All India Aakash Test Series for NEET - 2025

OPEN MOCK TEST - 2

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Test Date : 13/04/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (3)

Hint and Sol.: $\mu_r = 1 + \chi$, the magnetic susceptibility of diamagnetic material is slightly negative. The susceptibility of paramagnetic material is slightly positive and susceptibility of ferromagnetic material is large and positive.

2. Answer (4)

Hint: *bc* is isochoric process.

Sol.: $Q_{bc} = \Delta U = nC_V\Delta T$

$= \frac{3}{2}nR\Delta T$

$= 1.5(P_2V_2 - P_1V_1)$

$= 1.5[12 \times 10^4 \times 10^3 \times 10^{-6} - 4 \times 10^4 \times 10^3 \times 10^{-6}]$

$= 1.5[120 - 40] = 120$ J

3. Answer (3)

Hint: $v = \lambda f$

Sol.: $\lambda' = \frac{\lambda}{\mu}$ and frequency remains same. So, speed decreases.

4. Answer (1)

Hint: $\frac{P_S}{P_P} = \frac{V_S I_S}{V_P I_P}$

Sol.: $\frac{P_S}{P_P} = \left(\frac{V_S}{V_P}\right)\left(\frac{I_S}{I_P}\right) = \frac{4}{1} \times \frac{1}{4} = 1$

For ideal transformer, the efficiency is 100%.

5. Answer (1)

Hint and Sol.: From the graph, it can be observed that x-coordinate is increasing with time, hence velocity is positive.

6. Answer (3)

Hint: Reading = MSR + CSR – zero error

Sol.: MSR = 4 mm

CSR = 20 × 0.01 mm

= 0.20 mm

Zero error = – 0.02 mm

Reading = 4 + 0.20 + 0.02

= 4.22 mm = 0.422 cm

7. Answer (4)

Hint: Elastic limit is equal to the stress until which stress is proportional to strain.

Sol.: $Y = \frac{\text{Stress}}{\text{Strain}}$

Stress = $Y \times$ Strain $= 2 \times 10^{11} \times \frac{2 \times 10^{-3}}{2}$

$= 2 \times 10^8$ N/m^2

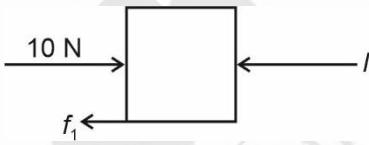
8. Answer (2)

Hint: $a = \frac{F - f}{m}$ for both blocks

Sol.: Blocks move together

$a = \frac{10 - 0.2(5) \times 10}{5} = 0$

For 2 kg block



$10 - 0.2 \times 20 = N_1$

$N_1 = 10 - 4 = 6$ N

9. Answer (1)

Hint and Sol.: The central fringe will be white because path difference of all the wavelengths of light is zero and intensity will be maximum for the central fringe.

10. Answer (4)

Hint: $\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2mqV}}$

Sol.: $\lambda^2 \propto \frac{1}{V}$

Hence graph between λ^2 and $\frac{1}{V}$ is a straight line with positive slope.

11. Answer (1)

Hint: Use the concept of balanced Wheatstone bridge network

Sol.: $C_{eq} = C_1 + C_2$

$C_1 = C_2 = \frac{12 \times 4}{12 + 4} = 3\ \mu F$

$C_{eq} = 6\ \mu F$

$Q = 10 \times 6\ \mu C = 60\ \mu C$

12. Answer (3)

Hint: Use Lenz's law

Sol.: The magnetic field is increasing in outward direction for *A* and downward direction in *B*. So to oppose the increasing flux, current is clockwise in *A* and anticlockwise in *B*.

13. Answer (4)

Hint and Sol.: LEDs are forward biased while photodiodes are reverse biased.

14. Answer (3)

Hint and Sol.: $\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$

$\frac{1}{10}=\frac{1}{v}+\frac{1}{30}$

$\frac{1}{v}=\frac{1}{10}-\frac{1}{30}$

$\frac{1}{v}=\frac{20}{300}$

v = 15 cm

15. Answer (3)

Hint and Sol.: At axial point of a dipole

$E=\frac{2kp}{r^3}=\frac{2\times9\times10^9\times10^{-6}}{(1)}\ \text{V m}^{-1}$

$= 18 \times 10^3\ \text{V m}^{-1}$

16. Answer (4)

Hint: M. I. about mid-point is $\frac{ML^2}{12}$ and

M. I. about one end is $\frac{ML^2}{3}$

Sol.: $\frac{ML^2}{12}=2400\ \text{g cm}^2$

$\frac{ML^2}{3}=4\left(\frac{ML^2}{12}\right)=9600\ \text{g cm}^2$

17. Answer (1)

Hint: Kirchhoff's loop rule

Sol.: $I=\frac{8\ \text{V}-4\ \text{V}}{4\ \Omega}=\frac{4}{4}=1\ \text{A}$

$\varepsilon = (4 + 2 \times 1) = 6$ V

18. Answer (3)

Hint: $\frac{hc}{\lambda}=\Delta E$

Sol.: $\frac{1}{\lambda}=R\left[\frac{1}{n_1^2}-\frac{1}{n_2^2}\right]$

For transition from n = 2 to n = 1,

$\frac{1}{\lambda}=R\left[\frac{1}{1}-\frac{1}{4}\right]=\frac{3R}{4}$

$\Rightarrow\ \lambda=\frac{4}{3R}=121.6\ \text{nm}$

Similarly, we can find the wavelength for other transitions.

19. Answer (1)

Hint: Momentum $=\frac{h}{\lambda}$

Sol.: $\frac{hc}{\lambda}=E$

$\frac{h}{\lambda}=\frac{E}{c}$

20. Answer (3)

Hint: In α-decay, mass number decreases by 4 while atomic number decreases by 2. In β^- decay, a neutron is converted into proton by losing an electron and antineutrino and β^+ is reverse of β^- decay.

Sol.: $^{A}_{Z}X\xrightarrow{\alpha}{}^{A-4}_{Z-2}Y\xrightarrow{\alpha}{}^{A-8}_{Z-4}Z\xrightarrow{\beta^-}{}^{A-8}_{Z-3}P\xrightarrow{\beta^+}{}^{A-8}_{Z-4}Q$

21. Answer (2)

Hint: Power $\vec{P}=\vec{F}\cdot\vec{v}$

Sol.: $a = t^3$

$\frac{dv}{dt}=t^3$

$\Rightarrow\ \int_0^v dv=\int_0^1 t^3dt$

$v=\frac{[t^4]_0^1}{4}=\frac{1}{4}\ \text{m s}^{-1}$

$P=\left(4\times1\times\frac{1}{4}\right)\text{W}$

= 1 W

22. Answer (2)

Hint and Sol.: $Y=\overline{\bar{A}+\bar{B}}=A.B$ (AND gate)

23. Answer (3)

Hint: $g=\frac{GM}{R^2}=\frac{4}{3}\pi\rho GR$

Sol.: $g'=\frac{4}{3}\pi(4\rho)(G)\left(\frac{R}{2}\right)$

$=2\left[\frac{4}{3}\pi\rho GR\right]=2\times9.8$

$= 19.6\ \text{m s}^{-2}$

24. Answer (1)

Hint and Sol.: According to Bohr's postulates, electron revolves around nucleus in circular orbit without radiating energy and the required centripetal force is provided by electrostatic force. These orbits are called stationary orbits.

25. Answer (3)

Hint: Use formula $v = \omega r$

Sol.: $v_P = v_Q = v_R = \omega r$

$\Rightarrow \quad v_P : v_Q : v_R = 1 : 1 : 1$

26. Answer (2)

Hint: In uniform circular motion, velocity is variable but speed is constant.

Sol.:

(i) Tangential acceleration is rate of change of speed.

$$a_t = \frac{d|\vec{v}|}{dt} = 0$$

(ii) $\left|\vec{F}\right| = \frac{mv^2}{R} = \text{constant}$

27. Answer (1)

Hint: Time period of oscillations of magnet $T = 2\pi\sqrt{\frac{I}{MB}}$

Sol.: $T' = 2\pi\sqrt{\frac{I'}{M'B'}}$

where $I' = \frac{I}{2}$; $M' = \frac{M}{2}$ and $B' = 2B$

$$\therefore\ T' = 2\pi\sqrt{\frac{I}{2\left(\frac{M}{2}\right)(2B)}} = \frac{T}{\sqrt{2}}$$

28. Answer (1)

Hint: Use loss of energy concept in collision

Sol.: $\frac{K_2}{K_1} = \frac{K_1 - \text{loss of energy}}{K_1}$

$$= \frac{\frac{1}{2}mv^2 - \frac{1}{2}\left(\frac{m\times m}{m+m}\right)(v)^2}{\frac{1}{2}mv^2}$$

$$= \frac{\frac{1}{2}mv^2\left(\frac{1}{2}\right)}{\frac{1}{2}mv^2}$$

$$= \frac{1}{2}$$

29. Answer (2)

Hint: Maximum speed $v = A\omega$ and time period $T = \frac{2\pi}{\omega}$

Sol.: $T = \frac{2\pi}{2\pi}$ = 1 second

$v = 5 \times 2\pi = 10\pi$

$= 10 \times 3.14$ m s^{-1}

$= 31.4$ m s^{-1}

30. Answer (1)

Hint and Sol.: [L] = [mvr] = [ML^{2}T^{-1}]

[Energy] = [hf]

$$[h] = \frac{[ML^2T^{-2}]}{\frac{1}{T}} = [ML^2\,T^{-1}]$$

31. Answer (2)

Hint: Potential inside the spherical shell remains same.

Sol.: $V_A = V_C = \frac{KQ}{R} = 9$ V

$$V_B = \frac{2KQ}{3R} = \frac{2}{3}\times 9 \text{ V} = 6 \text{ V}$$

$V_A - V_B = 9 - 6 = 3$ V

32. Answer (4)

Hint: Centripetal force is provided by tension.

Sol.: $T_2 = m\omega^2(2\ell)$

$T_1 - T_2 = m\omega^2(\ell)$

$T_1 = m\omega^2\ell + m\omega^2(2\ell)$

$T_1 = 3m\omega^2\ell$

$$\frac{T_1}{T_2} = \frac{3m\omega^2\ell}{2m\omega^2\ell} = \frac{3}{2}$$

33. Answer (4)

Hint: $R = \frac{\rho\ell}{A} = K\ell^2$

Sol.: $R = K\ell^2$

$R' = K(4\ell)^2 = 16K\ell^2 = 16R$

$$\frac{1}{R_{eq}} = \frac{1}{4R} + \frac{1}{4R} + \frac{1}{4R} + \frac{1}{4R}$$

$$\Rightarrow \quad \frac{1}{R_{eq}} = \frac{4}{4R}$$

$\Rightarrow \quad R_{eq} = R$

34. Answer (3)

Hint and Sol.: $F_B = mg \Rightarrow \rho_\ell \times V_d \times g = \rho_0 \times V_0 \times g$

$1 \times V_d = 0.8 \times V_0$

$V_d = 0.8\ V_0$

It means displaced volume is 80%, hence volume of block that will be outside the water is 20%.

35. Answer (1)

Hint and Sol.: Ideal gas equation:

$PV = nRT$

$$n = \frac{7\text{g}}{28\text{g}} = \frac{1}{4}$$

$$\therefore \quad PV = \frac{1}{4}RT$$

36. Answer (3)

Hint and Sol.: Magnetic force on a charged particle is given by

$\vec{F} = q(\vec{v} \times \vec{B})$

Direction of $\vec{F} \Rightarrow \hat{j} \times \hat{k} = \hat{i}$

Hence direction of acceleration will be along $+x$ axis.

37. Answer (2)

Hint: Voltage remains same and capacitance increases.

Sol.: Energy = $\frac{1}{2}KCV^2$, $C' = KC$

$QV = KCV^2$, $\frac{Q}{V} = KC$

38. Answer (4)

Hint: $[E] = [\alpha x^2] = [\beta x^3]$

Sol.: $\left[\frac{\alpha}{\beta}\right] = [x]$

$$\left[\frac{\alpha}{\beta x}\right] = [M^0L^0T^0]$$

39. Answer (2)

Hint: Thermal stress = $Y\alpha\,\Delta T$

Sol.: $\frac{100 \times 10^3}{10^{-4}} = Y \times 10^{-5} \times 100$

$Y = 10^{12}$ N m^{-2}

40. Answer (3)

Hint: Total magnification, $m = m_0 m_e$

Sol.: $m_0 = \frac{v}{u} = \frac{4}{-4} = -1$

$$m_e = \left(1 + \frac{D}{f_e}\right) = \left(1 + \frac{25}{12.5}\right)$$

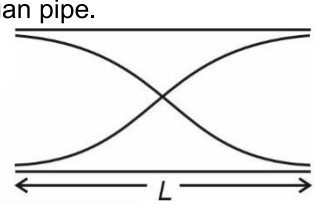
$= (1 + 2)$

$= 3$

$\therefore \quad m = 3$

41. Answer (4)

Hint and Sol.: Fundamental mode of an open organ pipe.



$L = \frac{\lambda}{2}$

$v = \lambda \times f \Rightarrow v = 2L \times f$

$320 = 2 \times 1 \times f \Rightarrow f = 160$ Hz

42. Answer (2)

Hint: For a purely inductive AC circuit, $I_{rms} = \frac{V_{rms}}{X_L}$

Sol.: $I_{rms} = \frac{V_{rms}}{X_L} = \frac{220}{2 \times \frac{22}{7} \times 50 \times 100 \times 10^{-3}}$

$$I_{rms} = \frac{220}{2 \times \frac{22}{7} \times 5}$$

$I_{rms} = 7$ A

$I_m = \sqrt{2} I_{rms}$

$= 7\sqrt{2}$ A

43. Answer (1)

Hint: $P_S\,(\text{Series}) = \frac{P_1P_2}{P_1 + P_2}$, $P_P(\text{Parallel}) = P_1 + P_2$

Sol.: $P_S \times t_1 = P_P \times t_2$

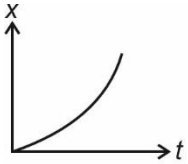
$$\frac{3 \times 6}{3 + 6} \times 9 = (9) \times t_2$$

$t = 2$ seconds

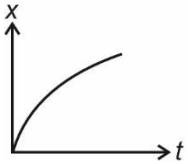
44. Answer (1)

Hint: From origin to *A*, acceleration is positive while for *BC*, the acceleration is negative.

Sol.:



for increasing velocity



for decreasing velocity

45. Answer (2)

Hint: The energy required is the difference of total energy of satellite in the two orbits.

Sol.: $\Delta E = TE_2 - TE_1$

$$= -\frac{GMm}{6R} + \frac{GMm}{4R}$$

$$= \frac{-4GMm + 6GMm}{24R} = \frac{GMm}{12R}$$

[CHEMISTRY]

46. Answer (2)

Hint: Reagent which gets consumed completely in chemical reaction is known as the limiting reagent.

