

All India Aakash Test Series for NEET - 2026

OPEN MOCK TEST - I**Click here for
Code-B Sol.**

Test Date : 22/03/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint: Average speed = $\frac{\text{Total displacement}}{\text{Total time}}$

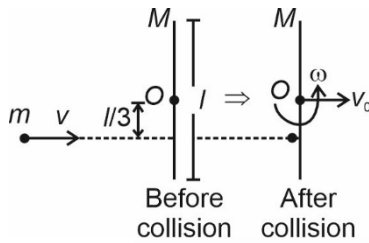
Sol.: Average speed = $\frac{6 \times \frac{1}{2} + 9 \times \frac{5}{6}}{1.5}$

= $\frac{3 + 7.5}{1.5} = \frac{10.5}{1.5} = 7 \text{ km/h}$

2. Answer (4)

Hint: Conserve angular momentum of system about centre of rod.

Sol.:



Initial angular momentum before collision = final angular momentum after collision

$\Rightarrow \frac{mvl}{3} = \frac{Ml^2 \cdot \omega}{12}$

$\Rightarrow \omega = \frac{4mv}{Ml}$

3. Answer (1)

Hint & Sol.: Speed of sound, $V_{\text{sound}} = \sqrt{\frac{\gamma RT}{M_0}}$

Here γ , R and T are same

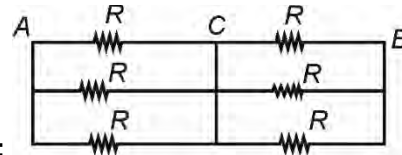
$\therefore V_{\text{sound}} \propto \frac{1}{\sqrt{M_0}}$

Hydrogen gas has least value of M_0

Hence V_{sound} in hydrogen gas is maximum.

4. Answer (2)

Hint: Points which are directly connected by a wire have same potential and thus name these points by same alphabet and redraw the circuit.



Sol.:

$C_{AB} = \frac{R}{3} + \frac{R}{3} = \frac{2R}{3}$

5. Answer (3)

Hint & Sol.: Radius of curvature of common

surface, $r_c = \frac{r_1 r_2}{r_1 - r_2} = \frac{2 \times 3}{3 - 2} = 6 \text{ cm}$

6. Answer (4)

Hint: Magnetic flux, $\phi = \vec{B} \cdot \vec{A}$ in uniform magnetic field.

Sol.: $\vec{A} = 4 \hat{k} \text{ m}^2$

$\phi = \vec{B} \cdot \vec{A}$

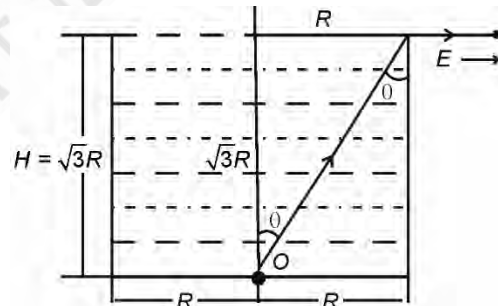
= $(2\hat{i} - 3\hat{j} + 4\hat{k}) \cdot (4\hat{k})$

= 16 Wb

7. Answer (4)

Hint: $\sin C = \frac{1}{\mu}$, where C is critical angle.

Sol.:



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

$\theta = 30^\circ$

$\sin C = \frac{1}{\mu}$; for least μ , C will be maximum

$\theta = C = 30^\circ$

$\therefore \mu = \frac{1}{\sin 30^\circ} = 2$

8. Answer (1)

Hint: First orbit of H-atom is Bohr orbit and $r = 0.53n^2 \text{ \AA}$

Sol.: Bohr's radius of n^{th} orbit of hydrogen atom is given by

$$r = 0.53(n^2) \text{ \AA}$$

$$\Rightarrow r \propto n^2$$

$$\Rightarrow \frac{r_1}{r_2} = \frac{1}{2^2} \quad \Rightarrow r_2 = 4r_1$$

$$\boxed{r_2 = 4a_0}$$

9. Answer (2)

Hint & Sol.: Required ratio $= \frac{\phi_E}{\phi_B} = \frac{EA}{BA} = \frac{E}{B}$

We know that in EM wave, $\frac{E}{B} = c \Rightarrow$ speed of light

$$\Rightarrow \text{Dimensions of } \frac{\phi_E}{\phi_B} = [M^0LT^{-1}]$$

10. Answer (1)

Hint & Sol.:

$$E = h\nu = \frac{hc}{\lambda} = Pc$$

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

11. Answer (4)

Hint: Use lens maker's formula,

$$\frac{1}{f} = (\mu - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$$

Sol.: In air, $\frac{1}{f_a} = (\mu_g - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right] \dots (I)$

In water, $\frac{1}{f_w} = (\mu_{g/w} - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right] \dots (II)$

Divide equation (I) by equation (II)

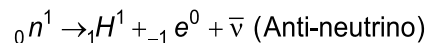
$$\Rightarrow \frac{f_w}{f_a} = \frac{\mu_g - 1}{\mu_{g/w} - 1}$$

$$\frac{f_w}{f_a} = \frac{\frac{1}{2}}{\frac{9}{8} - 1} = \frac{1}{2} \times \frac{8}{1}$$

$$f_w = 4 \times 12 = 48 \text{ cm}$$

12. Answer (3)

Hint & Sol.: A neutron transforms into proton and emits electron, nuclear reaction is as follows.



13. Answer (2)

Hint: Magnetic field inside a long solenoid is

$$B = \mu_0 nI, \text{ and } \frac{N}{\ell} = n$$

Sol.: $B = \frac{\mu_0 NI}{\ell}$

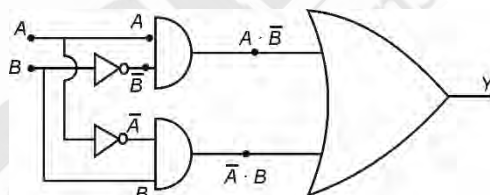
$$\ell = \frac{\mu_0 NI}{B} = \frac{4\pi \times 10^{-7} \times 100 \times 0.30}{3.0 \times 10^{-4}}$$

$$= 4\pi \times 10^{-1} \times 10^{-1} = 4\pi \times 10^{-2} \text{ m}$$

$$= 4\pi \text{ cm}$$

14. Answer (3)

Hint & Sol.:



$$\boxed{Y = A \cdot \bar{B} + \bar{A} \cdot B}$$

15. Answer (2)

Hint: Zener diode for voltage $V < V_z$ (breakdown voltage) act as a normal diode in reverse bias.

Sol.: Voltage across Zener diode,

$$V = \frac{20}{5} \times 1 = 4 \text{ V}$$

$$\therefore V < V_z$$

$$i_z = 0, \quad i_{1k\Omega} = \frac{20}{5 \times 10^3}$$

$$= 4 \text{ mA}$$

16. Answer (4)

Hint & Sol.: Adiabatic process $\rightarrow Q = 0$

Isochoric process $\rightarrow V = \text{constant}, \Delta V = 0, W = 0$

Isobaric process $\rightarrow P = \text{constant}, W \neq 0, \Delta U \neq 0$

Isothermal process $\rightarrow T = \text{constant}, P \propto \frac{1}{V}$

17. Answer (1)

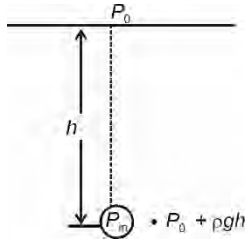
Hint: $I_d = \frac{CdV}{dt}$

Sol.: $\frac{dV}{dt} = \frac{I_d}{C} = \frac{0.25 \times 10^{-3}}{25 \times 10^{-6}}$

= 10 V/s

18. Answer (4)

Hint & Sol.: Excessive pressure inside air bubble



$$P_{\text{inside}} - P_{\text{outside}} = \frac{2T}{r}$$

$$P_{\text{in}} - P_0 - \rho gh = \frac{2T}{r}$$

$$\therefore P_{\text{in}} - P_0 = \rho gh + \frac{2T}{r}$$

19. Answer (3)

Hint: Power $P = \tau \cdot \omega$ and torque $\tau = I\alpha$

Sol.: $\omega = \frac{d\theta}{dt} = 2t - 2$

$\Rightarrow \omega = 2(2) - 2 = 2 \text{ rad/s, at } t = 2 \text{ s}$

$\alpha = \frac{d\omega}{dt} = 2 \text{ rad/s}^2$

Now, $P = \tau \cdot \omega = I\alpha\omega$

= $\frac{MR^2}{2} \times 2 \times 2$

= $2 MR^2$

20. Answer (2)

Hint: Electrostatic potential energy,

$U = \frac{1}{4\pi\epsilon_0} \frac{q_1q_2}{r}$ and

$r = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$

Sol.: $U = \frac{9 \times 10^9 \times 8 \times 10^{-6} \times 4 \times 10^{-6}}{16 \times 10^{-2}}$

= $18 \times 10^{-1} = 1.8 \text{ joule}$

21. Answer (3)

Hint & Sol.: Fringe width $(\beta) = \frac{\lambda D}{d}$; in denser medium, λ decreases $\therefore \beta$ decreases.

22. Answer (2)

Hint & Sol.: Energy of incident photon,

$E = \frac{12400}{\lambda(\text{\AA})} = \frac{12400}{5500} \approx 2.25 \text{ eV}$

Therefore, photoelectric effect is possible for Cs only

23. Answer (1)

Hint: Electrostatic energy of capacitor,

$\Delta U = \frac{1}{2}KCV^2 - \frac{1}{2}CV^2 = \frac{1}{2}CV^2(K - 1)$

Sol.:

$\Delta U = \frac{1}{2} \times 20 \times 10^{-6} \times 10^4 \times (2)$

= 0.2 J

24. Answer (2)

Hint and Sol.: Height traversed in 1st second

$y_0 = \left(\frac{50}{2} \times 1\right) - \left(\frac{1}{2} \times 10 \times 1^2\right) = 20 \text{ m}$

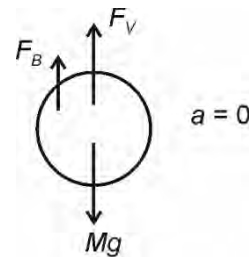
Height covered in last second of ascent journey is equal to height fallen in first second of descent journey.

$\therefore y'_0 = \frac{1}{2} \times g \times t^2 = \frac{1}{2} \times 10 \times 1^2 = 5 \text{ m}$

$\Rightarrow \frac{y_0}{y'_0} = \frac{20}{5} = 4$

25. Answer (3)

Hint & Sol.: In equilibrium condition, $F_{\text{net}} = 0$



$Mg = F_B + F_V$

$\Rightarrow Mg - F_B = F_V$


$$\Rightarrow Mg - \frac{V\rho g}{3} = F_V$$

$$\Rightarrow Mg - \frac{Mg}{3} = F_V$$


$$\frac{2Mg}{3} = F_V$$

$$F_V = \frac{2}{3} \times 0.3 \times 10 = 2 \text{ N}$$

26. Answer (3)

Hint & Sol.:  $\Rightarrow \frac{1}{F_1} = (\mu - 1) \frac{2}{R} \Rightarrow P = 4 \text{ D}$

After cutting,

 $\Rightarrow \frac{1}{F_2} = (\mu - 1) \times \frac{1}{R} = \frac{P}{2} = 2 \text{ D}$

27. Answer (3)

Hint & Sol.: Initially $l_0 = \frac{E_0}{R}$

Finally $l'_0 = \frac{E_0}{\frac{R}{2}} = \frac{2E_0}{R} = 2l_0$

28. Answer (2)

Hint & Sol.: For uniform speed, $v = \frac{E}{B}$

and $r = \frac{mv}{eB}$

$$\Rightarrow r = \frac{mv}{eE} = \frac{mv^2}{eE}$$

$$\Rightarrow E = \frac{mv^2}{er} = \frac{1.6 \times 10^{-27} \times 10^5 \times 10^5}{1.6 \times 10^{-19} \times 4 \times 10^{-2}}$$

$$\Rightarrow E = \frac{1}{4} \times 10^{-6} \times 10^{10}$$

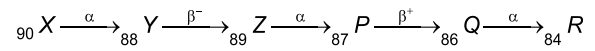
$$= \frac{10^4}{4} = 2.5 \times 10^3 \text{ N/C}$$

29. Answer (2)

Hint: By emitting α particle atomic number decreases by 2, by emitting β^- particle atomic

number increases by 1 and by emitting β^+ particle atomic number decreases by 1.

Sol.:



30. Answer (3)

Hint & Sol.: $\gamma = \frac{C_P}{C_V} = \frac{3}{2}$

and use $TV^{\gamma-1} = \text{constant}$

$$\Rightarrow T_1 V_1^{\gamma-1} = T_2 V_2^{\gamma-1}$$

$$\Rightarrow 300(V)^{\frac{1}{2}} = T_2 \left(\frac{V}{4}\right)^{\frac{1}{2}}$$

$$\Rightarrow T_2 = 300 \times 2 = 600 \text{ K}$$

$$\Delta T = T_2 - T_1 = 600 - 300 = 300 \text{ K}$$

31. Answer (3)

Hint & Sol.: Area under $v-t$ graph = displacement \rightarrow distance (here)

$$= \frac{1}{2} \times 10 \times 10 + 10 \times 10 = 150 \text{ m}$$

32. Answer (4)

Hint: In limiting case, maximum friction will act that will balance the suspended block B

Sol.: At equilibrium, limiting friction between block A and surface = weight of block B

$$\Rightarrow \mu(m_A + m_c)g = m_B g$$

$$\Rightarrow 0.2(8 + m)g = 4g$$

$$\Rightarrow 8 + m = \frac{4}{0.2} = \frac{40}{2} = 20$$

$$m = 12 \text{ kg}$$

33. Answer (3)

Hint: Area under force-displacement graph = work done = change in KE

Sol.: $\frac{1}{2}(8 + 4) \times 10 = \frac{1}{2} \times 0.1 v^2$

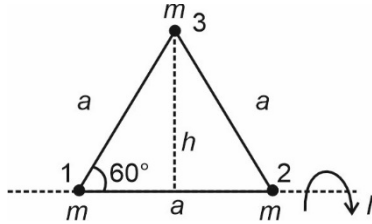
$$\Rightarrow 120 = 0.1 v^2 \Rightarrow v^2 = 1200$$

$$\Rightarrow v = 20\sqrt{3} \text{ m/s}$$

34. Answer (3)

Hint: Moment of inertia (MI) of a point mass about an axis = mass × (square of perpendicular distance of point mass from the axis)

Sol.:



$$I = I_1 + I_2 + I_3$$

$$= 0 + 0 + mh^2$$

$$= m \times (a \sin 60^\circ)^2$$

$$= ma^2 \times \sin^2 60^\circ = \frac{3}{4} ma^2$$

35. Answer (4)

Hint: $P \propto T$ at constant V

Sol.: $\frac{P_2}{P_1} = \frac{T_2}{T_1}$

$$\Rightarrow T_2 = \frac{P_2}{P_1} \times T_1 = \frac{3P}{P} \times 300$$

$$= 900 \text{ K}$$

$$= 900 - 273 = 627^\circ\text{C}$$

36. Answer (2)

Hint & Sol.: Using Pascal's law

$$\frac{f}{a} = \frac{F}{A}$$

$$\Rightarrow F = \frac{f}{a} A = \frac{100 \times 1000}{5}$$

$$= 2 \times 10^4 \text{ N}$$

37. Answer (2)

Hint: For dispersion without deviation $\delta_{\text{net}} = 0$ and for thin prism $\delta = A(\mu - 1)$

Sol.: $\delta_{\text{net}} = 0 \Rightarrow \delta_1 + \delta_2 = 0$

$$(\mu_1 - 1)A_1 - (\mu_2 - 1)A_2 = 0$$

$$(1.54 - 1)4^\circ - (1.72 - 1)A_2 = 0$$

$$A_2 = \frac{0.54 \times 4}{0.72} = 3^\circ$$

38. Answer (3)

Hint: Intensity of wave is directly proportional to square of its amplitude

$$\frac{I_{\text{max}}}{I_{\text{min}}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2} = \frac{(a_1 + a_2)^2}{(a_1 - a_2)^2}$$

Sol.:

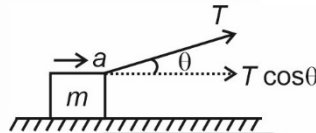
$$\frac{I_{\text{max}}}{I_{\text{min}}} = \frac{(4 + 1)^2}{(4 - 1)^2} = \frac{25}{9}$$

39. Answer (2)

Hint: Both blocks have same acceleration: find acceleration of blocks, draw FBD of m , use $F_{\text{net}} = ma$

Sol.: Acceleration of block (a) = $\frac{F}{m + M}$

F.B.D. of m



$$T \cos \theta = ma$$

$$= \frac{mF}{m + M}$$

$$T = \frac{mF}{(m + M) \cos \theta}$$

40. Answer (1)

Hint & Sol.: Time period of spring-block system

$$T = 2\pi \sqrt{\frac{m}{k}} : \text{independent of angle of inclination } (\theta)$$

of plane on which block oscillates.

