



Aakash

Medical | IIT-JEE | Foundations

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FINAL TEST SERIES for NEET-2025

MM : 720

Test - I2

Time : 180 Mins.

Answers

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

Hints and Solutions

PHYSICS

(1) Answer : (4)

Solution:Number of electric lines of force \propto Strength of charge

$$\bullet \quad \left| \frac{Q_1}{Q_2} \right| = \frac{12}{5}$$

(2) Answer : (1)

Solution:

$$W = 2.303 nRT \log \left(\frac{V_2}{V_1} \right)$$

$$= 2.303 \times 1 \times 8.3 \times 400 \log (2) = 2301 \text{ J}$$

$$= \frac{2301}{4.2} = 548 \text{ cal}$$

(3) Answer : (1)

Solution:Increasing slope of $x-t$ graph is positive acceleration.Decreasing slope of $x-t$ graph is negative acceleration.

(4) Answer : (4)

Solution:

$$K_{\text{eff}} = \frac{K_1 K_2}{K_1 + K_2} = \frac{200 \times 200}{200 + 200} = 100 \text{ N/m}$$

$$T = 2\pi \sqrt{\frac{1}{100}} = \frac{2\pi}{10}$$

(5) Answer : (2)

Solution:

By Lami's theorem,

$$\frac{P}{\sin \theta_1} = \frac{R}{\sin 150^\circ} \Rightarrow \frac{1}{\frac{1}{2}} = \frac{R}{\cos 60^\circ}$$

$$\bullet \quad R = 2 \cos 60^\circ = 1 \text{ N}$$

(6) Answer : (3)

Solution:

$$\text{Current through load resistance } (i_L) = \frac{8}{2 \times 10^3}$$

$$= 4 \text{ mA}$$

$$\text{Current through } 500 \Omega (i) = \frac{12}{500} = 24 \text{ mA}$$

$$\text{Current through diode } (i_D) = i - i_L$$

$$= 24 - 4 = 20 \text{ mA}$$

(7) Answer : (3)

Solution:

$$\vec{r} = (x - x_0)\hat{i} + (y - y_0)\hat{j} + (z - z_0)\hat{k}$$

$$= (3 - 2)\hat{i} + (6 - 7)\hat{j} + (9 - 8)\hat{k}$$

$$= (\hat{i} - \hat{j} + \hat{k}) \text{ m}$$

$$\vec{\tau} = \vec{r} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix}$$

$$= \hat{i}[1 - 1] - \hat{j}[-1 - 1] + \hat{k}[1 + 1]$$

$$= (2\hat{j} + 2\hat{k}) \text{ N m}$$

(8) Answer : (1)

Solution:

$$\frac{I_g}{R} = V_g$$

$$\Rightarrow R = \frac{I_g}{V_g} = \frac{5}{10^{-3} \times 25} \Omega$$

$$= \frac{5000}{25} = 200 \Omega$$

(9) Answer : (3)**Solution:**

During propagation of a plane progressive mechanical wave, all the particles within the medium vibrate with different phases.

(10) Answer : (1)**Solution:****Hint:**

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

Sol.:

$$\frac{1}{f} = \left(\frac{3}{2} - 1 \right) \left(\frac{1}{20} + \frac{1}{20} \right)$$

$$\frac{1}{f} = \frac{1}{20}$$

$$f = 20 \text{ cm}$$

$$\text{Given, } f_m = f$$

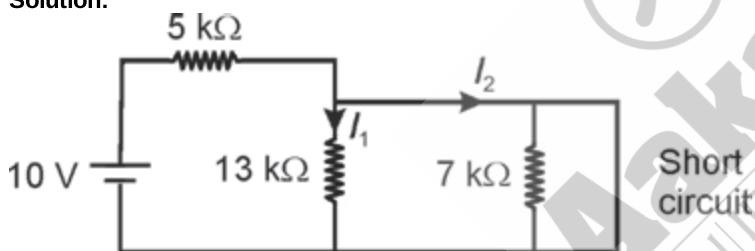
 \Rightarrow

$$\frac{R_m}{2} = 20$$

$$\Rightarrow R_m = 40 \text{ cm}$$

(11) Answer : (2)**Hint:**

Both diodes are in forward bias.

Solution:

$$\text{So, } I_1 = 0$$

$$I_2 = \frac{10}{5 \times 10^3} = 2 \text{ mA}$$

(12) Answer : (3)**Solution:**

Bernoulli's equation is

$$P + \frac{1}{2} \rho v^2 + \rho gh = \text{constant}$$

\Rightarrow This is the equation in form of total energy per unit volume.

i.e.

$$PV + \frac{1}{2} (\rho V) v^2 + (\rho V) gh = \text{constant}$$

$$PV + \frac{1}{2} m v^2 + mgh = \text{constant}$$

Pressure energy + Kinetic energy + Potential energy = constant

Now

$$\frac{PV}{m} + \frac{1}{2} \frac{m v^2}{m} + \frac{mgh}{m} = \text{constant}$$

(energy per unit mass)

$$\frac{P}{\rho} + \frac{v^2}{2} + gh = \text{constant}$$

$$\text{Also } \frac{PV}{mg} + \frac{1}{2} \frac{m v^2}{mg} + \frac{mgh}{mg}$$

(energy per unit weight)

$$\Rightarrow \frac{P}{\rho g} + \frac{v^2}{2g} + h = \text{constant}$$

(13) Answer : (2)**Solution:**

$$(m + W) \times S \times \Delta T = ML$$

$$(400 + 200) \times 1 \times (40 - 0) = M \times 80$$

$$m = 300 \text{ g}$$

(14) Answer : (4)**Hint:**

$$I_{\text{ind}} = \frac{\varepsilon_{\text{ind}}}{R} = \frac{1}{R} \left| \frac{d\phi}{dt} \right|$$

Solution:

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

$$\frac{d\phi}{dt} = \frac{dB}{dt} \cdot A = K \cdot \frac{1}{2} \cdot \frac{l\sqrt{3}l}{2}$$

$$= \frac{K\sqrt{3}l^2}{4}$$

$$I_{\text{ind}} = \frac{1}{3\rho l} \cdot \frac{K\sqrt{3}l^2}{4} = \frac{Kl}{4\sqrt{3}\rho}$$

(15) Answer : (3)**Solution:**

Electric field is the negative gradient of the electric potential.

(16) Answer : (2)**Solution:**

$$BE = 0.0303 \times 931.5 \text{ MeV}$$

$$= 28.22 \text{ MeV}$$

$$BE/\text{Nucleon} = \frac{28.22}{4} \approx 7 \text{ MeV}$$

(17) Answer : (1)**Solution:**

$$\frac{K_1}{K_2} = \left(\frac{u_1}{u_2} \right)^2 = 4$$

$$K_1 = \frac{hc}{\lambda} - \phi = \frac{1240}{248} - \phi$$

$$K_1 = (5 - \phi) \dots (i)$$

Similarly

$$K_2 = \frac{1240}{310} - \phi$$

$$K_2 = (4 - \phi) \dots (ii)$$

$$\frac{K_1}{K_2} = \frac{(5 - \phi)}{(4 - \phi)} = 4$$

$$3\phi = 11$$

$$\phi = \frac{11}{3} = 3.7 \text{ eV}$$

(18) Answer : (3)**Solution:**

Resistivity is the property of material.