Sol.:

$$Ca(s) + \frac{1}{2}O_2(s) \rightarrow CaO(s)$$

Moles; 0.5 0.5

1 mole of Ca $\rightarrow \frac{1}{2}$ moles of O_2

$\frac{1}{2}$ mole Ca $\rightarrow \frac{1}{4}$ moles of O_2

given moles of $O_2 = 0.5$

Therefore, oxygen is the reagent in excess

Excess amount of oxygen is $= \left(\frac{1}{2} - \frac{1}{4}\right) \times 32$

$= 8$ g

47. Answer (3)

Hint: Molarity $= \frac{\text{number of moles of solute}}{\text{Volume of solution in litre}}$

Sol.: Number of moles of glucose $= \frac{6.02 \times 10^{21}}{N_A}$

$= 10^{-2}$

$$\text{Molarity} = \frac{10^{-2}}{\frac{200}{1000}} = 5 \times 10^{-2} = 0.05\ \text{M}$$

48. Answer (3)

Hint and Sol.: n = 4, l = 2 represents 4*d* subshell, one *d*-subshell contains 5 orbitals, one orbital can have maximum two electrons, therefore in 4*d*-subshell maximum 10 electrons can be filled.

49. Answer (2)

Hint: For de-Broglie wavelength (λ) of an electron.

$$2\pi r_n = n\lambda$$

Sol.: For hydrogen atom

$\boxed{r_n = a_0 n^2}$

$r_4 = 52.9 \times 4^2$

For de-Broglie wavelength (λ)

$n\lambda = 2\pi r_n$

$4 \times \lambda = 2 \times \pi \times 52.9 \times 4^2$

$\lambda = 423.2\ \pi$ pm

50. Answer (4)

Hint: A large difference between first and second ionisation enthalpies (4560 – 496 = 4064 kJ mol^{-1}) confirms the metal to be alkalimetal.

Sol.: $\underset{1\,mol}{MOH} + \underset{1\,mol}{HCl} \rightarrow MCl + H_2O$

$\underset{1\,mol}{2MOH} + \underset{0.5\,mol}{H_2SO_4} \rightarrow \underset{0.5\,mol}{M_2SO_4} + \underset{1\,mol}{2H_2O}$

51. Answer (2)

Hint: Ionic radii order for isoelectronic species is anion size > neutral atom > cation size

Sol.: Correct order of ionic size.

(a) $H^{\ominus} > H > H^{\oplus}$

(b) $N^{3-} > O^{2-} > F^-$

(c) $O^{2-} > F^- > Na^+$

(d) $N^{3-} > Mg^{2+} > Al^{3+}$

52. Answer (1)

Hint and Sol.:

$SF_6 \rightarrow$ Octahedral

$XeF_4 \rightarrow$ Square planar

$NH_4^+ \rightarrow$ Tetrahedral

$BF_3 \rightarrow$ Trigonal planar

53. Answer (4)

Hint and Sol.: Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis because aryl halides don't undergo nucleophilic substitution with anion formed by phthalimide.

54. Answer (1)

Hint: The enthalpy change that occurs when one mole of the substance is formed from its constituent elements in their standard states is enthalpy of formation.

Sol.: $C(graphite) + O_2(g) \rightarrow CO_2(g)$, $\Delta_r H°$ ...(i)

$= -393.5$ kJ mol^{-1}

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ …(ii), $\Delta_r H°$

$= -285.8$ kJ mol^{-1}

$CO_2(g) + 2H_2O(l) \rightarrow CH_4(g)$ …(iii), $\Delta_r H°$

$= +890.3$ kJ mol^{-1}

(i) + 2 × (ii) + (iii) we have,

$C(graphite) + 2H_2(g) \rightarrow CH_4(g)$

$\Delta_r H° = -393.5 + 2(-285.8) + 890.3$

$= -74.8$ kJ/mol

55. Answer (2)

Hint and Sol.: Spectrochemical series (as given in NCERT)

$I^- < Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4^{2-} < H_2O < NCS^- < edta^{4-} < NH_3 < en < CN^- < CO$

56. Answer (1)

Hint: For first order reaction $K = \frac{2.303}{t} \log \frac{A_0}{A_t}$

Sol.: For first order rate equation

$$K = \frac{2.303}{t} \log \frac{A_0}{A_t}$$

$$9.212 \times 10^{-3} = \frac{2.303}{t} \log \frac{4}{0.4}$$

$$t = \frac{2.303}{9.212 \times 10^{-3}} \log 10$$

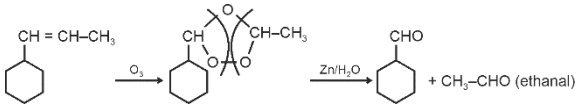
$$= \frac{10^3}{4} \times 1$$

$$= \frac{1000}{4} = 250 \text{ s}$$

57. Answer (2)

Hint: Reduction ozonolysis is used to identify the position of multiple bond.

Sol.:



58. Answer (2)

Hint: Depression in freezing point $\Delta T_f = i K_f m$

Sol.: i = 1

$$\Delta T_f = 1 \times 5.12 \times \frac{\frac{10}{58}}{\frac{200}{1000}}$$

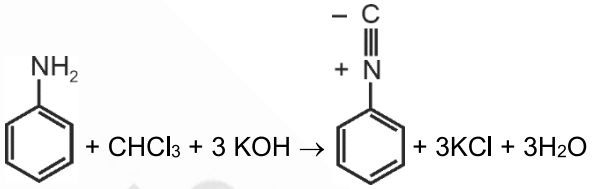
$$= 5.12 \times \frac{10}{58} \times 5 = 4.413$$

$\Delta T_f = T_i - T_f$

$T_f = 5.5 - 4.41 = 1.1°C$

59. Answer (3)

Hint and Sol.: Aliphatic and aromatic primary amines gives carbylamine test.



60. Answer (2)

Hint: Ammonium chloride is a salt of strong acid and weak base therefore its salt solution is acidic in nature.

Sol.: $NH_4^+ + H_2O \rightarrow NH_4OH + H^+$

61. Answer (4)

Hint:

$$\text{Enthalpy change} = \left[\begin{matrix}\text{Sum of bond energy of} \\ \text{reactants}\end{matrix}\right] - \left[\begin{matrix}\text{Sum of bond energy of} \\ \text{product}\end{matrix}\right]$$

Sol.: $H_2(g) + I_2(g) \rightarrow 2HI(g)$ $\Delta H = -8$ kJ mol^{-1}

$\Delta H = \sum(BE)_R - \sum(BE)_P$

$= (BE_{H-H}) + (BE_{I-I}) - 2(BE_{H-I})$.

$-8 = (435) + (151) - 2(BE_{H-I})$

$$BE_{H-I} = \frac{8 + 435 + 151}{2} = 297 \text{ kJ mol}^{-1}$$

62. Answer (3)

Hint: Electron withdrawing group increases the acidic strength of phenol.

Sol.: In para-nitrophenol, $-NO_2$ group is present at para position which stabilized phenoxide ion by –I and – M effect.

63. Answer (1)

Hint and Sol.: Xerophthalmia is a vitamin-A deficiency disease, in which hardening of cornea of eye (night blindness) occurs.

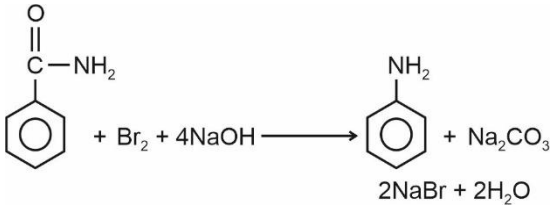
64. Answer (4)

Hint and Sol.: Primary alkyl halides does not give S_N1 reactions.

65. Answer (4)

Hint: Hoffmann bromamide degradation reaction. Convert primary amide into primary amine.

Sol.:



66. Answer (2)

Hint and Sol.: Buckminsterfullerene contains twenty six-membered rings and twelve five membered rings.

67. Answer (1)

Hint and Sol.: In heavier members of group 14 elements, tendency to show +2 oxidation state increases as Ge < Sn < Pb.

$$Sn + 2H_2O \xrightarrow{\Delta} SnO_2 + 2H_2$$

68. Answer (2)

Hint: $P_4 + NaOH + H_2O \xrightarrow{\Delta} PH_3 + NaH_2PO_2$

Sol.: It explodes in contact with traces of oxidising agent like HNO_3.

69. Answer (3)

Hint: $E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$

Sol.: $E^\circ_{Hg^{2+}/Hg_2^{2+}} - E^\circ_{I_2/I^\ominus} = 0.92 - 0.54$

= 0.38 V

70. Answer (1)

Hint:

$$\lambda^\circ_{m(CH_3COONa)} = \lambda^\circ_{m(CH_3COONa)} + \frac{\lambda^\circ_{m(H_2SO_4)}}{2} - \frac{\lambda^\circ_m(Na_2SO_4)}{2}$$

Sol.: $\lambda^\circ_{m(CH_3COOH)} = Z + \frac{X}{2} - \frac{Y}{2}$

$$= \frac{(X-Y)}{2} + Z$$

71. Answer (2)

Hint:

$$\% \text{ Nitrogen} = \frac{1.4 \times \text{No. of milliequivalent of acid}}{\text{wt. of organic compound}}$$

Sol.: $\% \text{ Nitrogen} = \frac{1.4 \times 20 \times 0.6 \times 2}{0.8}$

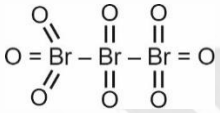
$$= \frac{1.4 \times 20 \times 1.2}{0.8}$$

$$= \frac{1.4 \times 20 \times 12}{8}$$

= 14 × 3 = 42%

72. Answer (1)

Hint & Sol.:



$$O.N = \frac{+6+4+6}{3} = \frac{16}{3}$$

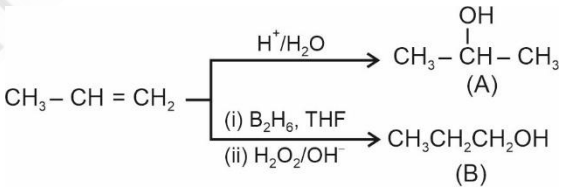
73. Answer (4)

Hint and Sol.: Higher the positive oxidation state, higher will be the oxidising power.

Stability of $Cu^{2+}(aq)$ rather than $Cu^{+}(aq)$ is due to much more negative enthalpy of hydration of $Cu^{2+}(aq)$.

74. Answer (3)

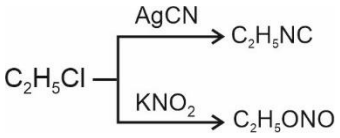
Hint and Sol.:



- 'A' gives iodoform test but 'B' does not.
- A and B are position isomer.
- 'A' gives blue while 'B' gives red colour during Victor Meyer test.

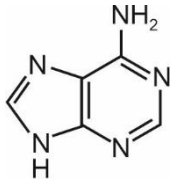
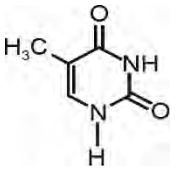
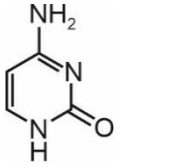
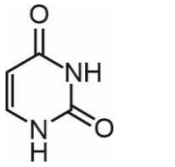
75. Answer (2)

Hint and Sol.:



76. Answer (1)

Hint and Sol.:

	→	Adenine
	→	Thymine
	→	Cytosine
	→	Uracil

77. Answer (4)

Hint: Mixed oxides of Lanthanoids are used as catalysts in Petroleum cracking.

Sol.: Mischmetall consists of (95%) Lanthanoid metal.

78. Answer (1)

Hint: Strong field ligand (CN^-) causes pairing of electron in complex compound.

Sol.: $[Ni(CN)_4]^{2-}$ has no unpaired electrons so it is diamagnetic in nature.

79. Answer (3)

Hint: Buffer solution is formed by conjugate acid base pair

Sol.:

CH_3COOH	+	NaOH	→	CH_3COONa	+	H_2O
$0.1\times V$		$0.05\times V$		0		0
$0.1\,V-0.05\,V$ $=0.095\,V$		LR		0.05 V		0.05 V

$$pH = pKa + \log\frac{\left[CH_3COO^-\right]}{[CH_3COOH]}$$

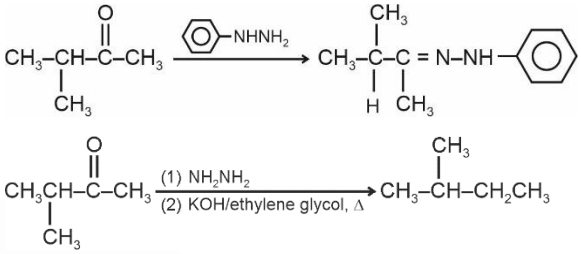
Therefore 0.1 M CH_3COOH and 0.05 M NaOH will formed acidic buffer solution when mixed in equal volume.

80. Answer (3)

Hint and Sol.: Co^{2+}, Ni^{2+}, Mn^{2+} and Zn^{2+} are group – IV cations. Pb^{+2} belongs to group-I and II.

81. Answer (4)

Hint and Sol.:



82. Answer (1)

Hint: Silica gel and alumina are used as adsorbents in adsorption chromatography.

Sol.: Paper chromatography is a type of partition chromatography.

83. Answer (3)

Hint: $E_{H^\oplus/H_2} = E^\circ_{H^\oplus/H_2} - \frac{0.059}{2}\log\frac{P_{(H_2)}}{\left[H^+\right]^2}$

Sol.: $E^\circ_{H^\oplus/H_2} = 0, \quad P_{H_2} = 1\,bar$

$$E_{H^\oplus/H_2} = 0 - \frac{0.059}{2}\log\frac{1}{\left[H^+\right]^2}$$

$$= -\frac{0.059}{2}\left[\log 1 - 2\log\left[H^+\right]\right]$$

$$= -\frac{0.059}{2}\left[0 - 2\log\left[H^+\right]\right]$$

$= 0.059 \log [H^+]$

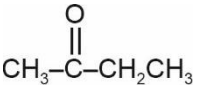
$= – 0.059 [– \log [H^+]$

$= – 0.059 [pH]$

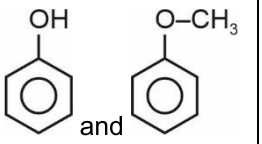
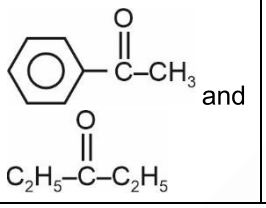
$= – 0.059 \times 4$

$= – 0.236$ V

84. Answer (2)

Hint: CH_3–CHO and  can be distinguish by Tollens' reagent.

Sol.:

	Compounds	Reagent for distinguish
(a)	CH_3CHO and $CH_3\overset{\overset{O}{\|\|}}{C}CH_2CH_3$	Tollens' reagent
(b)		Neutral $FeCl_3$
(c)	$CH_3-\underset{\underset{OH}{\|}}{CH}-CH_3$ and $CH_3-\overset{\overset{O}{\|\|}}{C}-CH_3$	Lucas reagent
(d)		I_2/NaOH

85. Answer (1)

Hint: $Cl_2O_7 \rightarrow 2x + 7(-2) = 0, x = +7$

Sol.: $NaClO_3 \rightarrow 1 + x + 3(-2) = 0, x = +5$

$Cl_2O \rightarrow 2x - 2 = 0, x = +1$

$ClO_2 \rightarrow x + 2(-2) = 0, x = +4$

86. Answer (4)

Hint: Partial hydrolysis of XeF_6 gives different products.