41. Answer (4)

Hint & Sol.: $\sin t$, $\cos t$ and their sum having same coefficient of t , as well as $b \sin t$ or $b \cos t$, represent equation of SHM.

Fundamentally for SHM we should verify

$$\frac{d^2x}{dt^2} = -kx, \text{ where } k \text{ is a constant}$$

42. Answer (4)

Hint & Sol.: Stopping potential $V_s = \frac{h\nu - \phi_0}{e}$ i.e.,

stopping potential does not depend upon intensity

and intensity $I = \frac{nh\nu}{A}$.

On increasing intensity (I), number of photons incident per second (n) increases, so the number of photo-electrons ejected increases.

43. Answer (1)

$$\text{Hint: } v_e = \sqrt{\frac{2GM}{r}}, M = \rho \times \frac{4}{3}\pi r^3$$

$$\text{Sol.: } v = \sqrt{\frac{2G \times \rho \times \frac{4}{3}\pi r^3}{r}} \Rightarrow v \propto r$$

44. Answer (1)

$$\text{Hint: Electric field, } |\vec{E}| = \frac{kq}{|\vec{r} - \vec{r}_0|^2}$$

$$\text{Sol.: } \vec{r} - \vec{r}_0 = (4\hat{i} + 5\hat{j}) - (\hat{i} + \hat{j})$$

$$= (3\hat{i} + 4\hat{j}) \text{ m}$$

$$|\vec{r} - \vec{r}_0| = \sqrt{3^2 + 4^2} = 5 \text{ m}$$

$$|\vec{E}| = \frac{kq}{|\vec{r} - \vec{r}_0|^2} = \frac{9 \times 10^9 \times 50 \times 10^{-6}}{5^2}$$

46. Answer (2)



Sol.: Number of moles of HCl = $0.4 \times 0.125 = 0.05$ mole

Therefore, number of moles of Ca(OH)_2 neutralised = 0.025

So, mass of Ca(OH)_2 neutralised = $0.025 \times 74 \text{ g} = 1.85 \text{ g}$

So, mass of Ca(OH)_2 left unreacted = $(2 - 1.85) \text{ g} = 0.15 \text{ g} = 150 \text{ mg}$

47. Answer (2)

Hint: At STP, 1 mole of gas occupies 22400 mL volume.

$$\text{Sol.: } 11200 \text{ mL of CH}_4 \text{ gas at STP} = \frac{11200}{22400} \text{ mole}$$

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

$$\text{which contains} = \frac{N_A}{2} \times 5 \text{ atoms}$$

$$= 2.5 N_A \text{ atoms}$$

- 6.022×10^{22} molecules of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) contains $6.022 \times 10^{22} \times 24$ atoms i.e., $2.4 N_A$ atoms

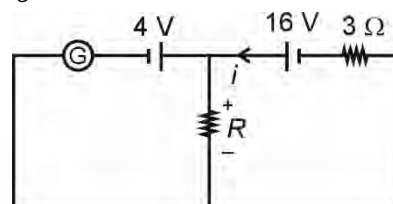
$$= \frac{9 \times 10^3 \times 50}{25}$$

$$= 18,000 \text{ N/C}$$

45. Answer (1)

Hint: Use Kirchoff's loop law

$$\text{Sol.: } i_G = 0$$



$$16 - iR - 3i = 0 \dots(1) \text{ and}$$

$$iR = 4 \dots(2)$$

On solving equation (1) and (2)

$$\Rightarrow i = 4 \text{ A}$$

$$\Rightarrow R = \frac{4}{4} = 1 \Omega$$

[CHEMISTRY]

46. Answer (2)



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- 6.022×10^{22} molecules of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) contains $6.022 \times 10^{22} \times 24$ atoms i.e., $2.4 N_A$ atoms

- 48 g ozone = $\frac{48}{48} \times N_A \times 3$ oxygen atoms
= $3N_A$ oxygen atoms

- 35 g of CO contains = $\frac{35}{28} \times N_A \times 2$

$$= 2.5 N_A \text{ atoms}$$

So, 48 g ozone contains maximum number of atoms.

48. Answer (4)

Hint: Hund's rule states that pairing of electrons in the orbitals belonging to the same subshell does not take place until each orbital belonging to that subshell is singly occupied.

Sol.: The following representation of electronic distribution in a p-subshell is not following Hund's rule



49. Answer (3)

Hint: For 1 s orbital the probability density is maximum at the nucleus.

$$\text{Sol.: Number of nodes} = (n - 1)$$

- Completely filled subshells are extra stable due to larger exchange energy
- $n = 5$ has s, p, d, f and g subshells.

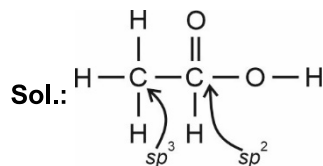
50. Answer (1)

Hint: Both CO and CN⁻ are strong field ligands, so presence of these ligands make the d-electrons of metal to get paired.

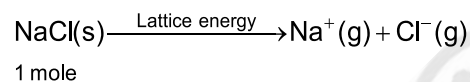
Sol.: In Ni(CO)₄, Ni is sp³ hybridised so has tetrahedral geometry and it is diamagnetic as it contains no unpaired electron.

51. Answer (3)

Hint: In the change, AlCl₃ + Cl⁻ → AlCl₄⁻, hybridisation of Al changes from sp² → sp³



In PCl₅, axial bonds are longer than equatorial bonds.



In both H₃O⁺ and H₂O, oxygen atoms are sp³ hybridised.

52. Answer (3)

Hint: In PCl₃F₂ molecule, the two F atoms acquire axial positions.

Sol.:

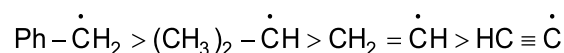
	Molecule	Molecular shape	Molecular Polarity
a.	PCl ₃ F ₂	Trigonal bipyramidal	μ = 0, nonpolar
b.	PCl ₂ F ₃	Trigonal bipyramidal	μ ≠ 0, polar
c.	SF ₄	See-saw	μ ≠ 0, polar
d.	SO ₂	V-shaped	μ ≠ 0, polar

53. Answer (2)

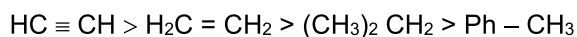
Hint: Lesser is the bond dissociation enthalpy of C – H bond, more stable is the radical formed on carbon atom.

Greater the s-character, shorter will be bond formed.

Sol.: Stability of free radical radicals follows the order.



So, BDE of C – H bonds in these species will be in the order



BDE for the given C – H bonds will be :

Molecule	BDE (kcal/mol)
H – CH ₂ – Ph	88
H – HC – (CH ₃) ₂	95
H – CH = CH ₂	110
H – C ≡ CH	132

54. Answer (3)

Hint: Molality of a solution is defined as the number of mole of solute dissolved per kg of the solvent.

Sol.: As molarity of the solution is 1.8 $\frac{\text{mol}}{\text{L}}$

So, 1.8 moles of the salt 'X' is dissolved in 1 L solvent i.e., 0.6 kg of the solvent.

Molality of the solution (m).

$$m = \frac{1.8 \text{ mol}}{0.6 \text{ kg}} = 3$$

55. Answer (2)

Hint:

- Radius of nth orbit $r_n = 0.529 \frac{n^2}{Z} \text{ \AA}$
- Potential energy of electron = - 2 (kinetic energy of the electron)

Sol.: Orbital angular momentum of an electron is given as $\mu = \sqrt{\ell(\ell+1)} \frac{h}{2\pi}$. For lowest orbital i.e.

s-orbital, $\ell = 0$

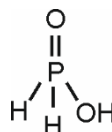
$$\therefore \mu = 0$$

- Velocity of an electron in nth orbit $v_n \propto \frac{Z}{n}$

56. Answer (2)

Hint: The oxidation state of phosphorus in H₃PO₂ is +1.

Sol.: The structure of phosphinic acid (H₃PO₂) is



There are 2 P – H bonds present in the molecule.

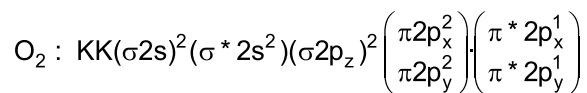
57. Answer (1)

Hint: An orbital can have maximum of two electrons

Sol.: $n = 2$, $\ell = 1$ represents 2p subshell and an orbital in 2p subshell can have maximum 2 electrons with opposite spins.

58. Answer (1)

Hint:



Sol.:

	Species	Bond order
1.	O_2	$\frac{10-6}{2} = 2$
2.	O_2^+	$\frac{10-5}{2} = 2.5$
3.	O_2^-	$\frac{10-7}{2} = 1.5$
4.	O_2^{2-}	$\frac{10-8}{2} = 1$

Both CO and NO^+ have 14 electrons, so both will have the same bond order i.e., 3

59. Answer (2)

Hint: $C_{(graphite)} + O_2(g) \longrightarrow CO_2(g); \Delta_f H$

$$\Delta_f H = -393 \text{ kJ mol}^{-1}$$

Sol.: Heat release upon combustion of 1 mole of carbon (graphite) = $\Delta_f H (CO_2)$

Since, upon of formation of 44 g of CO_2 , 393 kJ heat is released

Therefore, heat released upon formation of 27.5 g

$$\text{of } CO_2 = \frac{393}{44} \times 27.5 \text{ kJ}$$

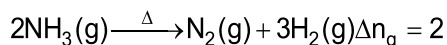
$$= 245.63 \text{ g}$$

60. Answer (1)

Hint: Increasing temperature increases the entropy while cooling leads to decrease in entropy

Sol.:

Thermal decomposition of ammonia involves increase in number of moles of the substance, so in this process entropy increases



61. Answer (4)

Hint:

- For an atomic species X, the decreasing order of radii is $X^- > X > X^+$
- Both ZnO and PbO are amphoteric in nature.

Sol.: Aluminium is least electronegative in group 13.

$Li < B < Be < C$ (First ionization enthalpy)

62. Answer (4)

Hint & Sol.: IUPAC official name of the element with atomic number 107 is Bohrium.

63. Answer (2)

Hint: In the redox reaction



n-factor for MnO_4^- and $C_2O_4^{2-}$ respectively are 5 and 2.

Sol.: Balanced redox reaction is given as



So, coefficients of MnO_4^- and H^+ are 2 and 16 respectively.

64. Answer (2)

Hint: The depression in freezing point,

$$\Delta T_f = iK_f \times m$$

Sol.: HX is 25% ionised, so



van't Hoff factor, $i = 1 + 0.25 = 1.25$

Now, therefore $\Delta T_f = 1.25 \times 1.86 \times 0.2$

$$= 0.465$$

65. Answer (1)

Hint: Osmotic pressure $\pi = CRT$

Sol.: As solute is non-electrolyte, so $i = 1$ taking $R = 0.082 \text{ L-bar mol}^{-1} \text{ K}^{-1}$

So, slope of the straight line is RT

$$26.24 = 0.082 T$$

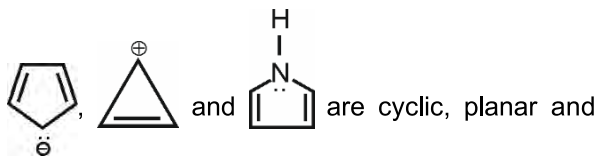
$$\therefore T = 320 \text{ K}$$

$$= 320 - 273 = 47^\circ\text{C}$$

66. Answer (3)

Hint: Chemical species which are cyclic, planar and follow Huckel's $(4n + 2)\pi$ rule are said to be aromatic.

Sol.: The species like

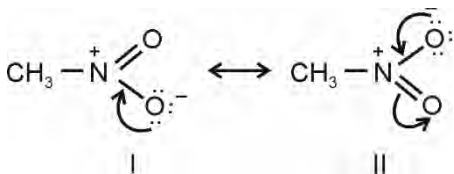


are cyclic, planar and have 6π , 2π , 6π delocalised π electrons, hence, these are aromatic in nature.

67. Answer (2)

Hint: $\text{CH}_3-\text{N}=\text{O}$ has conjugated structure so, it involves resonance.

Sol.:



Resonating structures of nitromethane

- When inductive and electromeric effects operate in opposite direction, the electromeric effect predominates.

68. Answer (1)

Hint: Equivalent of H_2SO_4 reacted = Equivalent of NH_3 produced

Sol.: Equivalent of NH_3 produced = $10 \times 1 \times 2 \times 10^{-3} = 20 \times 10^{-3}$

Percentage of nitrogen in the sample

$$= \frac{14 \times 20 \times 10^{-3} \times 100}{0.8} = 35\%$$

69. Answer (1)

Hint: For a weak acid, $[\text{H}^+] = C\alpha$

Sol.: A salt of weak acid and weak base is formed on mixing equal volumes of equimolar solutions of weak acid and weak base like CH_3COOH and NH_4OH . So, solution contains $\text{CH}_3\text{COONH}_4$ salt.

A solution of salt of weak acid and weak base for ex. solution of $\text{CH}_3\text{COONH}_4$ acts as a buffer.

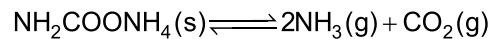
- For pH of an acid $[\text{H}^+] = C\alpha$
 $= 0.01 \times 10^{-2}$
 $[\text{H}^+] = 10^{-4}$

$$\therefore \text{pH} = -\log 10^{-4} = 4$$

70. Answer (3)

Hint: Partial pressure of a gas is given as $p_{\text{gas}} = X_{\text{gas}} \times P_{\text{total}}$

Sol.: For the reaction,



Partial pressure of NH_3 and CO_2 are

$$p_{\text{NH}_3} = \frac{2}{3}P, \quad p_{\text{CO}_2} = \frac{P}{3}$$

$$\begin{aligned} \text{Therefore equilibrium constant } K_p &= \left(\frac{2P}{3}\right)^2 \times \left(\frac{P}{3}\right) \\ &= \frac{4}{27}P^3 \end{aligned}$$

71. Answer (2)

Hint:

- At equilibrium, $\Delta G = 0$

Sol.:

- $\Delta G = \Delta G^\circ + RT \ln K$

$$\therefore \Delta G^\circ = -RT \ln K = -2.303 RT \log K$$

(at equilibrium)

- Addition of inert gas at constant volume does not effect equilibrium.
- pH of 10^{-8} M HCl is less than 7
- At 25°C , $K_a \times K_b = 10^{-14}$ (for conjugate acid-base pair)

72. Answer (3)

Hint: Unit of rate constant for zero order reaction is $\text{mol L}^{-1} \text{s}^{-1}$.

