

## AIPMT 2014

**Q.1** If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are -

- (1)  $[FVT^{-1}]$                       (2)  $[FVT^{-2}]$   
(3)  $[FV^{-1}T^{-1}]$                 (4)  $[FV^{-1}T]$

**Ans.** [4]

**Sol.**

Assuming

$$M = F^a V^b T^c$$

Here we have to calculate value of a, b, c

Dimension of L.H.S. = R.H.S.

$$M^1 L^0 T^0 = (M^1 L^1 T^{-2})^a (L^1 T^{-1})^b (T^1)^c$$

$$M^1 L^0 T^0 = M^a L^{a+2a} T^{-2a-b+c}$$

$$M^1 L^0 T^0 = M^a L^{a+b} T^{-2a-b+c}$$

Comparing power of M

$$a = 1 \quad \dots(1)$$

Comparing power of L

$$a + b = 0$$

$$1 + b = 0$$

$$b = -1$$

Comparing power of T

$$0 = -2a - b + c$$

Putting value of 'a' and 'b'

$$0 = -2(1) - (-1) + c$$

$$0 = -1 + c$$

$$c = 1$$

So  $M = F^1 V^{-1} T^1$

**Q.2** A projectile is fired from the surface of the earth with a velocity of  $5 \text{ ms}^{-1}$  and angle  $\theta$  with the horizontal. Another projectile fired from another planet with a velocity of  $3 \text{ ms}^{-1}$  at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in  $\text{ms}^{-2}$ ) - (given  $g = 9.8 \text{ ms}^{-2}$ )

- (1) 3.5                                      (2) 5.9  
(3) 16.3                                    (4) 110.8

**Ans.** [1]

**Sol.** Here range should be same

$$R_1 = R_2$$

$$\frac{u_e^2 \sin 2\theta}{2g_e} = \frac{u_p^2 \sin 2\theta}{2g_p}$$

$$\frac{5^2 \times \sin 2\theta}{2 \times 9.8} = \frac{3^2 \times \sin 2\theta}{2 \times g_p}$$

$$g_p = \frac{9.8 \times 9}{25} = 3.52 \text{ m/s}^2$$

**Q.3** A particle is moving such that its position coordinates (x, y) are

(2m, 3m) at time t = 0.

(6m, 7m) at time t = 2 s and

(13m, 14m) at time t = 5s.

Average velocity vector  $\left( \vec{V}_{av} \right)$  from t = 0 to

t = 5 s is -

(1)  $\frac{1}{5} (13\hat{i} + 14\hat{j})$       (2)  $\frac{7}{3} (\hat{i} + \hat{j})$

(3)  $2 (\hat{i} + \hat{j})$       (4)  $\frac{11}{5} (\hat{i} + \hat{j})$

**Ans.** [4]

**Sol.** Average velocity =  $\frac{\text{displacement}}{\text{time taken}}$

$$= \frac{\vec{r}_2 - \vec{r}_1}{t_2 - t_1}$$

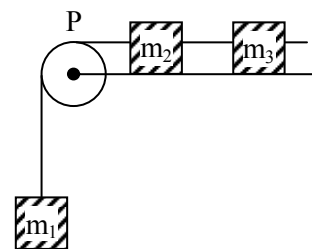
$$= \frac{(13\hat{i} + 14\hat{j}) - (2\hat{i} + 3\hat{j})}{5 - 0}$$

$$= \frac{11\hat{i} + 11\hat{j}}{5}$$

$$= \frac{11}{5} (\hat{i} + \hat{j})$$

**Q.4** A system consists of three masses  $m_1$ ,  $m_2$  and  $m_3$  connected by a string passing over a pulley P. The mass  $m_1$  hangs freely and  $m_2$  and  $m_3$  are on a rough horizontal table (the coefficient of friction =  $\mu$ ). The pulley is frictionless and of negligible mass. The downward acceleration of mass  $m_1$  is -

(Assume  $m_1 = m_2 = m_3 = m$ )



