



# Aakash

Medical | IIT-JEE | Foundations

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## FINAL TEST SERIES for NEET-2025

MM : 720

Test - 8

Time : 180 Mins.

### Answers

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

## Hints and Solutions

## PHYSICS

(1) Answer : (2)

Solution:

Waves	Wavelength
AM radio waves	$10^2$ m
Microwaves	$10^{-2}$ m
Infrared radiations	$10^{-4}$ m
X-rays	$10^{-10}$ m

(a) - (ii)

(b) - (iii)

(c) - (iv)

(d) - (i)

(2) Answer : (1)

Solution:

$$F_{\text{up}} = 2000g + 3000$$

$$= 23000 \text{ N}$$

$$\text{Minimum power } P_{\text{min}} = \vec{F} \cdot \vec{v}$$

$$P_{\text{min}} = Fv = 23000 \times \frac{3}{2}$$

$$= 34500 \text{ W}$$

(3) Answer : (4)

Solution:

$$\text{Potential of conducting hollow sphere} = \frac{kQ}{R}$$

Now,  $Q = \text{same}$ 

$$\Rightarrow V \propto \frac{1}{R} \Rightarrow \text{more the radius less will be the potential.}$$

 $\Rightarrow$  Hence potential would be more on smaller sphere

(4) Answer : (1)

Solution:

We know, velocity of transverse wave

$$v = \sqrt{\frac{T}{\mu}}$$

$$\therefore v_i = \sqrt{\frac{T}{\mu}} \text{ and } v_f = \sqrt{\frac{2T}{\mu}}$$

$$\therefore \frac{v_i}{v_f} = \frac{1}{\sqrt{2}}$$

(5) Answer : (3)

Solution:

$$\text{Excess pressure inside the bubble} = \Delta P = \frac{4T}{R}$$

$$P_{\text{in}} = P_{\text{out}} + \frac{4T}{R}$$

as ' $R$ ' increases ' $P$ ' decreases

(6) Answer : (1)

Solution:

$$S_n = u + \frac{1}{2}a(2n - 1)$$

$$S_{1st} = \frac{1}{2}g(2 \times 1 - 1) = \frac{g}{2}$$

$$S_{2^{\text{nd}}} = \frac{1}{2}g(2 \times 2 - 1) = 3 \left(\frac{1}{2}g\right)$$

$$S_{3^{\text{rd}}} = \frac{1}{2}g(2 \times 3 - 1) = 5 \times \left(\frac{1}{2}g\right)$$

$$S_{4^{\text{th}}} = \frac{1}{2}g(2 \times 4 - 1) = 7 \times \left(\frac{1}{2}g\right)$$

$$S_{1^{\text{st}}} : S_{2^{\text{nd}}} : S_{3^{\text{rd}}} : S_{4^{\text{th}}} \\ = 1 : 3 : 5 : 7$$

**(7) Answer :** (4)**Solution:**

We know, magnetic field at centre of solenoid

$$B = \mu_0 \frac{N}{l} l = \mu_0 n l \quad \left[ n = \frac{N}{l} \right]$$

$$= 4\pi \times 10^{-7} \times 100 \times 10^3 \times 1 \quad \left[ n = \frac{100}{10^{-3}} \right]$$

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

$$B = 12.56 \times 10^{-2} \text{ T}$$

**(8) Answer :** (2)**Solution:**

Slope of x-t curves gives the velocity

$$\Rightarrow \text{Ratio} = \frac{\tan 30^\circ}{\tan 45^\circ} = \frac{1}{\sqrt{3}} = 1 : \sqrt{3}$$

**(9) Answer :** (1)**Solution:**

We know,

$$\text{RMS value of A.C. } E_{\text{rms}} = \frac{E_0}{\sqrt{2}}$$

$$E_0 = \sqrt{2} E_{\text{rms}}$$

**(10) Answer :** (2)**Solution:**

$$E_n = \frac{E_0}{n^2}, \text{ For first excited state } \Rightarrow n = 2$$

$$\text{For second excited state } \Rightarrow n = 3$$

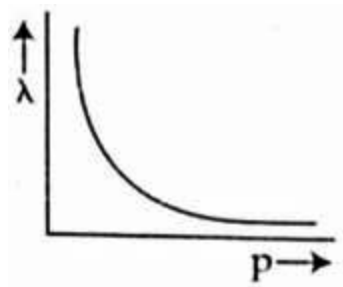
$$\Rightarrow \frac{T_1}{T_2} = \frac{\frac{E_0}{4}}{\frac{E_0}{9}} = \frac{9}{4}$$

**(11) Answer :** (2)**Solution:**

de-Broglie wavelength associated with a particle is given by

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

$$\lambda \propto \frac{1}{p}$$

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

$$\text{Plane angle} = \frac{\text{Arc}}{\text{Radius}} = \frac{[L]}{[L]} \rightarrow \text{Unit} = \text{Radian}$$

$$= [M^0 L^0 T^0]$$

$$\text{Solid angle} = \frac{\text{Area}}{(\text{Radius})^2} \rightarrow \text{Unit} = \text{Steradian}$$

$$= \frac{L^2}{L^2} = [M^0 L^0 T^0]$$

∴ Both have units but no dimensions

(13) Answer : (2)

**Solution:**

Potential drops across the  $p$ - $n$  junctions will be same if either both junctions are forward biased or both junction are reverse biased.

In figure (a) and (c), both junctions are forward biased therefore both have same potential.

In figure (b) first junction is forward biased and second junction is reverse biased, so both junctions have different potential difference.

(14) Answer : (4)

**Solution:**

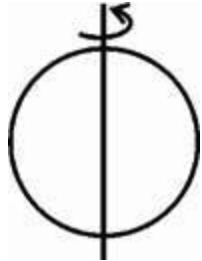


$$I_1 = \frac{MR^2}{2}$$

$$k_1 = \sqrt{\frac{I_1}{M}}$$

$$= \frac{R}{\sqrt{2}}$$

$$I_2 = \frac{MR^2}{4}$$



$$k_2 = \sqrt{\frac{I_2}{M}}$$

$$= \frac{R}{2}$$

$$\frac{k_1}{k_2} = \frac{\frac{R}{\sqrt{2}}}{\frac{R}{2}}$$

$$= \sqrt{2} : 1$$

(15) Answer : (2)

**Solution:**

$$\text{Resistance, } R = \rho \frac{L}{A} = \frac{L}{\sigma A}$$

$$\Rightarrow \sigma = \frac{L}{RA}$$

$$\text{Also current density } j = \sigma E = \frac{LE}{RA}$$

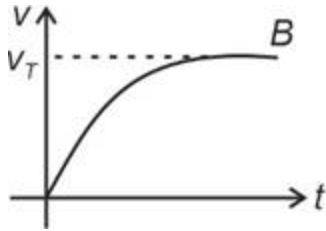
$$j = \frac{10 \times 10}{10 \times \pi \left( \frac{10^{-2}}{\sqrt{\pi}} \right)^2} = \frac{100}{10 \times \pi \times \left( \frac{10^{-4}}{\pi} \right)}$$

$$= 10^5 \text{ A/m}^2$$

(16) Answer : (4)

**Solution:**

Initial speed of ball is zero and it finally attains terminal speed



(17) Answer : (4)

**Solution:**

For parallel combination

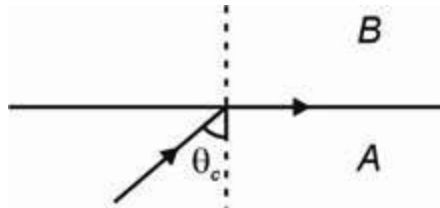
$$P = \frac{V^2}{R}$$

$$\frac{P_1}{P_2} = \frac{R_2}{R_1}$$

$$\Rightarrow \frac{P_1}{P_2} = \frac{200}{100} = 2$$

(18) Answer : (4)

**Solution:**



$$\mu_A = \frac{3 \times 10^8}{1.5 \times 10^8} = 2$$

$$\mu_B = \frac{3 \times 10^8}{2 \times 10^8} = 1.5$$

For TIR, ray of light should travel from denser to rarer medium

$$\mu_A \sin \theta_C = \mu_B \sin 90^\circ$$

$$2 \sin \theta_C = 1.5 \sin 90^\circ$$

$$\sin \theta_C = 0.75$$

$$\theta_C = \sin^{-1}(0.75)$$

(19) Answer : (2)

**Solution:**

$$\beta = \frac{\lambda D}{d}$$

Let length of segment of screen =  $l$

$$\Rightarrow l = 8\beta_1 = \frac{8\lambda_1 D}{d} \dots(1)$$

$$\text{and } l = n\beta_2 = \frac{n\lambda_2 D}{d} \dots(2)$$

from (1) and (2)

$$8\lambda_1 = n\lambda_2$$

$$8(600 \text{ nm}) = n(400 \text{ nm})$$

$$n = 12$$

(20) Answer : (2)