(19) Answer : (3)**Solution:**

$$[\text{Gravitation constant}] = [M^{-1}L^3T^{-2}]$$

$$[\text{Boltzmann's constant}] = [ML^2T^{-2}K^{-1}]$$

$$[\text{Stefan's constant}] = [ML^0T^{-3}K^{-4}]$$

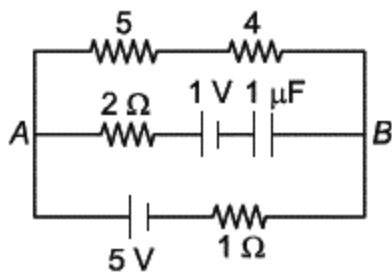
$$[\text{Planck's constant}] = [ML^2T^{-1}]$$

(20) Answer : (3)**Solution:**

No current in the branch which has capacitor in steady state.

$$i = \frac{5}{1+5+4} = 0.5 \text{ A}$$

$$\Rightarrow V_{AB} = 0.5 \times 9 = 4.5 \text{ V}$$



$$V_A - V_B = 1 + V_C$$

$$4.5 - 1 = V_C$$

$$\Rightarrow V_C = 3.5 \text{ volt}$$

$$\text{Energy stored} = \frac{1}{2} C V^2 = \frac{1}{2} 10^{-6} \times 3.5 \times 3.5$$

$$= 6.125 \mu\text{J}$$

(21) Answer : (2)

Solution:

$$3F - 30 \text{ g} = 30 \times 1$$

$$3F = 30 + 300$$

$$F = 110 \text{ N}$$

$$\text{Force by ceiling} = 4 \times 110 = 440 \text{ N}$$

(22) Answer : (1)

Solution:

In LCR series circuit at resonance,

Impedance (Z) = R (ohmic resistance)

$$\text{We know that, } Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$\text{Now, } X_L = X_C \Rightarrow Z = R$$

(23) Answer : (3)

Solution:

Work done by friction force may be positive negative or zero.

(24) Answer : (1)

Solution:

Linear momentum is always conserved because $\Sigma F_{\text{ext}} = 0$.

Kinetic energy will not be conserved during elastic collision. It is conserved before and after elastic collision.

(25) Answer : (2)

Solution:

If ball is thrown vertically up,

$$\theta = 0^\circ \text{ and } h_{\text{max}} = \frac{v_0^2}{2g}$$

(26) Answer : (3)

Solution:

$$\text{Orbital speed of satellite, } v = \sqrt{\frac{GM_e}{r}}$$

$$L = mvr = m \sqrt{\frac{GM_e}{r}} r = m \sqrt{GM_e r} \propto r^{\frac{1}{2}}$$

(27) Answer : (3)

Solution:

Ideal gas equation is $PV = nRT$

$$\Rightarrow \frac{P}{T} \text{ vs } \frac{1}{V} \text{ will be linear graph.}$$

$$\Rightarrow \frac{P}{T} \text{ vs } V \text{ will be hyperbolic graph.}$$

$$\Rightarrow \frac{T}{V} \text{ vs } P \text{ will be linear graph.}$$

$$\Rightarrow PV \text{ vs } T \text{ will be linear graph.}$$

(28) Answer : (2)

Solution:

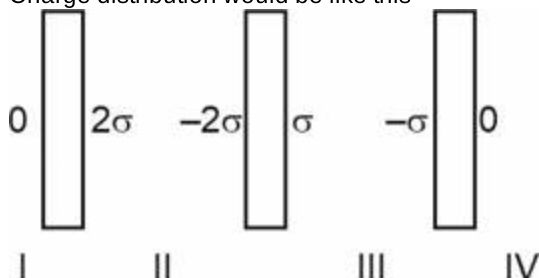
Mass remains conserved during steady flow.

(29) Answer : (2)**Solution:**By 1st law of thermodynamics, $\Delta U = -W$ as $Q = \text{zero}$. W is negative as work is done on the system. $\therefore \Delta U = \text{positive}$ or temperature of gas increases**(30) Answer : (4)****Solution:**

When a charged particle enters in a uniform magnetic field its speed remains same therefore kinetic energy remains constant.

(31) Answer : (1)**Solution:**

Charge distribution would be like this

 $E = 0$ in regions I and IV $E \neq 0$ in regions II and III**(32) Answer : (2)****Solution:**

$$\text{Average power consumed} = V_{\text{rms}} i_{\text{rms}} \cos \phi = \frac{1}{2} V_{\text{peak}} i_{\text{peak}} \cos \phi$$

$$= \frac{1}{2} \times V_0 \times \frac{V_0}{Z} \times \frac{80}{Z} \quad \left(\text{where } Z = \sqrt{80^2 + 60^2} = 100 \, \Omega \right)$$

$$= \frac{1}{2} \times 200 \times \frac{200}{100} \times \frac{80}{100} = 160 \, \text{W}$$

(33) Answer : (2)**Solution:**

$$\text{A. Time period of revolution of electron} = T = \frac{2\pi r}{v} \Rightarrow T \propto \frac{n^3}{Z^2}$$

$$\text{B. Radius } r = 0.53 \frac{n^2}{Z} \, \text{\AA} = 0.53 \times \frac{4^2}{1} = 8.48 \, \text{\AA}$$

$$\text{C. Velocity } v = \frac{c}{137} \times \frac{Z}{4} = \frac{c}{548}$$

$$\text{D. Total energy of electron} = -13.6 \frac{Z^2}{n^2} \, \text{eV} = \frac{-13.6}{16} = -0.85 \, \text{eV}$$

(34) Answer : (2)**Solution:**

$$n_1 u_1 = n_2 u_2$$

$$n_1 \left[\text{MLT}^{-2} \right] = n_2 \cdot \frac{3M3L}{3^2 T^2}$$

$$n_1 = n_2$$

(35) Answer : (2)**Solution:**

$$\text{Self-inductance } L \propto n^2 \Rightarrow \frac{72}{L} = \left(\frac{300}{125} \right)^2$$

$$\Rightarrow \frac{72}{L} = \frac{36}{25} \Rightarrow L = 50 \, \text{mH}$$

(36) Answer : (4)**Solution:**

$$\text{Tensile stress on this plane} = \frac{F \sin \theta}{\frac{A}{\sin \theta}} = \frac{F}{A} \sin^2 \theta \text{ is maximum at } \theta = 90^\circ$$

(37) Answer : (2)**Solution:**

P.E. will be maximum when K.E. is minimum.

K.E. is minimum at aphelion (farthest point) which is point B.

(38) Answer : (4)

Solution:

$\vec{L}_0 = \vec{r} \times m \vec{v}$ is perpendicular to \vec{r} at each and every point on circular path.

$|\vec{L}_0| = mvr$ is constant in magnitude.