Sol.:

- If unit of zero order rate constant (k) is $\text{mol L}^m \text{s}^n$ then $m + n = -2$,
- As $r = k[\text{A}]^n$ and

$$\frac{r_2}{r_1} = \frac{1}{2} = \left(\frac{2c}{c}\right)^n$$

$$\text{So, } \frac{1}{2} = (2)^n$$

$$\Rightarrow n = -1$$

- $t_{1/2}$ for a zero order is directly proportional to the initial concentration of the reactant, as

$$t_{1/2} = \frac{[\text{R}]_0}{2k} \text{ hence } x = 1$$

- For the reaction, rate = $k[\text{A}]^{1/2}[\text{B}]^1$

$$\therefore \text{Order of the reaction} = \frac{1}{2} + 1 = \frac{3}{2}$$

73. Answer (3)

Hint: For a first order reaction, rate constant

$$k = \frac{2.303}{t} \log \frac{[\text{A}]_0}{[\text{A}]_t}$$

Sol.: For a first order reaction

$$t = \frac{2.303}{k} \log \frac{[A]_0}{[A]_t} \text{ hence } x = 1$$

$$= \frac{2.303}{4.606 \times 10^{-3}} \log \frac{10}{1}$$

$$t = 500 \text{ s}$$

74. Answer (3)

Hint: Electronic configuration of Cu^+ ion is $[\text{Ar}]3d^{10}, 4s^0$

Sol.:

Ion	Unpaired electron(s)
1. Zn^{2+}	0
2. Mn^{2+}	5
3. Ni^{2+}	2
4. Cu^+	0

75. Answer (4)

Hint: In water d^8 is more stable as compared to d^5 due to better CFSE.

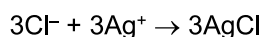
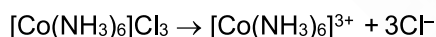
Sol.:

- In ability to stabilise high oxidation states of 3d series metal oxygen exceeds fluorine.
- In both MnO_4^- and Mn_2O_7 , oxidation states of Mn is +7
- Ce^{4+} ($4f^0$) is diamagnetic while Nd^{2+} ($4f^4$) is paramagnetic.

76. Answer (2)

Hint: Number of Cl^- ions present outside the coordination sphere = Number of moles of AgCl precipitated

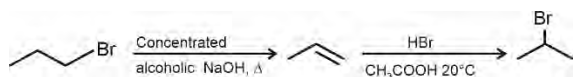
Sol.:



77. Answer (2)

Hint: Concentrated alcoholic NaOH at high temperature favours elimination.

Sol.:



78. Answer (4)

Hint: F^- ion is highly solvated in water due to H-bonding

Sol.:

$\text{F}^-, \text{Cl}^-, \text{Br}^-, \text{I}^-$

-----> Charge density decreases

-----> Size of ion solvated decreases

-----> Nucleophilicity increases

In water decreasing order of nucleophilicity is

$\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$

79. Answer (3)

Hint: The lone pair of electron on Xe in XeF_6 is one.



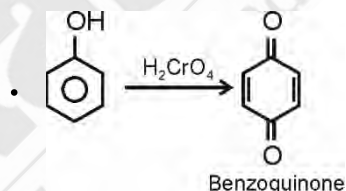
Sol.:

The shape of XeF_6 is distorted octahedral

80. Answer (4)

Hint: Mixture of o-Nitrophenol and p-Nitrophenol can be separated by steam distillation.

Sol.:

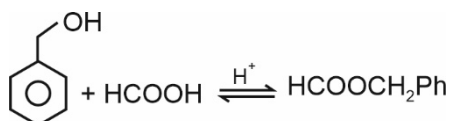
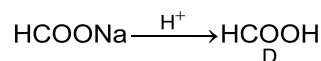
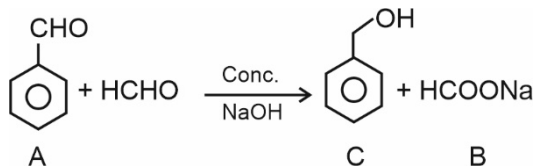


- NaBH_4 does not reduce carboxylic acids to alcohols.

81. Answer (4)

Hint: In cross Cannizzaro reaction, HCHO undergoes oxidation to give sodium formate

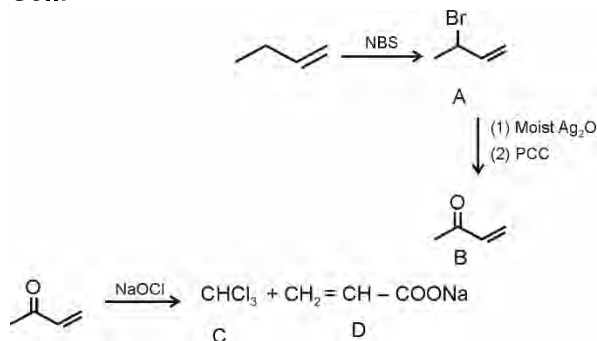
Sol.:



82. Answer (4)

Hint: NBS is N-Bromosuccinimide which performs allylic bromination.

Sol.:



83. Answer (1)

Hint: E is a 1° amine

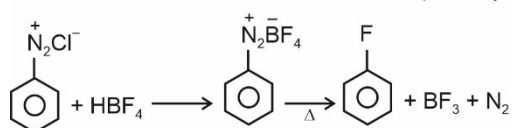
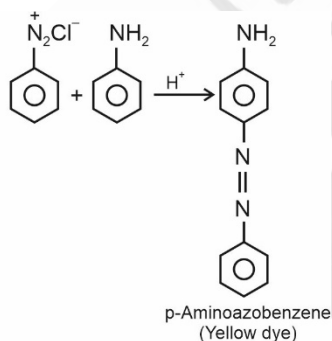
Sol.:

- E is propan-1-amine which is a 1° amine.
- E gives carbylamine test and forms unstable diazonium salt.
- E is soluble in water due to H-bond formation.

84. Answer (2)

Hint: Aniline in acidic medium reacts with benzenediazonium chloride to form yellow dye.

Sol.:



85. Answer (3)

Hint: $2\text{H}_2\text{O} \longrightarrow \text{O}_2 + 4\text{H}^+ + 4\text{e}^-$

Sol.: To get 1 mol of O_2 from water, we need to pass 4F charge

86. Answer (4)

Hint: E° values are intensive properties, so these are non-additive. ΔG° are additive.

Sol.: $\Delta G^\circ = -nFE^\circ$

So for the reactions

(1) $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$, $E^\circ = 0.337 \text{ V}$

(2) $\text{Cu}^{2+} + \text{e}^- \rightarrow \text{Cu}^+$, $E^\circ = 0.153 \text{ V}$

So, $\Delta G_1^\circ = -2 \times F \times 0.337$... (a)

and $\Delta G_2^\circ = -1 \times F \times 0.153$... (b)

Applying (a) – (b) we get equation (c) as

$\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu}$... (c)

$\therefore \Delta G_3^\circ = -1 \times F \times E_3^\circ$

Also $\Delta G_3^\circ = \Delta G_1^\circ - \Delta G_2^\circ$

$\therefore E_3^\circ = (2 \times 0.337) - (1 \times 0.153)$

$= 0.521 \text{ V} \approx 0.52 \text{ V}$

87. Answer (2)

Hint: Degree of dissociation of weak acid (α)

$$\alpha = \frac{\Lambda_m}{\Lambda_m^\circ}$$

Sol.: Degree of dissociation of weak monobasic

$$\text{acid } (\alpha) = \frac{10}{500} = \frac{1}{50} = .02$$

Also, dissociation constant (K_a) of weak acid is given as

$$K_a = C\alpha^2 \quad (\text{as } \alpha \ll 1)$$

$$K_a = \frac{1}{20} \times (.02)^2 = 2 \times 10^{-5}$$

88. Answer (3)

Hint:

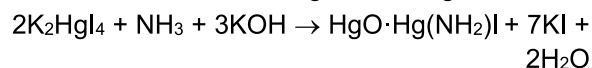
PbCrO_4 is yellow in colour

Sol.:

Compound	Colour
$\text{Na}_4[\text{Fe}(\text{CN})_5\text{NOS}]$	Violet
PbCrO_4	Yellow
$[\text{FeNO}(\text{H}_2\text{O})_5]\text{SO}_4$	Brown
$\text{Mg}(\text{NH}_4)\text{PO}_4$	White

89. Answer (2)

Hint & Sol.: Nessler's reagent is K_2HgI_4 ,



90. Answer (4)

Hint:

- The two cyclic hemiacetal forms of glucose are called anomers *i.e.*, α -form and β form

Sol.:

- Glucose does not form addition product with NaHSO_3
- Maltose is a disaccharide formed of two α -D-glucose units
- Lactose is a reducing sugar

[BIOLOGY]

91. Answer (3)
Hint.: Lower the taxa, more are the characteristics that the members within a taxon share.
Sol.: Higher the category, greater is the difficulty of determining the relationship to other taxa at the same level.
92. Answer (3)
Hint.: Potato spindle tuber disease is caused by an agent that is smaller than virus.
Sol.: Potato spindle tuber disease is caused by viroids.
93. Answer (1)
Hint.: Diatoms are the chief producers in the oceans.
Sol.: The given figure is of a dinoflagellate. The cell wall has stiff cellulose plates on the outer surface.
94. Answer (2)
Hint.: *Neurospora* is used extensively in biochemical and genetic work and it is also called as *Drosophila* of the plant kingdom.
Sol.: *Agaricus* is mushroom.
95. Answer (3)
Hint.: *Gelidium* is used to grow microbes and in preparations of ice-creams and jellies.
Sol.: *Chlorella* is rich in proteins and used by space travellers as a food source.
96. Answer (1)
Hint.: Bryophytes are known as the first embryophytes.
Sol.: Gametophyte is the main plant body in bryophytes which is haploid.
97. Answer (4)
Hint.: Thorns of citrus is a modification of stem.
Sol.: Pitcher of *Nepenthes* is a modification of leaf.
98. Answer (3)
Hint.: The ovary in a hypogynous flower is superior.
Sol.: The ovary in peach is half-inferior.
99. Answer (4)
Hint.: Free central placentation is seen in *Dianthus*.
Sol.: Marginal placentation - Pea
 Axile placentation - Lemon
 Basal placentation - Marigold
100. Answer (3)
Hint.: Peduncle has a limited growth in cymose inflorescence.
Sol.: In racemose inflorescence, the flowers are borne in an acropetal succession.
101. Answer (2)
Hint.: Hypodermis is collenchymatous in dicot stem.
Sol.: Ground tissue is not well differentiated in monocot stems and vascular bundle is conjoint and closed.
102. Answer (4)
Hint.: Bean-shaped or kidney-shaped guard cells are present in dicot plants.
Sol.: Tomato is a dicot plant.
103. Answer (2)
Hint.: The given figure represents collenchyma.
Sol.: Sclerenchymatous cells lose their protoplasm and become dead at maturity. Collenchyma is an elastic, living, mechanical tissue.
104. Answer (3)
Hint.: Antonie Von Leeuwenhoek was the first to see and describe a living cell.
Sol.: Nucleus, as a cell organelle, was first described by Robert Brown.
 Chromatin is named so because it gets stained with certain basic dyes and it was first discovered by Flemming.
105. Answer (3)
Hint.: Fimbriae are small bristle like fibres, sprouting out of the cell. They are known to help in attaching the bacteria to rocks in streams.
Sol.: Mesosome is a specialised extension of the prokaryotic cell membrane which helps in respiration and secretion processes.
106. Answer (2)
Hint: Pharynx

Sol.: The squamous epithelium is found in the walls of blood vessels and air sacs of lungs. Cuboidal epithelium is found in tubular parts of nephrons in kidney. Compound epithelium is multi-layered and covers the dry surface of skin, buccal cavity, pharynx, inner lining of ducts of salivary glands.

107. Answer (4)

Hint: Fluid-filled space

Sol.:

Bone	Cartilage
<ul style="list-style-type: none"> ▪ Hard, non-pliable ground substance 	<ul style="list-style-type: none"> ▪ Solid, pliable ground substance
<ul style="list-style-type: none"> ▪ Presence of lacunae where osteocytes are present 	<ul style="list-style-type: none"> ▪ Presence of lacunae where chondrocytes are present
<ul style="list-style-type: none"> ▪ Presence of lamellae 	<ul style="list-style-type: none"> ▪ Absence of lamellae

108. Answer (1)

Hint: Substrate of succinic dehydrogenase

Sol.: Palmitic acid is 16 carbon lipids. Glutamate is an acidic amino acid. Malonate is the competitive inhibitor and succinate is the substrate.

109. Answer (4)

Hint: 2' deoxyribose

Sol.: A nucleotide has three chemically distinct components.

- Heterocyclic nitrogenous base
 - Purines (double ring)
 - Pyrimidines (single ring)
- Phosphate or Phosphoric acid
- Monosaccharide
 - Ribose (RNA)
 - 2' deoxyribose (DNA)

110. Answer (3)

Hint: Left end in a protein is represented by the first amino acid

Sol.: A protein is imagined as a line, the left end is represented by the first amino acid and the right end is represented by the last amino acid. The first amino acid is also called the N-terminal amino acid. The last amino acid is called the C-terminal amino acid. In a polysaccharide chain (say glycogen), the right end is called the reducing end and the left end is called the non-reducing end.

111. Answer (4)

Hint: Exclude the bell-shaped graph

Sol.: With the increase in substrate concentration, the velocity of the enzymatic reaction rises at first. The reaction ultimately reaches a maximum velocity (V_{max}) which is not exceeded by any further rise in concentration of the substrate. This is because the enzyme molecules are fewer than the substrate and after saturation of these molecules, there are no free enzyme molecules to bind with the additional substrate molecules.

112. Answer (2)

Hint: Low molecular weight biomolecule found in retentate

Sol.: Arachidonic acid is an unsaturated fatty acid and has 20 carbon atoms including the carboxyl carbon.

Glutamic acid is an acidic amino acid.

113. Answer (1)

Hint: Normal expiration

Sol.: Relaxation of the diaphragm and the external inter-costal muscles returns the diaphragm and sternum to their normal positions and reduce the thoracic volume and thereby the pulmonary volume in antero-posterior and dorsoventral axis respectively.

114. Answer (3)

Hint: Endothelium of capillaries

Sol.: The diffusion membrane is made up of three major layers namely, the thin squamous epithelium of alveoli, the endothelium of alveolar capillaries and the basement substance (composed of a thin basement membrane supporting the squamous epithelium and the basement membrane surrounding the single layer

endothelial cell of capillaries) in between them. However, its total thickness is much less than a millimetre.

115. Answer (4)

Hint: Exclude deep breathing

Sol.: Centre present in the pons region of the brain, called pneumotaxic centre can moderate the functions of the respiratory rhythm centre. Neural signals from this centre can reduce the duration of inspiration and thereby alter the respiratory rate. A chemosensitive area is situated adjacent to the rhythm centre which is highly sensitive to CO₂ and hydrogen ions. Increase in these substances can activate this centre which in turn can signal the rhythm centre to make necessary adjustments in the respiratory process by which these substances can be eliminated.

116. Answer (4)

Hint.: Golgi body is an important site of glycosylation of proteins and glycosidation of lipids.

Sol.: Smooth endoplasmic reticulum is associated with muscle contraction by release and uptake of Ca⁺² ions.

117. Answer (1)

Hint.: All organisms are composed of cell and products of cells.