**Solution:**

$$v = \frac{1}{\sqrt{\epsilon_m \mu_m}}$$

$$v = \frac{1}{\sqrt{\epsilon_0 \epsilon_r \mu_0 \mu_r}}$$

$$\text{Since } c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$$

$$\Rightarrow v = \frac{c}{\sqrt{\epsilon_r \mu_r}}$$

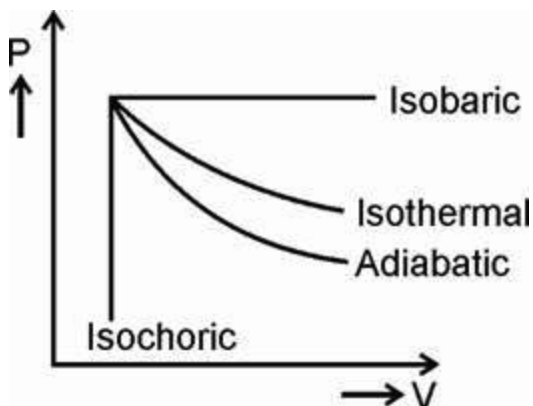
(21) Answer : (4)

**Solution:**

$$\text{Sol. } \left( \frac{dP}{dV} \right)_{\text{adiabatic}} = -\gamma P$$

$$\left(\frac{dP}{dV}\right)_{\text{isothermal}} = -P$$

$$\left(\frac{dP}{dV}\right)_{\text{adiabatic}} > \left(\frac{dP}{dV}\right)_{\text{isothermal}}$$



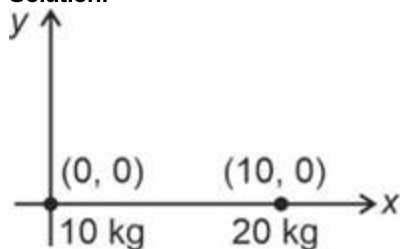
(22) Answer : (1)

**Solution:**

As the temperature increases the resistivity of the conductor increases hence the electrical resistance increases. However for semiconductor the resistivity decreases with the temperature. Hence electrical resistance of semiconductor decreases.

(23) Answer : (4)

**Solution:**



$$\begin{aligned} X_{\text{cm}} &= \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2} \\ &= \frac{10 \times 0 + 20 \times 10}{10 + 20} \\ &= \frac{200}{30} = \frac{20}{3} \text{ m} \end{aligned}$$

(24) Answer : (1)

**Solution:**

In half wave rectifier, the output frequency is same as that of input frequency.

(25) Answer : (1)

**Solution:**

According to Biot-Savart's law  $d\vec{B} = \frac{\mu_0}{4\pi} \frac{Id\vec{l} \times \vec{r}}{r^3}$  which is applicable for infinitesimal element. It is analogous to Coulomb's

law, where  $Id\vec{l}$  is vector source and electric field is produced by scalar source  $q$ . Here statement I is correct and statement II is incorrect.

(26) Answer : (3)

**Solution:**

Energy = Power  $\times$  time

$$\begin{aligned} E &= 100 \times 10^3 \times 3600 \\ &= 36 \times 10^7 \text{ J} \end{aligned}$$

(27) Answer : (4)

**Solution:**

$$F = mE_G$$

$$3 = \frac{60}{1000} E_G$$

$$E_G = 50 \text{ N/kg}$$

(28) Answer : (1)

**Solution:**

Power of lens is given by

$$P = \frac{1}{f(m)}$$

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

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

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

$$P = \frac{1}{20 \times 10^{-2}}$$

$$= 5 \text{ D}$$

**(29) Answer : (1)****Solution:**

Momentum of the system would remain conserved.

Initial momentum = 0

Final momentum should also be zero.

Let masses be  $2m$ ,  $2m$ , and  $m$ 

Momentum along  $x$ -direction =  $2mv\hat{i}$

Momentum along  $y$ -direction =  $2mv\hat{j}$

Net momentum =  $\sqrt{(2mv)^2 + (2mv)^2} = \sqrt{2} \cdot 2mv$

Now,  $2\sqrt{2}mv = mv'$

$$v' = 2\sqrt{2}v$$

**(30) Answer : (1)****Solution:**Dimensional formula of magnetic permeability is  $[\text{MLT}^{-2}\text{A}^{-2}]$ **(31) Answer : (1)****Solution:**

$$dV = -\vec{E} \cdot d\vec{r}$$

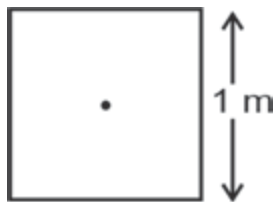
$$dV = -E dr \cos \theta$$

For equipotential surface,

$$dV = 0$$

$$\cos \theta = 0$$

$$\Rightarrow \theta = 90^\circ$$

**(32) Answer : (4)****Solution:**

Magnetic flux ( $\phi_B$ ) =  $\vec{B} \cdot \vec{A}$

 $\vec{B}$  and  $\vec{A}$  are in same direction, therefore

$$\phi_B = B.A = 0.5 \times 1^2$$

$$= 0.5 \text{ Wb}$$

**(33) Answer : (1)****Solution:**

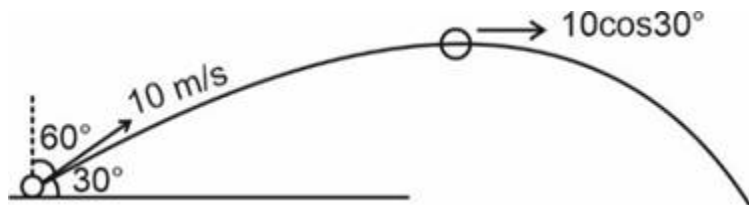
Given  $i = 60^\circ$  and  $\mu = \sqrt{3}$

$$\Rightarrow \text{Here, angle of incidence} \Rightarrow i = \tan^{-1}(\mu)$$

Hence, reflected and refracted rays would be perpendicular to each other.

**(34) Answer : (4)****Solution:**

At highest point vertical component of velocity become zero.



At highest point speed of object =  $10\cos 30^\circ$   
 $= 5\sqrt{3}$  m/s

(35) Answer : (4)

Solution:

$$\omega L = \frac{1}{\omega C}$$

$$\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{10 \times 10 \times 10^{-6}}}$$

$$\omega = 100$$

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

$$\nu_0 = f_0 = \frac{100}{2\pi} = \frac{50}{\pi} \text{ Hz, } \omega = 100$$

$$\nu = f = \frac{100}{2\pi} = \frac{50}{\pi}$$

(36) Answer : (2)

Solution:

Area = Length  $\times$  Breadth

$$= 55.3 \times 25 \text{ m}^2 = 1382.5 \text{ m}^2$$

$$= 14 \times 10^2 \text{ m}^2 \text{ (Rounding off of two significant figures)}$$

(37) Answer : (3)

Solution:

$$T = 2\pi\sqrt{\frac{L}{g}}$$

Let  $n_1$  and  $n_2$  be integer.

$$n_1 T_1 = n_2 T_2$$

$$2\pi n_1 \sqrt{\frac{1.21}{g}} = 2\pi n_2 \sqrt{\frac{1.00}{g}}$$

$$\Rightarrow \frac{n_2}{n_1} = \frac{11}{10}$$

$\therefore$  After completion of 11<sup>th</sup> oscillation of shorter pendulum, it will be in phase with longer pendulum.

(38) Answer : (1)

Solution:

It is true that stretching of spring is determined by shear modulus of the spring as when coil spring is stretched neither its length nor its volume changes, there is only change in its shape.

Tensile strength of steel is more than that of copper.

Hence Assertion is true and reason is false.

(39) Answer : (4)

Solution:

For  $R \gg L$ , arrangement is an electric dipole

$$E = \frac{2p}{4\pi\epsilon_0 R^3}; \text{ where } p = qL$$

$$E \propto \frac{1}{R^3}$$

(40) Answer : (1)

Solution:

Radius of nuclei with mass number  $A$  varies as

$$R = R_0 A^{1/3}$$

$$\frac{R_1}{R_2} = \left(\frac{125}{64}\right)^{1/3} = \frac{5}{4} = 5 : 4$$

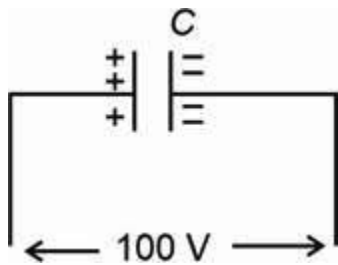
(41) Answer : (1)

Solution:

$$q_1 = CV$$

$$= 900 \times 10^{-12} \times 100$$

$$= 9 \times 10^{-8} C$$



$$V = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$$

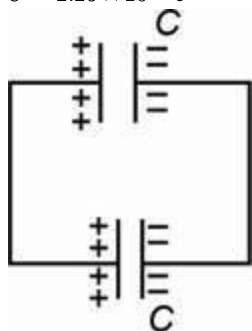
$$= \frac{9 \times 10^{-8} + 0}{1800 \times 10^{-12}} = \frac{100}{2} = 50 \text{ V}$$

$$U = \frac{1}{2} (C_1 + C_2) V^2$$

$$= \frac{1}{2} \times 1800 \times 10^{-12} \times 50 \times 50$$

$$= 225 \times 10^{-8}$$

$$U = 2.25 \times 10^{-6} \text{ J}$$



(42) Answer : (1)