(39) Answer : (2)

Solution:

For the second plano-concave lens,

$u = +10$ cm

$f = -10$ cm

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{v} - \frac{1}{+10} = \frac{1}{-10} \Rightarrow v = \infty$$

Parallel rays incident at 3rd lens would converge at its focus, 40 cm away.

(40) Answer : (3)

Solution:

$$\frac{l_1}{l_2} = \frac{1}{2} = \frac{A_1}{A_2} \text{ and } \rho_1 = \rho_2 \text{ (due to same material)}$$

$$\frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{A_2}{A_1} = \frac{1}{2} \times \frac{2}{1} = 1 : 1$$

In parallel connection, current gets divided in inverse ratio of resistances.

$$\bullet \quad \frac{I_1}{I_2} = \frac{R_2}{R_1} = 1 : 1$$

$$\frac{v_{d1}}{v_{d2}} = \frac{I_1}{I_2} \times \frac{A_2}{A_1} = 1 \times 2 = 2 : 1 \quad \left(\bullet \quad I = neAv_d \right)$$

(41) Answer : (3)

Solution:

For a p - n junction diode under reverse bias, the direction of applied voltage is same as the direction of barrier potential. As a result, the barrier height increases.

(42) Answer : (1)

Solution:

$$\tan \alpha = \mu$$

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

(43) Answer : (2)

Solution:

Magnitude of velocity of B w.r.t A i.e. $|\vec{v}_{BA}| = |\vec{v}_B - \vec{v}_A|$

$$= |(6\hat{i} + 7\hat{j}) - (2\hat{i} + 4\hat{j})|$$

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

$$= 5 \text{ m/s}$$

(44) Answer : (3)

Solution:

$$\text{Torque on the needle, } \vec{\tau} = \vec{M} \times \vec{B} \Rightarrow \tau = MB \sin 60^\circ = \frac{MB\sqrt{3}}{2}$$

$$U = -\vec{M} \cdot \vec{B} = -MB \cos 60^\circ = \frac{-MB}{2} = \frac{-\tau}{\sqrt{3}}$$

(45) Answer : (4)

Solution:

The speed of EM waves in a material medium is given by $v = \frac{1}{\sqrt{\mu\epsilon}}$, where μ is the permeability of medium and ϵ is its permittivity.

They interact with matter via their electric and magnetic fields which set in oscillation charges present in all matter.

CHEMISTRY

(46) Answer : (2)

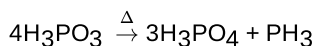
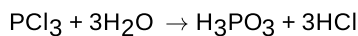
Solution:

$$\text{Mole of glucose (C}_6\text{H}_{12}\text{O}_6) = 200 \times 0.5 \times 10^{-3} = 0.1$$

$$\begin{aligned}\text{Number of carbon atoms} &= 0.1 \times 6 \times 6.02 \times 10^{23} \\ &= 3.6 \times 10^{23}\end{aligned}$$

(47) Answer : (1)

Solution:



(48) Answer : (1)

Solution:

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

$$\lambda = \frac{6.6 \times 10^{-34}}{0.2 \times 10^{-6} \times 1000}$$

$$\lambda = 33 \times 10^{-31} = 3.3 \times 10^{-30} \text{ m}$$

(49) Answer : (2)

Solution:

Angular node = $l = 3$ Radial nodes = $(n - l - 1) = 5 - 3 - 1 = 1$

(50) Answer : (4)

Solution:

Chalcogen \rightarrow Te (elements of oxygen family)Lanthanoid \rightarrow SmActinoid \rightarrow Am d -block element \rightarrow Re

(51) Answer : (2)

Solution:

Element		Electronegativity
B	\rightarrow	2.0
C	\rightarrow	2.5
Al	\rightarrow	1.5
Si	\rightarrow	1.8

(52) Answer : (1)

Solution:

Species		Bond Order $[\frac{1}{2}(N_b - N_a)]$
H_2^+	$-$	$[\frac{1}{2}(1 - 0) = 0.5]$
O_2^+	$-$	$\frac{1}{2}(10 - 5) = 2.5$

(53) Answer : (4)

Solution:

PCl_5	$-$	Trigonal bipyramidal
BrF_5	$-$	Square pyramidal
SF_4	$-$	See-saw
XeF_4	$-$	Square planar

(54) Answer : (2)

Solution:The process is adiabatic hence, $q = 0$

The process is irreversible hence

$$w = -P\Delta V$$

$$= -3 \times (8.7 - 4.2)$$

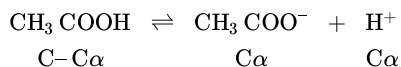
$$= -3 \times 4.5 = -13.5 \text{ L-atm}$$

$$\Delta U = q + w$$

$$\Delta U = w [\because q = 0]$$

$$\Delta U = -13.5 \times 101.3 = -1.367 \text{ kJ}$$

(55) Answer : (3)

Hint:

$$K_a = \frac{[\text{CH}_3 \text{ COO}^-][\text{H}^+]}{[\text{CH}_3 \text{ COOH}]}$$

$$= \frac{C\alpha^2}{1-\alpha} \simeq C\alpha^2$$

Solution:

$$\Lambda_{\text{CH}_3 \text{ COOH}}^\circ = \Lambda_{\text{H}^+}^\circ + \Lambda_{\text{CH}_3 \text{ COO}^-}^\circ$$

$$= 350 + 50$$

$$= 400 \text{ S cm}^2 \text{ mol}^{-1}$$

$$\alpha = \frac{\Lambda_m}{\Lambda_m^\circ} = \frac{4}{400} = 0.01$$

$$K_a = C\alpha^2 = 0.1 \times (0.01)^2$$

$$= 10^{-5}$$

(56) Answer : (2)

Solution:

Because of inert pair effect lead in +4 oxidation state is oxidising in nature.

(57) Answer : (1)

Hint:

In cis-But-2-ene two methyl groups are in same direction.

Solution:

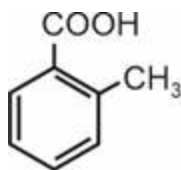
In cis-But-2-ene due to net dipole moment it has boiling point greater than trans-But-2-ene.

(58) Answer : (3)

Solution:

$$\text{Percentage of bromine} = \frac{80 \times 0.94 \times 100}{188 \times 0.8} = 50\%$$

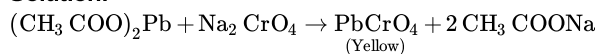
(59) Answer : (4)

Solution:

Because of ortho effect,

is most acidic in nature.

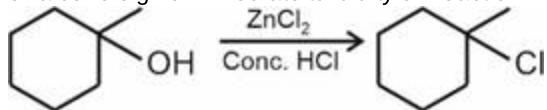
(60) Answer : (1)

Solution:

(61) Answer : (3)

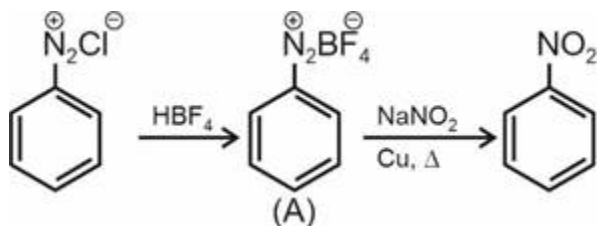
Solution:

3° alcohols give immediate turbidity on reaction with Lucas reagent.