Sol.: Anything less than a complete structure of a cell does not ensure independent living and hence, cell is the fundamental structural and functional unit of all living organisms.

118. Answer (4)

Hint.: DNA replication and chromosomal duplication occur in S phase.

Sol.: Mitochondria, chloroplasts and Golgi bodies duplicate during G₂ phase.

119. Answer (4)

Hint.: Mitosis is also called as equational division.

Sol.: Meiosis provides a chance for the formation of new combinations of chromosomes.

120. Answer (3)

Hint.: *Sorghum* is a C₄ plant. The first stable product is 3-phosphoglycerate in C₃ pathway of photosynthesis.

Sol.: The first stable product of CO₂ fixation in *Sorghum* is oxaloacetic acid.

121. Answer (4)

Hint.: Cyclic photophosphorylation is performed by the photosystem I independently.

Sol.: Cyclic photophosphorylation does not involve the photolysis of water and therefore, no oxygen is evolved.

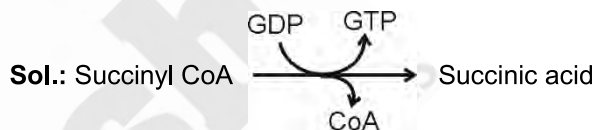
122. Answer (3)

Hint.: Substrate used in protoplasmic respiration is protein.

Sol.: When a protein is the respiratory substrate, the RQ value is about 0.9.

123. Answer (2)

Hint.: CO₂ is released during the conversion of oxalosuccinic acid to α-ketoglutaric acid in the Krebs' cycle.



124. Answer (2)

Hint.: It is a gaseous plant hormone.

Sol.: Ethylene increases the number of female flowers in cucumber.

125. Answer (3)

Hint.: Meristematic cells are the continuously dividing cells.

Sol.: The cells in meristematic phase of growth have high respiration rate.

126. Answer (4)

Hint.: In an albuminous seed, endosperm is not entirely consumed during embryonic development.

Sol.: Pea, beans and groundnut are the examples of exalbuminous seeds.

127. Answer (4)

Hint.: Pollens are light and non-sticky in the wind-pollinated flower.

Sol.: Nectaries are absent in wind pollinated flowers.

128. Answer (1)

Hint.: Sex of the offspring is determined by the male parent in *Drosophila*.

Sol.: Male heterogamety → Grasshopper, *Drosophila*

Female heterogamety → Birds, moth, butterfly

129. Answer (4)

Hint.: A.H. Sturtevant suggested that recombination frequencies can be utilised in predicting the sequence of genes on the chromosome.

Sol.: Chromosomal theory of inheritance was proposed by Sutton and Boveri.

130. Answer (3)

Hint.: Human skin colour is an example of polygenic inheritance.

Sol.: AB blood group shows co-dominance.

131. Answer (1)

Hint: A mollusc

Sol.: Cuttle fish – Mollusc

Frog – Amphibian

Calotes – Reptile

Nephron – Bird

Fishes have a 2-chambered heart with an atrium and a ventricle. Amphibians and the reptiles (except crocodiles) have a 3-chambered heart with two atria and a single ventricle, whereas crocodiles, birds and mammals possess a 4-chambered heart with two atria and two ventricles.

132. Answer (1)

Hint: Closure of tricuspid and bicuspid valves

Sol.: During each cardiac cycle, two prominent sounds are produced which can easily be heard through a stethoscope. The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas the second heart sound (dub) is associated with the closure of the semilunar valves.

133. Answer (3)

Hint: Polymorphonuclear leucocytes

Sol.: Neutrophils, eosinophils and basophils are the different types of granulocytes while lymphocytes and monocytes are the agranulocytes. Neutrophils are the most abundant cells (60-65 per cent) among all of them. Basophils

are the least (0.5-1 per cent). Neutrophils are phagocytic cells which destroy foreign organisms entering the body.

134. Answer (3)

Hint: Tibia and fibula are present in hindlimb.

Sol.: Ethmoid – Cranial bone

Incus – Ear ossicle

Ilium – Pelvic bone

Ulna – Forelimb bone

Tibia – Hindlimb bone

135. Answer (2)

Hint: Exclude the genetic disorder

Sol.:

Gout	–	Inflammation of joints due to accumulation of uric acid crystals
Muscular dystrophy	–	Progressive degeneration of skeletal muscle mostly due to genetic disorder
Osteoporosis	–	Age-related disorder characterised by decreased bone mass and increased chances of fractures

136. Answer (4)

Hint: Breaking of cross bridges.

Sol.: A new ATP molecule binds to the myosin head and cross bridge is broken. Thus, if binding of a new ATP molecule does not occur, then cycle of new cross bridge formation and further sliding won't occur.

137. Answer (3)

Hint: $1/5^{\text{th}}$ of the cardiac output

Sol.: Cardiac output = 5000 mL - 6000 mL

⇒ Blood filtered by kidneys = $1/5^{\text{th}}$ of the cardiac output

⇒ $1/5 \times 5000-6000$ mL

⇒ 1000 -1200 mL

⇒ 1-1.2 L

138. Answer (2)

Hint: ADH is released from posterior pituitary.

Sol.: An excessive loss of fluid from the body can activate the hypothalamus to release ADH or vasopressin from neurohypophysis. ADH facilitates water reabsorption from latter parts of tubule, thereby preventing diuresis. ADH can also affect the kidney function by its constrictory effect on blood vessels causing an increase in blood pressure and thereby the GFR.

139. Answer (3)

Hint: Also called perikaryon

Sol.: The cerebral cortex is referred to as the grey matter due to its greyish appearance. The neuronal cell bodies are concentrated here giving the colour. Fibres of the tracts are covered with the myelin sheath which constitutes the inner part of cerebral hemisphere. They give an opaque white appearance to the layer and hence is called the white matter.

140. Answer (4)

Hint: Axoplasm has high concentration of K^+

Sol.: The axoplasm inside the axon contains high concentration of K^+ and negatively charged proteins and low concentration of Na^+ . In contrast, the fluid outside the axon contains high concentration of Na^+ and low concentration of K^+ and thus, forms a concentration gradient.

141. Answer (3)

Hint: Excess secretion of growth hormone

Sol.: In adults especially in middle age excessive secretion of growth hormone can result in severe disfigurement called acromegaly. Exophthalmic goitre is a form of hyperthyroidism. Underproduction of hormones by the adrenal cortex alters the carbohydrate metabolism causing acute weakness and fatigue leading to a disease called Addison's disease.

142. Answer (3)

Hint: Released from adrenal medulla.

Sol.: Adrenal cortex – Mineralocorticoids

Glucocorticoids

Androgenic steroids

Hormones releasing from cortical region have intracellular receptors in their target cells

Adrenal medulla – Epinephrine

Nor-epinephrine

Hormones from medullary region have membrane-bound receptors on their target cells.

143. Answer (4)

Hint: First part of thorax

Sol.: Thorax in cockroach consists of three parts – prothorax, mesothorax and metathorax. The head is connected with thorax by a short extension of the prothorax known as neck.

144. Answer (2)

Hint: Conus arteriosus

Sol.: In frogs, RBCs are nucleated with haemoglobin. Sinus venosus joins the right atrium which receives blood from vena cava. In hepatic portal circulation, deoxygenated blood reaches liver from intestine.

145. Answer (1)

Hint: Double fold of peritoneum

Sol.: Mesenteron is another name for midgut of cockroaches. Malpighian tubules are the excretory structures present in cockroaches. Mesoglea is seen in diploblastic animals.

146. Answer (2)

Hint: Mouth is ventral in cartilaginous fishes.

Sol.: *Pristis* is a cartilaginous fish. It has a long snout with sharp points.

- Ventrally located mouth
- No operculum
- Notochord is persistent throughout life
- Marine habitat and internal fertilisation

147. Answer (2)

Hint: Sea hare is a mollusc.

Sol.: Sea-pen (*Pennatula*) – coelenterate

- In coelenterates, digestion is extracellular and intracellular.
- Hooks and suckers are the parasitic adaptations in members of the phylum Platyhelminthes but *Fasciola* lacks hooks.

148. Answer (2)

Hint: Coelenterate

Sol.: Radial symmetry is seen in adult echinoderms, coelenterates and ctenophores.

Echinus – Echinoderm

Ophiura – Echinoderm

Physalia – Coelenterate

Pheretima - Annelid

149. Answer (2)

Hint: Tertiary follicle

Sol.: Sperm possesses an elongated haploid nucleus.

In males, the secondary spermatocytes undergo the second meiotic division to produce four equal haploid spermatids (non-motile).

Oogenesis in females begins the during embryonic developmental stage.

150. Answer (4)

Hint: Less than 50

Sol.: The glandular tissue of each breast is divided into 15-20 mammary lobes.

151. Answer (4)

Hint: After ovulation

Sol.: The second meiotic division in females occurs during fertilisation when a sperm enters the ovum and leads to completion of meiotic division of secondary oocyte and formation of ootid and 2nd polar body.

152. Answer (3)

Hint: Immediate to urinary bladder

Sol.:

- Prostate gland is an unpaired male sex accessory gland
- Epididymis is an extra-testicular accessory duct.
- Presence or absence of hymen is not a reliable indicator for virginity.

153. Answer (1)

Hint: Exclude the feature for condoms

Sol.: Vaults are barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through cervix.

Male and female condoms provide additional benefit of protecting the users from contracting STIs.

154. Answer (4)

Hint: Result of convergent evolution

Sol.: Vertebrate hearts or brains exhibit homology.

In plants, the thorns and tendrils of *Bougainvillea* and *Cucurbita* respectively exhibit homology.

155. Answer (2)

Hint: First ancestor who walked upright

Sol.: *Homo habilis* were the first human-like being. Fossils discovered in Java in 1891 revealed the next stage *i.e.*, *Homo erectus* about 1.5 mya.

About 15 mya, primates like *Dryopithecus* were existing. *Dryopithecus* was more ape-like.

156. Answer (2)

Hint.: Klinefelter's syndrome is developed due to the presence of an additional copy of X-chromosome.

Sol.: Down's syndrome develops due to the trisomy of chromosome number 21.

157. Answer (2)

Hint.: The inducer inactivates the repressor.

Sol.: The presence of lactose or allolactose in a medium does not inhibit the expression of inhibitor gene. It inactivates the product of inhibitor gene, *i.e.*, repressor protein.

158. Answer (2)

Hint.: Genetic code is independent and one codon does not overlap the other.

Sol.: AUG codes for methionine and it also acts as the initiator codon.

159. Answer (2)

Hint.: The removal of introns and joining of exons in hnRNA is called RNA splicing.

Sol.: Gene expression can be regulated at several levels.

1. Transcriptional level
2. Processing level
3. Transport of mRNA from nucleus to the cytoplasm
4. Translational level

160. Answer (2)

Hint & Sol.: 5386 nucleotides are present in $\phi \times 174$ bacteriophage.

161. Answer (4)

Hint.: Bottled juices are clarified by using pectinases and proteases.

Sol.: *Monascus purpureus* is a fungus.

162. Answer (4)

Hint.: *Lactobacillus* produces lactic acid.

Sol.: *Acetobacter aceti* produces acetic acid and *Aspergillus niger* produces gluconic acid.

163. Answer (4)

Hint.: In parasitism, only one species gets benefit (parasite) and the interaction is detrimental to the other species (host).

Sol.: Parasites show high reproductive capacity.

164. Answer (3)

Hint.: In competition, both partners are adversely affected.

Sol.: On the rocky coasts of Scotland, the larger and competitively superior barnacle *Balanus* dominates the intertidal area and excludes the smaller barnacle *Chthamalus* from that zone.

165. Answer (2)

Hint.: Logistic growth pattern is observed when the resources present in the environment are limiting.

Sol.: The logistic population growth is expressed by the equation:

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

where, N = Population density at time t

r = intrinsic rate of natural increase

K = Carrying capacity

166. Answer (2)

Hint.: Producers are also known as converters or transducers.

Sol.: Key industry animals convert plant matter into animal matter.

167. Answer (2)

Hint & Sol.: Primary productivity is expressed in terms of energy as $\text{kcal m}^{-2} \text{yr}^{-1}$

168. Answer (3)

Hint.: In an aquatic ecosystem, the producers are majorly phytoplanktons.

Sol.: Humus is an acidic, amorphous and colloidal substance.

169. Answer (2)

Hint.: The term biodiversity was popularised by the sociobiologist, Edward Wilson.

Sol.: Alexander von Humboldt – Species-area relationship

Paul Ehrlich – Rivet popper hypothesis

Robert May – Estimated global species diversity to be about 7 million

170. Answer (3)

Hint: The pedigree is true for sickle cell anaemia.

Sol: The given pedigree shows the inheritance of an autosomal recessive disease. Genotype of the individual I-2 is Aa.

171. Answer (3)

Hint: Less than 55

Sol.: The lymphoid tissue located within the lining of the major tracts (respiratory, digestive and urogenital tracts) is called MALT. It constitutes about 50% of the lymphoid tissue in human body.

172. Answer (4)

Hint: Depressant

Sol.: Excessive dosage of cocaine causes hallucination. Marijuana, hashish, charas and ganja are hallucinogens. Heroin is a depressant.

173. Answer (2)

Hint: Exclude the mode of spread of infection of pneumonia.

Sol.: Chikungunya, dengue and filariasis spread through the bite of infected female *Aedes* mosquitos.

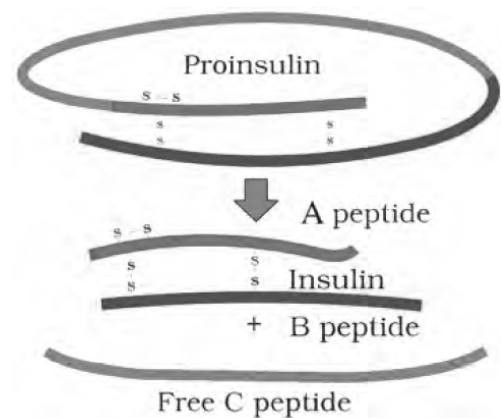
Pneumonia spreads through droplet infection.

Common cold is spread through contaminated unanimate objects.

174. Answer (3)

Hint: Two interchain disulphide are present

Sol.:



175. Answer (4)

Hint: Involves silencing due to dsRNA

Sol.: Using *Agrobacterium* vectors, nematode-specific genes were introduced into the host plant. The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other formed a double stranded RNA (dsRNA) that initiated RNAi and thus, silenced the specific mRNA of the nematode. The consequence was that the parasite could not survive in a transgenic host expressing specific interfering RNA.

176. Answer (3)

Hint: Methylase and restriction endonuclease

Sol.: In the year 1963, the two enzymes responsible for restricting the growth of bacteriophage in *E.coli* were isolated. One of these added methyl groups to the DNA of *E. coli* and other cuts genetic material of bacteriophage.

177. Answer (4)

Hint: Phosphodiester bond

Sol.: Each restriction endonuclease finds its specific recognition sequence where it will bind to DNA and cut each of the two strands of double helix at specific points in their sugar-phosphate backbones.

178. Answer (4)

Hint: Transformation of cells

Sol.: Recombinant DNA can be forced into the cells by incubating the cells with recombinant DNA on ice followed by placing them briefly at 42°C (Heat shock) and then putting them back on ice. Heat shock method is associated with upstream process.

179. Answer (2)

Hint: Insertional inactivation of tetracycline resistance gene.

Sol.: Insertional inactivation of tetracycline resistance gene will occur due to ligation of DNA at *SalI* on pBR322.

Thus, recombinants will be *tet^s amp^R*.

180. Answer (2)

Hint: Process after gel electrophoresis

Sol.: *Thermus aquaticus* is a thermophilic bacteria. Chitinase is used for the isolation of DNA from fungus. Exonucleases remove nucleotides from the ends of DNA.