Sol.: $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

$XeF_6 + 2H_2O \rightarrow \underset{(X)}{XeO_2F_2} + 4HF$

Shape of X is see-saw and hybridisation of xenon in XeO_2F_2 is sp^3d

87. Answer (1)

Hint and Sol.: A mixture showing negative deviation from Raoult's Law, interaction between two different components should be stronger than that in their pure forms.

88. Answer (4)

Hint: Haber's process $\rightarrow$ Iron oxide with small amount of K_2O and Al_2O_3

Sol.: Ostwald's process $\rightarrow$ Pt/Rh gauge

Contact process $\rightarrow V_2O_5$

Deacon's process $\rightarrow CuCl_2$

89. Answer (1)

Hint and Sol.: α-black phosphorus is formed when red phosphorus is heated in a sealed tube at 803K.

β-black phosphorus is prepared by heating white phosphorus at 473 K under high pressure.

90. Answer (3)

Hint and Sol.: In dry cell, the space between the electrodes is filled by a moist paste of ammonium chloride (NH_4Cl) and zinc chloride ($ZnCl_2$).

[BIOLOGY]

91. Answer (4)

Hint: Food is stored as floridean starch in red algae.

Sol.: In members of red algae, the food is stored as floridean starch which is very similar to amylopectin and glycogen in structure.

92. Answer (1)

Hint: In glycolysis, for one molecule of glucose, four substrate level phosphorylation reactions occur.

Sol.: For a sucrose molecule which is undergoing glycolysis, eight substrate level phosphorylation reactions will occur.

93. Answer (3)

Hint: This structure consists of many flat, disc shaped sacs or cisternae (stacked parallel to each other).

Sol.: Golgi apparatus principally performs the function of packaging materials and it is the important site of formation of glycoproteins and glycolipids.

94. Answer (3)

Hint: Thalassemia and sickle cell anaemia are autosomal recessive traits.

Sol.: Haemophilia is an X-linked recessive trait. Myotonic dystrophy is an autosomal dominant trait.

95. Answer (2)

Hint: Centrosome starts moving towards opposite poles and radiate out microtubule during prophase.

Sol.: The correct sequence of events in M phase is as follows:

Centrosome starts radiating out microtubules (Prophase)

↓

Complete disintegration of nuclear envelope (starting of metaphase)

↓

Spindle fibres attach to kinetochores of chromosomes (Metaphase)

↓

Chromosome moved to spindle equator and get aligned along metaphase plate (Metaphase)

↓

Centromere splits and chromatids separate (Anaphase)

96. Answer (3)

Hint: In members of phycomycetes, asexual reproduction involves both motile and non-motile spores.

Sol.: Asexual reproduction takes place by zoospores (motile) or by aplanospores (non-motile) in members of phycomycetes.

97. Answer (4)

Hint: Cell wall is absent in *Euglena*.

Sol.: Instead of a cell wall, *Euglena* have protein rich layer called pellicle which makes their body flexible.

Dinoflagellates have two flagella, one lies longitudinally and other transversely.

98. Answer (2)

Hint: Primata is an order.

Sol.: Family – Muscidae

Genus – *Triticum*

Class – Insecta

99. Answer (4)

Hint: *Vallisneria* shows epihydrophily.

Sol.: In *Vallisneria*, light and unwettable pollen grains are present. Male flowers, after breakage float on the surface of water and pollens are carried passively by water currents. Hence, pollination takes place on the surface of water.

100. Answer (4)

Hint: Haemophilia is a sex-linked recessive trait.

Sol.: The heterozygous female (carrier) for haemophilia may transmit the disease to sons.

A single protein that is a part of the cascade of protein involved in the clotting of blood is affected.

101. Answer (2)

Hint: When male individual produces two different types of gametes then, sperms determine the sex of the offspring.

Sol.: Grasshopper shows male *heterogamety* and hence, sperms determine the sex of the offspring.

102. Answer (3)

Hint: In dicot root, during secondary growth vascular cambium initiates from pericycle.

Sol.: In dicot roots, next to endodermis lies a few layers of thick-walled parenchymatous cells referred to as pericycle. Initiation of lateral roots and vascular cambium during secondary growth takes place in these cells.

103. Answer (4)

Hint: Dicot stems, have single layered endodermis and also show secondary growth.

Sol.: In dicot stem, conjoint, collateral and open vascular bundles are present. Hypodermis is collenchymatous in nature. Pith is made up of parenchymatous cells.

104. Answer (2)

Hint: In marginal placentation, the placenta forms a ridge along the ventral suture of the ovary and ovules are borne on this ridge forming two rows, as in pea.

Sol.: Basal placentation – Placenta develops at the base of ovary.

Free central placentation- Ovules are borne on central axis and septa are absent.

Parietal placentation- Ovules develop on the inner wall of ovary.

105. Answer (4)

Hint: Bicarpellary and syncarpous gynoecium is found in the members of solanaceae.

Sol.: *Nicotiana* is a member of solanaceae and have bicarpellary and syncarpous gynoecium.

106. Answer (2)

Hint: Allow cardiac muscle cells to contract as a unit

Sol.: Cardiac muscle fibres are present in heart and smooth muscle fibres present in the walls of blood vessels. Presence of gap junctions is a

common feature between cardiac and smooth muscle fibres. Cardiac muscle fibres differ from smooth muscle fibres in presence of striations, branching and having cylindrical shape.

107. Answer (1)

Hint: Equal to the total number of limbs in frog

Sol.: In frogs, the hind limbs and forelimbs help in swimming, walking, leaping and burrowing. The hind limbs end in five digits and they are larger and muscular than forelimbs that end in four digits.

108. Answer (4)

Hint: Gives rise to alveoli

Sol.: The trachea, primary, secondary and tertiary bronchi and initial bronchioles are supported by incomplete cartilaginous rings. Each terminal bronchiole gives rise to a number of very thin, irregular-walled and vascularised bag-like structures called alveoli.

The part starting with the external nostrils up to the terminal bronchioles constitute the conducting part whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system.

109. Answer (3)

Hint: Exclude the proteins that assist in blood coagulation

Sol.: Fibrinogens, globulins and albumins are the major plasma proteins. Fibrinogens are needed for clotting or coagulation of blood. Globulins are primarily involved in defense mechanisms of the body and the albumins help in osmotic balance.

110. Answer (2)

Hint: Sweat is produced by sweat glands

Sol.: Sweat produced by sweat glands is a watery fluid containing NaCl, small amounts of urea, lactic acid, *etc*. Though the primary function of sweat is to facilitate a cooling effect on the body surface, it also helps in the removal of some of the wastes mentioned above.

Sebum produced from sebaceous glands provides a protective oily covering for the skin.

Liver assists in removal of degraded steroid hormones, vitamins and drugs.

111. Answer (2)

Hint: Polarity of resting plasma membrane is reversed.

Sol.: When a neuron is not conducting any impulse, *i.e.*, resting, the axonal membrane is comparatively more permeable to K^+ and nearly impermeable to Na^+. Similarly, the membrane is impermeable to negatively charged proteins present in the axoplasm.

During depolarisation, there is opening of voltage gated Na^+ channels, that leads to rapid influx of Na^+ followed by reversal of polarity *i.e.*, the outer surface of the membrane becomes negatively charged and the inner side becomes positively charged.

112. Answer (1)

Hint: Released from pars intermedia

Sol.: Adenohypophysis consists of two parts, pars distalis and pars intermedia. The pars distalis region of pituitary, commonly called anterior pituitary, produces growth hormone (GH), prolactin (PRL), thyroid stimulating hormone (TSH), luteinising hormone (LH), follicle stimulating hormone (FSH), and adrenocorticotrophic hormone (ACTH). Pars intermedia secretes only one hormone called Melanocyte Stimulating Hormone (MSH).

113. Answer (3)

Hint: *Pleurobrachia* bears comb plates

Sol.:

Organism	Phylum
Pleurobrachia	Ctenophora
Planaria	Platyhelminthes

114. Answer (4)

Hint: Flying fox

Sol.: *Pteropus* is a mammal.

Petromyzon (Cyclostome)	–	Body is devoid of scales and paired fins
Pterophyllum (Bony fish)	–	External fertilisation and direct development
Pristis (Cartilaginous fish)	–	Lack operculum and air bladder

115. Answer (3)

Hint: Role of secondary oocyte

Sol.: The process of formation of a mature female gamete is called oogenesis which is markedly different from spermatogenesis. Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary. At puberty, only 60,000 – 80,000 primary follicles are left in each ovary.

The secondary oocyte is responsible for forming zona pellucida, which is a non-cellular layer.

116. Answer (3)

Hint: An immunosuppressive agent used in organ transplant patients is produced by *Trichoderma polysporum.*

Sol.: Pectinase – It helps in clarifying fruit juices.

Streptokinase – It is produced by bacteria and after modification by genetic engineering used as clot buster.

Statins – Have been commercialised as blood cholesterol lowering agents.

117. Answer (2)

Hint: When centromere is away from the centre then this leads to the formation of unequal arms.

Sol.: In sub-metacentric and acrocentric type of chromosomes, p and q arms are of unequal length.

118. Answer (2)

Hint: Synaptonemal complex is formed during zygotene stage.

Sol.: The chromosomal synapsis is accompanied by a structure called synaptonemal complex and it is thought to stabilise the homologous chromosomes till crossing over.

119. Answer (3)

Hint: Phragmoplast is formed in plant cell.

Sol.: In plant cell, cell plate formation starts at the centre of the cell and grows outwards, towards the lateral walls dividing the cell into two halves.

120. Answer (2)

Hint: Actinomorphic flowers show radial symmetry.

Sol.: Actinomorphic flowers – Mustard, Datura, Chilli

Zygomorphic flowers – Pea, Bean, Gulmohur, *Cassia*

121. Answer (4)

Hint: When one molecule of 3-PGAL is completely oxidised, then 5 NADH $+H^+$, 1 $FADH_2$, and 3 ATP molecules are produced.

Sol.: For 3 molecules of PGAL

In glycolysis $\rightarrow$ 1 NADH + H^+ × 3 = 3×3 = 9

2 ATP × 3 = 6

Link reaction $\rightarrow$ 1 NADH + H^+ × 3 = 3 × 3 = 9

Krebs cycle $\rightarrow$ 3 NADH + H^+ × 3 = 9 × 3 = 27

1 $FADH_2$ × 3 = 2 × 3 = 6

1 GTP × 3 = 3

Total= 60

122. Answer (3)

Hint: In Calvin cycle, carboxylation reaction is catalysed by the enzyme RuBisCO and it results in the formation of two molecules of 3 PGA.

Sol.: In Calvin cycle, the fixation of six molecules of CO_2 and six turns of the cycle are required for the formation of one molecule of glucose from the pathway.

In Calvin cycle, 18 ATP and 12 NADPH molecules are used to make a molecule of glucose.

123. Answer (2)

Hint: Regulator gene synthesises a regulator protein which can act positively as activator and negatively as repressor.

Sol.: Structural gene – transcribes mRNA for polypeptide synthesis.

Promotor gene- It provides attachment site for RNA polymerase.

Operator gene – It is a gene which receives the product of regulator gene. It allows the functioning of the operon when it is not interacting with the biochemical product produced by the regulator gene.

124. Answer (4)

Hint: Generally prokaryotic organisms have circular DNA.

Sol.: In *E. coli*, double stranded circular DNA is present with 4.6×10^6 bp

125. Answer (3)

Hint: In RNA, in place of thymine, uracil is present.

Sol.: In the given DNA stretch

5' ACGCTAGCTATTCGT 3' template strand

3' TGCGATCGATAAGCA 5' coding strand

↓

3' UGCGAUCGAUAAGCA 5' mRNA

126. Answer (4)

Hint: During first phase of translation, charging of tRNA takes place in the presence of enzyme aminoacyl tRNA synthetase.

Sol.: The first step in translation mechanism is aminoacylation of tRNA.

127. Answer (1)

Hint: According to Chargaff's rule = A = T

C = G

Sol.: Given, 30 % thymine

$\therefore$ Adenine = 30%

$\because$ A+C+G+T = 100%

(60%) + (G+C) = 100%

G+C = 100% – 60%

C = 20%

128. Answer (3)

Hint: Phenylalanine hydroxylase converts amino acid phenylalanine into tyrosine.

Sol.: Phenylketonuria affected individual lacks a liver enzyme called phenylalanine hydroxylase which converts phenylalanine into tyrosine.

129. Answer (3)

Hint: Floating debris is removed by primary treatment.

Sol.: Floating debris is removed by sequential filtration.

130. Answer (4)

Hint: Here, r = (b-d)

Sol.: In the given logistic growth equation, the intrinsic rate of natural increase is called biotic potential and is represented by r.

131. Answer (4)

Hint: Saheli was developed at CDRI, Lucknow

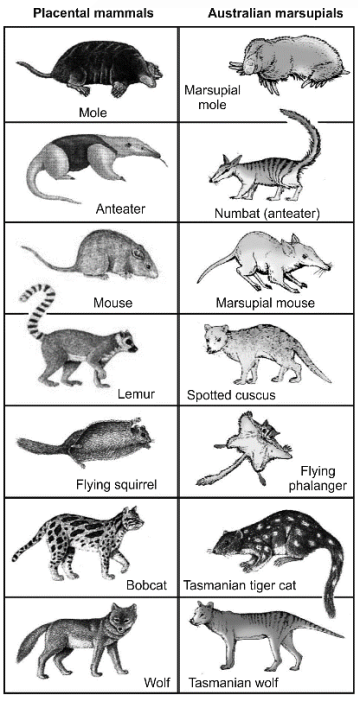
Sol.: Saheli – the new oral contraceptive pill for the females contains a non-steroidal preparation. It is a 'once a week' pill with very few side effects and high contraceptive value.

Progestogens alone or in combination with estrogen can be used by females as injections or implants under the skin.

132. Answer (1)

Hint: Flying squirrel and sugar glider

Sol.:



133. Answer (2)

Hint: Bacterial disease

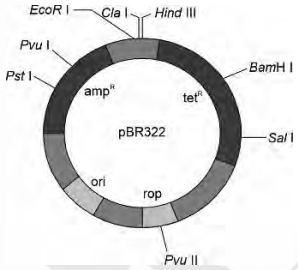
Sol.: Typhoid fever is confirmed by Widal test. Sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache, loss of appetite are some of the common symptoms of typhoid. Intestinal perforation and death may occur in severe cases.

- *Haemophilus influenzae* is the causative agent of pneumonia while *Entamoeba histolytica* causes amoebiasis.