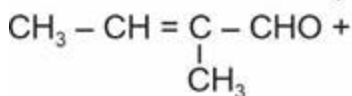
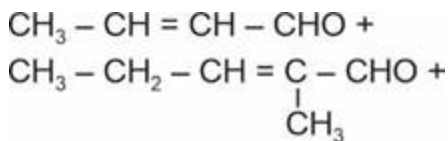
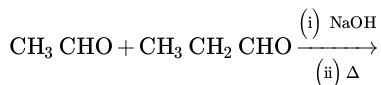
(62) Answer : (3)

Solution:



(63) Answer : (4)

Solution:



(64) Answer : (2)

Solution:

Compounds	Boiling point (K)
Propan-1-ol	370
Acetone	329
Propanal	322
Methoxyethane	281

(65) Answer : (2)

Solution:

Common name	Structure
Adipic acid	– HOOC – (CH ₂) ₄ – COOH
Malonic acid	– HOOC – CH ₂ – COOH
Glutaric acid	– HOOC – (CH ₂) ₃ – COOH
Succinic acid	– HOOC – (CH ₂) ₂ – COOH

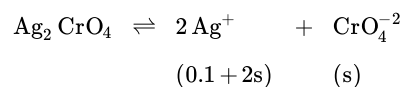
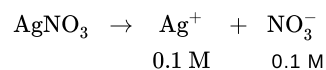
(66) Answer : (4)

Hint:

Work done is path function.

(67) Answer : (1)

Solution:



$$K_{\text{sp}} = [\text{Ag}^+]^2 [\text{CrO}_4^{2-}]$$

$$K_{\text{sp}} = (0.1 + 2s)^2 (s)$$

$$4 \times 10^{-12} \simeq (0.1)^2 (s)$$

$$s = 4 \times 10^{-10} \text{ M}$$

(68) Answer : (1)**Hint:**

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

Solution:

For HA acid

$$i = 1 + (n - 1)\alpha$$

$$i = 1 + \alpha$$

$$\alpha = 0.2$$

$$i = 1 + 0.2 = 1.2$$

$$\Delta T_f = 1.2 \times 0.25 \times 1.86$$

$$\Delta T_f = 0.56 \text{ K}$$

(69) Answer : (4)**Solution:**

Rate of reaction

$$-\frac{d[A]}{dt} = -\frac{1}{2} \frac{d[B]}{dt} = \frac{1}{4} \frac{d[C]}{dt} = \frac{1}{3} \frac{d[D]}{dt}$$

(70) Answer : (2)**Hint:**On adding two reaction their ΔG will be added to obtain ΔG for final reaction.**Solution:**

Reverse equation (i) and add it to equation (ii).

$$-(\text{Cu}^+ + e^- \rightarrow \text{Cu}), \Delta G_1 = -1 F E_1^\circ$$

$$+(\text{Cu}^{2+} + 2e^- \rightarrow \text{Cu}), \Delta G_2 = -2 F E_2^\circ$$

$$\text{Cu}^{2+} + e^- \rightarrow \text{Cu}^+, \Delta G = -1 F E^\circ$$

$$\Delta G = \Delta G_2 - \Delta G_1$$

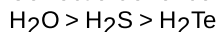
$$-1 F E^\circ = -2 F E_2^\circ + 1 F E_1^\circ$$

$$E^\circ = 2 E_2^\circ - E_1^\circ$$

$$= 0.674 - 0.52 = 0.154 \text{ V}$$

(71) Answer : (3)**Hint:**

Correct order of bond angle is

Compound (H_2E) HEH angle

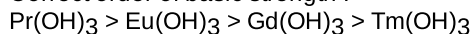
$$\text{H}_2\text{O} \quad 104$$

$$\text{H}_2\text{S} \quad 92$$

$$\text{H}_2\text{Te} \quad 90$$

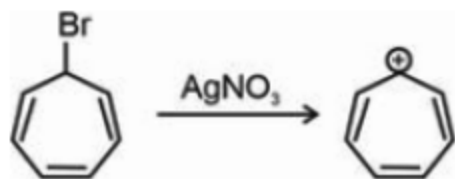
(72) Answer : (1)**Solution:**

Correct order of basic strength :

**(73) Answer : (3)****Hint:**

Higher the negative charge on metal carbonyl, stronger is the back donation of electron from metal to ligand.

Solution:Back donation of electron from metal to the vacant π^* orbital of CO takes place hence bond order of CO decreases and bond length increases. More electron density on metal increases back donation.**(74) Answer : (2)****Solution:**



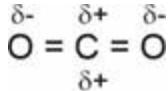
Aromatic species

Aromatic compound

(75) Answer : (1)

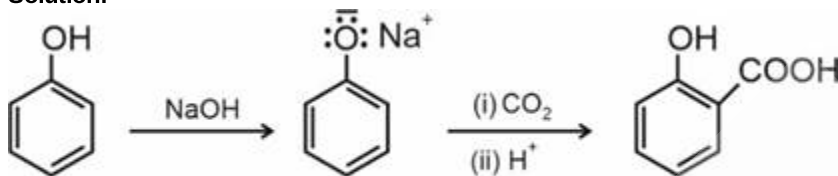
Hint:

Phenoxide ion is more reactive than phenol towards electrophile



in Kolbe's reaction.

Solution:



Salicylic acid

The above reaction is called Kolbe's reaction.

(76) Answer : (2)

Hint:

In Buckminsterfullerene, each carbon atom forms three sigma bonds with other three carbon atoms.

Solution:

- Fullerenes are the only pure form of carbon because they have smooth structure without having 'dangling' bonds.
- In Buckminsterfullerene, all the carbon atoms are equal and they undergo sp^2 hybridization.

(77) Answer : (4)

Solution:

- NaCl is a salt of strong acid and strong base so its aq. solution will be neutral.

$$pH = \frac{pK_w}{2} = \frac{14}{2} = 7$$

- NH_4Cl is a salt of strong acid and weak base so its pH will be less than 7.

$$pH = \frac{1}{2} [pK_w - pK_b - \log c]$$

- CH_3COONa is a salt of strong base and weak acid so its pH will be more than 7.

$$pH = \frac{1}{2} [pK_w + pK_a + \log c]$$

- NH_4CN is a salt of weak acid and weak base and pH of its aq. solution will be independent of concentration of salt.

$$pH = \frac{1}{2} [pK_w + pK_a - pK_b]$$

(78) Answer : (2)

Solution:

Answer (2)

$$\text{Mole fraction of A} = \frac{2}{2+3} = 0.4$$

$$\text{Mole fraction of B} = \frac{3}{5} = 0.6$$

$$\begin{aligned} P_A &= x_A p_A^0 + x_B p_B^0 \\ &= 0.4 \times 300 + 0.6 \times 500 \\ &= 420 \text{ mm Hg} \end{aligned}$$

