity declines.

161. Answer (1)

Fibres and fibroblasts are compactly packed in dense connective tissues in both regular and irregular type and they are loosely arranged in loose connective tissues. In the dense regular connective tissues, the collagen fibres are present in rows between many parallel bundles of fibres.

162. Answer (4)

Mitochondria, chloroplast and nucleus are double membrane bound organelles.

163. Answer (4)

Primary structure of a protein is imagined as a line, the first amino acid is situated at left end and is also called N-terminal amino acid and last amino acid present at right end is also called C-terminal amino acid. Adult human haemoglobin is an assembly of 2α and 2β polypeptide chains and represents quaternary structure of a protein.

164. Answer (4)

Turner's syndrome is caused due to the absence of one of the X chromosomes.

165. Answer (1)

Seed bearing plants (angiosperms and gymnosperms) follow diplontic life cycle pattern. Phase of cell elongation of plant cells is characterised by increased vacuolation. Stroma lamellae only have PS I. The process of copying genetic information from one strand of the DNA into RNA is termed as transcription.

166. Answer (2)

Fasciola	–	Flame cells
Amoeba	–	Contractile vacuole
Locusta	–	Malpighian tubules
Nereis	–	Nephridia

167. Answer (2)

The salient feature of genetic code is, that it is non-overlapping.

168. Answer (1)

The vasa efferentia leave the testis and open into epididymis located along the posterior surface of each testis.

The epididymis leads to vas deferens that ascends to the abdomen and loops over the urinary bladder.

169. Answer (3)

Bilateral symmetry is present in platyhelminths, aschelminths, annelids, molluscs, arthropods and larvae of echinoderms. Radial symmetry is present in coelenterates, ctenophores and in adult echinoderms.

170. Answer (4)

Protective colouration in animals including frogs is called mimicry. During hibernation, frogs perform cutaneous respiration. In male frogs, the urinogenital duct opens into cloaca. It is a common passage for transportation of sperms and urine. Bidder's canal is present in kidneys of male frogs.

171. Answer (2)

In frogs, food is captured by bilobed tongue. Bile emulsifies fat for its digestion. Sinus venosus is a triangular structure connected with right atrium of the heart. Forebrain includes paired olfactory lobes, paired cerebral hemispheres and unpaired diencephalon.

172. Answer (2)

Sedimentation coefficient is indirectly a measure of density and size.

173. Answer (4)

In frogs, among sense organs, eyes and internal ears are well-organised. Eyes are a pair of spherical structures which are simple eyes possessing only one unit. Multiple units are present in compound eyes of insects.

174. Answer (4)

Tubectomy	–	Surgical method
Lactational amenorrhoea	–	Natural method
Diaphragm	–	Barrier method
Saheli	–	Oral method

175. Answer (2)

Gliding joint	–	Between the carpals
Hinge joint	–	Between femur and tibia
Pivot joint	–	Between atlas and axis
Fibrous joint	–	Between flat skull bones

176. Answer (4)

The genetic material should be stable enough not to change with different stage of life cycle, age or with change in physiology of the organism.

177. Answer (3)

In prokaryotes, the DNA in nucleoid is organised in large loops held by proteins.

178. Answer (1)

The symbol representing unspecified sex in human pedigree analysis is ◇.

179. Answer (1)

Wolf is a placental mammal. Numbat, wombat marsupial mole, marsupial mouse, marsupial rat, Tasmanian wolf, Tasmanian tiger cat, bandicoot, koala and kangaroo are marsupial mammals exhibiting adaptive radiation.

180. Answer (2)

A single stranded DNA or RNA, tagged with a radioactive molecule is called probe. If any protein encoding gene is expressed in a heterologous host, it is called a recombinant protein. BAC and YAC are cloning vectors.

181. Answer (3)

Smack is chemically diacetylmorphine and acts as a depressant. Hashish has receptors mainly in brain and has effects on cardiovascular system of the body. Crack has potent stimulating action on CNS. Amphetamines are stimulants and are used in patients suffering from mental illness such as depression.