(1)  $\frac{g(1 - g\mu)}{9}$

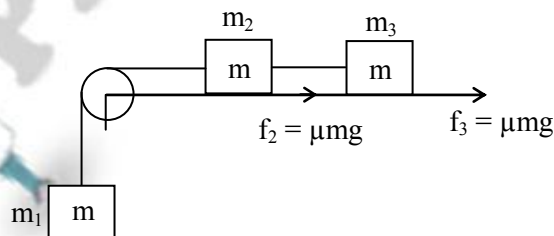
(2)  $\frac{2g\mu}{3}$

(3)  $\frac{g(1 - 2\mu)}{3}$

(4)  $\frac{g(1 - 2\mu)}{2}$

**Ans.** [3]

**Sol.**



Here friction  $f_2$  and  $f_3$  will oppose the motion and weight ( $m_1g = mg$ ) will support the motion

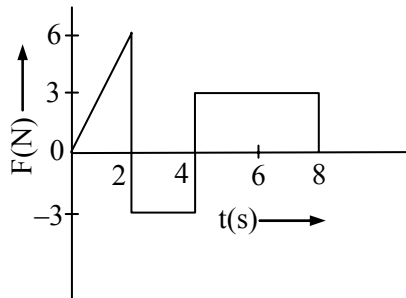
so acceleration (a) =  $\frac{\text{Net force}}{\text{Total mass}}$

$$a = \frac{mg - \mu mg - \mu mg}{3m}$$

$$a = \frac{mg(1 - 2\mu)}{3m}$$

$$a = \frac{g(1 - 2\mu)}{3}$$

**Q.5** The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is -

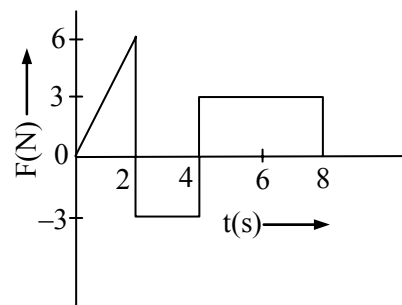


- (1) 24 Ns                      (2) 20 Ns  
(3) 12 Ns                      (4) 6 Ns

**Ans.** [3]

**Sol.**

Change in momentum will be equal to the area between F- t curve and time axis



$$\text{Area } \Delta p = 6 - 6 + 12 = 12 \text{ Ns}$$

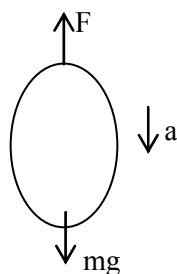
**Q.6** A balloon with mass 'm' is descending down with an acceleration 'a' (where  $a < g$ ). How much mass should be removed from it so that it starts moving up with an acceleration 'a' ?

- (1)  $\frac{2ma}{g+a}$                       (2)  $\frac{2ma}{g-a}$   
(3)  $\frac{ma}{g+a}$                       (4)  $\frac{ma}{g-a}$

**Ans.** [1]

**Sol.**

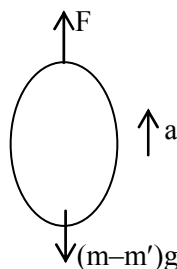
When balloon is descending



F is thrust force

$$mg - F = ma \dots (i)$$

When  $m'$  mass is removed balloon start moving up



so

$$F - (m - m')g = (m - m')a \dots (ii)$$

From (i) + (ii)

$$mg - (m - m')g = ma + (m - m')a$$

$$m'g = ma + ma - m'a$$

$$m'(g + a) = 2ma$$

$$m' = \frac{2ma}{g + a}$$

**Q.7** A body of mass (4m) is lying in x-y plane at rest. It suddenly explodes into three pieces. Two pieces, each of mass (m) move perpendicular to each other with equal speeds (v). The total kinetic energy generated due to explosion is -

- (1)  $mv^2$                       (2)  $3/2 mv^2$   
 (3)  $2 mv^2$                       (4)  $4 mv^2$

**Ans.** [2]

**Sol.**

Using law of conservation of linear momentum

momentum before explosion = after explosion

$$0 = \vec{p}_1 + \vec{p}_2 + \vec{p}_3$$

$$\vec{p}_3 = -(\vec{p}_1 + \vec{p}_2)$$

$$|\vec{p}_3| = |-(\vec{p}_1 + \vec{p}_2)| = \sqrt{p_1^2 + p_2^2} \quad \because p_1 \perp p_2$$

$$m_3 v_3 = \sqrt{(m_1 v_1)^2 + (m_2 v_2)^2}$$

$$[\text{given } m_1 = m_2 = m ; v_1 = v_2 = v ; m_3 = 2m]$$

$$2m v_3 = \sqrt{(mv)^2 + (mv)^2}$$

$$v_3 = \frac{\sqrt{2}mv}{2m} = \frac{v}{\sqrt{2}}$$

so total kinetic energy generated in the explosion

$$\begin{aligned} \Delta K &= \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}2m\left(\frac{v}{\sqrt{2}}\right)^2 \\ &= \frac{3}{2}mv^2 \end{aligned}$$