(79) Answer : (4)

Solution:

$$k = \frac{2.303}{t} \log \left(\frac{A_0}{A} \right)$$

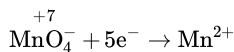
$$k = \frac{2.303}{80} \log \left(\frac{100}{20} \right) = \frac{2.303}{80} \log (5)$$

$$\frac{0.693}{t_{1/2}} = \frac{2.303}{80} \log 5 \Rightarrow t_{1/2} = \frac{0.693 \times 80}{2.303 \log 5}$$

$$= 34.4 \text{ minutes}$$

(80) Answer : (2)

Hint:



Solution:

$$Q = 0.5 \times 5 \times 96500 \text{ C}$$

$$= 2.4 \times 10^5 \text{ C}$$

(81) Answer : (2)

Solution:

Element $\Delta_{\text{eg}} H (\text{kJ mol}^{-1})$

F -333

Cl -349

Br -325

I -296

(82) Answer : (2)

Solution:

In acidic medium, MnO_4^- converts to Mn^{2+} and has n-factor value = 5.

Number of equivalents of MnO_4^- = number of equivalents of FeC_2O_4

FeC_2O_4 converts to Fe^{3+} and CO_2 .

n-factor for $\text{FeC}_2\text{O}_4 = 3$

$$\text{Moles of } \text{KMnO}_4 \times 5 = 3 \times 1$$

$$\text{Moles of } \text{KMnO}_4 = \frac{3}{5}$$

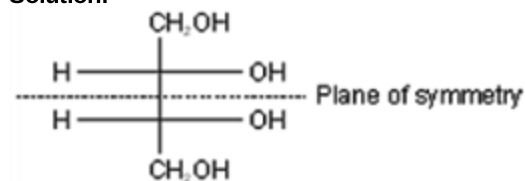
(83) Answer : (2)

Solution:

Stronger is ligand, field strength, more in Δ_0 value and shorter is the wavelength of light absorbed.

(84) Answer : (4)

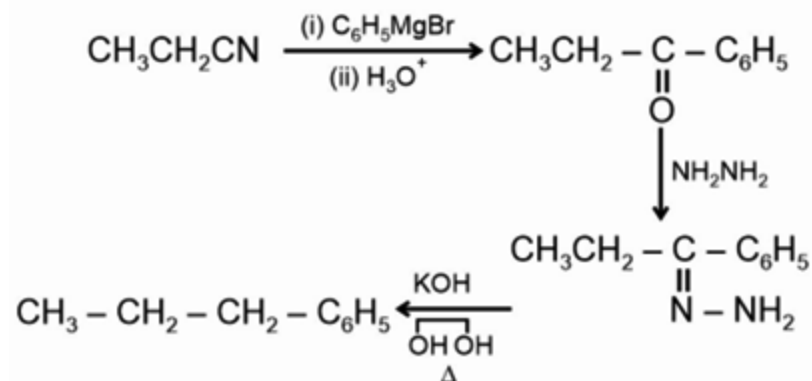
Solution:



The compound contains plane of symmetry. Its optical rotation is zero because of internal compensation.

(85) Answer : (2)

Solution:



(86) Answer : (4)

Solution:
Beri-Beri

(87) Answer : (2)

Hint:

$$r_n = \frac{52.9 n^2}{Z} \text{ pm}$$

Solution:

$$r_2 = \frac{52.9 \times (2)^2}{3}$$

$$= 70.5 \text{ pm}$$

(88) Answer : (2)

Solution:

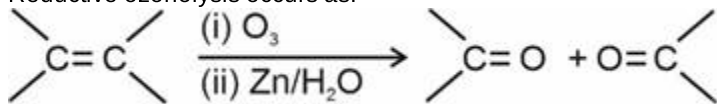


is resonance stabilized (back bonding).

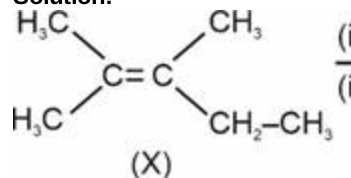
(89) Answer : (3)

Hint:

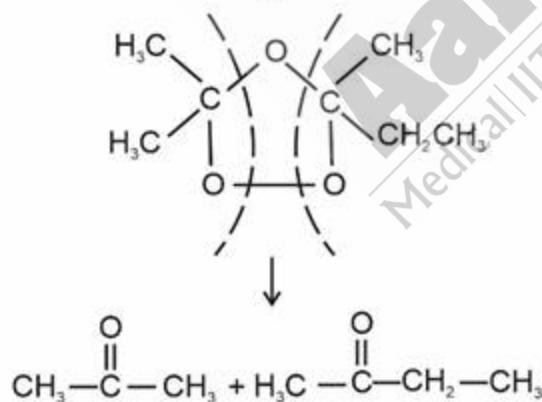
Reductive ozonolysis occurs as:



Solution:



2,3-Dimethylpent-2-ene

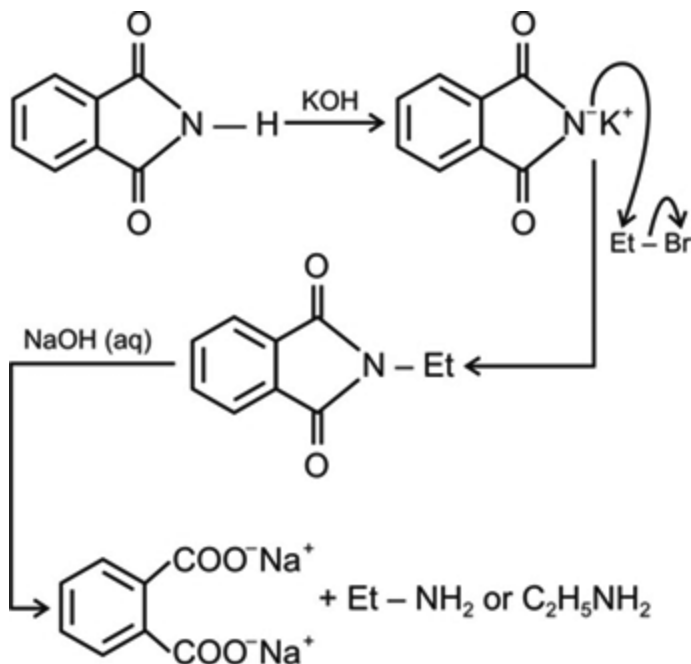


(90) Answer : (2)

Hint:

Et—Br undergoes S_N2 reaction in Gabriel phthalimide synthesis of 1° amines.

Solution:



BIOLOGY

(91) Answer : (1)

Solution:

In sickle cell anaemia, glutamic acid is substituted by valine in beta globin chain of haemoglobin.

(92) Answer : (3)

Solution:Hershey and Chase performed their experiments on T_2 bacteriophage and *E. coli*.

(93) Answer : (3)

Solution:

In Griffith's experiment, mice died when injected with heat-killed S-strain combined with live R-strain bacteria.

(94) Answer : (3)

Solution:

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

Prokaryotes do not have a defined nucleus, but the DNA is not scattered throughout the cell.