134. Answer (2)

Hint: Exclude the ones present within tet^R gene

Sol.:



135. Answer (1)

Hint: Equals to the total number of parietal bones in humans

Sol.: The first clinical gene therapy was given in 1990 to a 4-year old girl with ADA deficiency.

- In 1983, Eli Lilly, an American company prepared two DNA sequences corresponding to A and B chains of human insulin and introduced them in plasmids of *E. coli* to produce insulin chains.
- In 1997, an American company got patent rights on basmati rice through the US Patent and Trademark Office.

  Also, in year 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 g/L)

136. Answer (3)

Hint: DNA fragments are negatively charged molecules.

Sol.: The cutting of DNA by restriction endonuclease results in the fragmentation of DNA. These fragments can be separated by a technique known as gel electrophoresis. Since DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the anode under an electric field through a medium/matrix.

- The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiations.

137. Answer (3)

Hint: Role in gene therapy

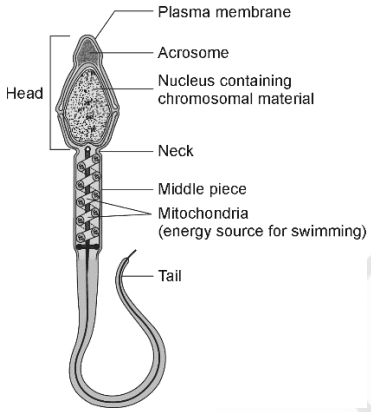
Sol.: The proteins encoded by the genes *cryIAc* and *cryIIAb* control the cotton bollworms, that of *cryIAb* controls corn borer.

- Using *Agrobacterium* vectors, transgenic tobacco plants were produced.
- Proinsulin possesses chain A, B and C. It contains 3 disulphide bonds.

138. Answer (2)

Hint: Filled with enzymes that aids in fertilisation

Sol.:



A plasma membrane envelops the whole body of sperm. The sperm head contains an elongated haploid nucleus, the anterior portion of which is covered by acrosome.

139. Answer (3)

Hint: Fertilisation occurs inside the female body

Sol.: ZIFT (Zygote Intra Fallopian Transfer), IUT (Intra Uterine Transfer) and ICSI (Intra Cytoplasmic Sperm Injection) involve *in vitro* fertilisation.

Artificial Insemination (AI), Gamete Intra Fallopian Transfer (GIFT) and Intra Uterine Insemination (IUI) involve *in vivo* fertilisation.

140. Answer (1)

Hint: Equal to the number of ear ossicles in one ear of man

Sol.: The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography is called adaptive radiation.

Darwin's finches represent one of the best examples of this phenomenon.

Darwin's finches also exhibit natural selection and founder effect.

141. Answer (2)

Hint: Opioid

Sol.: Heroin commonly called smack, is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound. This is obtained by acetylation of morphine, which is extracted from the latex of poppy plant, *Papaver somniferum*.

Cocaine is commonly known as coke or crack which is obtained from the coca plant, *Erythroxylum coca*.

142. Answer (3)

Hint: Garden lizard

Sol.: *Calotes* – Garden lizard; *Chelone* – Turtle

143. Answer (4)

Hint: Feature observed in nematodes

Sol.: Metagenesis, *i.e.*, alternation of generation of body forms is seen in *Obelia* but not in *Adamsia*.

- The body of ctenophores bears eight external rows of ciliated comb plates, which help in locomotion.
- Hooks and suckers are present in tapeworms while only suckers are present in liver fluke.

144. Answer (2)

Hint: Fibrous joint is present between cranial bones.

Sol.: Fibrous joints do not allow any movement. This type of joint is shown by the flat skull bones which fuse end-to-end with the help of dense fibrous connective tissues.

- Cartilaginous joints permit limited movements and are present between the adjacent vertebrae in the vertebral column.
- Saddle joint and gliding joint are the types of synovial joints.

145. Answer (3)

Hint: Part of hind brain

Sol.: Pons consists of fibre tracts that interconnect different regions of the brain. Pons contains pneumotaxic centre that can moderate the functions of respiratory rhythm centre.

Three major regions make up the brain stem; midbrain, pons and medulla oblongata.

146. Answer (3)

Hint: Conditional reabsorption of Na^+ takes place here

Sol.: Conditional reabsorption of Na^+ and water takes place in DCT. DCT is capable of reabsorption of HCO_3^- and selective secretion of

H^+, K^+ and NH_3 to maintain the pH and sodium balance in blood.

- Ascending limb of Henle's loop is impermeable to water but allows transport of electrolytes actively or passively.
- Blood from glomerulus is carried away by an efferent arteriole.
- The epithelial cells of Bowman's capsule called podocytes are arranged in an intricate manner so as to leave some minute spaces called slit pores that assist in ultrafiltration.

147. Answer (1)

Hint: Phase in which AV valves are open

Sol.: During joint diastole, all the four chambers of heart are in a relaxed state. Blood from the pulmonary veins and vena cava flows into the left and right ventricle respectively through the left and right atria.

- During ventricular systole, there is increase in the ventricular pressure causing the closure of AV valves due to attempted back flow of blood into the atria. As the ventricular pressure increases further, the semilunar valves guarding the pulmonary artery and the aorta are forced open, allowing the blood in the ventricles to flow through these vessels into the circulatory pathways.

148. Answer (4)

Hint: 5 L = 5000 mL

Sol.: Every 100 mL of oxygenated blood can deliver around 5 mL of O_2 to the tissues under normal physiological conditions.

$\therefore$ 1000 mL of oxygenated blood would deliver 50 mL of O_2 to the tissues thus, 5000 mL of oxygenated blood would deliver 250 mL of O_2 to the tissues under normal physiological conditions.

149. Answer (1)

Hint: Assist in exchange of gases

Sol.: The respiratory system of cockroach consists of a network of trachea, that open through 10 pairs of small holes called spiracles present on the lateral side of the body.

- A ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of foregut and midgut, which secretes digestive juice.
- At the junction of midgut and hindgut, there is presence of a ring of 100-150 yellow coloured thin filamentous Malpighian tubules.

150. Answer (3)

Hint: Simple squamous epithelium

Sol.: The simple squamous epithelium is found in the walls of blood vessels and air sacs of lungs and is involved in functions like forming a diffusion boundary.

- The cuboidal epithelium is present in the ducts of glands and the tubular parts of nephrons.
- The columnar epithelium is found in the lining of small intestine.
- Compound epithelium is present in the pancreatic ducts.

151. Answer (4)

Hint: Exclude toxins

Sol.:

Pigments	Carotenoids, Anthocyanins, *etc*.
Alkaloids	Morphine, Codeine, *etc*.
Terpenoides	Monoterpenes, Diterpenes *etc*.
Essential oils	Lemon grass oil, *etc*.
Toxins	Abrin, Ricin
Lectins	Concanavalin A
Drugs	Vinblastin, curcumin, etc.
Polymeric substances	Rubber, gums, cellulose

152. Answer (2)

Hint: Possess structures which are the outgrowths of cell membrane.

Sol.: In *Paramoecium*, cilia help in the movement of food through cytopharynx and in locomotion as well.

- Ciliary movement occurs in most of our internal tubular organs which are lined by ciliated epithelium. The coordinated movements of cilia in the trachea help us in removing dust particles and some of the foreign substances inhaled along with the atmospheric air.
- Movement of our limbs, jaws, tongue, *etc*., require muscular movement.
- Flagellar movement helps in the swimming of spermatozoa, maintenance of water current in porifers, *etc*.

153. Answer (3)

Hint : Barrier method of contraception

Sol.: Vaults (Barrier method of contraception) – Reusable and used along with spermicidal jellies, foams and creams.

Nirodh (Brand name for male condom) – Protects the users from contracting STIs

LNG-20 (Hormone releasing IUD) – Suppresses sperm motility and the fertilising capacity of sperms

154. Answer (4)

Hint: Possess pneumotaxic centre in humans

Sol.: The brain of frog is divided into fore-brain, mid-brain and hind-brain. Forebrain includes olfactory lobes, paired cerebral hemispheres and an unpaired diencephalon. The mid-brain is characterised by a pair of optic lobes. Hind-brain consists of cerebellum and medulla oblongata.

155. Answer (4)

Hint: Fungus

Sol.: The causative agent of ringworms is fungi. The genetic material of fungi is DNA. In order to cut the DNA with restriction enzymes, it needs to be in pure form, free from other macro-molecules. Fungal cell wall is made up of chitin, thus, chitinase is used.

- DNase digests DNA, so it cannot be used.

156. Answer (1)

Hint: Key industry animals are primary consumers.

Sol.: Key industry animals are also called herbivores.

157. Answer (2)

Hint: Pollen grains are light and non-sticky in anemophilous flowers.

Sol.: In majority of wind pollinated flowers, nectaries are absent.

158. Answer (3)

Hint: Auxin occurs in the growing apices of the stems and roots.

Sol.: Auxin is composed of indole compounds.

159. Answer (4)

Hint: Plastocyanin is located after cytochrome B_6f

Sol.: During chemiosmosis, plastocyanin transfers electrons from cyt B_6f to PS I.

160. Answer (1)

Hint: In aquatic ecosystem, the pyramid of biomass is inverted.

Sol.: In aquatic ecosystem, the biomass of zooplanktons is higher than that of phytoplanktons as life span of former is longer and the latter multiply much faster though having shorter life span.

161. Answer (3)

Hint: *in situ* conservation strategy of biodiversity emphasises protection of whole ecosystem.

Sol.: *in situ* conservation – National park, Biosphere reserve, Wildlife Sanctuaries

ex situ conservation – Seed banks, Botanical gardens, Wildlife Safari parks, Cryopreservation

162. Answer (2)

Hint: In Amensalism, one species is harmed and another is neither harmed nor benefitted.

Sol.: In predation and parasitism, one species is harmed and another is benefitted.

163. Answer (4)

Hint: Lysosomes are formed by the process of packaging in Golgi apparatus.

Sol.: They are rich in hydrolytic enzymes such as lipases, proteases and carbohydrases.

Contractile vacuole helps in excretion in *Amoeba*.

164. Answer (2)

Hint: The nascent RNA synthesised by RNA polymerase II is called primary transcript.

Sol.: The nascent RNA synthesized by RNA polymerase II is called hnRNA or primary transcript.

165. Answer (4)

Hint: ABO blood group is also a good example of co-dominance.

Sol.:

$I^AI^B \times I^B i$

↓

	I^A	I^B
I^B	I^AI^B	I^BI^B
i	I^Ai	I^Bi

Genotypes : I^AI^B, I^Bi, I^Ai, I^BI^B

Phenotypes : AB, B, A

166. Answer (3)

Hint: Abscisic acid acts as an antagonist to GA and it is also known as anti-GA

Sol.: Application of minute amount of ABA to leaves reduces transpiration to a great extent through closure of stomata.

167. Answer (1)

Hint: Complex I is also known as NADH dehydrogenase.

Sol.: NADH dehydrogenase transfers the electrons to complex III via ubiquinone.

168. Answer (3)

Hint: In C_4 plants, the primary CO_2 acceptor is phosphoenol pyruvate.

Sol.: The primary CO_2 acceptor is a 3 carbon molecule, phosphoenol pyruvate and is present in the mesophyll cells of C_4 plants.

169. Answer (2)

Hint: Bryophytes exhibit haplo-diplontic life cycle pattern.

Sol.: In bryophytes, the sporophyte is not free-living but attached to the photosynthetic gametophyte and derives nourishment from it.

170. Answer (4)

Hint: Cortex is further differentiated into three zones – hypodermis, general cortex and endodermis.

Sol.:

The correct sequence of tissues in ground tissue system is:

Hypodermis → General cortex → Endodermis →

Pericycle → Pith

171. Answer (2)

Hint: Produced by GIT cells

Sol.: Exocrine glands secrete mucus, saliva, earwax, oil, milk, digestive enzymes and other cell products. These products are released through ducts or tubes. In contrast, endocrine glands do not have ducts. Their products called hormones (*e.g.*, secretin) are secreted directly into the fluid bathing the gland.

172. Answer (4)

Hint: Exclude viral STIs

Sol.: Except for hepatitis-B, genital herpes and HIV infections, other STIs are completely curable, if detected early and treated properly.

- Hepatitis-B is a viral STI, caused by Hepatitis-B virus.
- Genital warts is a viral STI, caused by Human papillomavirus.
- Trichomoniasis is a protozoan STI, caused by *Trichomoniasis vaginalis*.

173. Answer (3)

Hint: A urochordate

Sol.: In cephalochordates, cyclostomes and cartilaginous fishes, notochord is persistent throughout the life.

Carcharodon and *Scoliodon* are cartilaginous fishes and *Branchiostoma* is a cephalochordate.

- *Doliolum* is a urochordate in which notochord is present only in larval tail.

174. Answer (1)

Hint: An insect

Sol.: Insects and birds possess crop and gizzard in their digestive system.

- Birds are vertebrate animals while insects are invertebrates.
- *Corvus* (crow) and *Pavo* (peacock) are birds while *Periplaneta* (cockroach) is an insect.

175. Answer (4)

Hint: Component of DNA

Sol.: Palmitic acid has 16 carbons including carboxyl carbon and arachidonic acid has 20 carbon atoms including the carboxyl carbon.

- Adenylic acid is a nucleotide, which possesses adenine, pentose (ribose) sugar and a phosphate moiety.
- Glutamic acid is an acidic amino acid.

176. Answer (2)

Hint: Occurs in the alveoli

Sol.: In the alveoli, where there is high pO_2, low pCO_2, lesser H^+ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin; whereas in the tissues, where low pO_2, high pCO_2, high H^+ concentration and higher temperature exist, the conditions are favourable for the dissociation of oxygen from the oxyhaemoglobin.

177. Answer (3)

Hint: QRS complex represents the ventricular depolarisation.

Sol.: In a standard ECG, the P-wave represents the electrical excitation of the atria. The QRS complex represents the depolarisation of the ventricles which initiates the ventricular contraction. The contraction starts shortly after Q-wave and marks the beginning of the systole.

The T-wave represents the return of ventricles from excited to normal state (repolarisation).

178. Answer (3)

Hint: Ammonotelic

Sol.: Many aquatic amphibians, bony fishes and aquatic insects are ammonotelic.

- Mammals, many terrestrial amphibians and marine fishes are ureotelic in nature.
- Reptiles, land snails, birds and insects are uricotelic animals.

179. Answer (2)

Hint: True for nodes of Ranvier

Sol.: Myelinated nerve fibres are found in spinal and cranial nerves. Unmyelinated nerve fibres are enclosed by Schwann cells that do not form a myelin sheath around the axon, and are commonly found in autonomous and the somatic neural systems.

180. Answer (1)

Hint: Cortisol retards phagocytic activity of WBCs

Sol.: Cortisol produces anti-inflammatory reactions and suppresses the immune response. Cortisol retards phagocytic activities of WBCs and thus suppresses inflammatory reactions. Cortisol also suppresses the synthesis of antibodies by inhibiting the production of lymphocytes in the lymphoid tissue and is therefore also called an immunosuppresor.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2025

OPEN MOCK TEST - 2

Click here for Code-E Sol.