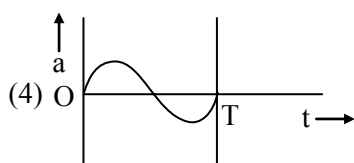
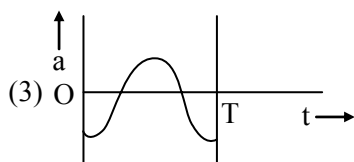
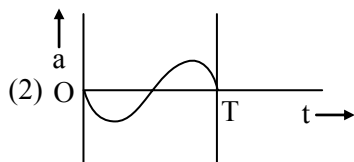
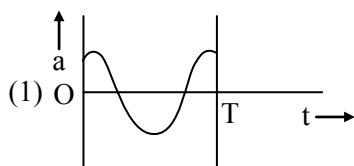
**Q.8** The oscillation of a body on a smooth horizontal surface is represents by the equation

$$X = A \cos(\omega t)$$

where X = displacement at time t

$\omega$  = frequency of oscillation

Which one of the following graph shows correctly the variation 'a' with 't' ?



Here  $a$  = acceleration at time  $t$

$T$  = time period

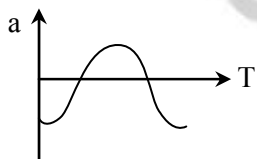
**Ans.** [3]

**Sol.**

$$X = A \cos \omega t$$

$$V = \frac{dX}{dt} = -A\omega \sin \omega t$$

$$a = \frac{dV}{dt} = -A\omega^2 \cos \omega t$$



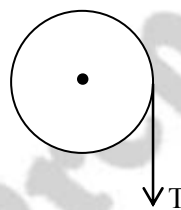
**Q.9** A solid cylinder of mass 50 kg and radius 0.5 m is free to rotate about the horizontal axis. A massless string is wound round the cylinder with one end attached to it and

other hanging freely. Tension in the string required to produce an angular acceleration of 2 revolutions  $s^{-2}$  is -

- (1) 25 N                      (2) 50 N  
(3) 78.5 N                  (4) 157 N

**Ans.** [4]

**Sol.**



given  $m = 50 \text{ kg}$ ,  $R = 0.5 \text{ m}$

$$\alpha = 2 \text{ rev./s}^2 = 2 \times 2\pi \text{ rad/s}^2$$

here tension will produce the torque

$$\tau = I\alpha$$

$$TR = \frac{MR^2}{2} \alpha$$

$$T(0.5) = \frac{50 \times (0.5)^2}{2} \times 2 \times 2\pi$$

$$T = 157 \text{ N}$$

**Q.10** The ratio of the accelerations for a solid sphere (mass 'm' and radius 'R') rolling down an incline of angle ' $\theta$ ' without slipping and slipping down the incline without rolling is -

- (1) 5 : 7                      (2) 2 : 3  
(3) 2 : 5                      (4) 7 : 5

**Ans.** [1]

**Sol.**

When sphere is rolling

$$a_r = \frac{g \sin \theta}{1 + k^2/R^2}$$

when sphere is sliding

$$a_s = \frac{g \sin \theta}{1 + 0} \quad \left[ \text{for sliding } \frac{k^2}{R^2} = 0 \right]$$

$$\frac{a_r}{a_s} = \frac{\frac{g \sin \theta}{1 + \frac{2}{5}}}{g \sin \theta} = \frac{5}{7}$$

**Q.11** A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass =  $5.98 \times 10^{24}$  kg) have to be compressed to be a black hole ?