Solution:

$$C = (\overline{A \cdot B}) \cdot (\overline{\overline{A \cdot B}})$$

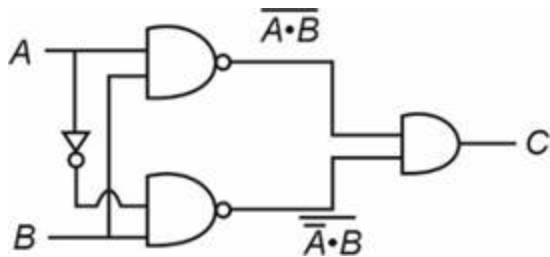
$$\Rightarrow C = \overline{A \cdot B + \overline{A \cdot B}}$$

$$\Rightarrow C = \overline{(A + \overline{A})B}$$

$$\Rightarrow C = \overline{B}$$

The truth table would be

A	B	C
0	0	1
0	1	0
1	0	1
1	1	0



(43) Answer : (4)

Solution:

$$(a) [G] = \frac{Fr^2}{m_1 m_2}$$

$$[G] = \frac{Fr^2}{m_1 m_2} = \frac{[MLT^{-2}]L^2}{[MM]} = [M^{-1}L^3T^{-2}]$$

(b) Gravitational potential energy =  $[ML^2T^{-2}]$

(c) Gravitational potential =  $\frac{PE}{m} = [L^2T^{-2}]$

(d) Gravitational field intensity =  $\frac{F}{m} = [LT^{-2}]$

(44) Answer : (1)

**Solution:**For solid wire  
Inside point

$$B = \frac{\mu_0 I r^2}{R^2 \times 2\pi r}$$

$$= \frac{\mu_0 I r}{R^2 \times 2\pi}$$

$$B \propto r$$

Outside point

$$B = \frac{\mu_0 I}{2\pi r}$$

$$B \propto \frac{1}{r}$$

(45) Answer : (1)

**Solution:**

$$\phi_B = NBA \cos \omega t$$

$$\varepsilon = \frac{-d\phi_B}{dt} = -NBA\omega(-\sin \omega t)$$

$$\varepsilon = NBA\omega \sin \omega t$$

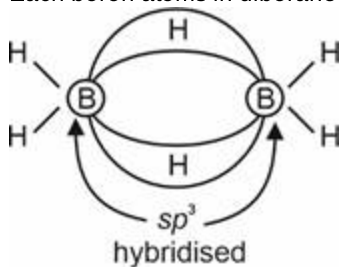
$$i_{\max} = \frac{\varepsilon_{\max}}{R} = \frac{NBA\omega}{R}$$

$$= \frac{1000 \times 2 \times 10^{-5} \times \pi (10)^2 \times 2}{12.56}$$

$$= 1 \text{ A}$$

CHEMISTRY

(46) Answer : (2)

**Solution:**Each boron atoms in diborane uses  $sp^3$  hybrid orbitals for bonding.

(47) Answer : (1)

**Solution:**

In general, interhalogen compounds are more reactive than halogens (except fluorine). I-Cl bond is stronger than I-I bond.

(48) Answer : (4)

**Solution:**

Molality is the moles of solute dissolved per kg of solvent therefore 500 g, 1 molal solution contains 0.5 of solute, as

$$m = \frac{\text{Moles of solute}}{\text{Mass of solvent (in kg)}}$$

$$1 = \frac{0.5}{\text{Mass of solvent (in kg)}}$$

$$\therefore \text{Mass of solvent (in kg)} = 0.5$$

$$= 500 \text{ g}$$

(49) Answer : (3)

**Solution:**



Methanal is gas at room temperature

**Solution:**

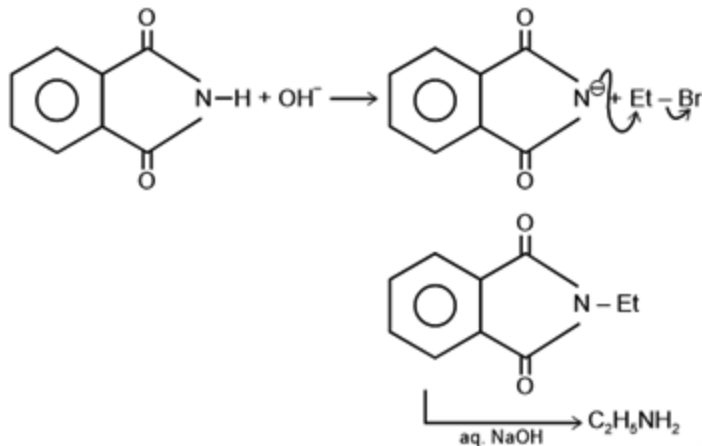
Due to dipole-dipole interaction, the boiling point of aldehydes and ketones are higher than hydrocarbons and ether of comparable molecular mass.

(54) Answer : (2)

**Hint:**

Et—Br undergoes  $S_N2$  reaction in Gabriel phthalimide synthesis of  $1^\circ$  amines.

**Solution:**



(55) Answer : (2)

**Solution:**

	Coordination compounds		Metal present
a.	Chlorophyll	(i)	Magnesium
b.	Vitamin B <sub>12</sub>	(ii)	Cobalt
c.	Wilkinson catalyst	(iii)	Rhodium
d.	Haemoglobin	(iv)	Iron

(56) Answer : (3)

**Solution:**

- Solution having large positive deviation from Raoult's law form minimum boiling azeotrope.
- Isotonic solutions have same osmotic pressure at a given temperature.
- $K_f$  is independent of solute concentration.

(57) Answer : (3)

**Solution:**

- The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses due to weak molecular association in aldehydes and ketones arising out of the dipole - dipole interaction.
- Alcohols involved intermolecular hydrogen bonding, because of which the boiling point of aldehydes and ketones are lower than the alcohols of similar molecular masses.

(58) Answer : (3)

**Solution:**

IUPAC name of element : 119 : ununennium

(59) Answer : (2)

**Solution:**

For a reaction to be spontaneous,  $E_{cell}^\circ$  must be positive.

• For,  $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

$$E_{cell}^\circ = E_{cathode}^\circ - E_{anode}^\circ$$

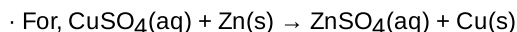
$$= -0.44 \text{ V} - (-0.76 \text{ V})$$

$$= 0.32 \text{ V}$$

• For,  $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$

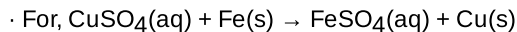
$$E_{cell}^\circ = 0.34 \text{ V} - 0.80 \text{ V}$$

$$= -0.46 \text{ V}$$



$$E_{\text{cell}}^{\circ} = 0.34 \text{ V} - (-0.76 \text{ V})$$

$$= 1.1 \text{ V}$$



$$E_{\text{cell}}^{\circ} = 0.34 \text{ V} - (-0.44)$$

$$= 0.78 \text{ V}$$

(60) Answer : (1)

**Solution:**

Kjeldahl method is not applicable to compounds containing nitrogen in nitro group, azo groups and nitrogen present in the ring (e.g., pyridine) as nitrogen of these compounds does not change to ammonium sulphate under these conditions.

(61) Answer : (1)

**Solution:**

· For zero order reaction

$$r = k[\text{A}]^0$$

$$r = k \text{ (constant)}$$

hence, 'y' as 'rate' and 'x' as concentration will give desired graph.

· For first order reaction

$$t_{1/2} = \frac{0.693}{k} \text{ (constant)}$$

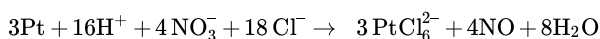
hence, 'y' as ' $t_{1/2}$ ' and 'x' as concentration will give desired graph.

(62) Answer : (3)

**Hint:**

Aqua regia on reaction with Pt gives  $[\text{PtCl}_6]^{2-}$  species

**Solution:**



(63) Answer : (2)

**Solution:**

Arrhenius equation,  $k = A e^{\frac{-E_a}{RT}}$

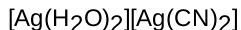
$$\ln k = \ln A - \frac{E_a}{RT}$$

Compare with,  $y = c + mx$

$$\text{Slope} = m = -\frac{E_a}{R}$$

(64) Answer : (2)

**Solution:**



IUPAC name : diaquasilver(I)dicyanidoargentate(I)

(65) Answer : (1)

**Solution:**

Diamond : •  $sp^3$  hybridised carbon atom

- Covalent solid
- 3-D structure
- Cannot be used as dry lubricant

Graphite : •  $sp^2$  hybridised carbon atom

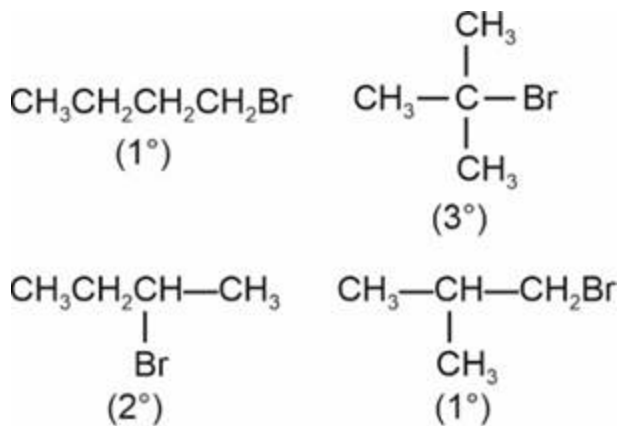
- Covalent solid
- 3-D structure
- Used as dry lubricant

(66) Answer : (2)

**Hint:**

There are four structural isomers of  $\text{C}_4\text{H}_9\text{Br}$

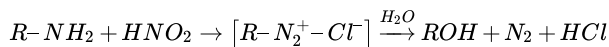
**Solution:**



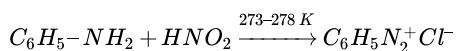
(67) Answer : (1)

**Solution:**

· Primary aliphatic amines react with  $\text{HNO}_2$  and give unstable diazonium salt which turns into alcohol



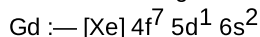
· Primary aromatic amines reacts with  $\text{HNO}_2$  and give stable diazonium salt which are stable at 273 to 278 K.