All India Aakash Test Series for NEET - 2026

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Test Date : 22/03/2026

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (2)

Hint: Average speed = $\frac{\text{Total displacement}}{\text{Total time}}$

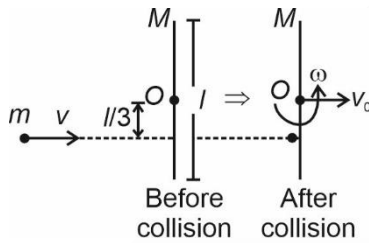
Sol.: Average speed = $\frac{6 \times \frac{1}{2} + 9 \times \frac{5}{6}}{1.5}$

= $\frac{3 + 7.5}{1.5} = \frac{10.5}{1.5} = 7 \text{ km/h}$

2. Answer (4)

Hint: Conserve angular momentum of system about centre of rod.

Sol.:



Initial angular momentum before collision = final angular momentum after collision

$\Rightarrow \frac{mvl}{3} = \frac{Ml^2 \cdot \omega}{12}$

$\Rightarrow \omega = \frac{4mv}{Ml}$

3. Answer (1)

Hint & Sol.: Speed of sound, $V_{\text{sound}} = \sqrt{\frac{\gamma RT}{M_0}}$

Here γ , R and T are same

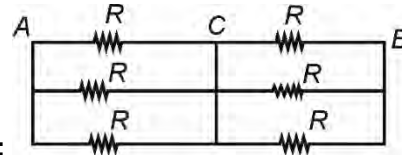
$\therefore V_{\text{sound}} \propto \frac{1}{\sqrt{M_0}}$

Hydrogen gas has least value of M_0

Hence V_{sound} in hydrogen gas is maximum.

4. Answer (2)

Hint: Points which are directly connected by a wire have same potential and thus name these points by same alphabet and redraw the circuit.



Sol.:

$C_{AB} = \frac{R}{3} + \frac{R}{3} = \frac{2R}{3}$

5. Answer (3)

Hint & Sol.: Radius of curvature of common surface,

$r_c = \frac{r_1 r_2}{r_1 - r_2} = \frac{2 \times 3}{3 - 2} = 6 \text{ cm}$

6. Answer (4)

Hint: Magnetic flux, $\phi = \vec{B} \cdot \vec{A}$ in uniform magnetic field.

Sol.: $\vec{A} = 4 \hat{k} \text{ m}^2$

$\phi = \vec{B} \cdot \vec{A}$

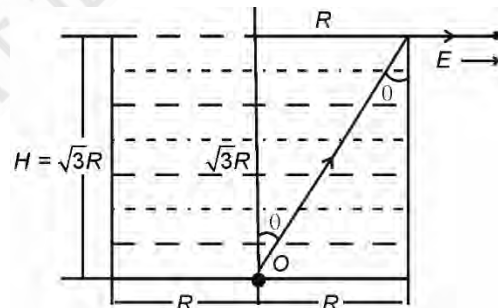
= $(2\hat{i} - 3\hat{j} + 4\hat{k}) \cdot (4\hat{k})$

= 16 Wb

7. Answer (4)

Hint: $\sin C = \frac{1}{\mu}$, where C is critical angle.

Sol.:



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

$\theta = 30^\circ$

$\sin C = \frac{1}{\mu}$; for least μ , C will be maximum

$\theta = C = 30^\circ$

$\therefore \mu = \frac{1}{\sin 30^\circ} = 2$

8. Answer (1)

Hint: First orbit of H-atom is Bohr orbit and $r = 0.53n^2 \text{ \AA}$

Sol.: Bohr's radius of n^{th} orbit of hydrogen atom is given by

$$r = 0.53(n^2) \text{ \AA}$$

$$\Rightarrow r \propto n^2$$

$$\Rightarrow \frac{r_1}{r_2} = \frac{1}{2^2} \quad \Rightarrow r_2 = 4r_1$$

$$\boxed{r_2 = 4a_0}$$

9. Answer (2)

Hint & Sol.: Required ratio = $\frac{\phi_E}{\phi_B} = \frac{EA}{BA} = \frac{E}{B}$

We know that in EM wave, $\frac{E}{B} = c \Rightarrow$ speed of light

$$\Rightarrow \text{Dimensions of } \frac{\phi_E}{\phi_B} = [M^0 L T^{-1}]$$

10. Answer (1)

Hint & Sol.:

$$E = h\nu = \frac{hc}{\lambda} = Pc$$

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

11. Answer (4)

Hint: Use lens maker's formula,

$$\frac{1}{f} = (\mu - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$$

Sol.: In air, $\frac{1}{f_a} = (\mu_g - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right] \dots (I)$

In water, $\frac{1}{f_w} = (\mu_{g/w} - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right] \dots (II)$

Divide equation (I) by equation (II)

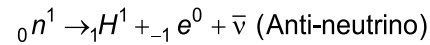
$$\Rightarrow \frac{f_w}{f_a} = \frac{\mu_g - 1}{\mu_{g/w} - 1}$$

$$\frac{f_w}{f_a} = \frac{\frac{1}{2} - 1}{\frac{9}{8} - 1} = \frac{1}{2} \times \frac{8}{1}$$

$$f_w = 4 \times 12 = 48 \text{ cm}$$

12. Answer (3)

Hint & Sol.: A neutron transforms into proton and emits electron, nuclear reaction is as follows.



13. Answer (2)

Hint: Magnetic field inside a long solenoid is

$$B = \mu_0 n I, \text{ and } \frac{N}{\ell} = n$$

Sol.: $B = \frac{\mu_0 N I}{\ell}$

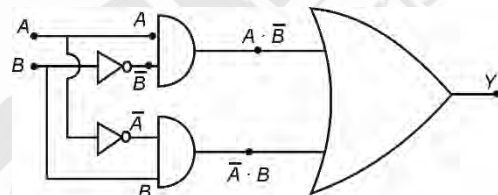
$$\ell = \frac{\mu_0 N I}{B} = \frac{4\pi \times 10^{-7} \times 100 \times 0.30}{3.0 \times 10^{-4}}$$

$$= 4\pi \times 10^{-1} \times 10^{-1} = 4\pi \times 10^{-2} \text{ m}$$

$$= 4\pi \text{ cm}$$

14. Answer (3)

Hint & Sol.:



$$\boxed{Y = A \cdot \bar{B} + \bar{A} \cdot B}$$

15. Answer (2)

Hint: Zener diode for voltage $V < V_z$ (breakdown voltage) act as a normal diode in reverse bias.

Sol.: Voltage across Zener diode,

$$V = \frac{20}{5} \times 1 = 4 \text{ V}$$

$$\therefore V < V_z$$

$$i_z = 0, i_{k\Omega} = \frac{20}{5 \times 10^3}$$

$$= 4 \text{ mA}$$

16. Answer (4)

Hint & Sol.: Adiabatic process $\rightarrow Q = 0$

Isochoric process $\rightarrow V = \text{constant}, \Delta V = 0, W = 0$

Isobaric process $\rightarrow P = \text{constant}, W \neq 0, \Delta U \neq 0$

Isothermal process $\rightarrow T = \text{constant}, P \propto \frac{1}{V}$

17. Answer (1)

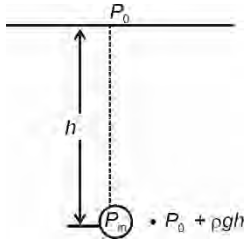
Hint: $I_d = \frac{CdV}{dt}$

Sol.: $\frac{dV}{dt} = \frac{I_d}{C} = \frac{0.25 \times 10^{-3}}{25 \times 10^{-6}}$

= 10 V/s

18. Answer (4)

Hint & Sol.: Excessive pressure inside air bubble



$$P_{\text{inside}} - P_{\text{outside}} = \frac{2T}{r}$$

$$P_{\text{in}} - P_0 - \rho gh = \frac{2T}{r}$$

$$\therefore P_{\text{in}} - P_0 = \rho gh + \frac{2T}{r}$$

19. Answer (3)

Hint: Power $P = \tau \cdot \omega$ and torque $\tau = I\alpha$

Sol.: $\omega = \frac{d\theta}{dt} = 2t - 2$

$\Rightarrow \omega = 2(2) - 2 = 2 \text{ rad/s, at } t = 2 \text{ s}$

$$\alpha = \frac{d\omega}{dt} = 2 \text{ rad/s}^2$$

Now, $P = \tau \cdot \omega = I\alpha\omega$

$$= \frac{MR^2}{2} \times 2 \times 2$$

$$= 2 MR^2$$

20. Answer (2)

Hint: Electrostatic potential energy,

$$U = \frac{1}{4\pi\epsilon_0} \frac{q_1q_2}{r} \text{ and}$$

$$r = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

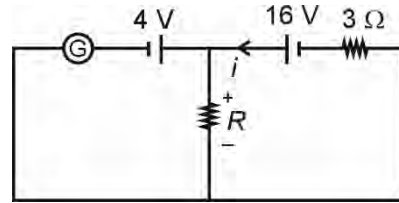
Sol.: $U = \frac{9 \times 10^9 \times 8 \times 10^{-6} \times 4 \times 10^{-6}}{16 \times 10^{-2}}$

$$= 18 \times 10^{-1} = 1.8 \text{ joule}$$

21. Answer (1)

Hint: Use Kirchoff's loop law

Sol.: $i_G = 0$



$$16 - iR - 3i = 0 \dots(1) \text{ and}$$

$$iR = 4 \dots(2)$$

On solving equation (1) and (2)

$$\Rightarrow i = 4 \text{ A}$$

$$\Rightarrow R = \frac{4}{4} = 1 \Omega$$

22. Answer (1)

Hint: Electric field, $|\vec{E}| = \frac{kq}{|\vec{r} - \vec{r}_0|^2}$

Sol.: $\vec{r} - \vec{r}_0 = (4\hat{i} + 5\hat{j}) - (\hat{i} + \hat{j})$

$$= (3\hat{i} + 4\hat{j}) \text{ m}$$

$$|\vec{r} - \vec{r}_0| = \sqrt{3^2 + 4^2} = 5 \text{ m}$$

$$|\vec{E}| = \frac{kq}{|\vec{r} - \vec{r}_0|^2} = \frac{9 \times 10^9 \times 50 \times 10^{-6}}{5^2}$$

$$= \frac{9 \times 10^3 \times 50}{25}$$

$$= 18,000 \text{ N/C}$$

23. Answer (1)

Hint: $v_e = \sqrt{\frac{2GM}{r}}$, $M = \rho \times \frac{4}{3} \pi r^3$

Sol.: $v = \sqrt{\frac{2G \times \rho \times \frac{4}{3} \pi r^3}{r}} \Rightarrow v \propto r$

24. Answer (4)

Hint & Sol.: Stopping potential $V_s = \frac{h\nu - \phi_0}{e}$ i.e.,

stopping potential does not depend upon intensity

and intensity $I = \frac{nh\nu}{A}$.

On increasing intensity (I), number of photons incident per second (n) increases, so the number of photo-electrons ejected increases.

25. Answer (4)

Hint & Sol.: $\sin t$, $\cos t$ and their sum having same coefficient of t , as well as $b \sin t$ or $b \cos t$, represent equation of SHM.

Fundamentally for SHM we should verify

$$\frac{d^2x}{dt^2} = -kx, \text{ where } k \text{ is a constant}$$

26. Answer (1)

Hint & Sol.: Time period of spring-block system

$$T = 2\pi\sqrt{\frac{m}{k}}; \text{ independent of angle of inclination } (\theta)$$

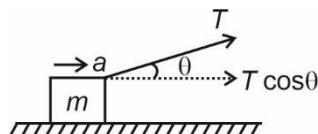
of plane on which block oscillates.

27. Answer (2)

Hint: Both blocks have same acceleration: find acceleration of blocks, draw FBD of m , use $F_{\text{net}} = ma$

Sol.: Acceleration of block $(a) = \frac{F}{m+M}$

F.B.D. of m



$$T \cos \theta = ma$$

$$= \frac{mF}{m+M}$$

$$T = \frac{mF}{(m+M)\cos \theta}$$

28. Answer (3)

Hint: Intensity of wave is directly proportional to square of its amplitude

$$\frac{I_{\text{max}}}{I_{\text{min}}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2} = \frac{(a_1 + a_2)^2}{(a_1 - a_2)^2}$$

Sol.:

$$\frac{I_{\text{max}}}{I_{\text{min}}} = \frac{(4+1)^2}{(4-1)^2} = \frac{25}{9}$$

29. Answer (2)

Hint: For dispersion without deviation $\delta_{\text{net}} = 0$ and for thin prism $\delta = A(\mu - 1)$

Sol.: $\delta_{\text{net}} = 0 \Rightarrow \delta_1 + \delta_2 = 0$

$$(\mu_1 - 1)A_1 - (\mu_2 - 1)A_2 = 0$$

$$(1.54 - 1)4^\circ - (1.72 - 1)A_2 = 0$$

$$A_2 = \frac{0.54 \times 4}{0.72} = 3^\circ$$

30. Answer (2)

Hint & Sol.: Using Pascal's law

$$\frac{f}{a} = \frac{F}{A}$$

$$\Rightarrow F = \frac{f}{a}A = \frac{100 \times 1000}{5}$$

$$= 2 \times 10^4 \text{ N}$$

31. Answer (4)

Hint: $P \propto T$ at constant V

Sol.: $\frac{P_2}{P_1} = \frac{T_2}{T_1}$

$$\Rightarrow T_2 = \frac{P_2}{P_1} \times T_1 = \frac{3P}{P} \times 300$$

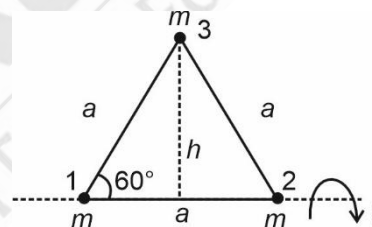
$$= 900 \text{ K}$$

$$= 900 - 273 = 627^\circ\text{C}$$

32. Answer (3)

Hint: Moment of inertia (MI) of a point mass about an axis = mass \times (square of perpendicular distance of point mass from the axis)

Sol.:



$$I = I_1 + I_2 + I_3$$

$$= 0 + 0 + mh^2$$

$$= m \times (a \sin 60^\circ)^2$$

$$= ma^2 \times \sin^2 60^\circ = \frac{3}{4} ma^2$$

33. Answer (3)

Hint: Area under force-displacement graph = work done = change in KE

Sol.: $\frac{1}{2}(8+4) \times 10 = \frac{1}{2} \times 0.1 v^2$

$$\Rightarrow 120 = 0.1 v^2 \Rightarrow v^2 = 1200$$

$$\Rightarrow v = 20\sqrt{3} \text{ m/s}$$

34. Answer (4)

Hint: In limiting case, maximum friction will act that will balance the suspended block B

Sol.: At equilibrium, limiting friction between block A and surface = weight of block B

$$\Rightarrow \mu(m_A + m_c)g = m_B g$$

$$\Rightarrow 0.2(8 + m)g = 4g$$

$$\Rightarrow 8 + m = \frac{4}{0.2} = \frac{40}{2} = 20$$

$$m = 12 \text{ kg}$$

35. Answer (3)

Hint & Sol.: Area under $v-t$ graph = displacement
→ distance (here)

$$= \frac{1}{2} \times 10 \times 10 + 10 \times 10 = 150 \text{ m}$$

36. Answer (3)

Hint & Sol.: $\gamma = \frac{C_P}{C_V} = \frac{3}{2}$

and use $TV^{\gamma-1} = \text{constant}$

$$\Rightarrow T_1 V_1^{\gamma-1} = T_2 V_2^{\gamma-1}$$

$$\Rightarrow 300(V)^{\frac{1}{2}} = T_2 \left(\frac{V}{4}\right)^{\frac{1}{2}}$$

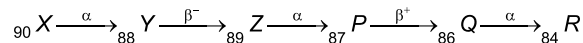
$$\Rightarrow T_2 = 300 \times 2 = 600 \text{ K}$$

$$\Delta T = T_2 - T_1 = 600 - 300 = 300 \text{ K}$$

37. Answer (2)

Hint: By emitting α particle atomic number decreases by 2, by emitting β^- particle atomic number increases by 1 and by emitting β^+ particle atomic number decreases by 1.