Test Date : 13/04/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint: The energy required is the difference of total energy of satellite in the two orbits.

Sol.: $\Delta E = TE_2 - TE_1$

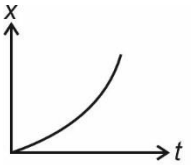
$$= -\frac{GMm}{6R} + \frac{GMm}{4R}$$

$$= \frac{-4GMm + 6GMm}{24R} = \frac{GMm}{12R}$$

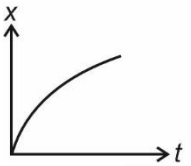
2. Answer (1)

Hint: From origin to *A,* acceleration is positive while for *BC*, the acceleration is negative.

Sol.:



for increasing velocity



for decreasing velocity

3. Answer (1)

Hint: $P_S\,(\text{Series}) = \frac{P_1P_2}{P_1+P_2}$, $P_P(\text{Parallel}) = P_1 + P_2$

Sol.: $P_S \times t_1 = P_P \times t_2$

$$\frac{3\times 6}{3+6}\times 9 = (9)\times t_2$$

t = 2 seconds

4. Answer (2)

Hint: For a purely inductive AC circuit, $I_{rms} = \frac{V_{rms}}{X_L}$

Sol.: $I_{rms} = \frac{V_{rms}}{X_L} = \frac{220}{2\times\frac{22}{7}\times 50\times 100\times 10^{-3}}$

$$I_{rms} = \frac{220}{2\times\frac{22}{7}\times 5}$$

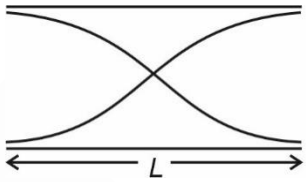
I_{rms} = 7 A

$I_m = \sqrt{2} I_{rms}$

$= 7\sqrt{2}$ A

5. Answer (4)

Hint and Sol.: Fundamental mode of an open organ pipe.



$L = \frac{\lambda}{2}$

$v = \lambda \times f \Rightarrow v = 2L \times f$

$320 = 2 \times 1 \times f \Rightarrow f = 160$ Hz

6. Answer (3)

Hint: Total magnification, $m = m_0 m_e$

Sol.: $m_0 = \frac{v}{u} = \frac{4}{-4} = -1$

$$m_e = \left(1 + \frac{D}{f_e}\right) = \left(1 + \frac{25}{12.5}\right)$$

$= (1 + 2)$

$= 3$

$\therefore \quad m = 3$

7. Answer (2)

Hint: Thermal stress = $Y\,\alpha\,\Delta T$

Sol.: $\frac{100\times 10^3}{10^{-4}} = Y \times 10^{-5} \times 100$

$Y = 10^{12}$ N m^{-2}

8. Answer (4)

Hint: $[E] = [\alpha x^2] = [\beta x^3]$

Sol.: $\left[\frac{\alpha}{\beta}\right] = [x]$

$$\left[\frac{\alpha}{\beta x}\right] = [M^0L^0T^0]$$

9. Answer (2)

Hint: Voltage remains same and capacitance increases.

Sol.: Energy = $\frac{1}{2} KCV^2$, $C' = KC$

$QV = KCV^2$, $\frac{Q}{V} = KC$

10. Answer (3)

Hint and Sol.: Magnetic force on a charged particle is given by

$\vec{F} = q(\vec{v} \times \vec{B})$

Direction of $\vec{F} \Rightarrow \hat{j} \times \hat{k} = \hat{i}$

Hence direction of acceleration will be along +x axis.

11. Answer (1)

Hint and Sol.: Ideal gas equation:

$PV = nRT$

$n = \frac{7\,\text{g}}{28\,\text{g}} = \frac{1}{4}$

$\therefore \quad PV = \frac{1}{4}RT$

12. Answer (3)

Hint and Sol.: $F_B = mg \Rightarrow \rho_\ell \times V_d \times g = \rho_0 \times V_0 \times g$

$1 \times V_d = 0.8 \times V_0$

$V_d = 0.8\ V_0$

It means displaced volume is 80%, hence volume of block that will be outside the water is 20%.

13. Answer (4)

Hint: $R = \frac{\rho\ell}{A} = K\ell^2$

Sol.: $R = K\ell^2$

$R' = K(4\ell)^2 = 16K\ell^2 = 16R$

$\frac{1}{R_{eq}} = \frac{1}{4R} + \frac{1}{4R} + \frac{1}{4R} + \frac{1}{4R}$

$\Rightarrow \quad \frac{1}{R_{eq}} = \frac{4}{4R}$

$\Rightarrow \quad R_{eq} = R$

14. Answer (4)

Hint: Centripetal force is provided by tension.

Sol.: $T_2 = m\omega^2(2\ell)$

$T_1 - T_2 = m\omega^2(\ell)$

$T_1 = m\omega^2\ell + m\omega^2(2\ell)$

$T_1 = 3m\omega^2\ell$

$\frac{T_1}{T_2} = \frac{3m\omega^2\ell}{2m\omega^2\ell} = \frac{3}{2}$

15. Answer (2)

Hint: Potential inside the spherical shell remains same.

Sol.: $V_A = V_C = \frac{KQ}{R} = 9\ \text{V}$

$V_B = \frac{2KQ}{3R} = \frac{2}{3} \times 9\ \text{V} = 6\ \text{V}$

$V_A - V_B = 9 - 6 = 3\ \text{V}$

16. Answer (1)

Hint and Sol.: [L] = [mvr] = [ML^2T^{-1}]

[Energy] = [hf]

$[h] = \frac{[ML^2T^{-2}]}{\frac{1}{T}} = [ML^2\,T^{-1}]$

17. Answer (2)

Hint: Maximum speed $v = A\omega$ and time period $T = \frac{2\pi}{\omega}$

Sol.: $T = \frac{2\pi}{2\pi}$ = 1 second

$v = 5 \times 2\pi = 10\pi$

$= 10 \times 3.14\ \text{m s}^{-1}$

$= 31.4\ \text{m s}^{-1}$

18. Answer (1)

Hint: Use loss of energy concept in collision

Sol.: $\frac{K_2}{K_1} = \frac{K_1 - \text{loss of energy}}{K_1}$

$= \frac{\frac{1}{2}mv^2 - \frac{1}{2}\left(\frac{m \times m}{m+m}\right)(v)^2}{\frac{1}{2}mv^2}$

$= \frac{\frac{1}{2}mv^2\left(\frac{1}{2}\right)}{\frac{1}{2}mv^2}$

$= \frac{1}{2}$

19. Answer (1)

Hint: Time period of oscillations of magnet $T = 2\pi\sqrt{\frac{I}{MB}}$

Sol.: $T' = 2\pi\sqrt{\frac{I'}{M'B'}}$

where $I' = \frac{I}{2};\ M' = \frac{M}{2}$ and $B' = 2B$

$\therefore\ T' = 2\pi\sqrt{\frac{I}{2\left(\frac{M}{2}\right)(2B)}} = \frac{T}{\sqrt{2}}$

20. Answer (2)

Hint: In uniform circular motion, velocity is variable but speed is constant.

Sol.:

(i) Tangential acceleration is rate of change of speed.

$$a_t = \frac{d|\vec{v}|}{dt} = 0$$

(ii) $|\vec{F}| = \frac{mv^2}{R} = \text{constant}$

21. Answer (3)

Hint: Use formula $v = \omega r$

Sol.: $v_P = v_Q = v_R = \omega r$

$\Rightarrow \quad v_P : v_Q : v_R = 1 : 1 : 1$

22. Answer (1)

Hint and Sol.: According to Bohr's postulates, electron revolves around nucleus in circular orbit without radiating energy and the required centripetal force is provided by electrostatic force. These orbits are called stationary orbits.

23. Answer (3)

Hint: $g = \frac{GM}{R^2} = \frac{4}{3}\pi\rho GR$

Sol.: $g' = \frac{4}{3}\pi(4\rho)(G)\left(\frac{R}{2}\right)$

$= 2\left[\frac{4}{3}\pi\rho GR\right] = 2 \times 9.8$

= 19.6 m s^{-2}

24. Answer (2)

Hint and Sol.: $Y = \overline{\bar{A} + \bar{B}} = A.B$ (AND gate)

25. Answer (2)

Hint: Power $\vec{P} = \vec{F} \cdot \vec{v}$

Sol.: $a = t^3$

$\frac{dv}{dt} = t^3$

$\Rightarrow \quad \int_0^v dv = \int_0^1 t^3 dt$

$v = \frac{[t^4]_0^1}{4} = \frac{1}{4}$ m s^{-1}

$P = \left(4 \times 1 \times \frac{1}{4}\right)$ W

= 1 W

26. Answer (3)

Hint: In α-decay, mass number decreases by 4 while atomic number decreases by 2. In β^- decay, a neutron is converted into proton by losing an electron and antineutrino and β^+ is reverse of β^- decay.

Sol.: $^{A}_{Z}X \xrightarrow{\alpha} {}^{A-4}_{Z-2}Y \xrightarrow{\alpha} {}^{A-8}_{Z-4}Z \xrightarrow{\beta^-}$

$${}^{A-8}_{Z-3}P \xrightarrow{\beta^+} {}^{A-8}_{Z-4}Q$$

27. Answer (1)

Hint: Momentum $= \frac{h}{\lambda}$

Sol.: $\frac{hc}{\lambda} = E$

$\frac{h}{\lambda} = \frac{E}{c}$

28. Answer (3)

Hint: $\frac{hc}{\lambda} = \Delta E$

Sol.: $\frac{1}{\lambda} = R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

For transition from n = 2 to n = 1,

$\frac{1}{\lambda} = R\left[\frac{1}{1} - \frac{1}{4}\right] = \frac{3R}{4}$

$\Rightarrow \quad \lambda = \frac{4}{3R} = 121.6$ nm

Similarly, we can find the wavelength for other transitions.

29. Answer (1)

Hint: Kirchhoff's loop rule

Sol.: $I = \frac{8\text{ V} - 4\text{ V}}{4\ \Omega} = \frac{4}{4} = 1$ A

$\varepsilon = (4 + 2 \times 1) = 6$ V

30. Answer (4)

Hint: M. I. about mid-point is $\frac{ML^2}{12}$ and

M. I. about one end is $\frac{ML^2}{3}$

Sol.: $\frac{ML^2}{12} = 2400$ g cm^2

$\frac{ML^2}{3} = 4\left(\frac{ML^2}{12}\right) = 9600$ g cm^2

31. Answer (3)

Hint and Sol.: At axial point of a dipole

$E = \frac{2kp}{r^3} = \frac{2 \times 9 \times 10^9 \times 10^{-6}}{(1)}$ V m^{-1}

= 18 × 10^3 V m^{-1}

32. Answer (3)

Hint and Sol.: $\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$

$\frac{1}{10}=\frac{1}{v}+\frac{1}{30}$

$\frac{1}{v}=\frac{1}{10}-\frac{1}{30}$

$\frac{1}{v}=\frac{20}{300}$

v = 15 cm

33. Answer (4)

Hint and Sol.: LEDs are forward biased while photodiodes are reverse biased.

34. Answer (3)

Hint: Use Lenz's law

Sol.: The magnetic field is increasing in outward direction for *A* and downward direction in *B*. So to oppose the increasing flux, current is clockwise in *A* and anticlockwise in *B*.

35. Answer (1)

Hint: Use the concept of balanced Wheatstone bridge network

Sol.: $C_{eq} = C_1 + C_2$

$C_1 = C_2 = \frac{12\times 4}{12+4} = 3\ \mu F$

C_{eq} = 6 μF

Q = 10 × 6 μC = 60 μC

36. Answer (4)

Hint: $\lambda = \frac{h}{mv} = \frac{h}{\sqrt{2mqV}}$

Sol.: $\lambda^2 \propto \frac{1}{V}$

Hence graph between λ^2 and $\frac{1}{V}$ is a straight line with positive slope.

37. Answer (1)

Hint and Sol.: The central fringe will be white because path difference of all the wavelengths of light is zero and intensity will be maximum for the central fringe.

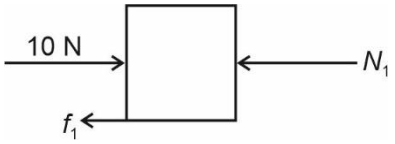
38. Answer (2)

Hint: $a = \frac{F-f}{m}$ for both blocks

Sol.: Blocks move together

$a = \frac{10-0.2(5)\times 10}{5} = 0$

For 2 kg block



$10 - 0.2 \times 20 = N_1$

$N_1 = 10 - 4 = 6$ N

39. Answer (4)

Hint: Elastic limit is equal to the stress until which stress is proportional to strain.

Sol.: $Y = \frac{\text{Stress}}{\text{Strain}}$

Stress = Y × Strain $= 2\times 10^{11}\times\frac{2\times 10^{-3}}{2}$

= 2 × 10^8 N/m^2

40. Answer (3)

Hint: Reading = MSR + CSR – zero error

Sol.: MSR = 4 mm

CSR = 20 × 0.01 mm

= 0.20 mm

Zero error = – 0.02 mm

Reading = 4 + 0.20 + 0.02

= 4.22 mm = 0.422 cm

41. Answer (1)

Hint and Sol.: From the graph, it can be observed that x-coordinate is increasing with time, hence velocity is positive.

42. Answer (1)

Hint: $\frac{P_S}{P_P} = \frac{V_S I_S}{V_P I_P}$

Sol.: $\frac{P_S}{P_P} = \left(\frac{V_S}{V_P}\right)\left(\frac{I_S}{I_P}\right) = \frac{4}{1}\times\frac{1}{4} = 1$

For ideal transformer, the efficiency is 100%.

43. Answer (3)

Hint: $v = \lambda f$

Sol.: $\lambda' = \frac{\lambda}{\mu}$ and frequency remains same. So, speed decreases.

44. Answer (4)

Hint: *bc* is isochoric process.

Sol.: $Q_{bc} = \Delta U = nC_V\Delta T$

$= \frac{3}{2}nR\Delta T$

$= 1.5(P_2V_2 - P_1V_1)$

$= 1.5[12 \times 10^4 \times 10^3 \times 10^{-6} - 4 \times 10^4 \times 10^3 \times 10^{-6}]$

$= 1.5[120 - 40] = 120$ J

45. Answer (3)

Hint and Sol.: $\mu_r = 1 + \chi$, the magnetic susceptibility of diamagnetic material is slightly negative. The susceptibility of paramagnetic material is slightly positive and susceptibility of ferromagnetic material is large and positive.

[CHEMISTRY]

46. Answer (3)

Hint & Sol.: In dry cell, the space between the electrodes is filled by a moist paste of ammonium chloride (NH_4Cl) and zinc chloride ($ZnCl_2$).

47. Answer (1)

Hint and Sol.: α-black phosphorus is formed when red phosphorus is heated in a sealed tube at 803K.

β-black phosphorus is prepared by heating white phosphorus at 473 K under high pressure.