(68) Answer : (4)

**Solution:**

Electronic configuration of Gadolinium



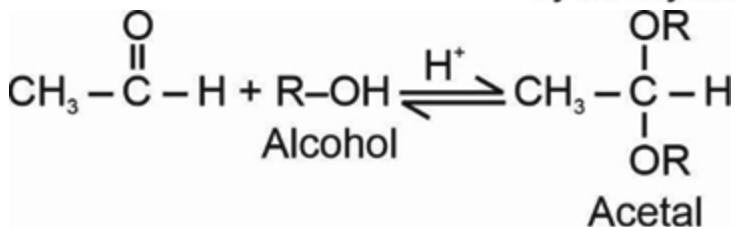
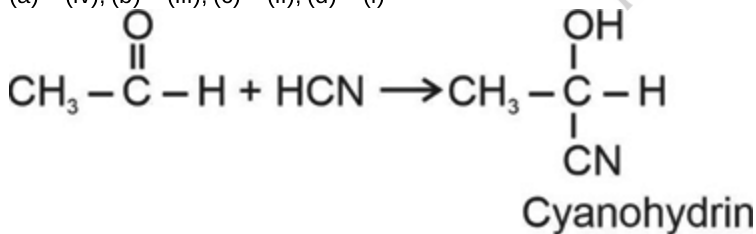
In case of 3<sup>rd</sup> ionisation enthalpy electron will be removed from 5d and resultant configuration will be  $[\text{Xe}]4f^7$  that is stable electronic configuration as it will have high exchange energy, hence less energy will be required to remove 3<sup>rd</sup> electron.

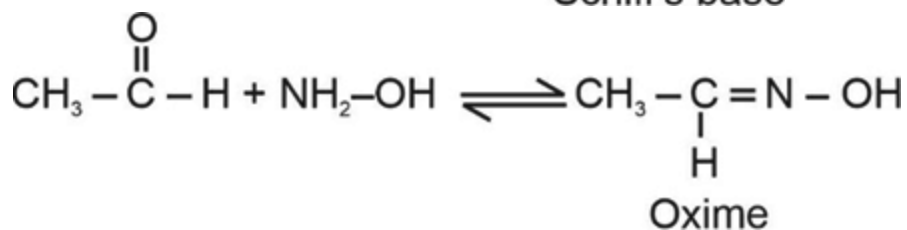
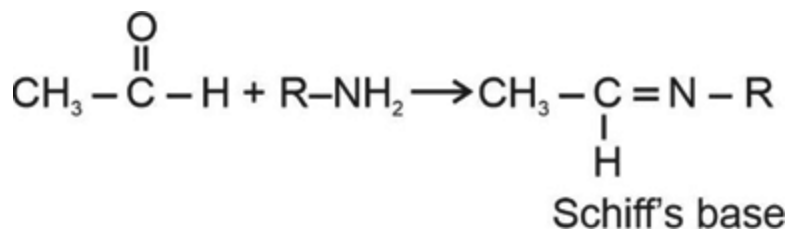
(69) Answer : (2)

**Solution:**

List - I (Products formed)		List - II (Reaction of carbonyl compound with)	
(a)	Cyanohydrin	(iv)	HCN
(b)	Acetal	(iii)	Alcohol
(c)	Schiff's base	(ii)	$\text{RNH}_2$
(d)	Oxime	(i)	$\text{NH}_2\text{OH}$

(a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)





(70) Answer : (4)

**Solution:**

Compound Boiling point (K)

H<sub>2</sub>O 373H<sub>2</sub>S 213H<sub>2</sub>Se 232H<sub>2</sub>Te 269

- The boiling points of these hybrids not exactly increases with increase in molar mass.
- H<sub>2</sub>O has maximum boiling point due to intermolecular hydrogen bonding.

(71) Answer : (3)

**Solution:**CH<sub>3</sub>COONa + CH<sub>3</sub>COOH, CH<sub>3</sub>COOH(pK<sub>a</sub>) = 4.57

0.1M 0.01M

50 mL 50 mL

It is a mixture of weak acid and salt of its conjugate base. Hence it is acidic buffer.

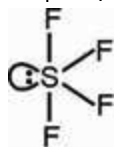
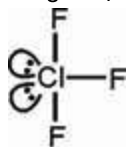
$$\text{pH} = \text{p}K_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$$

$$= 4.57 + \log \left( \frac{0.1}{0.01} \right)$$

$$= 4.57 + 1$$

$$= 5.57$$

(72) Answer : (2)

**Solution:**SF<sub>4</sub> → sp<sup>3</sup>d + 1 lone pairXeF<sub>2</sub> → sp<sup>3</sup>d + 3 lone pairClF<sub>3</sub> → sp<sup>3</sup>d + 2 lone pairIF<sub>5</sub> → sp<sup>3</sup>d<sup>2</sup> + 1 lone pair



$\text{XeF}_2$  having maximum lone pairs, so, it has maximum 'lone pair-lone pair' electron repulsions.

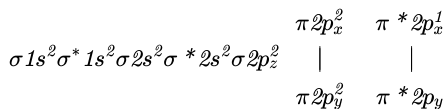
(73) Answer : (1)

**Solution:**

The stereoisomers related to each other as non-superimposable mirror image are called enantiomers.

(74) Answer : (2)

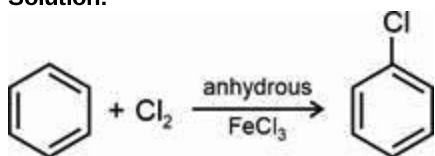
**Solution:**



Due to one unpaired electron in  $\pi^* 2p$  molecular orbital,  $\text{O}_2^+$  is a paramagnetic ion.

(75) Answer : (3)

**Solution:**

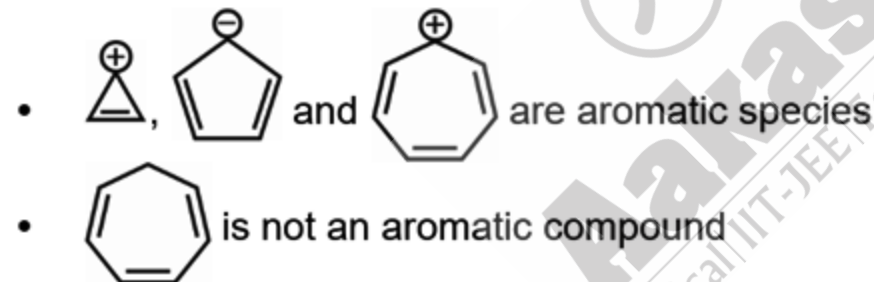


Benzene reacts with chlorine in presence of anhydrous  $\text{FeCl}_3$  to give chlorobenzene

(76) Answer : (2)

**Solution:**

• Planar, cyclic, conjugated species containing  $(4n + 2)\pi$  electrons will be aromatic in nature ( $n$  is an integer)



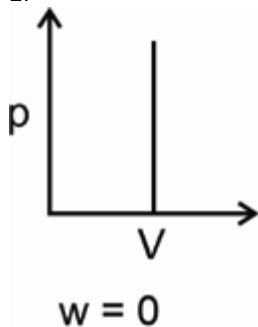
(77) Answer : (4)

**Solution:**

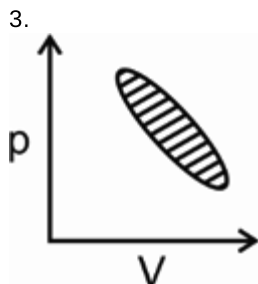
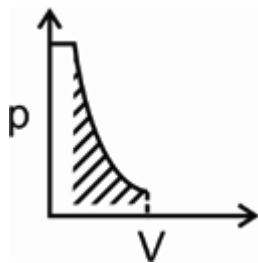
Work done under any thermodynamic process can be determined by area under the 'p-V' graph.

As it can be observed maximum area is covered in option '4'.

1.

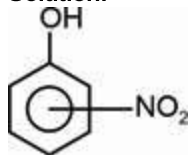


2.



(78) Answer : (1)

Solution:

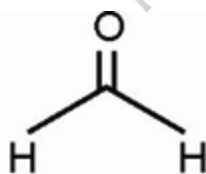
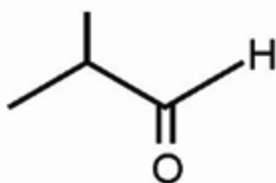


• Nitro group has electron withdrawing tendency. It can withdraw electrons both by  $-I$  effect and  $-R$  effect. Thus the acidic strength of monosubstituted nitrophenol is higher than phenol.