182. Answer (4)

Recombinant DNA Technology, Polymerase Chain Reaction, Enzyme Linked Immuno-sorbent Assay are some of the techniques that serve the purpose of early diagnosis of diseases. pBR322 is a cloning vector.

183. Answer (4)

In humans, all copulations do not lead to fertilisation and pregnancy because fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary region of fallopian tube.

184. Answer (1)

HBB gene is present on chromosome 11. HBA1 and HBA2 genes are present on chromosome 16. 2968 genes are found on chromosome 1 and 231 genes are found on Y chromosome.

185. Answer (1)

Conditional reabsorption of Na^+ and water takes place in distal convoluted tubules depending upon the osmolarity of the body fluids under the effect of ADH and aldosterone. Mammals have the ability to produce concentrated urine due to the presence of counter current mechanism. The loop of Henle of juxtamedullary nephrons and vasa recta participate in counter current mechanism to concentrate urine.

SECTION-B

186. Answer (4)

Anal cerci are a pair of segmented, filamentous structures found attached with the 10^{th} abdominal segment in both male and female cockroaches.

187. Answer (1)

Recombination nodules appear during pachytene. Diakinesis is characterised by terminalisation of chiasmata.

188. Answer (3)

The secretion of PTH is regulated by the circulating levels of calcium ions by negative feedback mechanism. TCT is a peptide hormone. Thyroid hormones such as T_4 and T_3 support the process of red blood cell formation.

189. Answer (3)

In animals, mitotic cell division is seen in the diploid somatic cells.

190. Answer (3)

Frogs exhibit sexual dimorphism. Male frogs can be distinguished by the presence of sound producing vocal sacs and also a copulatory pad on the first digit of fore limbs which are absent in female frogs.

191. Answer (4)

Exponential growth $\rightarrow \frac{dN}{dt} = rN$

Logistic growth $\rightarrow \frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$

Species - Area relationship

$\rightarrow \log S = \log C + Z \log A$

Net primary productivity $\rightarrow$ GPP – R

192. Answer (2)

Glucocorticoids, particularly cortisol, produces anti-inflammatory reactions and suppresses the immune response. Cortisol is also involved in maintaining the cardiovascular system as well as the kidney functions.

193. Answer (4)

Four chambered heart is present in birds, mammals and crocodiles. Crop and gizzard are additional chambers in the alimentary canal of both birds and insects. Presence of feathers, long pneumatic bones and air sacs connected to lungs to supplement respiration are unique avian characteristics.

194. Answer (3)

In cardiac muscle, communication junctions (intercalated discs) at some fusion points allow the cells to contract as a unit, *i.e.*, when one cell receives a signal to contract, its neighbours are also stimulated to contract.

195. Answer (4)

Histaminase is synthesised by eosinophils to catabolise histamine. RBCs are the most abundant of all the cells present in blood.

196. Answer (4)

Proteases and RNases did not affect transformation and DNA is the hereditary material is proposed by Avery, Macleod and McCarty. During Griffith's experiment it was concluded that the R strain bacteria had somehow been transformed by the heat-killed S strain bacteria.

197. Answer (4)

The medulla contains centres which control respiration, cardiovascular reflexes and gastric secretions.

198. Answer (2)

Macrophages	–	Areolar connective tissue
Inner surface of fallopian tubes	–	Ciliated epithelium
Bones, cartilages and blood	–	Specialized connective tissues
Inner lining of stomach and intestine	–	Simple columnar epithelium

199. Answer (2)

Fat bodies are responsible for storage of fats. Gills are responsible for respiration in larval stage of frogs. Adult frogs respire through skin in water as well as during aestivation and hibernation. On land, skin, buccal cavity and lungs act as respiratory organs.

200. Answer (4)

Ventral heart is present in all vertebrates. Cyclostomes lack jaws and bear 6-15 pairs of gill slits for respiration. Presence of paired pharyngeal gill slits is characteristic feature of all vertebrates during their embryonic development. Notochord is present in all vertebrates during embryonic development which is replaced by cartilaginous or bony vertebral column in adults.

❑ ❑ ❑