In eukaryotes, negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome.

(95) Answer : (2)

Solution:

Here, A represents structural genes, B represents promotor, C represents coding strand and D represents terminator.

Structural genes are polycistronic in prokaryotes. In eukaryotes, the coding strand of DNA has the same sequence as mRNA, which is transcribed from template DNA.

(96) Answer : (3)

Solution:

If waste water is to be used for domestic purpose, then tertiary treatment is done.

(97) Answer : (4)

Solution:

Test cross is cross of individual showing dominant phenotype with recessive parent.

(98) Answer : (4)

Solution:

(i) In interference competition, the feeding efficiency of one species is affected due to the inhibitory presence of the other.

(ii) Resources may not be limiting for competition to occur.

(99) Answer : (4)

Solution:

Base of an ecological pyramid represents the producer level.

(100) Answer : (4)

Solution:

In the exponential growth equation $N_t = N_0 e^{rt}$, e represents the base of natural logarithms

N_t = Population density after time t

N_0 = Population density at time zero

r = Intrinsic rate of natural increase also called biotic potential.

(101) Answer : (4)

Solution:

Wildlife safari park is an *ex-situ* conservation strategy of biodiversity.

(102) Answer : (3)

Solution:

Loss of biodiversity may lead to increased variability of ecosystem processes like productivity, water use etc.

(103) Answer : (3)

Solution:

In triangular age pyramid, biotic potential ($b-d=r$) is high and it represents expanding nature of population.

(104) Answer : (4)

Solution:

In a particular climatic condition, decomposition rate is slower if detritus is rich in lignin and chitin, and quicker, if detritus is rich in nitrogen and water-soluble substances like sugars.

(105) Answer : (4)

Solution:

There is no DNA replication during intrameiotic interphase.

(106) Answer : (1)

Solution:

Prosthetic groups are organic compounds and are tightly bound to the apoenzyme.

e.g. Haem in catalase.

(107) Answer : (4)

Solution:

The European Federation of Biotechnology (EFB) gave the definition of biotechnology that, it is the integration of natural sciences and organisms, cells, parts thereof, and molecular analogues for products and services.

'Saheli' was developed at CDRI. NACO is associated with AIDS.

(108) Answer : (3)

Solution:

The regions outside the seminiferous tubules called interstitial spaces, contain small blood vessels and interstitial cells or Leydig cells. Other immunologically competent cells are also present.

(109) Answer : (4)

Hint:

VC is the maximum volume of air a person can breathe in after a forced expiration.

Solution:

$FRC + TV + IRV = TLC$

Total volume of air accommodated in the lungs at the end of forced inspiration is called total lung capacity.

(110) Answer : (2)

Solution:

Nearly 20 – 25 per cent of CO_2 is transported by RBCs whereas 70 per cent of it is carried as bicarbonate through plasma and about 7 per cent of CO_2 is carried in a dissolved state through plasma. Thus, the total amount of CO_2 carried through blood plasma will be equal to around 77%.

(111) Answer : (2)

Solution:

Neurotransmitters are involved in chemical synapses; chemical synapses occur abundantly in the human body.

(112) Answer : (3)

Solution:

Centres for controlling respiratory rhythm and cardiovascular reflexes are present in the medulla oblongata. Taste, smell of food or tactile sensations of food in the mouth stimulates medulla oblongata that influences gastric secretions.

(113) Answer : (2)

Solution:

Hydrophilic hormones cannot cross the plasma membrane, so they interact with membrane-bound receptors and generate second messengers for their action in a cell. Proteinaceous hormones are water-soluble (ACTH, insulin, TSH). Steroidal hormones interact *via* intracellular receptors.

(114) Answer : (2)**Solution:**

Abdominal muscles help in forceful expiration.

(115) Answer : (1)**Solution:**

The 7th sternum of female cockroach is boat-shaped.

In male cockroaches, the mushroom-shaped gland is present in the 6th-7th abdominal segments and a pair of testes lie in the 4th-6th abdominal segments.

In female cockroaches, the ovaries lie in the 2nd-6th abdominal segments.

(116) Answer : (2)**Solution:**

(i) As we go from species to kingdom, the number of characteristics that member within a taxon share decreases.

(ii) Metabolic reactions can be demonstrated outside the body in cell free systems.

(117) Answer : (4)**Solution:**

Amoeboid protozoans have certain marine forms, which have silica shells on their surface.

(118) Answer : (1)**Solution:**

Albugo is the parasitic fungi, which causes white spots on mustard. Asexual reproduction is carried out zoospore oospore formation is the result of gametangial contact.

(119) Answer : (3)**Solution:**

In members of rhodophyceae, the cell wall is made up of cellulose, pectin and polysulphate esters, whereas in members of phaeophyceae cellulose and algin are present.

(120) Answer : (2)**Solution:**

In liverworts, asexual reproduction takes place by means of specialized multicellular structures called gemmae. Mosses reproduce asexually by fragmentation and budding.

(121) Answer : (3)**Solution:**

Xylem parenchyma are living cells and therefore they lack lignified cell walls.

(122) Answer : (2)**Solution:**

Conjunctive tissue, exarch arrangement of primary xylem, pericycle, casparian strips and parenchymatous cortex are common between dicot and monocot roots.

(123) Answer : (4)**Solution:**

Flagella are the surface structures of bacteria, which play a role in motility.

(124) Answer : (1)**Solution:**

a. **Auxin:** Induces parthenocarp in tomatoes.

b. **Ethylene:** Promotes rapid internode/petiole elongation in deep water rice plants.

c. **Abscisic acid:** Increases tolerance of plants to various kinds of stresses.

d. **Gibberellins:** Promotes elongation and improvement of shapes in apples.

(125) Answer : (4)**Solution:**

Cilia are fine "hair-like" outgrowths, which play a role in cell motility in protozoans like *Paramecium*.

(126) Answer : (4)**Solution:**

Meiosis takes place in meiocytes.

(127) Answer : (2)

Solution:

Mitosis helps in maintaining the size of the cell, as the cell becomes large, it enters mitosis to maintain proper surface area to volume ratio.

(128) Answer : (1)**Solution:**

Aggregate fruits like strawberries develop from multicarpellary and apocarpous gynoecium.

(129) Answer : (4)**Solution:**

In mustard, racemose inflorescence is observed, where the main axis (peduncle) continues to grow indefinitely.

(130) Answer : (3)**Solution:**

Stilt roots	–	Roots coming out of lower nodes of the stem to support main axis
Pneumatophores	–	Vertically upward growing roots to get oxygen for respiration.
Thorns	–	Axillary buds system get modified into woody, pointed structure
Tendrils	–	Slender and spirally coiled structures which help the plant in climbing

(131) Answer : (3)**Solution:**

The hind limbs of frogs end in five digits and they are larger and muscular than their fore limbs that end in four digits. They show winter sleep (hibernation) and summer sleep (aestivation) to protect themselves from extreme weather conditions.