• Nitro group present at  $o$ - and  $p$ -positions will have strong  $-R$  effect while nitro group present at  $m$ -position will influence only  $-I$  effect hence acidity of  $o/p$  isomer will be more than that of meta isomer.

(79) Answer : (3)

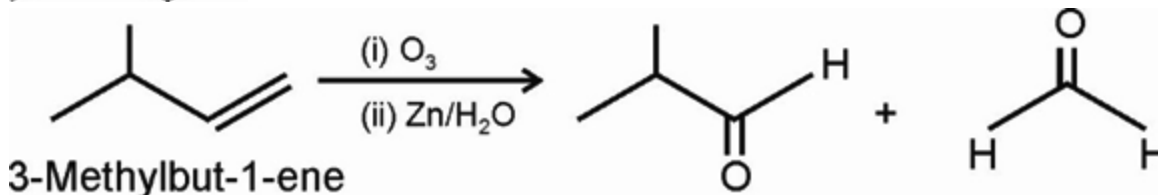
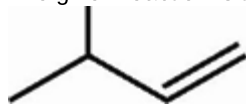
Solution:

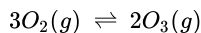


2-Methylpropanal

Formaldehyde

The given reaction is the reductive ozonolysis of an alkene. The alkene will be



**(80) Answer :** (3)**Solution:**

$$K_C = \frac{[O_3]^2}{[O_2]^3}$$

$$[O_3]^2 = K_C [O_2]^3 = 3 \times 10^{-59} \times (0.04)^3$$

$$[O_3]^2 = 1.9 \times 10^{-63} = 19 \times 10^{-64}$$

$$[O_3] = 4.38 \times 10^{-32}$$

Concentration of  $O_3$  at equilibrium =  $4.38 \times 10^{-32}$  M**(81) Answer :** (1)**Solution:**

$$P_A^\circ = 400 \text{ mm Hg} \quad P_B^\circ = 600 \text{ mm Hg}$$

$$P_{\text{total}} = P_A + P_B$$

$$= X_A P_A^\circ + X_B P_B^\circ$$

$$= X_A P_A^\circ + (1 - X_A) P_B^\circ$$

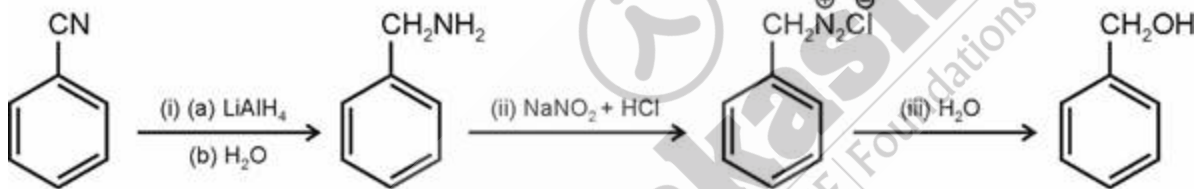
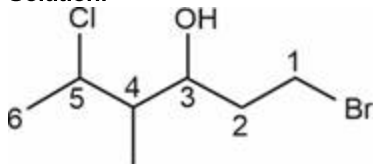
$$= X_A P_A^\circ + P_B^\circ - X_A P_B^\circ = P_B^\circ + (P_A^\circ - P_B^\circ) X_A$$

$$= 450 = 600 + (400 - 600) X_A$$

$$-150 = -200 X_A$$

$$X_A = 0.75$$

$$X_B = 0.25$$

**(82) Answer :** (2)**Solution:****(83) Answer :** (3)**Solution:**

1-bromo-5-chloro-4-methylhexan-3-ol

**(84) Answer :** (1)**Solution:**

Stronger the field strength of ligand, higher will be the energy absorbed by the complex.

 $\Rightarrow$  'en' has a stronger field strength than ' $H_2O$ ' according to spectrochemical series $\therefore$  Correct order of energy absorbed will be:

$$[Ni(en)_3]^{2+} > [Ni(H_2O)_2(en)_2]^{2+} > [Ni(H_2O)_4(en)]^{2+}$$

i.e. (C) &gt; (A) &gt; (B)

**(85) Answer :** (4)**Solution:**

For first order reaction,

$$K = \frac{2.303}{t} \log \frac{[A_0]}{[A]} ; \text{ where } A_0 \text{ is the initial concentration of reactant A.}$$

$$A_0 = 0.1 \text{ M}$$

$$A = 0.001 \text{ M}$$

$$t = 5 \text{ minute}$$

$$K = \frac{2.303}{5} \log \frac{0.1}{0.001} = \frac{2.303}{5} \log 10^2$$

$$= \frac{2.303}{5} \times 2$$

$$K = 0.9212 \text{ min}^{-1}$$

(86) Answer : (3)

Solution:

$$r_n \propto \frac{n^2}{Z}$$

$$\frac{r_3(Li^{2+})}{r_2(He^+)} = \frac{(n_3)^2}{Z(Li^{2+})} \times \frac{Z(He^+)}{(n_2)^2}$$

$$\frac{r_3(Li^{2+})}{105.8} = \frac{(3)^2}{3} \times \frac{2}{(2)^2}$$

$$= 105.8 \times \frac{3}{2}$$

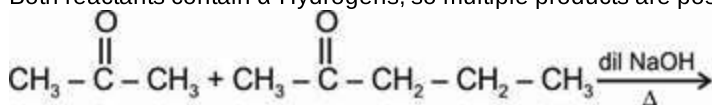
$$r_3(Li^{2+}) = 158.7 \text{ pm}$$

(87) Answer : (4)

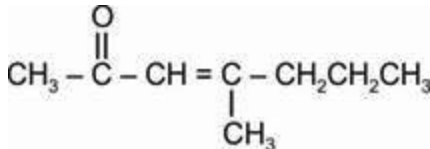
Solution:

Cross Aldol condensation reaction:

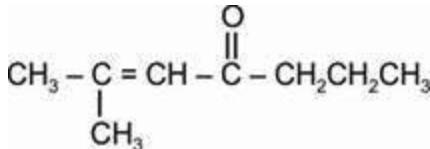
Both reactants contain  $\alpha$ -Hydrogens, so multiple products are possible which are as follows:



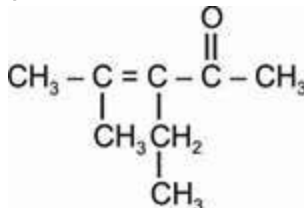
1.



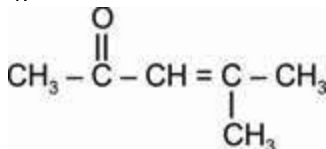
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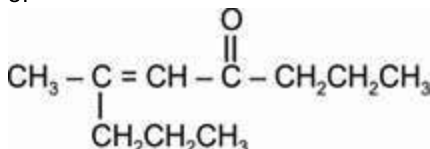
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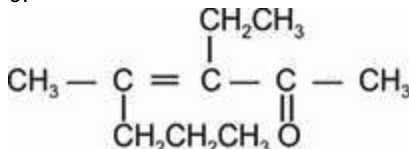
4.



5.

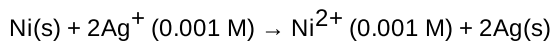


6.



(4) is not possible.

(88) Answer : (1)

**Solution:**

$$E_{cell}^{\circ} = 1.05 \text{ V}$$

$$E_{cell} = E_{cell}^{\circ} - \frac{0.059}{n} \log \frac{[\text{Ni}^{2+}]}{[\text{Ag}^+]^2}$$

$$= 1.05 - \frac{0.059}{2} \log \frac{(10^{-3})}{(10^{-3})^2}$$

$$\Rightarrow 1.05 - \frac{0.059}{2} \log (10)^3$$

$$\Rightarrow 1.05 - 0.0295 \times 3$$

$$= 1.05 - 0.0885$$

$$= 0.9615 \text{ V}$$

**(89) Answer : (1)****Solution:**

Primary, secondary and tertiary alcohols can be differentiated by their reaction with (HCl + anhy ZnCl<sub>2</sub>) Lucas reagent

· 3° alcohol  $\xrightarrow{\text{ZnCl}_2 + \text{HCl}}$  Immediate turbidity at room temperature

· 2° alcohol  $\xrightarrow{\text{ZnCl}_2 + \text{HCl}}$  Turbidity after 5 minutes at room temperature

· 1° alcohol  $\xrightarrow{\text{ZnCl}_2 + \text{HCl}}$  Do not gives turbidity at room temperature

**(90) Answer : (3)****Solution:**

In neutral or faintly alkaline solution.



Manganese (Mn) oxidation state is changing from +7 to +4.

BIOLOGY

**(91) Answer : (1)****Solution:**

Sickle cell anaemia is autosomal recessive disorder, whereas, haemophilia is sex linked recessive disorder. Both sickle cell anaemia and haemophilia are the genetic disorders related to blood.

**(92) Answer : (4)****Solution:**

In oocytes of some vertebrates, diplotene lasts for months or years. This stage is referred as dictyotene stage.