48. Answer (4)

Hint: Haber's process $\rightarrow$ Iron oxide with small amount of K_2O and Al_2O_3

Sol.: Ostwald's process $\rightarrow$ Pt/Rh gauge

Contact process $\rightarrow V_2O_5$

Deacon's process $\rightarrow CuCl_2$

49. Answer (1)

Hint and Sol.: A mixture showing negative deviation from Raoult's Law, interaction between two different components should be stronger than that in their pure forms.

50. Answer (4)

Hint: Partial hydrolysis of XeF_6 gives different products.

Sol.: $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

$XeF_6 + 2H_2O \rightarrow \underset{(X)}{XeO_2F_2} + 4HF$

Shape of X is see-saw and hybridisation of xenon in XeO_2F_2 is sp^3d

51. Answer (1)

Hint: $Cl_2O_7 \rightarrow 2x + 7(-2) = 0$, $x = +7$

Sol.: $NaClO_3 \rightarrow 1 + x + 3(-2) = 0$, $x = +5$

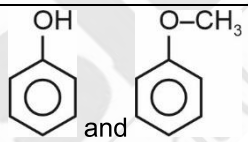
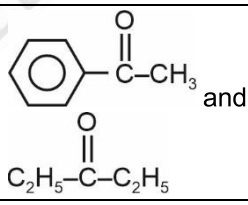
$Cl_2O \rightarrow 2x - 2 = 0$, $x = +1$

$ClO_2 \rightarrow x + 2(-2) = 0$, $x = +4$

52. Answer (2)

Hint: CH_3–CHO and $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_3$ can be distinguish by Tollens' reagent.

Sol.:

	Compounds	Reagent for distinguish
(a)	CH_3CHO and $CH_3\overset{\overset{O}{\|}}{C}CH_2CH_3$	Tollens' reagent
(b)		Neutral $FeCl_3$
(c)	$CH_3-\underset{\underset{OH}{\|}}{CH}-CH_3$ and $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$	Lucas reagent
(d)		I_2/NaOH

53. Answer (3)

Hint: $E_{H^{\oplus}/H_2} = E^{\circ}_{H^{\oplus}/H_2} - \frac{0.059}{2}\log\frac{P_{(H_2)}}{\left[H^+\right]^2}$

Sol.: $E^{\circ}_{H^{\oplus}/H_2} = 0, \quad P_{H_2} = 1\,\text{bar}$

$E_{H^{\oplus}/H_2} = 0 - \frac{0.059}{2}\log\frac{1}{\left[H^+\right]^2}$

$= -\frac{0.059}{2}\left[\log 1 - 2\log\left[H^+\right]\right]$

$$= -\frac{0.059}{2}\left[0 - 2\log\left[H^+\right]\right]$$

$= 0.059 \log [H^+]$

$= - 0.059 [- \log [H^+]$

$= - 0.059 [pH]$

$= - 0.059 \times 4$

$= - 0.236$ V

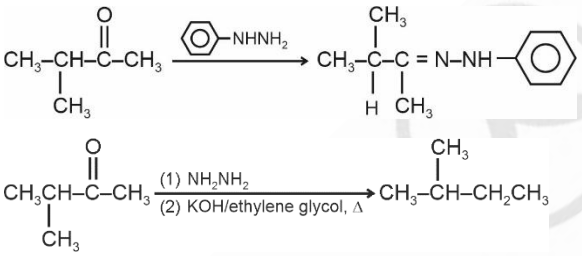
54. Answer (1)

Hint: Silica gel and alumina are used as adsorbents in adsorption chromatography.

Sol.: Paper chromatography is a type of partition chromatography.

55. Answer (4)

Hint and Sol.:



56. Answer (3)

Hint and Sol.: Co^{2+}, Ni^{2+}, Mn^{2+} and Zn^{2+} are group – IV cations. Pb^{+2} belongs to group-I and II.

57. Answer (3)

Hint: Buffer solution is formed by conjugate acid base pair

Sol.:

CH_3COOH	+	NaOH	→	CH_3COONa	+	H_2O
$0.1 \times V$		$0.05 \times V$		0		0
$0.1\,V - 0.05\,V$		LR		0.05 V		0.05 V

$= 0.095$ V

$$pH = pKa + \log\frac{\left[CH_3COO^-\right]}{\left[CH_3COOH\right]}$$

Therefore 0.1 M CH_3COOH and 0.05 M NaOH will formed acidic buffer solution when mixed in equal volume.

58. Answer (1)

Hint: Strong field ligand (CN^-) causes pairing of electron in complex compound.

Sol.: $[Ni(CN)_4]^{2-}$ has no unpaired electrons so it is diamagnetic in nature.

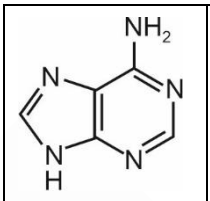
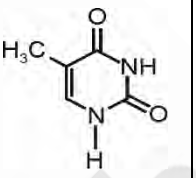
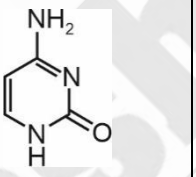
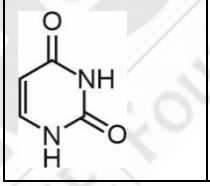
59. Answer (4)

Hint: Mixed oxides of Lanthanoids are used as catalysts in Petroleum cracking.

Sol.: Mischmetall consists of (95%) Lanthanoid metal.

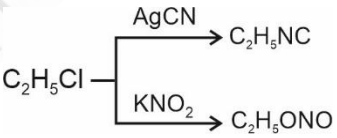
60. Answer (1)

Hint and Sol.:

	→	Adenine
	→	Thymine
	→	Cytosine
	→	Uracil

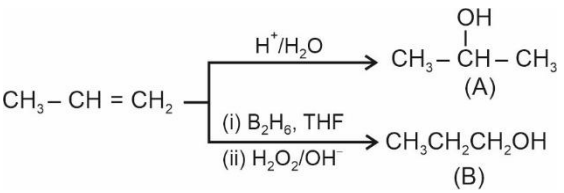
61. Answer (2)

Hint and Sol.:



62. Answer (3)

Hint and Sol.:



- 'A' gives iodoform test but 'B' does not.
- A and B are position isomer.
- 'A' gives blue while 'B' gives red colour during Victor Meyer test.

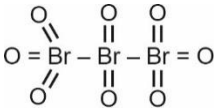
63. Answer (4)

Hint and Sol.: Higher the positive oxidation state, higher will be the oxidising power.

Stability of $Cu^{2+}(aq)$ rather than $Cu^{+}(aq)$ is due to much more negative enthalpy of hydration of $Cu^{2+}(aq)$.

64. Answer (1)

Hint & Sol.:



$$O.N = \frac{+6+4+6}{3} = \frac{16}{3}$$

65. Answer (2)

Hint:

$$\% \text{ Nitrogen} = \frac{1.4 \times \text{No. of milliequivalent of acid}}{\text{wt. of organic compound}}$$

Sol.: $$\% \text{ Nitrogen} = \frac{1.4 \times 20 \times 0.6 \times 2}{0.8}$$

$$= \frac{1.4 \times 20 \times 1.2}{0.8}$$

$$= \frac{1.4 \times 20 \times 12}{8}$$

= 14 × 3 = 42%

66. Answer (1)

Hint:

$$\lambda^{\circ}_{m(CH_3COONa)} = \lambda^{\circ}_{m}(CH_3COONa) + \frac{\lambda^{\circ}_{m}(H_2SO_4)}{2} - \frac{\lambda^{\circ}_{m}(Na_2SO_4)}{2}$$

Sol.: $$\lambda^{\circ}_{m}(CH_3COOH) = Z + \frac{X}{2} - \frac{Y}{2}$$

$$= \frac{(X-Y)}{2} + Z$$

67. Answer (3)

Hint: $E^{\circ}_{cell} = E^{\circ}_{cathode} - E^{\circ}_{anode}$

Sol.: $E^{\circ}_{Hg^{2+}/Hg_2^{2+}} - E^{\circ}_{I_2/I^{\ominus}} = 0.92 - 0.54$

= 0.38 V

68. Answer (2)

Hint: $P_4 + NaOH + H_2O \xrightarrow{\Delta} PH_3 + NaH_2PO_2$

Sol.: It explodes in contact with traces of oxidising agent like HNO_3.

69. Answer (1)

Hint and Sol.: In heavier members of group 14 elements, tendency to show +2 oxidation state increases as Ge < Sn < Pb.

$$Sn + 2H_2O \xrightarrow{\Delta} SnO_2 + 2H_2$$

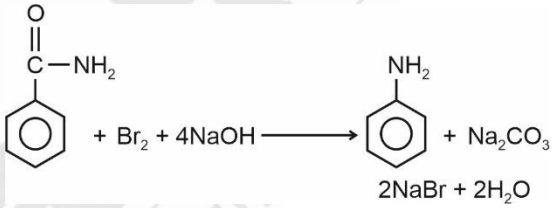
70. Answer (2)

Hint and Sol.: Buckminsterfullerene contains twenty six-membered rings and twelve five membered rings.

71. Answer (4)

Hint: Hoffmann bromamide degradation reaction. Convert primary amide into primary amine.

Sol.:



72. Answer (4)

Hint and Sol.: Primary alkyl halides does not give S_N1 reactions.

73. Answer (1)

Hint and Sol.: Xerophthalmia is a vitamin-A deficiency disease, in which hardening of cornea of eye (night blindness) occurs.

74. Answer (3)

Hint: Electron withdrawing group increases the acidic strength of phenol.

Sol.: In para-nitrophenol, $-NO_2$ group is present at para position which stabilized phenoxide ion by –I and – M effect.

75. Answer (4)

Hint:

$$\text{Enthalpy change} = \begin{bmatrix}\text{Sum of bond energy of}\\ \text{reactants}\end{bmatrix} - \begin{bmatrix}\text{Sum of bond energy of}\\ \text{product}\end{bmatrix}$$

Sol.: $H_2(g) + I_2(g) \rightarrow 2HI(g)$ $\Delta H = -8$ kJ mol^{-1}

$$\Delta H = \sum(BE)_R - \sum(BE)_P$$

$= (BE_{H-H}) + (BE_{I-I}) - 2(BE_{H-I})$.

$-8 = (435) + (151) - 2(BE_{H-I})$

$$BE_{H-I} = \frac{8 + 435 + 151}{2} = 297 \text{ kJ mol}^{-1}$$

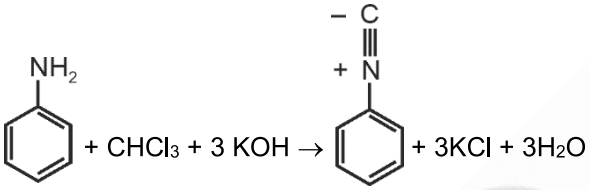
76. Answer (2)

Hint: Ammonium chloride is a salt of strong acid and weak base therefore its salt solution is acidic in nature.

Sol.: $NH_4^+ + H_2O \rightarrow NH_4OH + H^+$

77. Answer (3)

Hint and Sol.: Aliphatic and aromatic primary amines gives carbylamine test.



78. Answer (2)

Hint: Depression in freezing point $\Delta T_f = i K_f m$

Sol.: i = 1

$$\Delta T_f = 1 \times 5.12 \times \frac{\frac{10}{58}}{\frac{200}{1000}}$$

$$= 5.12 \times \frac{10}{58} \times 5 = 4.413$$

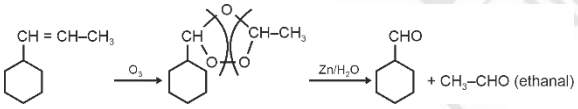
$\Delta T_f = T_i - T_f$

$T_f = 5.5 - 4.41 = 1.1°C$

79. Answer (2)

Hint: Reduction ozonolysis is used to identify the position of multiple bond.

Sol.:



80. Answer (1)

Hint: For first order reaction $K = \frac{2.303}{t} \log \frac{A_0}{A_t}$

Sol.: For first order rate equation

$$K = \frac{2.303}{t} \log \frac{A_0}{A_t}$$

$$9.212 \times 10^{-3} = \frac{2.303}{t} \log \frac{4}{0.4}$$

$$t = \frac{2.303}{9.212 \times 10^{-3}} \log 10$$

$$= \frac{10^3}{4} \times 1$$

$$= \frac{1000}{4} = 250 \text{ s}$$

81. Answer (2)

Hint and Sol.: Spectrochemical series (as given in NCERT)

$I^- < Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4^{2-}$

$< H_2O < NCS^- < edta^{4-} < NH_3 < en < CN^- < CO$

82. Answer (1)

Hint: The enthalpy change that occurs when one mole of the substance is formed from its constituent elements in their standard states is enthalpy of formation.

Sol.: $C(graphite) + O_2(g) \rightarrow CO_2(g)$, $\Delta_r H°$ ...(i)

$= -393.5 \text{ kJ mol}^{-1}$

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ …(ii), $\Delta_r H°$

$= -285.8 \text{ kJ mol}^{-1}$

$CO_2(g) + 2H_2O(l) \rightarrow CH_4(g)$ …(iii), $\Delta_r H°$

$= +890.3 \text{ kJ mol}^{-1}$

(i) + 2 × (ii) + (iii) we have,

$C(graphite) + 2H_2(g) \rightarrow CH_4(g)$

$\Delta_r H° = -393.5 + 2(-285.8) + 890.3$

$= -74.8$ kJ/mol

83. Answer (4)

Hint and Sol.: Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis because aryl halides don't undergo nucleophilic substitution with anion formed by phthalimide.

84. Answer (1)

Hint and Sol.:

$SF_6 \rightarrow$ Octahedral

$XeF_4 \rightarrow$ Square planar

$NH_4^+ \rightarrow$ Tetrahedral

$BF_3 \rightarrow$ Trigonal planar

85. Answer (2)

Hint: Ionic radii order for isoelectronic species is anion size > neutral atom > cation size

Sol.: Correct order of ionic size.

(a) $H^{\ominus} > H > H^{\oplus}$

(b) $N^{3-} > O^{2-} > F^-$

(c) $O^{2-} > F^- > Na^+$

(d) $N^{3-} > Mg^{2+} > Al^{3+}$

86. Answer (4)

Hint: A large difference between first and second ionisation enthalpies (4560 – 496 = 4064 kJ mol^{-1}) confirms the metal to be alkalimetal.

Sol.: $\underset{1\,mol}{MOH} + \underset{1\,mol}{HCl} \rightarrow MCl + H_2O$

$\underset{1\,mol}{2MOH} + \underset{0.5\,mol}{H_2SO_4} \rightarrow \underset{0.5\,mol}{M_2SO_4} + \underset{1\,mol}{2H_2O}$

87. Answer (2)

Hint: For de-Broglie wavelength (λ) of an electron.

$$2\pi r_n = n\lambda$$

Sol.: For hydrogen atom

$$\boxed{r_n = a_0 n^2}$$

$r_4 = 52.9 \times 4^2$

For de-Broglie wavelength (λ)

$n\lambda = 2\pi r_n$

$4 \times \lambda = 2 \times \pi \times 52.9 \times 4^2$

$\lambda = 423.2\ \pi$ pm

88. Answer (3)

Hint and Sol.: n = 4, l = 2 represents 4*d* subshell, one *d*-subshell contains 5 orbitals, one orbital can have maximum two electrons, therefore in 4*d*-subshell maximum 10 electrons can be filled.