On land, the buccal cavity, skin and lungs act as respiratory organs. The respiration by buccal cavity is called buccopharyngeal respiration. The respiration by skin is called cutaneous respiration and respiration by lungs is called pulmonary respiration. They exhibit sexual dimorphism.

(132) Answer : (3)**Solution:**

Condoms are barriers made up of thin rubber/latex sheath that are used to cover the penis in the male or vagina and cervix in the female, just before coitus so that ejaculated semen would not enter into the female reproductive tract. They are used to prevent unwanted conceptions. They can be self-inserted and thereby provide privacy to the users.

(133) Answer : (2)**Solution:**

About 2000 million years ago (mya) the first cellular forms of life appeared on Earth. By the time of 500 mya, invertebrates (without vertebral column) were formed and active.

(134) Answer : (2)**Solution:**

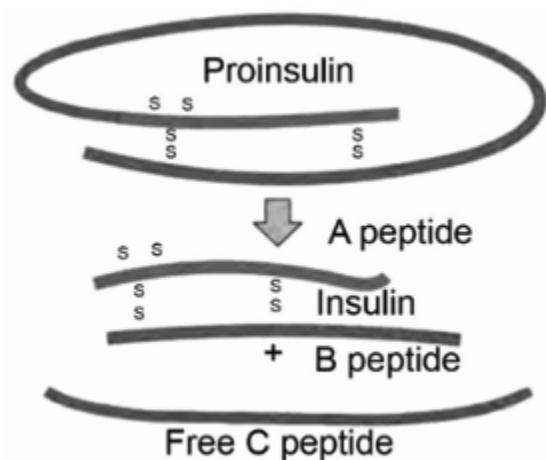
Plasmodium enters the human body as sporozoites (infectious form) through the bite of an infected female *Anopheles* mosquito. *Plasmodium* requires two hosts: Human and female *Anopheles* mosquito to complete its life cycle.

(135) Answer : (3)**Solution:**

Columnar epithelium is composed of a single layer of tall and slender cells. The nuclei in columnar epithelial cells are located at the base. This epithelium is found in the lining of the stomach and intestine.

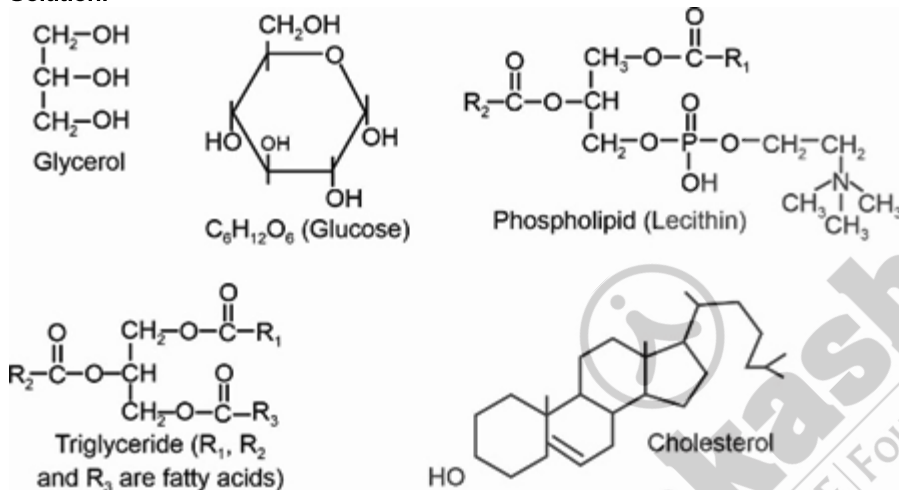
Air sacs of lungs and inner walls of blood vessels are lined by squamous epithelium. Pharynx contains compound epithelium.

(136) Answer : (4)**Solution:**



(137) Answer : (4)

Solution:

Number of $-OH$ groups in glycerol = 3Number of $-OH$ groups in glucose = 5.

(138) Answer : (3)

Solution:

IUT – Intra-Uterine Transfer

IUI – Intra-Uterine Insemination

ICSI – Intra-Cytoplasmic Sperm Injection.

Test tube baby and ICSI involved *in-vitro* methods, while IUI and GIFT involve *in-vivo* fertilisation. IUD is a contraceptive device.

(139) Answer : (3)

Solution:

Insulin is a hormone (protein) which acts as an intercellular messenger. Proteins are heteropolymers.

Inulin is a storage homopolysaccharide. It is made up of fructose and is found in plants. In proteins, the left end is the N-terminal whereas the right end is the C-terminal.

(140) Answer : (4)

Solution:

Echinus (echinoderm) is a non-chordate.*Pterophyllum* (bony fish) and *Aptenodytes* (bird) have notochord at some stage in their embryonic life.*Salpa* (urochordate) do not have notochord in their adult life.*Scoliodon* (cartilaginous fish) and *Branchiostoma* (cephalochordate) have persistent notochord throughout their life.

(141) Answer : (2)

Solution:

Recombinant DNA technology involves several steps in specific sequence such as:

(a) Isolation of DNA.

(b) Fragmentation of DNA by restriction endonucleases.

(c) Isolation of a desired DNA fragment.

(d) Ligation of the DNA fragment into a vector.

- (e) Transferring the recombinant DNA into the host.
- (f) Culturing the host cells in a medium at a large scale.
- (g) Extraction of desired product.

(142) Answer : (2)

Solution:

Annelids (earthworm) and most chordates have a closed circulatory system in which blood pumped by heart is circulated in closed network of blood vessels and can be precisely regulated. Roundworms do not have blood circulatory system.

(143) Answer : (3)

Solution:

Different varieties of plants can be fused to get hybrid protoplasts which can further grow to form a new plant. This process is called somatic hybridisation.

(144) Answer : (3)

Solution:

In cockroach, 100-150 yellow coloured Malpighian tubules are present at the junction of midgut and hindgut and 6-8 gastric caecae are present at the junction of foregut and midgut.

(145) Answer : (4)

Solution:

On an average, 5 millions to 5.5 millions of RBCs are present in mm^{-3} of blood. They are formed in bone marrow of some bones in adults. RBCs are destroyed in spleen.

(146) Answer : (3)

Solution:

In the given linear DNA, after complete digestion with P → 2 fragments will be obtained. These 2 fragments will be of 4 kb and 6 kb respectively.

(147) Answer : (2)

Solution:

Oogenesis is initiated during the embryonic development stage when a couple of million gamete mother cells are formed within each foetal ovary.

Each primary oocyte then gets surrounded by a layer of granulosa cells and is called primary follicle.

A large number of these follicles degenerate during the phase from birth to puberty.

Therefore, at puberty, only 60,000-80,000 primary follicles are left in each ovary.

(148) Answer : (2)

Solution:

If the release of Ca^{2+} from sarcoplasmic reticulum stops, then, the following steps won't occur:

- Binding of Ca^{2+} with a subunit of troponin on actin filaments.
- Unmasking of active sites on actin filaments.
- Formation of cross-bridge after ATP hydrolysis.
- After sliding, binding of ATP to myosin head.

Release of acetylcholine on motor-end plate or neuro-muscular junction due to arrival of neural signals continues.