**(93) Answer : (1)****Solution:**

The numbers of species related to different taxa in Amazonian rain forest are as follows:

**Taxa    Number of species**

Plants &gt; 40,000

Mammals 427

Birds 1,300

Fishes 3,000

Invertebrates &gt; 1,25,000

**(94) Answer : (3)****Solution:**

When the small subunit of ribosome encounters an mRNA, the process of translation of the mRNA to protein begins. This process is followed by the binding of bigger/larger subunit.

t-RNA is activated by the addition of amino acid prior to the attachment of ribosome, in the first phase.

**(95) Answer : (3)****Solution:**

Crossing over and exchange of genetic material between homologous chromosomes occurs during pachytene stage of meiosis. The enzyme involved in this process is recombinase.

**(96) Answer : (1)****Solution:**

The reduction step of Calvin cycle involves utilisation of two molecules of ATP for phosphorylation and two molecules of NADPH for reduction per molecule of CO<sub>2</sub> fixed.

(97) Answer : (4)

**Solution:**

The ability of plant to follow different pathways and produce different structures in response to environment is called plasticity.

During differentiation, cells lose their ability to divide and form permanent cell.

The process where the differentiated cells again lose the ability to divide and form permanent cells is called redifferentiation.

(98) Answer : (3)

**Solution:**

*Chlamydomonas* is a unicellular alga. *Cycas* is a gymnosperm. *Selaginella* is a heterosporous pteridophyte and *Sphagnum* is a moss.

(99) Answer : (3)

**Solution:**

In metacentric chromosome, centromere is in the middle of the chromosomes. Acrocentric chromosome has centromere close to the end of the chromosome. In submetacentric chromosome, centromere is slightly away from the middle of the chromosome. Telocentric chromosome has terminal centromere.

(100) Answer : (3)

**Solution:**

Cytokinins are derived from adenine.

- Auxins are derivatives of indole compounds.

- Abscisic acid is derived from carotenoids.

Ethylene is derived from methionine.

(101) Answer : (3)

**Solution:**

Sutton and Boveri proposed chromosomal theory of inheritance. Thomas Morgan experimentally verified the chromosomal theory of inheritance. Gregor Mendel proposed laws of inheritance.

(102) Answer : (4)

**Solution:**

Rhizome is an underground stem modification with distinct nodes and internodes.

(103) Answer : (3)

**Solution:**

The phenomenon where certain living differentiated cells regain or attain their ability to divide and form new cells is known as dedifferentiation.

(104) Answer : (4)

**Solution:**

Perispermic seeds- seeds in which remains of nucellus are seen. The residual, persistent nucellus is called perisperm. Eg: Black pepper, beet

(105) Answer : (2)

**Hint:**

The World Summit on Sustainable Development held in 2002 in Johannesburg, South Africa, 190 countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels.

(106) Answer : (1)

**Solution:**

Option (1) is the incorrect statement, as bright coloured bands of DNA can be observed in the gel when separated DNA fragments are stained with EtBr (Ethidium bromide) followed by exposure to UV radiation.

(107) Answer : (4)

**Solution:**

Option (4) is the correct answer because both the statements are correct but the given reason is not the correct explanation of the assertion. Polymerase chain reaction is used for DNA amplification.

(108) Answer : (1)

**Solution:**

Option (1) is the correct answer as chitin forms the exoskeleton of arthropods and is found in the fungal cell wall as well. N-acetylglucosamine is the monomeric unit of chitin. Cellulose is a polysaccharide and Cutin is a derived lipid and both are component of the plant cell wall.

**(109) Answer :** (1)**Solution:**

Option (1) is the correct answer because statements (c), (d) and (e) are correct. Oils have lower melting point and hence remain as oil in winters. Lipids are generally insoluble in water but soluble in some organic solvents like chloroform or benzene.

Option (2), (3) and (4) are incorrect because statements (a) and (b) are incorrect. Lecithin is a type of phospholipid found in plasma membrane. Saturated fatty acids are without double bond ( $C = C$ ).

**(110) Answer :** (4)**Solution:**

Option (4) is the correct answer as a palindromic DNA sequence is a DNA sequence of base pairs that reads the same on the two strands when orientation of reading is kept the same. Out of the four given options, only option (4) represents a palindromic sequence which is recognised by EcoRI.

5'GAATTC3'

3'CTTAAG5'

**(111) Answer :** (4)**Solution:**

Option (4) is the correct answer as the source of the complementary RNA for RNAi could be mobile genetic elements (transposons) that replicate *via* an RNA intermediate.

Option (1) is incorrect as autoradiography is a technique that uses x-ray films or photographic films to detect and image radioactive materials.

Option (3) is incorrect because polymerase chain reaction is used to make multiple copies of any DNA sample and does not employ the use of transposons.

Option (2) is incorrect because transposons are not required during gene sequencing.

**(112) Answer :** (4)**Solution:**

Option (4) is the correct answer because in directional natural selection, more individuals acquire value other than the mean character value.

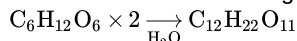
Option (1) is incorrect because in disruptive change, more individuals acquire peripheral character values at both the ends of the distribution curve.

Option (2) is incorrect because there is no random change in natural selection.

Option (3) is incorrect because natural selection leads to stabilisation when more individuals acquire mean character value.

**(113) Answer :** (1)**Solution:**

Option (1) is correct because maltose is a disaccharide formed by dehydration process *i.e.*, synthesis by elimination of one water molecule to form a glycosidic bond in between two glucose molecules. So, its molecular formula will be

**(114) Answer :** (4)**Solution:**

Option (4) is the correct answer because tegmina or forewings (the first pair of wings) in cockroach arises from mesothorax.

Options (1), (2) and (3) are incorrect because no wing arises from prothorax and hindwings arise from metathorax.

**(115) Answer :** (3)**Solution:**

Option (3) is the correct answer because the phylum Chordata is divided into three subphyla – Urochordata, Cephalochordata and Vertebrata. In the subphylum Vertebrata, notochord is replaced by bony or cartilaginous vertebral column in adults. Therefore, all vertebrates are chordates but all chordates are not vertebrates.

**(116) Answer :** (1)**Hint:**

The sclereids are the spherical, oval or cylindrical, highly thickened dead cells with very narrow cavities (lumen). These are found commonly in the fruit wall of nuts.

**(117) Answer :** (2)**Solution:**

The DNA-dependent DNA polymerases catalyse polymerisation only in one direction, that is  $5' \rightarrow 3'$ . This creates some additional complications at the replicating fork. Consequently, on one strand (the template with polarity  $3' \rightarrow 5'$ ), the replication is continuous, while on the other (the template with polarity  $5' \rightarrow 3'$ ), it is discontinuous.

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

Initiation of lateral roots and vascular cambium during secondary growth takes place in pericycle cells of dicot roots.

Epiblema, endodermis and cortex do not dedifferentiate.

**(119) Answer :** (3)**Solution:**In *lac* operon,The *i* gene codes for repressor protein.The *z* gene codes for  $\beta$ -galactosidase.The *y* gene codes for permease and the *a* gene codes for transacetylase.**(120) Answer :** (2)**Solution:**In TCA cycle, the intermediate which is a 5-C compound is  $\alpha$ -ketoglutaric acid.

Oxalosuccinic acid is a 6-C compound, whereas succinic acid and fumaric acid are 4-C compounds.

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

In artificial cross hybridisation, if female parent is bisexual then emasculation is done i.e., removal of anthers, before it dehisce.

If female parent is unisexual, there is no need of emasculation.

After emasculation, flowers are bagged to prevent contamination of stigma.

Desired pollen grains are dusted on stigma and it is rebagged after cross pollination.

Bisexual flowers which show protogynous condition can also be used for artificial hybridisation.

**(122) Answer :** (3)**Hint:**Imbricate aestivation is found in *Cassia*Valvate aestivation is found in *Calotropis*

Vexillary aestivation is found in Bean

Twisted aestivation is found in cotton

**(123) Answer :** (1)**Hint:**

During glycolysis, total 4 ATPs are produced from one glucose molecule with a net gain of 2 ATPs.

**(124) Answer :** (3)**Solution:**

The floral diagram given in the question represents Brassicaceae family. It can be easily identified by looking on its parietal placentation

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

Genetic material of

- Bacteriophage  $\phi \times 174$  contains 5386 nucleotides
- Bacteriophage lambda contains 48502 basepairs
- *Escherichia coli* contains  $4.6 \times 10^6$  basepairs
- Haploid content of human DNA contains  $3.3 \times 10^9$  basepairs

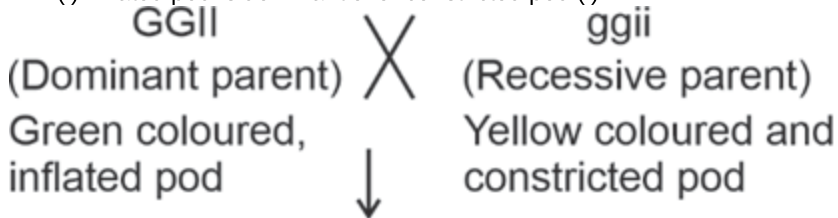
**(126) Answer :** (3)**Solution:**

Substances that have a hydrophilic moiety find it difficult to pass through the plasma membrane; thus, their movement has to be facilitated.