89. Answer (3)

Hint: Molarity $= \dfrac{\text{number of moles of solute}}{\text{Volume of solution in litre}}$

Sol.: Number of moles of glucose $= \dfrac{6.02 \times 10^{21}}{N_A}$

$= 10^{-2}$

$$\text{Molarity} = \frac{10^{-2}}{\frac{200}{1000}} = 5 \times 10^{-2} = 0.05\ M$$

90. Answer (2)

Hint: Reagent which gets consumed completely in chemical reaction is known as the limiting reagent.

Sol.:

$$Ca(s) + \frac{1}{2}O_2(s) \rightarrow CaO(s)$$

Moles; 0.5 0.5

1 mole of Ca $\rightarrow \dfrac{1}{2}$ moles of O_2

$\dfrac{1}{2}$ mole Ca $\rightarrow \dfrac{1}{4}$ moles of O_2

given moles of O_2 = 0.5

Therefore, oxygen is the reagent in excess

Excess amount of oxygen is $= \left(\dfrac{1}{2} - \dfrac{1}{4}\right) \times 32$

$= 8$ g

[BIOLOGY]

91. Answer (4)

Hint: Bicarpellary and syncarpous gynoecium is found in the members of solanaceae.

Sol.: *Nicotiana* is a member of solanaceae and have bicarpellary and syncarpous gynoecium.

92. Answer (2)

Hint: In marginal placentation, the placenta forms a ridge along the ventral suture of the ovary and ovules are borne on this ridge forming two rows, as in pea.

Sol.: Basal placentation – Placenta develops at the base of ovary.

Free central placentation- Ovules are borne on central axis and septa are absent.

Parietal placentation- Ovules develop on the inner wall of ovary.

93. Answer (4)

Hint: Dicot stems, have single layered endodermis and also show secondary growth.

Sol.: In dicot stem, conjoint, collateral and open vascular bundles are present. Hypodermis is collenchymatous in nature. Pith is made up of parenchymatous cells.

94. Answer (3)

Hint: In dicot root, during secondary growth vascular cambium initiates from pericycle.

Sol.: In dicot roots, next to endodermis lies a few layers of thick-walled parenchymatous cells referred to as pericycle. Initiation of lateral roots and vascular cambium during secondary growth takes place in these cells.

95. Answer (2)

Hint: When male individual produces two different types of gametes then, sperms determine the sex of the offspring.

Sol.: Grasshopper shows male *heterogamety* and hence, sperms determine the sex of the offspring.

96. Answer (4)

Hint: Haemophilia is a sex-linked recessive trait.

Sol.: The heterozygous female (carrier) for haemophilia may transmit the disease to sons.

A single protein that is a part of the cascade of protein involved in the clotting of blood is affected.

97. Answer (4)

Hint: *Vallisneria* shows epihydrophily.

Sol.: In *Vallisneria*, light and unwettable pollen grains are present. Male flowers, after breakage float on the surface of water and pollens are carried passively by water currents. Hence, pollination takes place on the surface of water.

98. Answer (2)

Hint: Primata is an order.

Sol.: Family – Muscidae

Genus – *Triticum*

Class – Insecta

99. Answer (4)

Hint: Cell wall is absent in *Euglena*.

Sol.: Instead of a cell wall, *Euglena* have protein rich layer called pellicle which makes their body flexible.

Dinoflagellates have two flagella, one lies longitudinally and other transversely.

100. Answer (3)

Hint: In members of phycomycetes, asexual reproduction involves both motile and non-motile spores.

Sol.: Asexual reproduction takes place by zoospores (motile) or by aplanospores (non-motile) in members of phycomycetes.

101. Answer (2)

Hint: Centrosome starts moving towards opposite poles and radiate out microtubule during prophase.

Sol.: The correct sequence of events in M phase is as follows:

Centrosome starts radiating out microtubules (Prophase)

↓

Complete disintegration of nuclear envelope (starting of metaphase)

↓

Spindle fibres attach to kinetochores of chromosomes (Metaphase)

↓

Chromosome moved to spindle equator and get aligned along metaphase plate (Metaphase)

↓

Centromere splits and chromatids separate (Anaphase)

102. Answer (3)

Hint: Thalassemia and sickle cell anaemia are autosomal recessive traits.

Sol.: Haemophilia is an X-linked recessive trait. Myotonic dystrophy is an autosomal dominant trait.

103. Answer (3)

Hint: This structure consists of many flat, disc shaped sacs or cisternae (stacked parallel to each other).

Sol.: Golgi apparatus principally performs the function of packaging materials and it is the important site of formation of glycoproteins and glycolipids.

104. Answer (1)

Hint: In glycolysis, for one molecule of glucose, four substrate level phosphorylation reactions occur.

Sol.: For a sucrose molecule which is undergoing glycolysis, eight substrate level phosphorylation reactions will occur.

105. Answer (4)

Hint: Food is stored as floridean starch in red algae.

Sol.: In members of red algae, the food is stored as floridean starch which is very similar to amylopectin and glycogen in structure.

106. Answer (2)

Hint: Allow cardiac muscle cells to contract as a unit

Sol.: Cardiac muscle fibres are present in heart and smooth muscle fibres present in the walls of blood vessels. Presence of gap junctions is a common feature between cardiac and smooth muscle fibres. Cardiac muscle fibres differ from smooth muscle fibres in presence of striations, branching and having cylindrical shape.

107. Answer (1)

Hint: Equal to the total number of limbs in frog

Sol.: In frogs, the hind limbs and forelimbs help in swimming, walking, leaping and burrowing. The hind limbs end in five digits and they are larger and muscular than forelimbs that end in four digits.

108. Answer (4)

Hint: Gives rise to alveoli

Sol.: The trachea, primary, secondary and tertiary bronchi and initial bronchioles are supported by incomplete cartilaginous rings. Each terminal bronchiole gives rise to a number of very thin, irregular-walled and vascularised bag-like structures called alveoli.

The part starting with the external nostrils up to the terminal bronchioles constitute the conducting part whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system.

109. Answer (3)

Hint: Exclude the proteins that assist in blood coagulation

Sol.: Fibrinogens, globulins and albumins are the major plasma proteins. Fibrinogens are needed for clotting or coagulation of blood. Globulins are primarily involved in defense mechanisms of the body and the albumins help in osmotic balance.

110. Answer (2)

Hint: Sweat is produced by sweat glands

Sol.: Sweat produced by sweat glands is a watery fluid containing NaCl, small amounts of urea, lactic acid, *etc*. Though the primary function of sweat is to facilitate a cooling effect on the body surface, it also helps in the removal of some of the wastes mentioned above.

Sebum produced from sebaceous glands provides a protective oily covering for the skin.

Liver assists in removal of degraded steroid hormones, vitamins and drugs.

111. Answer (2)

Hint: Polarity of resting plasma membrane is reversed.

Sol.: When a neuron is not conducting any impulse, *i.e*., resting, the axonal membrane is comparatively more permeable to K^+ and nearly impermeable to Na^+. Similarly, the membrane is impermeable to negatively charged proteins present in the axoplasm.

During depolarisation, there is opening of voltage gated Na^+ channels, that leads to rapid influx of Na^+ followed by reversal of polarity *i.e*., the outer surface of the membrane becomes negatively charged and the inner side becomes positively charged.

112. Answer (1)

Hint: Released from pars intermedia

Sol.: Adenohypophysis consists of two parts, pars distalis and pars intermedia. The pars distalis region of pituitary, commonly called anterior pituitary, produces growth hormone (GH), prolactin (PRL), thyroid stimulating hormone (TSH), luteinising hormone (LH), follicle stimulating hormone (FSH), and adrenocorticotrophic hormone (ACTH). Pars intermedia secretes only one hormone called Melanocyte Stimulating Hormone (MSH).

113. Answer (3)

Hint: *Pleurobrachia* bears comb plates

Sol.: Organism	Phylum
Pleurobrachia	Ctenophora
Planaria	Platyhelminthes

114. Answer (4)

Hint: Flying fox

Sol.: *Pteropus* is a mammal.

Petromyzon (Cyclostome)	–	Body is devoid of scales and paired fins
Pterophyllum (Bony fish)	–	External fertilisation and direct development
Pristis (Cartilaginous fish)	–	Lack operculum and air bladder

115. Answer (3)

Hint: Role of secondary oocyte

Sol.: The process of formation of a mature female gamete is called oogenesis which is markedly different from spermatogenesis. Oogenesis is

initiated during the embryonic development stage when a couple of million gamete mother cells (oogonia) are formed within each fetal ovary. At puberty, only 60,000 – 80,000 primary follicles are left in each ovary.

The secondary oocyte is responsible for forming zona pellucida, which is a non-cellular layer.

116. Answer (4)

Hint: Here, r = (b-d)

Sol.: In the given logistic growth equation, the intrinsic rate of natural increase is called biotic potential and is represented by r.

117. Answer (3)

Hint: Floating debris is removed by primary treatment.

Sol.: Floating debris is removed by sequential filtration.

118. Answer (3)

Hint: Phenylalanine hydroxylase converts amino acid phenylalanine into tyrosine.

Sol.: Phenylketonuria affected individual lacks a liver enzyme called phenylalanine hydroxylase which converts phenylalanine into tyrosine.

119. Answer (1)

Hint: According to Chargaff's rule = A = T
C = G

Sol.: Given, 30 % thymine

$\therefore$ Adenine = 30%

$\because$ A+C+G+T = 100%

(60%) + (G+C) = 100%

G+C = 100% – 60%

C = 20%

120. Answer (4)

Hint: During first phase of translation, charging of tRNA takes place in the presence of enzyme aminoacyl tRNA synthetase.

Sol.: The first step in translation mechanism is aminoacylation of tRNA.

121. Answer (3)

Hint: In RNA, in place of thymine, uracil is present.

Sol.: In the given DNA stretch

5' ACGCTAGCTATTCGT 3' template strand

3' TGCGATCGATAAGCA 5' coding strand

↓

3' UGCGAUCGAUAAGCA 5' mRNA

122. Answer (4)

Hint: Generally prokaryotic organisms have circular DNA.

Sol.: In *E. coli*, double stranded circular DNA is present with 4.6×10^6 bp

123. Answer (2)

Hint: Regulator gene synthesises a regulator protein which can act positively as activator and negatively as repressor.

Sol.: Structural gene – transcribes mRNA for polypeptide synthesis.

Promotor gene- It provides attachment site for RNA polymerase.

Operator gene – It is a gene which receives the product of regulator gene. It allows the functioning of the operon when it is not interacting with the biochemical product produced by the regulator gene.

124. Answer (3)

Hint: In Calvin cycle, carboxylation reaction is catalysed by the enzyme RuBisCO and it results in the formation of two molecules of 3 PGA.

Sol.: In Calvin cycle, the fixation of six molecules of CO_2 and six turns of the cycle are required for the formation of one molecule of glucose from the pathway.

In Calvin cycle, 18 ATP and 12 NADPH molecules are used to make a molecule of glucose.

125. Answer (4)

Hint: When one molecule of 3-PGAL is completely oxidised, then 5 NADH $+H^+$, 1 $FADH_2$, and 3 ATP molecules are produced.

Sol.: For 3 molecules of PGAL

In glycolysis $\rightarrow$ 1 NADH + H^+ × 3 = 3×3 = 9

2 ATP × 3 = 6

Link reaction $\rightarrow$ 1 NADH + H^+ × 3 = 3 × 3 = 9

Krebs cycle $\rightarrow$ 3 NADH + H^+ × 3 = 9 × 3 = 27

1 $FADH_2$ × 3 = 2 × 3 = 6

1 GTP × 3 = 3

Total= 60

126. Answer (2)

Hint: Actinomorphic flowers show radial symmetry.

Sol.: Actinomorphic flowers – Mustard, Datura, Chilli

Zygomorphic flowers – Pea, Bean, Gulmohur, *Cassia*

127. Answer (3)

Hint: Phragmoplast is formed in plant cell.

Sol.: In plant cell, cell plate formation starts at the centre of the cell and grows outwards, towards the lateral walls dividing the cell into two halves.

128. Answer (2)

Hint: Synaptonemal complex is formed during zygotene stage.

Sol.: The chromosomal synapsis is accompanied by a structure called synaptonemal complex and it is thought to stabilise the homologous chromosomes till crossing over.

129. Answer (2)

Hint: When centromere is away from the centre then this leads to the formation of unequal arms.

Sol.: In sub-metacentric and acrocentric type of chromosomes, p and q arms are of unequal length.

130. Answer (3)

Hint: An immunosuppressive agent used in organ transplant patients is produced by *Trichoderma polysporum.*

Sol.: Pectinase – It helps in clarifying fruit juices.

Streptokinase – It is produced by bacteria and after modification by genetic engineering used as clot buster.

Statins – Have been commercialised as blood cholesterol lowering agents.

131. Answer (4)

Hint: Fungus

Sol.: The causative agent of ringworms is fungi. The genetic material of fungi is DNA. In order to cut the DNA with restriction enzymes, it needs to be in pure form, free from other macro-molecules. Fungal cell wall is made up of chitin, thus, chitinase is used.

- DNase digests DNA, so it cannot be used.

132. Answer (4)

Hint: Possess pneumotaxic centre in humans

Sol.: The brain of frog is divided into fore-brain, mid-brain and hind-brain. Forebrain includes olfactory lobes, paired cerebral hemispheres and an unpaired diencephalon. The mid-brain is characterised by a pair of optic lobes. Hind-brain consists of cerebellum and medulla oblongata.

133. Answer (3)

Hint : Barrier method of contraception

Sol.: Vaults (Barrier method of contraception) – Reusable and used along with spermicidal jellies, foams and creams.

Nirodh (Brand name for male condom) – Protects the users from contracting STIs

LNG-20 (Hormone releasing IUD) – Suppresses sperm motility and the fertilising capacity of sperms

134. Answer (2)

Hint: Possess structures which are the outgrowths of cell membrane.

Sol.: In *Paramoecium*, cilia help in the movement of food through cytopharynx and in locomotion as well.

- Ciliary movement occurs in most of our internal tubular organs which are lined by ciliated epithelium. The coordinated movements of cilia in the trachea help us in removing dust particles and some of the foreign substances inhaled along with the atmospheric air.
- Movement of our limbs, jaws, tongue, *etc*., require muscular movement.
- Flagellar movement helps in the swimming of spermatozoa, maintenance of water current in porifers, *etc*.

135. Answer (4)

Hint: Exclude toxins

Sol.:

Pigments	Carotenoids, Anthocyanins, *etc*.
Alkaloids	Morphine, Codeine, *etc*.
Terpenoides	Monoterpenes, Diterpenes *etc*.
Essential oils	Lemon grass oil, *etc*.
Toxins	Abrin, Ricin
Lectins	Concanavalin A
Drugs	Vinblastin, curcumin, etc.
Polymeric substances	Rubber, gums, cellulose

136. Answer (3)

Hint: Simple squamous epithelium

Sol.: The simple squamous epithelium is found in the walls of blood vessels and air sacs of lungs and is involved in functions like forming a diffusion boundary.