- (1)  $10^{-9}$  m                      (2)  $10^{-6}$  m  
(3)  $10^{-2}$  m                      (4) 100 m

**Ans.** [3]

**Sol.**

Escape velocity on a black hole should be more or equal to speed of light

$$c \leq v_{es}$$

$$c \leq \sqrt{\frac{2GM}{R}}$$

$$3 \times 10^8 \leq \sqrt{\frac{2 \times 6.67 \times 10^{-11} \times 5.98 \times 10^{24}}{R}}$$

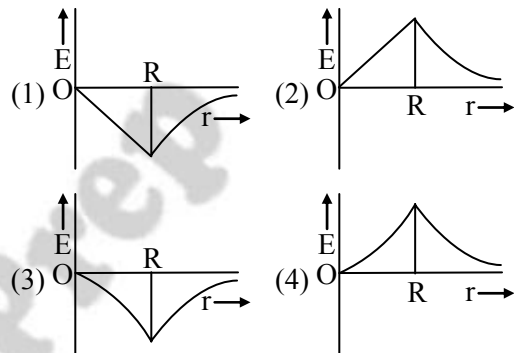
$$9 \times 10^{16} \leq \frac{2 \times 6.67 \times 10^{-11} \times 5.98 \times 10^{24}}{R}$$

$$R \leq \frac{2 \times 6.67 \times 5.98 \times 10^{13}}{9 \times 10^{16}}$$

$$R \leq 8.86 \times 10^{-3}$$

$$R \simeq 10^{-2} \text{ m}$$

**Q.12** Dependence of intensity of gravitational field (E) of earth with distance (r) from centre of earth is correctly represented by -



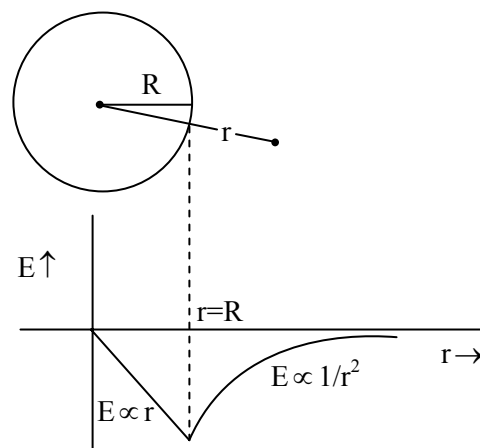
**Ans.** [1]

**Sol.** For solid sphere gravitational intensity

$$\text{When } r > R \quad E = -\frac{GM}{R^3}r$$

$$r = R \quad E = -\frac{GM}{R^2}$$

$$r > R \quad E = -\frac{GM}{r^2}$$





**Q.13** Copper of fixed volume 'V' is drawn into wire of length 'l'. When this wire is subjected to a constant force 'F', the extension produced in the wire is ' $\Delta l$ '. Which of the following graphs is a straight line ?

- (1)  $\Delta l$  versus  $1/l$       (2)  $\Delta l$  versus  $l^2$   
 (3)  $\Delta l$  versus  $1/l^2$       (4)  $\Delta l$  versus  $l$

**Ans.** [2]

**Sol.** 
$$Y = \frac{\text{stress}}{\text{strain}} = \frac{F/A}{\frac{\Delta l}{l}} = \frac{F l}{\Delta l A}$$

$$\Delta l = \left( \frac{F}{YA} \right) l$$

Here  $F = \text{constant}$  ;  $Y = \text{constant}$

$$V = A l = \text{constant}$$

$$A \propto \frac{1}{l}$$

$$\Delta l \propto \frac{A}{l} \propto l^2$$

$$\Delta l \propto l^2$$

Graph between  $\Delta l$  and  $l^2$  is straight line.

**Q.14** A certain number of spherical drops of a liquid of radius 'r' coalesce to form a single drop of radius 'R' and volume 'V'. If 'T' is the surface tension of the liquid, then -

(1) energy =  $4VT \left( \frac{1}{r} - \frac{1}{R} \right)$  is released

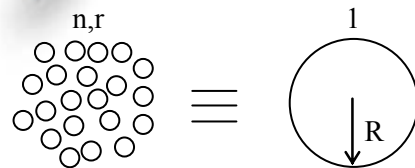
(2) energy =  $3VT \left( \frac{1}{r} + \frac{1}{R} \right)$  is absorbed