**(127) Answer :** (4)**Solution:**

(G) Green pod colour is dominant over yellow pod colour (g)

(I) Inflated pod is dominant over constricted pod (i)

Ggli  $\rightarrow$  F<sub>1</sub> progeny

(Green coloured, Inflated pod)

Ggli  $\times$  Ggli  $\rightarrow$  selfing

Expected percentage of F<sub>2</sub> progeny with yellow – inflated pod in this cross is

$$\frac{1}{4} \times \frac{3}{4} \times 100 = 18.75\%$$

(128) Answer : (1)

**Solution:**

Decomposition is the process by which decomposers breakdown complex organic matter into inorganic substances. The rate of decomposition is controlled by chemical composition of detritus and climatic factors. Decomposition is slower if detritus is rich in lignin and chitin and quicker, if detritus is rich in nitrogen and water soluble substances like sugars.

(129) Answer : (1)

**Solution:**

If the affected individual is with small head, furrowed tongue, partially open mouth and broad palm with characteristic palm crease and also the physical, psychomotor and mental development is retarded, the individual is suffering from Down's syndrome, an autosomal trisomy. Karyotype analysis of such an individual will show trisomy of chromosome 21.

(130) Answer : (3)

**Solution:**

In predation, one species is benefitted where as the other is harmed. It is (+ –) type of population interaction.

(131) Answer : (1)

**Solution:**

The correct answer is option (1) because hCG (human chorionic gonadotropin) is secreted by placenta. Leydig cells secrete androgens. Ovary secretes both estrogen and progesterone. Follicles present in ovary secrete estrogen and corpus luteum secretes progesterone.

(132) Answer : (4)

**Solution:**

Option (4) is the correct answer because every 100 mL of oxygenated blood can deliver around 5 mL of O<sub>2</sub> to the tissues, under normal physiological conditions.

Option (1), (2) and (3) are incorrect because every 100 mL of deoxygenated blood delivers approximately 4 mL of CO<sub>2</sub> to the alveoli.

(133) Answer : (2)

**Solution:**

Option (2) is the correct answer because two additional chambers, like crop and gizzard is present in the alimentary canal of birds.

*Pavo* (Peacock), *Psittacula* (Parrot), *Corvus* (Crow) and *Columba* (Pigeon) are birds.

Option (1), (3) and (4) are incorrect because *Catla* is a bony fish; *Crocodilus*, *Chameleon* and *Bangarus* are reptiles; *Bufo* is an amphibian and *Balaenoptera* is an aquatic mammal.

(134) Answer : (3)

**Solution:**

The correct answer is option (3). Early movements of foetus are evident around 20 weeks of human pregnancy. By the end of 24 weeks, eyelids separate and eyelashes are formed and the body is covered with fine hair.

(135) Answer : (2)

**Solution:**

Option (2) is the correct answer because birds (*Pavo*) excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water.

Option (1) and (4) are incorrect because many bony fishes (like *Hippocampus*) and aquatic amphibians (like *Salamandra*) are ammonotelic in nature.

Option (3) is incorrect because mammals (like *Ornithorhynchus*) mainly excrete urea and are called ureotelic animals.

(136) Answer : (4)

**Solution:**

Option (4) is the correct answer because cartilage (forming the intervertebral disc) is present between the adjacent bones of the vertebral column and it is a type of cartilaginous joint.

Option (1) is incorrect because areolar tissue is present beneath the skin and it is a type of loose connective tissue.

Option (2) is incorrect because smooth muscles are present in the visceral organs.

Option (3) is incorrect because intercalated discs are the characteristic feature of cardiac muscles present in heart.

(137) Answer : (3)

**Solution:**

Option (3) is the correct answer as cortisol is a steroidal hormone. Endorphins are natural painkillers that are neuropeptides.

Epinephrine/adrenaline is a catecholamine and a biogenic amine.

**(138) Answer :** (1)

**Solution:**

Option (1) is the correct answer because Statement II is incorrect as the transformation of spermatids into spermatozoa (sperms) are called spermiogenesis. After this, sperm head becomes embedded in the Sertoli cells and are finally released into the lumen of seminiferous tubules by the process called spermiation. Hence, Statement I is a correct statement. Spermatogenesis is the process of formation of sperms from spermatogonia.

**(139) Answer :** (2)

**Solution:**

Option (2) is the correct answer because coagulum or clot is formed mainly of a network of threads called fibrins. Hence, Statement I is incorrect.

RBCs are destroyed in the spleen after completion of their life span, so spleen is known as the graveyard of erythrocytes. Hence, Statement II is correct.

**(140) Answer :** (2)

**Solution:**

Option (2) is the correct answer.

- In both, spermatogenesis and oogenesis, haploid gametes are formed. So (a) is true for both.
- The spermatids are transformed into spermatozoa (sperms) by the process called spermiogenesis after the completion of meiosis. Hence, (b) is true for spermatogenesis only.
- Both spermatogenesis and oogenesis are controlled by LH and FSH secreted by the anterior pituitary. Hence (d) is true for both.
- Spermatogenesis is a continuous process that begins at puberty. So (e) is true for spermatogenesis only. Oogenesis, on the other hand, begins during embryonic development of the female.

**(141) Answer :** (1)

**Solution:**

Option (1) is the correct answer because the intrauterine device (IUD) presently available as the non-medicated IUD, is Lippes loop.

Option (2) is incorrect as are CuT, Cu7 and Multiload 375 are copper releasing IUDs

Option (3) and (4) are incorrect as diaphragms, cervical caps and vaults are categorized as barrier methods of contraception.

**(142) Answer :** (3)

**Solution:**

Option (3) is the correct answer because arthritis is inflammation of joints.

Option (1) is incorrect because myasthenia gravis is an auto-immune disorder affecting the neuro-muscular junction leading to fatigue, weakening and paralysis of skeletal muscles.

Option (2) is incorrect because muscular dystrophy is progressive degeneration of skeletal muscles mostly due to genetic disorder.

Option (4) is incorrect because tetany is rapid spasms in muscle due to low  $\text{Ca}^{++}$  in body fluid.

**(143) Answer :** (2)

**Solution:**

Option (2) is the correct answer. The part starting with the external nostrils upto the terminal bronchioles constitute the conducting part; whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system.

The conducting part transports the atmospheric air to the alveoli, clears it from foreign particles, humidifies and also brings the air to body temperature. Exchange part is the site of actual diffusion of  $\text{O}_2/\text{CO}_2$  between blood and atmospheric air.

**(144) Answer :** (2)

**Solution:**

Option (2) is the correct answer as

- Neuroglia are the supportive cells of nervous tissue. They make up more than half the volume of neural tissue. Neurons, the unit of neural system, are excitable cells.
- Cartilage and blood are categorised as specialised type of connective tissues.
- Adipose tissue is a loose connective tissue.

**(145) Answer :** (3)

**Solution:**

Option (3) is the correct answer because both the statements I and II are correct.

Each restriction endonuclease recognises a specific palindromic nucleotide sequences in the DNA. It will bind to the DNA and cut each of the two strands of double helix at specific point.

Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome site; but between the same two bases on the opposite strands. So, both the statements I and II are correct.

**(146) Answer :** (2)**Solution:**

Option (2) is the correct answer as genetically engineered lymphocytes are not immortal cells and die after some time.

Option (1) is not the correct answer. The lymphocytes from patient's blood are grown in culture outside the body, but it is not the correct reason.

Option (4) is also incorrect as if the gene isolated from bone marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure.

**(147) Answer :** (1)**Solution:**

Option (1) is the correct answer as osteoporosis is caused due to decreased levels of estrogen.

Osteoporosis is an age-related disorder characterised by decreased bone mass, hence, the chances of fractures increase.

**(148) Answer :** (4)**Solution:**

Option (4) is the correct answer as oogenesis is initiated during the embryonic development stage when million gamete mother cells (oogonia) are formed within each foetal ovary.

No more oogonia are formed and added after birth in a human female.

At puberty, only 60,000 to 80,000 primary follicles are left in each ovary, rest degenerate during the phase from birth to puberty.

Spermatogenesis is initiated at the on-set of puberty.

**(149) Answer :** (1)**Solution:**

Option (1) is the correct answer as auto-immune disorder is a condition where body defense mechanism recognises its own cells as foreign bodies. Sometimes, due to genetic and other unknown reasons, the body attacks self- cells.

Rheumatoid arthritis is an example where body attacks self cells (synovial membrane).

So, Statement I is correct but Statement II is incorrect.

**(150) Answer :** (2)**Solution:**

Option (2) is the correct answer as glycogen is a polysaccharide and is a storage product in animals.

- Globulins form antibodies which are also known as immunoglobulins.
- Some hormones are steroidal in nature as they are derivatives of cholesterol.
- Trypsin is a biocatalyst which acts on peptides.

**(151) Answer :** (4)**Solution:**

Option (4) is the correct answer because parathyroid hormone is a hypercalcemic hormone *i.e.*, it increases the blood calcium levels. It also increases the absorption of calcium from digested food. Glucocorticoids regulate the carbohydrate metabolism.

Option (a) is not included in the answer because parathyroid hormone stimulates the process of bone resorption.