(149) Answer : (2)

Solution:

Bottleneck effect is a ramification of genetic drift and is described as the decrease in genetic variability in a population.

(150) Answer : (4)

Solution:

The tertiary structure of proteins during coiling of polypeptide chains is stabilised by hydrogen bonds, covalent bonds, hydrophobic bonds and ionic bonds. Phosphodiester bonds are found in RNA and DNA.

(151) Answer : (4)

Solution:

Liver eliminates bile-containing substances like bilirubin, biliverdin, cholesterol, degraded steroid hormones, vitamins and drugs.

(152) Answer : (3)

Solution:

Addison's disease – Underproduction of adrenal cortical hormones.

Cretinism – Hypothyroidism in mother leads to the birth of baby suffering from cretinism.

Graves' disease – Hyperthyroidism

Diabetes insipidus – Underproduction of ADH.

(153) Answer : (1)

Solution:

Forebrain of frog, comprises two olfactory lobes, two cerebral hemispheres and unpaired diencephalon.
Hindbrain comprises cerebellum and medulla oblongata.

(154) Answer : (1)**Solution:**

In sponges, water enters through minute pores (ostia) into spongocoel from where it goes out through the osculum.

(155) Answer : (1)**Solution:**

Members of the phylum Aschelminthes and Annelida have organ-system level of organisation, bilateral symmetry and three germ layers.

Obelia, sea anemone and *Pleurobrachia* are diploblastic.

(156) Answer : (4)**Solution:**

Photolysis of water and concomitant oxygen evolution is common to both C_3 and C_4 plants.

(157) Answer : (2)**Solution:**

During chemiosmosis, electron transport within the thylakoid membrane occurs through photosystem.

(158) Answer : (3)**Solution:**

Cytochrome c is a mobile electron carrier, which is involved in the transfer of electrons between complex III and IV.

(159) Answer : (2)**Solution:**

Members of Monera are prokaryotes.

Most of the members of Monera are heterotrophic in nature.

(160) Answer : (1)**Solution:**

Riccia is a bryophyte.

Cycas and *Cedrus* are gymnosperms.

Pteridophytes have vascular tissues but they lack seeds. *Pteris* is a fern (pteridophyte). It has vascular tissues but lacks seed.

(161) Answer : (3)**Solution:**

Monocot stem does not have endodermis, pith and pericycle.

Monocot stem contains conjoint closed vascular bundles.

(162) Answer : (3)**Solution:**

Materials to be packaged in the form of vesicles from the ER, fuse with the *cis* face of the golgi apparatus and move towards the maturing face. This explains, why the golgi apparatus remains in close association with the ER.

(163) Answer : (1)**Solution:**

M phase represents the phase with actual cell division, which starts with nuclear division and ends with the division of the cytoplasm.

(164) Answer : (4)**Solution:**

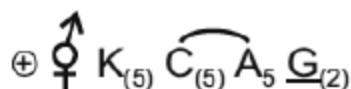
Majority of the enzymes required in TCA cycle are found in matrix except succinic acid dehydrogenase which is found attached to inner membrane of mitochondria.

(165) Answer : (3)**Solution:**

Due to sporopollenin pollen grains are well preserved as fossils.

(166) Answer : (2)**Solution:**

Floral formula of Solanaceae family is



(167) Answer : (4)**Solution:**

Methanogens are anaerobic microbes

(168) Answer : (2)**Solution:**

In wind pollinated flowers

(i) Pollens are light and non-sticky in nature.

(ii) Single ovule in each ovary.

(iii) No nectar is produced

(169) Answer : (2)**Solution:**

Experimental verification of the chromosomal theory of inheritance was done by Thomas Hunt Morgan.

(170) Answer : (2)**Solution:**

Down's syndrome is caused by an additional copy of chromosome number 21.

This disorder was first described by Langdon Down.

The affected individual is short statured with small round head, furrowed tongue and partially open mouth. Physical, psychomotor and mental development is retarded.

(171) Answer : (4)**Solution:**

Normal human male ejaculates about 200-300 million sperms during a coitus. For normal fertility, atleast 60 per cent of these sperms must have normal shape and size and atleast 40 per cent of them must show vigorous motility.

(172) Answer : (2)**Solution:**

Evolution of different shapes of beaks in Darwin's finches is an excellent example of adaptive radiation, divergent evolution and natural selection.

(173) Answer : (2)**Solution:**

Cocaine is a stimulant. Tobacco contains an alkaloid named nicotine that stimulates the adrenal gland to release adrenaline and nor adrenaline.

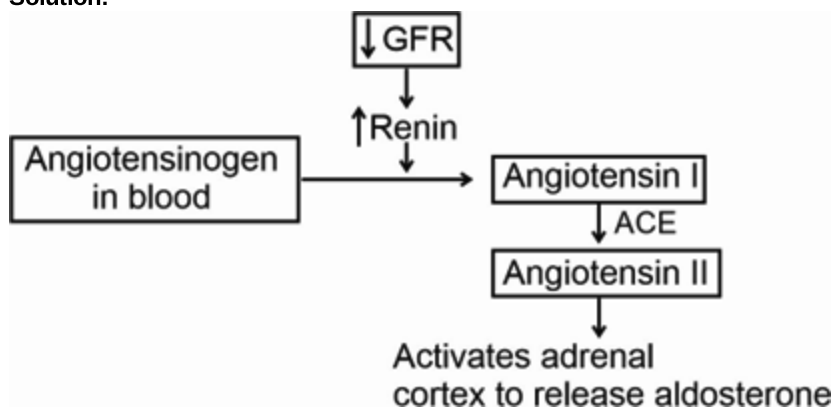
(174) Answer : (1)**Solution:***Wuchereria bancrofti* causes filariasis. *Microsporum*, *Trichophyton* and *Epidermophyton* are responsible for ringworms.**(175) Answer :** (1)**Solution:**

The DNA fragments get separated (resolve) according to their size through sieving effect provided by the agarose gel.

Since DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the positive electrode/anode under an electric field through the gel matrix.

(176) Answer : (3)**Solution:**

When Sal I is used for insertion of gene of interest in pBR322 then, insertional inactivation of tetracycline resistance gene will occur and recombinants will be resistant against ampicillin.

(177) Answer : (2)**Solution:**

• ANF causes vasodilation.

- Angiotensin II is a powerful vasoconstrictor that leads to an increase in glomerular blood pressure.

(178) Answer : (4)

Solution:

Emphysema is a chronic disorder in which alveolar walls are damaged due to which respiratory surface area gets decreased.

α -1-antitrypsin is produced from transgenic sheep which is used for the treatment of emphysema.

(179) Answer : (2)

Solution:

Aplysia – Sea-hare (Mollusc). It is a coelomate.

Asterias – Star fish (Echinoderm). It is a coelomate.

Planaria – Platyhelminth; shows high regeneration capacity.

(180) Answer : (2)

Solution:

Coxal bone – Ischium

Ear ossicles – Incus

Forelimb – Ulna

Cranial bone – Sphenoid

Facial bone – Lacrimal