(3) energy =  $3VT \left( \frac{1}{r} - \frac{1}{R} \right)$  is released

(4) energy is neither released nor absorbed

**Ans.** [3]

**Sol.**



$$\text{Volume same} \Rightarrow n \left( \frac{4}{3} \pi r^3 \right) = \frac{4}{3} \pi R^3$$

$$\boxed{R = (n)^{1/3} r}$$

$$n = \frac{R^3}{r^3}$$

$$U = T \Delta A$$

$$= T[4\pi R^2 - n4\pi r^2]$$

$$= 4\pi T[R^2 - nr^2]$$

$$= 4\pi T \left[ R^2 - \frac{R^3}{r^3} r^2 \right]$$

$$= 4\pi R^3 T \left[ \frac{1}{R} - \frac{1}{r} \right]$$

$$= 3 \left( \frac{4}{3} \pi R^3 \right) T \left( \frac{1}{R} - \frac{1}{r} \right)$$

$$\boxed{U = 3VT \left( \frac{1}{R} - \frac{1}{r} \right)} \quad (R > r)$$

$$\boxed{U = 3VT \left( \frac{1}{r} - \frac{1}{R} \right)} \text{ is released}$$

**Q.15** Steam at 100°C is passed into 20 g of water at 10°C. When water acquires a temperature of 80°C, the mass of water present will be -

[Take specific heat of water = 1 cal g<sup>-1</sup>°C<sup>-1</sup> and latent heat of steam = 540 cal g<sup>-1</sup>]

(1) 24 g                      (2) 31.5 g

(3) 42.5 g                      (4) 22.5 g

**Ans.** [4]

**Sol.**

$$\Delta Q_{\text{gain}} = M_w C_w (80 - 10)$$

$$\Delta Q_{\text{loss}} = M_s L_v + M_s C_w (100 - 80)$$

$$\Delta Q_{\text{gain}} = \Delta Q_{\text{loss}}$$

$$20 \times 1 \times 70 = M_s(540) + M_s(1)(80)$$

$$M_s = \frac{1400}{620} \text{ gm} = 2.2580 \text{ gm}$$

$$M_{\text{net}} = M_w + M_s$$

$$= 20 + 2.25$$

$$= 22.5 \text{ gm}$$

**Q.16** Certain quantity of water cools from 70°C to 60°C in the first 5 minutes and 60°C to 54°C in the next 5 minutes. The temperature of the surroundings is -

(1) 45°C                      (2) 20°C

(3) 42°C                      (4) 10°C

**Ans.** [1]

**Sol.** From Newtons law of cooling

$$\left( \frac{T_1 - T_2}{t} \right) = C_1 \left( \frac{T_1 + T_2}{2} - T_0 \right)$$

$$\left( \frac{70 - 60}{5} \right) = C_1 \left( \frac{70 + 60}{2} - T_0 \right) \dots (1)$$

$$\left( \frac{60 - 54}{5} \right) = C_1 \left( \frac{60 + 54}{2} - T_0 \right) \dots (2)$$

$$\frac{10}{5} = \frac{C_1(65 - T_0)}{C_1(57 - T_0)}$$

$$10(57 - T_0) = 6(65 - T_0)$$

$$570 - 10T_0 = 390 - 6T_0$$

$$4T_0 = 570 - 390$$

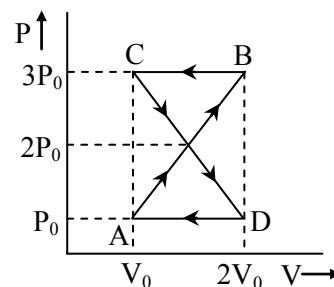
$$T_0 = 45^\circ\text{C}$$



**Q.17** A monoatomic gas at a pressure  $P$ , having a volume  $V$  expands isothermally to a volume  $2V$  and then adiabatically to a volume  $16V$ . The final pressure of the gas is – (take  $\gamma = 5/3$ )

- (1)  $64 P$                       (2)  $32 P$   
 (3)  $P/64$                       (4)  $16 P$

**Ans.** [3]



- (1)  $P_0 V_0$                       (2)  $2P_0 V_0$   
 (3)  $\frac{P_0 V_0}{2}$                       (4) Zero