Sol.:



38. Answer (2)

Hint & Sol.: For uniform speed, $v = \frac{E}{B}$

and $r = \frac{mv}{eB}$

$$\Rightarrow r = \frac{mv}{eE} = \frac{mv^2}{eE}$$

$$\Rightarrow E = \frac{mv^2}{er} = \frac{1.6 \times 10^{-27} \times 10^5 \times 10^5}{1.6 \times 10^{-19} \times 4 \times 10^{-2}}$$

$$\Rightarrow E = \frac{1}{4} \times 10^{-6} \times 10^{10}$$


$$= \frac{10^4}{4} = 2.5 \times 10^3 \text{ N/C}$$

39. Answer (3)


Hint & Sol.: Initially $l_0 = \frac{E_0}{R}$

Finally $l'_0 = \frac{E_0}{\frac{R}{2}} = \frac{2E_0}{R} = 2l_0$

40. Answer (3)

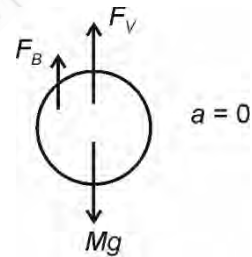
Hint & Sol.:  $\Rightarrow \frac{1}{F_1} = (\mu - 1) \frac{2}{R} \Rightarrow P = 4 \text{ D}$

After cutting,

 $\Rightarrow \frac{1}{F_2} = (\mu - 1) \times \frac{1}{R} = \frac{P}{2} = 2 \text{ D}$

41. Answer (3)

Hint & Sol.: In equilibrium condition, $F_{\text{net}} = 0$



$$Mg = F_B + F_V$$

$$\Rightarrow Mg - F_B = F_V$$

$$\Rightarrow Mg - \frac{V\rho g}{3} = F_V$$

$$\Rightarrow Mg - \frac{Mg}{3} = F_V$$

$$\frac{2Mg}{3} = F_V$$

$$F_V = \frac{2}{3} \times 0.3 \times 10 = 2 \text{ N}$$

42. Answer (2)

Hint and Sol.: Height traversed in 1st second

$$y_0 = \left(\frac{50}{2} \times 1\right) - \left(\frac{1}{2} \times 10 \times 1^2\right) = 20 \text{ m}$$

Height covered in last second of ascent journey is equal to height fallen in first second of descent journey.

$$\therefore y'_0 = \frac{1}{2} \times g \times t^2 = \frac{1}{2} \times 10 \times 1^2 = 5 \text{ m}$$

$$\Rightarrow \frac{y_0}{y'_0} = \frac{20}{5} = 4$$

43. Answer (1)

Hint: Electrostatic energy of capacitor,

$$\Delta U = \frac{1}{2} KCV^2 - \frac{1}{2} CV^2 = \frac{1}{2} CV^2 (K-1)$$

Sol.:

$$\Delta U = \frac{1}{2} \times 20 \times 10^{-6} \times 10^4 \times (2)$$

$$= 0.2 \text{ J}$$

44. Answer (2)

Hint & Sol.: Energy of incident photon,

$$E = \frac{12400}{\lambda(\text{\AA})} = \frac{12400}{5500} \approx 2.25 \text{ eV}$$

Therefore, photoelectric effect is possible for Cs only

45. Answer (3)

Hint & Sol.: Fringe width (β) = $\frac{\lambda D}{d}$; in denser medium, λ decreases $\therefore \beta$ decreases.

[CHEMISTRY]

46. Answer (4)

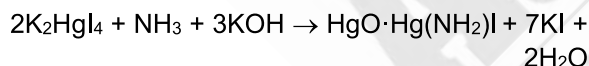
Hint:

- The two cyclic hemiacetal forms of glucose are called anomers *i.e.*, α -form and β form

Sol.:

- Glucose does not form addition product with NaHSO_3
- Maltose is a disaccharide formed of two α -D-glucose units
- Lactose is a reducing sugar

47. Answer (2)

Hint & Sol.: Nessler's reagent is K_2HgI_4 ,

48. Answer (3)

Hint: PbCrO_4 is yellow in colour**Sol.:**

Compound	Colour
$\text{Na}_4[\text{Fe}(\text{CN})_5\text{NOS}]$	Violet
PbCrO_4	Yellow
$[\text{FeNO}(\text{H}_2\text{O})_5]\text{SO}_4$	Brown
$\text{Mg}(\text{NH}_4)\text{PO}_4$	White

49. Answer (2)

Hint: Degree of dissociation of weak acid (α)

$$\alpha = \frac{\Lambda_m}{\Lambda_m^\circ}$$

Sol.: Degree of dissociation of weak monobasic

$$\text{acid } (\alpha) = \frac{10}{500} = \frac{1}{50} = .02$$

Also, dissociation constant (K_a) of weak acid is given as

$$K_a = C\alpha^2 \quad (\text{as } \alpha \ll 1)$$

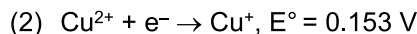
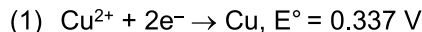
$$K_a = \frac{1}{20} \times (.02)^2 = 2 \times 10^{-5}$$

50. Answer (4)

Hint: E° values are intensive properties, so these are non-additive. ΔG° are additive.

$$\text{Sol.} \Delta G^\circ = -nFE^\circ$$

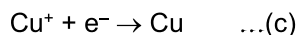
So for the reactions



$$\text{So, } \Delta G_1^\circ = -2 \times F \times 0.337 \quad \dots(a)$$

$$\text{and } \Delta G_2^\circ = -1 \times F \times 0.153 \quad \dots(b)$$

Applying (a) – (b) we get equation (c) as



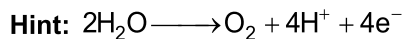
$$\therefore \Delta G_3^\circ = -1 \times F \times E_3^\circ$$

$$\text{Also } \Delta G_3^\circ = \Delta G_1^\circ - \Delta G_2^\circ$$

$$\therefore E_3^\circ = (2 \times 0.337) - (1 \times 0.153)$$

$$= 0.521 \text{ V} \approx 0.52 \text{ V}$$

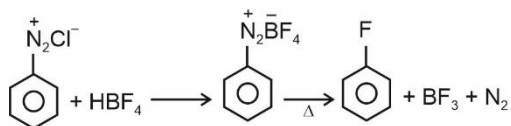
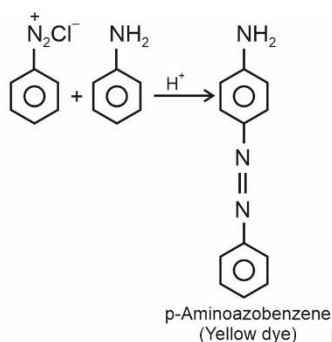
51. Answer (3)



Sol.: To get 1 mol of O_2 from water, we need to pass 4F charge

52. Answer (2)

Hint: Aniline in acidic medium reacts with benzenediazonium chloride to form yellow dye.

Sol.:

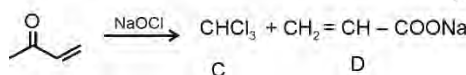
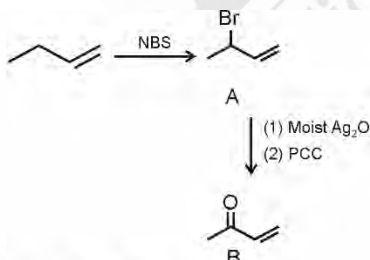
53. Answer (1)

Hint: E is a 1° amine**Sol.:**

- E is propan-1-amine which is a 1° amine.
- E gives carbylamine test and forms unstable diazonium salt.
- E is soluble in water due to H-bond formation.

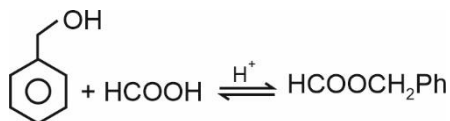
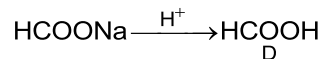
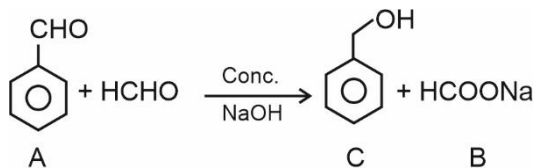
54. Answer (4)

Hint: NBS is N-Bromosuccinimide which performs allylic bromination.

Sol.:

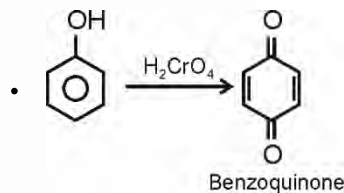
55. Answer (4)

Hint: In cross Cannizzaro reaction, HCHO undergoes oxidation to give sodium formate

Sol.:

56. Answer (4)

Hint: Mixture of o-Nitrophenol and p-Nitrophenol can be separated by steam distillation.

Sol.:

- NaBH_4 does not reduce carboxylic acids to alcohols.

57. Answer (3)

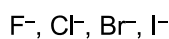
Hint: The lone pair of electron on Xe in XeF_6 is one.

**Sol.:**

The shape of XeF_6 is distorted octahedral

58. Answer (4)

Hint: F^- ion is highly solvated in water due to H-bonding

Sol.:

-----> Charge density decreases

-----> Size of ion solvated decreases

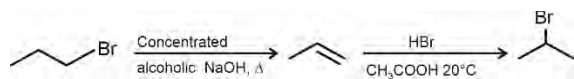
-----> Nucleophilicity increases

In water decreasing order of nucleophilicity is $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$

59. Answer (2)

Hint: Concentrated alcoholic NaOH at high temperature favours elimination.

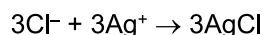
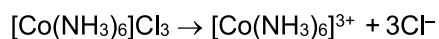
Sol.:



60. Answer (2)

Hint: Number of Cl⁻ ions present outside the coordination sphere = Number of moles of AgCl precipitated

Sol.:



61. Answer (4)

Hint: In water d^3 is more stable as compared to d^5 due to better CFSE.

Sol.:

- In ability to stabilise high oxidation states of 3d series metal oxygen exceeds fluorine.
- In both MnO_4^- and Mn_2O_7 , oxidation states of Mn is +7
- Ce^{4+} ($4f^0$) is diamagnetic while Nd^{2+} ($4f^4$) is paramagnetic.

62. Answer (3)

Hint: Electronic configuration of Cu^+ ion is $[\text{Ar}]3d^{10}, 4s^0$

Sol.:

Ion	Unpaired electron(s)
1. Zn^{2+}	0
2. Mn^{2+}	5
3. Ni^{2+}	2
4. Cu^+	0

63. Answer (3)

Hint: For a first order reaction, rate constant

$$k = \frac{2.303}{t} \log \frac{[\text{A}]_0}{[\text{A}]_t}$$

Sol.: For a first order reaction

$$t = \frac{2.303}{k} \log \frac{[\text{A}]_0}{[\text{A}]_t} \text{ hence } x = 1$$

$$= \frac{2.303}{4.606 \times 10^{-3}} \log \frac{10}{1}$$

$$t = 500 \text{ s}$$

64. Answer (3)

Hint: Unit of rate constant for zero order reaction is $\text{mol L}^{-1} \text{ s}^{-1}$.

Sol.:

- If unit of zero order rate constant (k) is $\text{mol L}^m \text{ s}^n$ then $m + n = -2$,

- As $r = k[\text{A}]^n$ and

$$\frac{r_2}{r_1} = \frac{1}{2} = \left(\frac{2c}{c}\right)^n$$

$$\text{So, } \frac{1}{2} = (2)^n$$

$$\Rightarrow n = -1$$

- $t_{1/2}$ for a zero order is directly proportional to the initial concentration of the reactant, as

$$t_{1/2} = \frac{[\text{R}]_0}{2k} \text{ hence } x = 1$$

- For the reaction, rate = $k[\text{A}]^{1/2}[\text{B}]^1$

$$\therefore \text{Order of the reaction} = \frac{1}{2} + 1 = \frac{3}{2}$$

65. Answer (2)

Hint:

- At equilibrium, $\Delta G = 0$

Sol.:

- $\Delta G = \Delta G^\circ + RT \ln K$

$$\therefore \Delta G^\circ = -RT \ln K = -2.303 RT \log K$$

(at equilibrium)

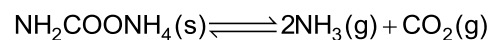
- Addition of inert gas at constant volume does not effect equilibrium.
- pH of 10^{-8} M HCl is less than 7
- At 25°C , $K_a \times K_b = 10^{-14}$ (for conjugate acid-base pair)

66. Answer (3)

Hint: Partial pressure of a gas is given as

$$p_{\text{gas}} = x_{\text{gas}} \times P_{\text{total}}$$

Sol.: For the reaction,



Partial pressure of NH_3 and CO_2 are

$$p_{\text{NH}_3} = \frac{2}{3}P, \quad p_{\text{CO}_2} = \frac{P}{3}$$

$$\begin{aligned} \text{Therefore equilibrium constant } K_P &= \left(\frac{2P}{3}\right)^2 \times \left(\frac{P}{3}\right) \\ &= \frac{4}{27}P^3 \end{aligned}$$

67. Answer (1)

Hint: For a weak acid, $[H^+] = C\alpha$ **Sol.:** A salt of weak acid and weak base is formed on mixing equal volumes of equimolar solutions of weak acid and weak base like CH_3COOH and NH_4OH . So, solution contains CH_3COONH_4 salt.A solution of salt of weak acid and weak base for ex. solution of CH_3COONH_4 acts as a buffer.

$$\begin{aligned} \bullet \text{ For pH of an acid } [H^+] &= C\alpha \\ &= 0.01 \times 10^{-2} \\ [H^+] &= 10^{-4} \end{aligned}$$

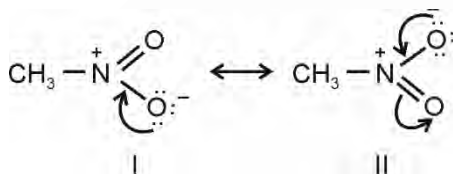
$$\begin{aligned} \therefore \text{pH} &= -\log 10^{-4} \\ &= 4 \end{aligned}$$

68. Answer (1)

Hint: Equivalent of H_2SO_4 reacted = Equivalent of NH_3 produced**Sol.:** Equivalent of NH_3 produced = $10 \times 1 \times 2 \times 10^{-3} = 20 \times 10^{-3}$

$$\begin{aligned} \text{Percentage of nitrogen in the sample} \\ &= \frac{14 \times 20 \times 10^{-3} \times 100}{0.8} = 35\% \end{aligned}$$

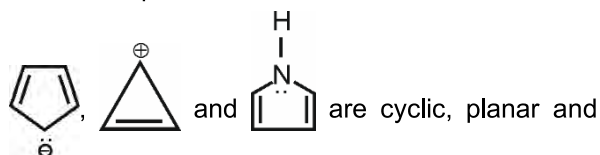
69. Answer (2)

Hint: $CH_3-N \begin{array}{l} \diagup O \\ \diagdown O \end{array}$ has conjugated structure so, it involves resonance.**Sol.:**

Resonating structures of nitromethane

- When inductive and electromeric effects operate in opposite direction, the electromeric effect predominates.