- The cuboidal epithelium is present in the ducts of glands and the tubular parts of nephrons.
- The columnar epithelium is found in the lining of small intestine.
- Compound epithelium is present in the pancreatic ducts.

137. Answer (1)

Hint: Assist in exchange of gases

Sol.: The respiratory system of cockroach consists of a network of trachea, that open through 10 pairs of small holes called spiracles present on the lateral side of the body.

- A ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of foregut and midgut, which secretes digestive juice.
- At the junction of midgut and hindgut, there is presence of a ring of 100-150 yellow coloured thin filamentous Malpighian tubules.

138. Answer (4)

Hint: 5 L = 5000 mL

Sol.: Every 100 mL of oxygenated blood can deliver around 5 mL of O_2 to the tissues under normal physiological conditions.

$\therefore$ 1000 mL of oxygenated blood would deliver 50 mL of O_2 to the tissues thus, 5000 mL of oxygenated blood would deliver 250 mL of O_2 to the tissues under normal physiological conditions.

139. Answer (1)

Hint: Phase in which AV valves are open

Sol.: During joint diastole, all the four chambers of heart are in a relaxed state. Blood from the pulmonary veins and vena cava flows into the left and right ventricle respectively through the left and right atria.

- During ventricular systole, there is increase in the ventricular pressure causing the closure of AV valves due to attempted back flow of blood into the atria. As the ventricular pressure increases further, the semilunar valves guarding the pulmonary artery and the aorta are forced open, allowing the blood in the ventricles to flow through these vessels into the circulatory pathways.

140. Answer (3)

Hint: Conditional reabsorption of Na^+ takes place here

Sol.: Conditional reabsorption of Na^+ and water takes place in DCT. DCT is capable of reabsorption of HCO_3^- and selective secretion of H^+, K^+ and NH_3 to maintain the pH and sodium balance in blood.

- Ascending limb of Henle's loop is impermeable to water but allows transport of electrolytes actively or passively.
- Blood from glomerulus is carried away by an efferent arteriole.
- The epithelial cells of Bowman's capsule called podocytes are arranged in an intricate manner so as to leave some minute spaces called slit pores that assist in ultrafiltration.

141. Answer (3)

Hint: Part of hind brain

Sol.: Pons consists of fibre tracts that interconnect different regions of the brain. Pons contains pneumotaxic centre that can moderate the functions of respiratory rhythm centre.

Three major regions make up the brain stem; midbrain, pons and medulla oblongata.

142. Answer (2)

Hint: Fibrous joint is present between cranial bones.

Sol.: Fibrous joints do not allow any movement. This type of joint is shown by the flat skull bones which fuse end-to-end with the help of dense fibrous connective tissues.

- Cartilaginous joints permit limited movements and are present between the adjacent vertebrae in the vertebral column.
- Saddle joint and gliding joint are the types of synovial joints.

143. Answer (4)

Hint: Feature observed in nematodes

Sol.: Metagenesis, *i.e.*, alternation of generation of body forms is seen in *Obelia* but not in *Adamsia*.

- The body of ctenophores bears eight external rows of ciliated comb plates, which help in locomotion.
- Hooks and suckers are present in tapeworms while only suckers are present in liver fluke.

144. Answer (3)

Hint: Garden lizard

Sol.: *Calotes* – Garden lizard; *Chelone* – Turtle

145. Answer (2)

Hint: Opioid

Sol.: Heroin commonly called smack, is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound. This is obtained by acetylation of morphine, which is extracted from the latex of poppy plant, *Papaver somniferum*.

Cocaine is commonly known as coke or crack which is obtained from the coca plant, *Erythroxylum coca*.

146. Answer (1)

Hint: Equal to the number of ear ossicles in one ear of man

Sol.: The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography is called adaptive radiation.

Darwin's finches represent one of the best examples of this phenomenon.

Darwin's finches also exhibit natural selection and founder effect.

147. Answer (3)

Hint: Fertilisation occurs inside the female body

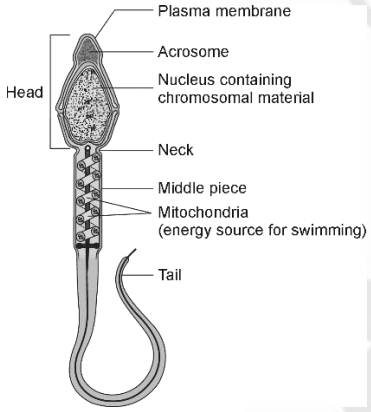
Sol.: ZIFT (Zygote Intra Fallopian Transfer), IUT (Intra Uterine Transfer) and ICSI (Intra Cytoplasmic Sperm Injection) involve *in vitro* fertilisation.

Artificial Insemination (AI), Gamete Intra Fallopian Transfer (GIFT) and Intra Uterine Insemination (IUI) involve *in vivo* fertilisation.

148. Answer (2)

Hint: Filled with enzymes that aids in fertilisation

Sol.:



A plasma membrane envelops the whole body of sperm. The sperm head contains an elongated haploid nucleus, the anterior portion of which is covered by acrosome.

149. Answer (3)

Hint: Role in gene therapy

Sol.: The proteins encoded by the genes *cryIAc* and *cryIIAb* control the cotton bollworms, that of *cryIAb* controls corn borer.

- Using *Agrobacterium* vectors, transgenic tobacco plants were produced.
- Proinsulin possesses chain A, B and C. It contains 3 disulphide bonds.

150. Answer (3)

Hint: DNA fragments are negatively charged molecules.

Sol.: The cutting of DNA by restriction endonuclease results in the fragmentation of DNA. These fragments can be separated by a technique known as gel electrophoresis. Since DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the anode under an electric field through a medium/matrix.

- The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiations.

151. Answer (1)

Hint: Equals to the total number of parietal bones in humans

Sol.: The first clinical gene therapy was given in 1990 to a 4-year old girl with ADA deficiency.

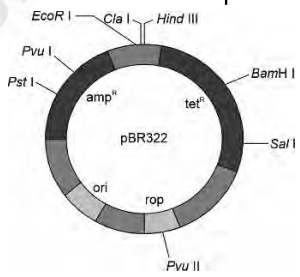
- In 1983, Eli Lilly, an American company prepared two DNA sequences corresponding to A and B chains of human insulin and introduced them in plasmids of *E. coli* to produce insulin chains.
- In 1997, an American company got patent rights on basmati rice through the US Patent and Trademark Office.

  Also, in year 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 g/L)

152. Answer (2)

Hint: Exclude the ones present within tet^R gene

Sol.:



153. Answer (2)

Hint: Bacterial disease

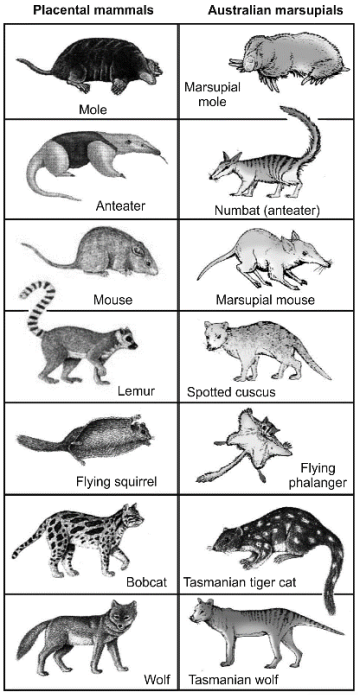
Sol.: Typhoid fever is confirmed by Widal test. Sustained high fever (39° to 40°C), weakness, stomach pain, constipation, headache, loss of appetite are some of the common symptoms of typhoid. Intestinal perforation and death may occur in severe cases.

- *Haemophilus influenzae* is the causative agent of pneumonia while *Entamoeba histolytica* causes amoebiasis.

154. Answer (1)

Hint: Flying squirrel and sugar glider

Sol.:



155. Answer (4)

Hint: Saheli was developed at CDRI, Lucknow

Sol.: Saheli – the new oral contraceptive pill for the females contains a non-steroidal preparation. It is a 'once a week' pill with very few side effects and high contraceptive value.

Progestogens alone or in combination with estrogen can be used by females as injections or implants under the skin.

156. Answer (4)

Hint: Cortex is further differentiated into three zones – hypodermis, general cortex and endodermis.

Sol.:

The correct sequence of tissues in ground tissue system is:

Hypodermis → General cortex → Endodermis →

Pericycle → Pith

157. Answer (2)

Hint: Bryophytes exhibit haplo-diplontic life cycle pattern.

Sol.: In bryophytes, the sporophyte is not free-living but attached to the photosynthetic gametophyte and derives nourishment from it.

158. Answer (3)

Hint: In C_4 plants, the primary CO_2 acceptor is phosphoenol pyruvate.

Sol.: The primary CO_2 acceptor is a 3 carbon molecule, phosphoenol pyruvate and is present in the mesophyll cells of C_4 plants.

159. Answer (1)

Hint: Complex I is also known as NADH dehydrogenase.

Sol.: NADH dehydrogenase transfers the electrons to complex III via ubiquinone.

160. Answer (3)

Hint: Abscisic acid acts as an antagonist to GA and it is also known as anti-GA

Sol.: Application of minute amount of ABA to leaves reduces transpiration to a great extent through closure of stomata.

161. Answer (4)

Hint: ABO blood group is also a good example of co-dominance.

Sol.:

$I^AI^B \times I^B i$

$\downarrow$

	I^A	I^B
I^B	I^AI^B	I^BI^B
i	I^Ai	I^Bi

Genotypes : I^AI^B, I^Bi, $I^A i$, I^BI^B

Phenotypes : AB, B, A

162. Answer (2)

Hint: The nascent RNA synthesised by RNA polymerase II is called primary transcript.

Sol.: The nascent RNA synthesized by RNA polymerase II is called hnRNA or primary transcript.

163. Answer (4)

Hint: Lysosomes are formed by the process of packaging in Golgi apparatus.

Sol.: They are rich in hydrolytic enzymes such as lipases, proteases and carbohydrases.

Contractile vacuole helps in excretion in *Amoeba*.

164. Answer (2)

Hint: In Amensalism, one species is harmed and another is neither harmed nor benefitted.

Sol.: In predation and parasitism, one species is harmed and another is benefitted.

165. Answer (3)

Hint: *in situ* conservation strategy of biodiversity emphasises protection of whole ecosystem.

Sol.: *in situ* conservation – National park, Biosphere reserve, Wildlife Sanctuaries

ex situ conservation – Seed banks, Botanical gardens, Wildlife Safari parks, Cryopreservation

166. Answer (1)

Hint: In aquatic ecosystem, the pyramid of biomass is inverted.

Sol.: In aquatic ecosystem, the biomass of zooplanktons is higher than that of phytoplanktons as life span of former is longer and the latter multiply much faster though having shorter life span.

167. Answer (4)

Hint: Plastocyanin is located after cytochrome B_6f

Sol.: During chemiosmosis, plastocyanin transfers electrons from cyt B_6f to PS I.

168. Answer (3)

Hint: Auxin occurs in the growing apices of the stems and roots.

Sol.: Auxin is composed of indole compounds.

169. Answer (2)

Hint: Pollen grains are light and non-sticky in anemophilous flowers.

Sol.: In majority of wind pollinated flowers, nectaries are absent.

170. Answer (1)

Hint: Key industry animals are primary consumers.

Sol.: Key industry animals are also called herbivores.

171. Answer (1)

Hint: Cortisol retards phagocytic activity of WBCs

Sol.: Cortisol produces anti-inflammatory reactions and suppresses the immune response. Cortisol retards phagocytic activities of WBCs and thus suppresses inflammatory reactions. Cortisol also suppresses the synthesis of antibodies by inhibiting the production of lymphocytes in the lymphoid tissue and is therefore also called an immunosuppresor.

172. Answer (2)

Hint: True for nodes of Ranvier

Sol.: Myelinated nerve fibres are found in spinal and cranial nerves.

Unmyelinated nerve fibres are enclosed by Schwann cells that do not form a myelin sheath around the axon, and are commonly found in autonomous and the somatic neural systems.

173. Answer (3)

Hint: Ammonotelic

Sol.: Many aquatic amphibians, bony fishes and aquatic insects are ammonotelic.

- Mammals, many terrestrial amphibians and marine fishes are ureotelic in nature.
- Reptiles, land snails, birds and insects are uricotelic animals.

174. Answer (3)

Hint: QRS complex represents the ventricular depolarisation.

Sol.: In a standard ECG, the P-wave represents the electrical excitation of the atria. The QRS complex represents the depolarisation of the ventricles which initiates the ventricular contraction. The contraction starts shortly after Q-wave and marks the beginning of the systole.

The T-wave represents the return of ventricles from excited to normal state (repolarisation).

175. Answer (2)

Hint: Occurs in the alveoli

Sol.: In the alveoli, where there is high pO_2, low pCO_2, lesser H^+ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin; whereas in the tissues, where low pO_2, high pCO_2, high H^+ concentration and higher temperature exist, the conditions are favourable for the dissociation of oxygen from the oxyhaemoglobin.

176. Answer (4)

Hint: Component of DNA

Sol.: Palmitic acid has 16 carbons including carboxyl carbon and arachidonic acid has 20 carbon atoms including the carboxyl carbon.

- Adenylic acid is a nucleotide, which possesses adenine, pentose (ribose) sugar and a phosphate moiety.
- Glutamic acid is an acidic amino acid.

177. Answer (1)

Hint: An insect

Sol.: Insects and birds possess crop and gizzard in their digestive system.

- Birds are vertebrate animals while insects are invertebrates.
- *Corvus* (crow) and *Pavo* (peacock) are birds while *Periplaneta* (cockroach) is an insect.

178. Answer (3)

Hint: A urochordate

Sol.: In cephalochordates, cyclostomes and cartilaginous fishes, notochord is persistent throughout the life.

Carcharodon and *Scoliodon* are cartilaginous fishes and *Branchiostoma* is a cephalochordate.

- *Doliolum* is a urochordate in which notochord is present only in larval tail.

179. Answer (4)

Hint: Exclude viral STIs

Sol.: Except for hepatitis-B, genital herpes and HIV infections, other STIs are completely curable, if detected early and treated properly.

- Hepatitis-B is a viral STI, caused by Hepatitis-B virus.
- Genital warts is a viral STI, caused by Human papillomavirus.
- Trichomoniasis is a protozoan STI, caused by *Trichomoniasis vaginalis*.

180. Answer (2)

Hint: Produced by GIT cells

Sol.: Exocrine glands secrete mucus, saliva, earwax, oil, milk, digestive enzymes and other cell products. These products are released through ducts or tubes. In contrast, endocrine glands do not have ducts. Their products called hormones (*e.g.*, secretin) are secreted directly into the fluid bathing the gland.

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