Option (2) and (3) gets eliminated as option (c) is correct w.r.t PTH. Reabsorption of  $\text{Ca}^{2+}$  by renal tubules gets stimulated due to PTH.

**(152) Answer :** (2)**Solution:**

Option (2) is the correct answer. Cloning vectors are the carriers of the desired gene in the host cell. The features desirable in a cloning vector are:-

- Presence of origin of replication (*ori*)
- Presence of marker genes (for selection of transformants)
- Presence of very few, preferably a single recognition site, for the commonly used restriction enzymes.
- Presence of two or more restriction sites, for a single restriction enzyme, complicates the process of gene cloning.

**(153) Answer :** (4)**Solution:**

Option (4) is the correct answer.

- Diaphragms are categorized as barrier method of contraception. They cover the cervix and block the entry of sperms.
- Contraceptive pills are preparations containing either progestogens alone or combinations of progestogen and estrogen. They inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent entry of sperms.
- Intra uterine devices increase the phagocytosis of sperms within the uterus.
- Lactational amenorrhoea is a natural method of contraception and it is based on the fact that the ovulation and therefore, the menstrual cycle do not occur during the period of intense lactation following parturition.

**(154) Answer :** (2)**Solution:**

Option (2) is the correct answer because flippers of penguins and dolphins are analogous organs as they help in swimming but do not have the same structure.

Option (1), (3) and (4) are true statements and hence cannot be the correct answer.

Homologous organs have the same structure but have different functions according to the needs of the organisms. Hence, homology indicates common ancestry.

Analogous structures have developed for the same function but do not show any similarity in structure. Hence, they are a result of convergent evolution.

Sweet potato is a root modification for food storage whereas potato is an underground stem modification for storage. Hence, they are analogous organs.

**(155) Answer :** (2)

**Solution:**

Option (2) is the correct answer as acquired immunity is a specific type of defence which is not present at the time of birth. Innate immunity is non-specific type of defense and it is present at the time of birth.

Option (1), (3) and (4) are true statements and hence cannot be the answer.

Anamnestic response or secondary immune response is a highly intensified response produced due to memory of the first encounter.

When our body encounters a pathogen for the first time then, the body elicits the primary immune response.

When there is a subsequent encounter with the same pathogen, secondary or anamnestic immune response is elicited.

**(156) Answer :** (2)

**Solution:**

Khasi Hills in Meghalaya are sacred groves. Zoological park is an *ex-situ* conservation strategy.

Nile perch is an alien species.

Amazon rain forest releases large quantity of O<sub>2</sub>

**(157) Answer :** (4)

**Solution:**

Correct sequence of events during Prophase I of meiosis is : (b) → (a) → (c) → (e) → (d)

(b) Chromosomes become gradually visible under microscope.

(a) Synapsis of homologous chromosomes.

(c) Crossing over between non-sister chromatids of homologous chromosomes.

(e) Dissolution of synaptonemal complex.

(d) Terminalisation of chiasmata.

**(158) Answer :** (4)

**Solution:**

Frugivorous birds are fruit eating birds found in large number in tropical forest mainly because of availability of fruits throughout the year.

**(159) Answer :** (3)

**Solution:**

- Primary acceptor of electron transfers its electron not to an electron carrier but to an H carrier.

- Protons increase in number in lumen of the thylakoid not in stroma.

**(160) Answer :** (4)

**Solution:**

If hybrid seeds are made into apomicts, there is no segregation of characters in the hybrid progeny

Then the farmers can keep on using the hybrid seeds to raise new crop year after year and they does not have to buy hybrid seeds every year.

**(161) Answer :** (2)

**Solution:**

Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called plasticity e.g. heterophylly in cotton, coriander and larkspur. In such plants, leaves of juvenile plant are different in a shape from those in mature plants.

Maize does not show plasticity.

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

**Solution:**

Gregor J. Mendel, conducted hybridisation experiments on garden peas and selected 14 true breeding pea plant varieties (seven contrasting traits). Contrasting traits studied were smooth or wrinkled seeds, yellow or green seeds, inflated or constricted pods, green or yellow pods, tall or dwarf plants, violet or white flowers and axial or terminal flower positions.

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

**Solution:**

Hydrocolloids are water holding substances for eg. carrageen obtained from red algae (Rhodophyceae).

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

**Solution:**

When a flower can be divided into two similar halves only in one particular vertical plane, it is zygomorphic for e.g. pea, gulmohar, bean, *Cassia*. Mustard, *Datura* and Chilli show actinomorphic flowers.

(165) Answer : (4)

**Solution:**

*In-situ* conservation means on site conservation i.e. when we conserve and protect the whole ecosystem, its biodiversity at all levels is protected.

National parks are type of *in-situ* conservation.

Whereas, micropropagation, cryopreservation and *in-vitro* fertilisation are methods of *ex-situ* conservation.

(166) Answer : (2)

**Solution:**

Less than seven percent of the energy in glucose is released during lactic acid fermentation and not all of it is trapped as high energy bonds of ATP.

(167) Answer : (4)

**Solution:**

Heterochromatin is transcriptionally inactive. A typical nucleosome contains 200 bp of DNA helix.

Euchromatin is the loosely packed chromatin region.

The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome. Histones are rich in basic amino acid residues lysine and arginine.

(168) Answer : (4)

**Solution:**

Ethylene is a gaseous plant hormone. It induces development of adventitious roots on various types of cutting. It promotes the development of lateral roots and growth of root hairs. Cytokinin helps to overcome the apical dominance.

Auxin is used to kill dicot weeds. Gibberellin speeds up the malting process

(169) Answer : (1)

**Solution:**

Grasshopper is an example of XO type of sex determination in which the males have only one X-chromosome besides the autosomes, whereas females have a pair of X-chromosomes.

(170) Answer : (1)

**Solution:**

Ethylene increases the number of female flowers and fruits in certain plants such as cucumber. Gibberellins are used to increase the size of fruits in some plants.

(171) Answer : (3)

**Solution:**

Option (3) is the correct answer.

Ciliated epithelium is mainly present in the inner surface of hollow organs like bronchioles and fallopian tubes. Their function is to move particles or mucus in a specific direction over the epithelium.

Some of the columnar or cuboidal cells get specialised for secretion and are called glandular epithelium. Goblet cells are unicellular glands.

Tendons are dense regular connective tissues. They attach skeletal muscles to bones.

Adipose tissue is a type of loose connective tissue located mainly beneath the skin. The cells of this tissue are specialised to store fats.

(172) Answer : (4)

**Solution:**

Option (4) is the correct answer as genetically engineered insulin has A-peptide and B-peptide chains of insulin which are produced separately in *E.coli*, then they are extracted and combined by creating disulphide bonds between them.

Statement (a) is incorrect as genetically engineered insulin does not have an extra stretch of C-peptide.

Statement (c) is incorrect as insulin obtained from cattles and pigs is not genetically engineered insulin.

Statement (d) is incorrect because conversion of pro-insulin to insulin is not required during production of insulin by genetic engineering as A-peptide and B-peptide chains are produced separately.

Statement (e) is incorrect as allergic reactions to insulin are mostly seen when the insulin is obtained from animals.

(173) Answer : (2)

**Solution:**

Option (2) is the correct answer as impulse transmission across an electrical synapse is always faster than that across a chemical synapse.

Chemical synapses use chemicals for impulse transmission which are known as neurotransmitters.

The membranes of pre-synaptic and post-synaptic neurons are in close proximity in an electrical synapse.

In an electrical synapse, the transmission of the impulse occurs in the form of an electrical current from one neuron to the next neuron.

(174) Answer : (1)

**Solution:**

Option (1) is the correct answer because during joint diastole, blood moves freely from atrium to ventricle as atrioventricular valves remain open during joint diastole.

Option (2) is incorrect because decrease in ventricular pressure (during ventricular diastole) closes semilunar valves to produce the 'dub' heart sound.

Option (3) is incorrect because SA node generates the maximum number of action potentials to stimulate atrial contraction.

Option (4) is incorrect because bicuspid and tricuspid valves open due to pressure exerted by blood (present in atria) and decrease in pressure in ventricles during ventricular diastole.

**(175) Answer :** (2)

**Solution:**

Biopiracy is term used for or refer to the use of bioresources by multinational companies and other organisation without proper authorisation from the countries and people concerned with compensatory payment

**(176) Answer :** (4)

**Solution:**

This technique is used for making multiple copies of gene (or DNA) of interest in vitro.

Each cycle has three steps

(i) Denaturation

(ii) Primer annealing

(iii) Extension of primer

**(177) Answer :** (3)

**Solution:**

Epinephrine is derived from tyrosine amino acid by the removal of carboxyl group. It is a catecholamine.

**(178) Answer :** (2)

**Solution:**

'Smack' also called as brown sugar/Heroin is formed by acetylation of morphine. It is obtained from the latex of unripe capsule of Poppy plant.

**(179) Answer :** (2)

**Solution:**

As per mutation theory given by Hugo de Vries, the evolution is a discontinuous phenomenon or saltatory phenomenon/saltation.

**(180) Answer :** (4)

**Solution:**

Nissl granules are present in the cyton and even extend into the dendrite but absent in axon and rest of the neuron. Nissl granules are in fact composed of free ribosomes and RER. They are responsible for protein synthesis.