70. Answer (3)

Hint: Chemical species which are cyclic, planar and follow Huckel's $(4n + 2)\pi$ rule are said to be aromatic.**Sol.:** The species like

have 6π , 2π , 6π delocalised π electrons, hence, these are aromatic in nature.

71. Answer (1)

Hint: Osmotic pressure $\pi = CRT$ **Sol.:** As solute is non-electrolyte, so $i = 1$ taking $R = 0.082 \text{ L-bar mol}^{-1} \text{ K}^{-1}$ So, slope of the straight line is RT

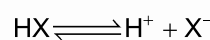
$$26.24 = 0.082 T$$

$$\begin{aligned} \therefore T &= 320 \text{ K} \\ &= 320 - 273 = 47^\circ\text{C} \end{aligned}$$

72. Answer (2)

Hint: The depression in freezing point,

$$\Delta T_f = iK_f \times m$$

Sol.: HX is 25% ionised, sovan't Hoff factor, $i = 1 + 0.25 = 1.25$

$$\begin{aligned} \text{Now, therefore } \Delta T_f &= 1.25 \times 1.86 \times 0.2 \\ &= 0.465 \end{aligned}$$

73. Answer (2)

Hint: In the redox reactionn-factor for MnO_4^- and $C_2O_4^{2-}$ respectively are 5 and 2.**Sol.:** Balanced redox reaction is given asSo, coefficients of MnO_4^- and H^+ are 2 and 16 respectively.

74. Answer (4)

Hint & Sol.: IUPAC official name of the element with atomic number 107 is Bohrium.

75. Answer (4)

Hint:

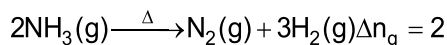
- For an atomic species X , the decreasing order of radii is $X^- > X > X^+$
- Both ZnO and PbO are amphoteric in nature.

Sol.: Aluminium is least electronegative in group 13. $Li < B < Be < C$ (First ionization enthalpy)

76. Answer (1)

Hint: Increasing temperature increases the entropy while cooling leads to decrease in entropy**Sol.:**

Thermal decomposition of ammonia involves increase in number of moles of the substance, so in this process entropy increases



77. Answer (2)

Hint: $\text{C}_{(\text{graphite})} + \text{O}_2(\text{g}) \longrightarrow \text{CO}_2(\text{g}); \Delta_f H$

$$\Delta_f H = -393 \text{ kJ mol}^{-1}$$

Sol.: Heat release upon combustion of 1 mole of carbon (graphite) = $\Delta_f H (\text{CO}_2)$

Since, upon of formation of 44 g of CO_2 , 393 kJ heat is released

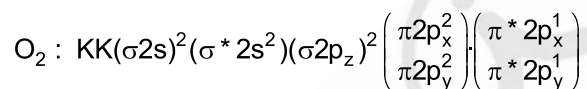
Therefore, heat released upon formation of 27.5 g

$$\text{of CO}_2 = \frac{393}{44} \times 27.5 \text{ kJ}$$

$$= 245.63 \text{ g}$$

78. Answer (1)

Hint:



Sol.:

	Species	Bond order
1.	O_2	$\frac{10-6}{2} = 2$
2.	O_2^+	$\frac{10-5}{2} = 2.5$
3.	O_2^-	$\frac{10-7}{2} = 1.5$
4.	O_2^{2-}	$\frac{10-8}{2} = 1$

Both CO and NO^+ have 14 electrons, so both will have the same bond order *i.e.*, 3

79. Answer (1)

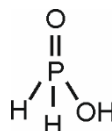
Hint: An orbital can have maximum of two electrons

Sol.: $n = 2, \ell = 1$ represents 2p subshell and an orbital in 2p subshell can have maximum 2 electrons with opposite spins.

80. Answer (2)

Hint: The oxidation state of phosphorus in H_3PO_2 is +1.

Sol.: The structure of phosphinic acid (H_3PO_2) is



There are 2 P – H bonds present in the molecule.

81. Answer (2)

Hint:

- Radius of n^{th} orbit $r_n = 0.529 \frac{n^2}{Z} \text{ \AA}$

- Potential energy of electron = -2 (kinetic energy of the electron)

Sol.: Orbital angular momentum of an electron is given as $\mu = \sqrt{\ell(\ell+1)} \frac{h}{2\pi}$. For lowest orbital *i.e.*

s-orbital, $\ell = 0$

$$\therefore \mu = 0$$

- Velocity of an electron in n^{th} orbit $v_n \propto \frac{Z}{n}$

82. Answer (3)

Hint: Molality of a solution is defined as the number of mole of solute dissolved per kg of the solvent.

Sol.: As molarity of the solution is $1.8 \frac{\text{mol}}{\text{L}}$

So, 1.8 moles of the salt 'X' is dissolved in 1 L solvent *i.e.*, 0.6 kg of the solvent.

Molality of the solution (m).

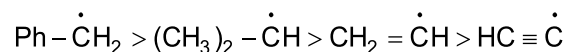
$$m = \frac{1.8 \text{ mol}}{0.6 \text{ kg}} = 3$$

83. Answer (2)

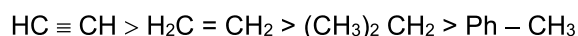
Hint: Lesser is the bond dissociation enthalpy of C – H bond, more stable is the radical formed on carbon atom.

Greater the s-character, shorter will be bond formed.

Sol.: Stability of free radical radicals follows the order.



So, BDE of C – H bonds in these species will be in the order



BDE for the given C – H bonds will be :

Molecule	BDE (kcal/mol)
H – CH ₂ – Ph	88
H – HC – (CH ₃) ₂	95
H – CH = CH ₂	110
H – C ≡ CH	132

84. Answer (3)

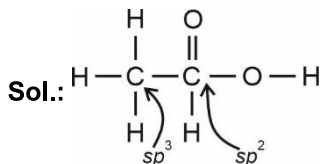
Hint: In PCl₃F₂ molecule, the two F atoms acquire axial positions.

Sol.:

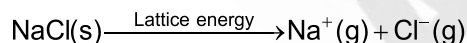
	Molecule	Molecular shape	Molecular Polarity
a.	PCl ₃ F ₂	Trigonal bipyramidal	$\mu = 0$, nonpolar
b.	PCl ₂ F ₃	Trigonal bipyramidal	$\mu \neq 0$, polar
c.	SF ₄	See-saw	$\mu \neq 0$, polar
d.	SO ₂	V-shaped	$\mu \neq 0$, polar

85. Answer (3)

Hint: In the change, $\text{AlCl}_3 + \text{Cl}^- \rightarrow \text{AlCl}_4^-$, hybridisation of Al changes from $sp^2 \rightarrow sp^3$



In PCl₅, axial bonds are longer than equatorial bonds.



1 mole

In both H₃O⁺ and H₂O, oxygen atoms are sp^3 hybridised.

86. Answer (1)

Hint: Both CO and CN⁻ are strong field ligands, so presence of these ligands make the d-electrons of metal to get paired.

Sol.: In Ni(CO)₄, Ni is sp^3 hybridised so has tetrahedral geometry and it is diamagnetic as it contains no unpaired electron.

87. Answer (3)

Hint: For 1 s orbital the probability density is maximum at the nucleus.

Sol.: Number of nodes = (n – 1)

- Completely filled subshells are extra stable due to larger exchange energy
- n = 5 has s, p, d, f and g subshells.

88. Answer (4)

Hint: Hund's rule states that pairing of electrons in the orbitals belonging to the same subshell does not take place until each orbital belonging to that subshell is singly occupied.

Sol.: The following representation of electronic distribution in a p-subshell is not following Hund's rule $\uparrow\downarrow \uparrow\downarrow \uparrow \square$

89. Answer (2)

Hint: At STP, 1 mole of gas occupies 22400 mL volume.

Sol.: 11200 mL of CH₄ gas at STP = $\frac{11200}{22400}$ mole

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

which contains = $\frac{N_A}{2} \times 5$ atoms

$$= 2.5 N_A \text{ atoms}$$

- 6.022×10^{22} molecules of glucose (C₆H₁₂O₆) contains $6.022 \times 10^{22} \times 24$ atoms i.e., $2.4 N_A$ atoms
- 48 g ozone = $\frac{48}{48} \times N_A \times 3$ oxygen atoms = $3N_A$ oxygen atoms
- 35 g of CO contains = $\frac{35}{28} \times N_A \times 2$

$$= 2.5 N_A \text{ atoms}$$

So, 48 g ozone contains maximum number of atoms.

90. Answer (2)

Hint: $\text{Ca(OH)}_2(\text{aq}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}(\text{l})$

Sol.: Number of moles of HCl = $0.4 \times 0.125 = 0.05$ mole

Therefore, number of moles of Ca(OH)₂ neutralised = 0.025

So, mass of Ca(OH)₂ neutralised = $0.025 \times 74\text{g} = 1.85\text{g}$

So, mass of Ca(OH)₂ left unreacted = $(2 - 1.85)\text{g} = 0.15\text{g} = 150\text{mg}$

[BIOLOGY]

91. Answer (3)

Hint.: Fimbriae are small bristle like fibres, sprouting out of the cell. They are known to help in attaching the bacteria to rocks in streams.

Sol.: Mesosome is a specialised extension of the prokaryotic cell membrane which helps in respiration and secretion processes.

92. Answer (3)

Hint.: Antonie Von Leeuwenhoek was the first to see and describe a living cell.

Sol.: Nucleus, as a cell organelle, was first described by Robert Brown.

Chromatin is named so because it gets stained with certain basic dyes and it was first discovered by Flemming.

93. Answer (2)

Hint.: The given figure represents collenchyma.

Sol.: Sclerenchymatous cells lose their protoplasm and become dead at maturity. Collenchyma is an elastic, living, mechanical tissue.

94. Answer (4)

Hint.: Bean-shaped or kidney-shaped guard cells are present in dicot plants.

Sol.: Tomato is a dicot plant.

95. Answer (2)

Hint.: Hypodermis is collenchymatous in dicot stem.

Sol.: Ground tissue is not well differentiated in monocot stems and vascular bundle is conjoint and closed.

96. Answer (3)

Hint.: Peduncle has a limited growth in cymose inflorescence.

Sol.: In racemose inflorescence, the flowers are borne in an acropetal succession.

97. Answer (4)

Hint.: Free central placentation is seen in *Dianthus*.

Sol.: Marginal placentation - Pea

Axile placentation - Lemon

Basal placentation - Marigold

98. Answer (3)

Hint.: The ovary in a hypogynous flower is superior.

Sol.: The ovary in peach is half-inferior.

99. Answer (4)

Hint.: Thorns of citrus is a modification of stem.

Sol.: Pitcher of *Nepenthes* is a modification of leaf.

100. Answer (1)

Hint.: Bryophytes are known as the first embryophytes.

Sol.: Gametophyte is the main plant body in bryophytes which is haploid.

101. Answer (3)

Hint.: *Gelidium* is used to grow microbes and in preparations of ice-creams and jellies.

Sol.: *Chlorella* is rich in proteins and used by space travellers as a food source.

102. Answer (2)

Hint.: *Neurospora* is used extensively in biochemical and genetic work and it is also called as *Drosophila* of the plant kingdom.

Sol.: *Agaricus* is mushroom.

103. Answer (1)

Hint.: Diatoms are the chief producers in the oceans.

Sol.: The given figure is of a dinoflagellate. The cell wall has stiff cellulose plates on the outer surface.

104. Answer (3)

Hint.: Potato spindle tuber disease is caused by an agent that is smaller than virus.

Sol.: Potato spindle tuber disease is caused by viroids.

105. Answer (3)

Hint.: Lower the taxa, more are the characteristics that the members within a taxon share.

Sol.: Higher the category, greater is the difficulty of determining the relationship to other taxa at the same level.

106. Answer (4)

Hint: Exclude deep breathing

Sol.: Centre present in the pons region of the brain, called pneumotaxic centre can moderate the

functions of the respiratory rhythm centre. Neural signals from this centre can reduce the duration of inspiration and thereby alter the respiratory rate. A chemosensitive area is situated adjacent to the rhythm centre which is highly sensitive to CO₂ and hydrogen ions. Increase in these substances can activate this centre which in turn can signal the rhythm centre to make necessary adjustments in the respiratory process by which these substances can be eliminated.

107. Answer (3)

Hint: Endothelium of capillaries

Sol.: The diffusion membrane is made up of three major layers namely, the thin squamous epithelium of alveoli, the endothelium of alveolar capillaries and the basement substance (composed of a thin basement membrane supporting the squamous epithelium and the basement membrane surrounding the single layer endothelial cell of capillaries) in between them. However, its total thickness is much less than a millimetre.

108. Answer (1)

Hint: Normal expiration

Sol.: Relaxation of the diaphragm and the external inter-costal muscles returns the diaphragm and sternum to their normal positions and reduce the thoracic volume and thereby the pulmonary volume in antero-posterior and dorsoventral axis respectively.

109. Answer (2)

Hint: Low molecular weight biomolecule found in retentate

Sol.: Arachidonic acid is an unsaturated fatty acid and has 20 carbon atoms including the carboxyl carbon.

Glutamic acid is an acidic amino acid.

110. Answer (4)

Hint: Exclude the bell-shaped graph

Sol.: With the increase in substrate concentration, the velocity of the enzymatic reaction rises at first. The reaction ultimately reaches a maximum velocity (V_{max}) which is not exceeded by any further rise in concentration of the substrate. This is because the enzyme molecules are fewer than the substrate and after saturation of these molecules, there are no free enzyme molecules to bind with the additional substrate molecules.

111. Answer (3)

Hint: Left end in a protein is represented by the first amino acid

Sol.: A protein is imagined as a line, the left end is represented by the first amino acid and the right end is represented by the last amino acid. The first amino acid is also called the N-terminal amino acid. The last amino acid is called the C-terminal amino acid. In a polysaccharide chain (say glycogen), the right end is called the reducing end and the left end is called the non-reducing end.

112. Answer (4)

Hint: 2' deoxyribose

Sol.: A nucleotide has three chemically distinct components.

- Heterocyclic nitrogenous base
 - Purines (double ring)
 - Pyrimidines (single ring)
- Phosphate or Phosphoric acid
- Monosaccharide
 - Ribose (RNA)
 - 2' deoxyribose (DNA)

113. Answer (1)

Hint: Substrate of succinic dehydrogenase

Sol.: Palmitic acid is 16 carbon lipids. Glutamate is an acidic amino acid. Malonate is the competitive inhibitor and succinate is the substrate.

114. Answer (4)

Hint: Fluid-filled space

Sol.:

Bone	Cartilage
▪ Hard, non-pliable ground substance	▪ Solid, pliable ground substance
▪ Presence of lacunae where osteocytes are present	▪ Presence of lacunae where chondrocytes are present
▪ Presence of lamellae	▪ Absence of lamellae

115. Answer (2)

Hint: Pharynx

Sol.: The squamous epithelium is found in the walls of blood vessels and air sacs of lungs. Cuboidal epithelium is found in tubular parts of nephrons in kidney. Compound epithelium is multi-layered and covers the dry surface of skin, buccal cavity, pharynx, inner lining of ducts of salivary glands.

116. Answer (3)

Hint.: Human skin colour is an example of polygenic inheritance.

Sol.: AB blood group shows co-dominance.

117. Answer (4)

Hint.: A.H. Sturtevant suggested that recombination frequencies can be utilised in predicting the sequence of genes on the chromosome.

Sol.: Chromosomal theory of inheritance was proposed by Sutton and Boveri.

118. Answer (1)

Hint.: Sex of the offspring is determined by the male parent in *Drosophila*.

Sol.: Male heterogamety → Grasshopper, *Drosophila*

Female heterogamety → Birds, moth, butterfly

119. Answer (4)

Hint.: Pollens are light and non-sticky in the wind-pollinated flower.

Sol.: Nectaries are absent in wind pollinated flowers.

120. Answer (4)

Hint.: In an albuminous seed, endosperm is not entirely consumed during embryonic development.

Sol.: Pea, beans and groundnut are the examples of exalbuminous seeds.

121. Answer (3)

Hint.: Meristematic cells are the continuously dividing cells.

Sol.: The cells in meristematic phase of growth have high respiration rate.

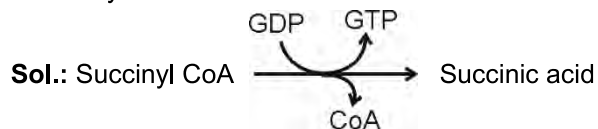
122. Answer (2)

Hint.: It is a gaseous plant hormone.

Sol.: Ethylene increases the number of female flowers in cucumber.

123. Answer (2)

Hint.: CO₂ is released during the conversion of oxalosuccinic acid to α-ketoglutaric acid in the Krebs' cycle.



124. Answer (3)

Hint.: Substrate used in protoplasmic respiration is protein.

Sol.: When a protein is the respiratory substrate, the RQ value is about 0.9.

125. Answer (4)

Hint.: Cyclic photophosphorylation is performed by the photosystem I independently.

Sol.: Cyclic photophosphorylation does not involve the photolysis of water and therefore, no oxygen is evolved.

126. Answer (3)

Hint.: *Sorghum* is a C₄ plant. The first stable product is 3-phosphoglycerate in C₃ pathway of photosynthesis.

Sol.: The first stable product of CO₂ fixation in *Sorghum* is oxaloacetic acid.

127. Answer (4)

Hint.: Mitosis is also called as equational division.

Sol.: Meiosis provides a chance for the formation of new combinations of chromosomes.

128. Answer (4)

Hint.: DNA replication and chromosomal duplication occur in S phase.

Sol.: Mitochondria, chloroplasts and Golgi bodies duplicate during G₂ phase.

129. Answer (1)

Hint.: All organisms are composed of cell and products of cells.

Sol.: Anything less than a complete structure of a cell does not ensure independent living and hence, cell is the fundamental structural and functional unit of all living organisms.

130. Answer (4)

Hint.: Golgi body is an important site of glycosylation of proteins and glycosidation of lipids.

Sol.: Smooth endoplasmic reticulum is associated with muscle contraction by release and uptake of Ca^{+2} ions.

131. Answer (2)

Hint: First ancestor who walked upright

Sol.: *Homo habilis* were the first human-like being. Fossils discovered in Java in 1891 revealed the next stage *i.e.*, *Homo erectus* about 1.5 mya.

About 15 mya, primates like *Dryopithecus* were existing. *Dryopithecus* was more ape-like.

132. Answer (4)

Hint: Result of convergent evolution

Sol.: Vertebrate hearts or brains exhibit homology.

In plants, the thorns and tendrils of *Bougainvillea* and *Cucurbita* respectively exhibit homology.

133. Answer (1)

Hint: Exclude the feature for condoms

Sol.: Vaults are barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through cervix.

Male and female condoms provide additional benefit of protecting the users from contracting STIs.

134. Answer (3)

Hint: Immediate to urinary bladder

Sol.:

- Prostrate gland is an unpaired male sex accessory gland
- Epididymis is an extra-testicular accessory duct.
- Presence or absence of hymen is not a reliable indicator for virginity.

135. Answer (4)

Hint: After ovulation

Sol.: The second meiotic division in females occurs during fertilisation when a sperm enters the ovum and leads to completion of meiotic division of secondary oocyte and formation of ootid and 2nd polar body.

136. Answer (4)

Hint: Less than 50

Sol.: The glandular tissue of each breast is divided into 15-20 mammary lobes.

137. Answer (2)

Hint: Tertiary follicle

Sol.: Sperm possesses an elongated haploid nucleus.

In males, the secondary spermatocytes undergo the second meiotic division to produce four equal haploid spermatids (non-motile).

Oogenesis in females begins during embryonic developmental stage.

138. Answer (2)

Hint: Coelenterate

Sol.: Radial symmetry is seen in adult echinoderms, coelenterates and ctenophores.

Echinus – Echinoderm

Ophiura – Echinoderm

Physalia – Coelenterate

Pheretima - Annelid

139. Answer (2)

Hint: Sea hare is a mollusc.

Sol.: Sea-pen (*Pennatula*) – coelenterate

- In coelenterates, digestion is extracellular and intracellular.
- Hooks and suckers are the parasitic adaptations in members of the phylum Platyhelminthes but *Fasciola* lacks hooks.

140. Answer (2)

Hint: Mouth is ventral in cartilaginous fishes.

Sol.: *Pristis* is a cartilaginous fish. It has a long snout with sharp points.

- Ventrally located mouth
- No operculum
- Notochord is persistent throughout life
- Marine habitat and internal fertilisation

141. Answer (1)

Hint: Double fold of peritoneum

Sol.: Mesenteron is another name for midgut of cockroaches. Malpighian tubules are the excretory structures present in cockroaches. Mesoglea is seen in diploblastic animals.

142. Answer (2)

Hint: Conus arteriosus**Sol.:** In frogs, RBCs are nucleated with haemoglobin. Sinus venosus joins the right atrium which receives blood from vena cava. In hepatic portal circulation, deoxygenated blood reaches liver from intestine.

143. Answer (4)

Hint: First part of thorax**Sol.:** Thorax in cockroach consists of three parts – prothorax, mesothorax and metathorax. The head is connected with thorax by a short extension of the prothorax known as neck.

144. Answer (3)

Hint: Released from adrenal medulla.**Sol.:** Adrenal cortex – Mineralocorticoids

Glucocorticoids

Androgenic steroids

Hormones releasing from cortical region have intracellular receptors in their target cells

Adrenal medulla – Epinephrine

Nor-epinephrine

Hormones from medullary region have membrane-bound receptors on their target cells.

145. Answer (3)

Hint: Excess secretion of growth hormone**Sol.:** In adults especially in middle age excessive secretion of growth hormone can result in severe disfigurement called acromegaly. Exophthalmic goitre is a form of hyperthyroidism. Underproduction of hormones by the adrenal cortex alters the carbohydrate metabolism causing acute weakness and fatigue leading to a disease called Addison's disease.

146. Answer (4)

Hint: Axoplasm has high concentration of K^+ **Sol.:** The axoplasm inside the axon contains high concentration of K^+ and negatively charged proteins and low concentration of Na^+ . In contrast, the fluid outside the axon contains high concentration of Na^+ and low concentration of K^+ and thus, forms a concentration gradient.

147. Answer (3)

Hint: Also called perikaryon**Sol.:** The cerebral cortex is referred to as the grey matter due to its greyish appearance. The neuronal cell bodies are concentrated here giving the colour. Fibres of the tracts are covered with the myelin sheath which constitutes the inner part of cerebral hemisphere. They give an opaque white appearance to the layer and hence is called the white matter.

148. Answer (2)

Hint: ADH is released from posterior pituitary.**Sol.:** An excessive loss of fluid from the body can activate the hypothalamus to release ADH or vasopressin from neurohypophysis. ADH facilitates water reabsorption from latter parts of tubule, thereby preventing diuresis. ADH can also affect the kidney function by its constrictory effect on blood vessels causing an increase in blood pressure and thereby the GFR.

149. Answer (3)

Hint: $1/5^{\text{th}}$ of the cardiac output**Sol.:** Cardiac output = 5000 mL - 6000 mL⇒ Blood filtered by kidneys = $1/5^{\text{th}}$ of the cardiac output⇒ $1/5 \times 5000-6000$ mL

⇒ 1000 -1200 mL

⇒ 1-1.2 L

150. Answer (4)

Hint: Breaking of cross bridges.**Sol.:** A new ATP molecule binds to the myosin head and cross bridge is broken. Thus, if binding of a new ATP molecule does not occur, then cycle of new cross bridge formation and further sliding won't occur.

151. Answer (2)

Hint: Exclude the genetic disorder**Sol.:**

Gout	–	Inflammation of joints due to accumulation of uric acid crystals
Muscular dystrophy	–	Progressive degeneration of skeletal muscle mostly due to genetic disorder

Osteoporosis	–	Age-related disorder characterised by decreased bone mass and increased chances of fractures
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152. Answer (3)

Hint: Tibia and fibula are present in hindlimb.

Sol.: Ethmoid – Cranial bone

Incus – Ear ossicle

Ilium – Pelvic bone

Ulna – Forelimb bone

Tibia – Hindlimb bone

153. Answer (3)

Hint: Polymorphonuclear leucocytes

Sol.: Neutrophils, eosinophils and basophils are the different types of granulocytes while lymphocytes and monocytes are the agranulocytes. Neutrophils are the most abundant cells (60-65 per cent) among all of them. Basophils are the least (0.5-1 per cent). Neutrophils are phagocytic cells which destroy foreign organisms entering the body.

154. Answer (1)

Hint: Closure of tricuspid and bicuspid valves

Sol.: During each cardiac cycle, two prominent sounds are produced which can easily be heard through a stethoscope. The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas the second heart sound (dub) is associated with the closure of the semilunar valves.

155. Answer (1)

Hint: A mollusc

Sol.: Cuttle fish – Mollusc

Frog – Amphibian

Calotes – Reptile

Nephron – Bird

Fishes have a 2-chambered heart with an atrium and a ventricle. Amphibians and the reptiles (except crocodiles) have a 3-chambered heart with two atria and a single ventricle, whereas crocodiles, birds and mammals possess a 4-chambered heart with two atria and two ventricles.

156. Answer (3)

Hint: The pedigree is true for sickle cell anaemia.

Sol: The given pedigree shows the inheritance of an autosomal recessive disease. Genotype of the individual I-2 is Aa.

157. Answer (2)

Hint.: The term biodiversity was popularised by the sociobiologist, Edward Wilson.

Sol.: Alexander von Humboldt – Species-area relationship

Paul Ehrlich – Rivet popper hypothesis

Robert May – Estimated global species diversity to be about 7 million

158. Answer (3)

Hint.: In an aquatic ecosystem, the producers are majorly phytoplanktons.

Sol.: Humus is an acidic, amorphous and colloidal substance.

159. Answer (2)

Hint & Sol.: Primary productivity is expressed in terms of energy as $\text{kcal m}^{-2} \text{yr}^{-1}$

160. Answer (2)

Hint.: Producers are also known as converters or transducers.

Sol.: Key industry animals convert plant matter into animal matter.

161. Answer (2)

Hint.: Logistic growth pattern is observed when the resources present in the environment are limiting.

Sol.: The logistic population growth is expressed by the equation:

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

where, N = Population density at time t

r = intrinsic rate of natural increase

K = Carrying capacity

162. Answer (3)

Hint.: In competition, both partners are adversely affected.

Sol.: On the rocky coasts of Scotland, the larger and competitively superior barnacle *Balanus* dominates the intertidal area and excludes the smaller barnacle *Chthamalus* from that zone.

163. Answer (4)

Hint.: In parasitism, only one species gets benefit (parasite) and the interaction is detrimental to the other species (host).

Sol.: Parasites show high reproductive capacity.

164. Answer (4)

Hint.: *Lactobacillus* produces lactic acid.

Sol.: *Acetobacter aceti* produces acetic acid and *Aspergillus niger* produces gluconic acid.

165. Answer (4)

Hint.: Bottled juices are clarified by using pectinases and proteases.

Sol.: *Monascus purpureus* is a fungus.

166. Answer (2)

Hint & Sol.: 5386 nucleotides are present in $\phi \times 174$ bacteriophage.

167. Answer (2)

Hint.: The removal of introns and joining of exons in hnRNA is called RNA splicing.

Sol.: Gene expression can be regulated at several levels.

1. Transcriptional level
2. Processing level
3. Transport of mRNA from nucleus to the cytoplasm
4. Translational level

168. Answer (2)

Hint.: Genetic code is independent and one codon does not overlap the other.

Sol.: AUG codes for methionine and it also acts as the initiator codon.

169. Answer (2)

Hint.: The inducer inactivates the repressor.

Sol.: The presence of lactose or allolactose in a medium does not inhibit the expression of inhibitor gene. It inactivates the product of inhibitor gene, i.e., repressor protein.

170. Answer (2)

Hint.: Klinefelter's syndrome is developed due to the presence of an additional copy of X-chromosome.

Sol.: Down's syndrome develops due to the trisomy of chromosome number 21.

171. Answer (2)

Hint: Process after gel electrophoresis

Sol.: *Thermus aquaticus* is a thermophilic bacteria. Chitinase is used for the isolation of DNA

from fungus. Exonucleases remove nucleotides from the ends of DNA.

172. Answer (2)

Hint: Insertional inactivation of tetracycline resistance gene.

Sol.: Insertional inactivation of tetracycline resistance gene will occur due to ligation of DNA at *Sa*/I on pBR322.

Thus, recombinants will be *tet^S amp^R*.

173. Answer (4)

Hint: Transformation of cells

Sol.: Recombinant DNA can be forced into the cells by incubating the cells with recombinant DNA on ice followed by placing them briefly at 42°C (Heat shock) and then putting them back on ice. Heat shock method is associated with upstream process.

174. Answer (4)

Hint: Phosphodiester bond

Sol.: Each restriction endonuclease finds its specific recognition sequence where it will bind to DNA and cut each of the two strands of double helix at specific points in their sugar-phosphate backbones.

175. Answer (3)

Hint: Methylase and restriction endonuclease

Sol.: In the year 1963, the two enzymes responsible for restricting the growth of bacteriophage in *E.coli* were isolated. One of these added methyl groups to the DNA of *E. coli* and other cuts genetic material of bacteriophage.

176. Answer (4)

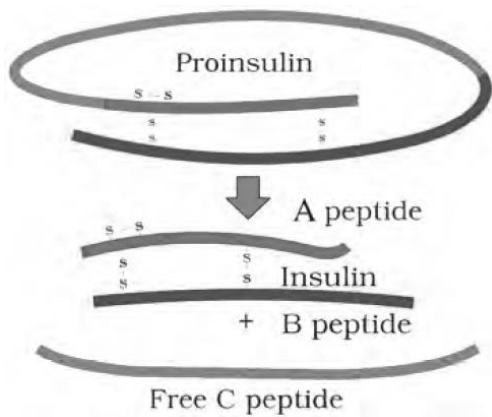
Hint: Involves silencing due to dsRNA

Sol.: Using *Agrobacterium* vectors, nematode-specific genes were introduced into the host plant. The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other formed a double stranded RNA (dsRNA) that initiated RNAi and thus, silenced the specific mRNA of the nematode. The consequence was that the parasite could not survive in a transgenic host expressing specific interfering RNA.

177. Answer (3)

Hint: Two interchain disulphide are present

Sol.:



178. Answer (2)

Hint: Exclude the mode of spread of infection of pneumonia.

Sol.: Chikungunya, dengue and filariasis spread through the bite of infected female *Aedes* mosquitos.

Pneumonia spreads through droplet infection.

Common cold is spread through contaminated unanimate objects.

179. Answer (4)

Hint: Depressant

Sol.: Excessive dosage of cocaine causes hallucination. Marijuana, hashish, charas and ganja are hallucinogens. Heroin is a depressant.

180. Answer (3)

Hint: Less than 55

Sol.: The lymphoid tissue located within the lining of the major tracts (respiratory, digestive and urogenital tracts) is called MALT. It constitutes about 50% of the lymphoid tissue in human body.



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