**Sol.** I.T Process :-

$$P_1 V_1 = P_2 V_2$$

$$P_2 = P_1 \left( \frac{V_1}{V_2} \right) = \frac{P_1}{2}$$

A.D process:-

$$P_2 V_2^\gamma = P_3 V_3^\gamma$$

$$P_3 = P_2 \left( \frac{V_2}{V_3} \right)^\gamma$$

$$= \frac{P_1}{2} \left( \frac{2V}{10V} \right)^{5/3}$$

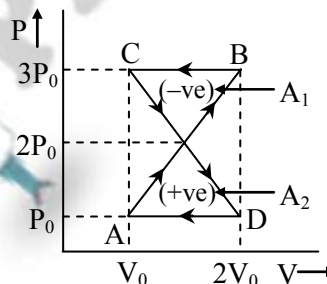
$$= \frac{P}{2} \left( \frac{1}{2^3} \right)^{5/3}$$

$$= \frac{P}{2} \left( \frac{1}{2^5} \right)$$

$$P_3 = \frac{P}{64}$$

**Ans.** [4]

**Sol.**



$$W_{\text{net}} = A_1 - A_2 = 0$$

**Q.19** The mean free path of molecules of a gas, (radius 'r') is inversely proportional to -

- (1)  $r^3$                       (2)  $r^2$   
 (3)  $r$                       (4)  $\sqrt{r}$

**Ans.** [2]

**Sol.**  $\lambda_M = \frac{1}{\sqrt{2} \pi d^2 n}$        $\left[ \begin{array}{l} d = \text{diameter of gas} \\ \text{molecule} = r/2 \end{array} \right]$

$$\lambda_M \propto \frac{1}{d^2} \propto \frac{1}{r^2}$$

**Q.18** A thermodynamic system undergoes cyclic process ABCDA as shown in figure. The work done by the system in the cycle is -



**Q.20** If  $n_1$ ,  $n_2$  and  $n_3$  are the fundamental frequencies of three segments into which a string is divided, then the original fundamental frequency  $n$  of the string is given by -

$$(1) \frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$$

$$(2) \frac{1}{\sqrt{n}} = \frac{1}{\sqrt{n_1}} + \frac{1}{\sqrt{n_2}} + \frac{1}{\sqrt{n_3}}$$

$$(3) \sqrt{n} = \sqrt{n_1} + \sqrt{n_2} + \sqrt{n_3}$$

$$(4) n = n_1 + n_2 + n_3$$

**Ans.** [1]

**Sol.**

$$l = l_1 + l_2 + l_3$$

$$n_{\text{string}} = \frac{1}{2l} \sqrt{\frac{T}{m}} \propto \frac{1}{l}$$

$$l \propto \frac{1}{n}$$

$$\frac{1}{n} = \frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3}$$

**Q.21** The number of possible natural oscillations of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are - (velocity of sound = 340 ms<sup>-1</sup>)

- (1) 4      (2) 5      (3) 7      (4) 6

**Ans.** [4]

**Sol.**  $n_{\text{fundamental}} = \frac{V}{4l} = \frac{340}{4 \times \frac{85}{100}} = 100 \text{ Hz}$

Possible frequency of C.O.P. = 1 : 3 : 5 : 7 : 9 : 11 ....

$$n_1 = 100 < 1250$$

$$n_2 = 300 < 1250$$

$$n_3 = 500 < 1250$$

$$n_4 = 700 < 1250$$

$$n_5 = 900 < 1250$$

$$n_6 = 1100 < 1250$$

$$n_7 = 1300 > 1250$$

Now possible frequencies = 6.

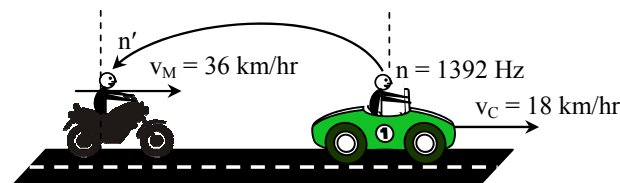
**Q.22** A speeding motorcyclist sees traffic jam ahead of him. He slows down to 36 km/hour. He finds that traffic has eased and a car moving ahead of him at 18 km/hour is honking at a frequency of 1392 Hz. If the speed of sound is 343 m/s, the frequency of the honk as heard by him will be -

(1) 1332 Hz      (2) 1372 Hz

(3) 1412 Hz      (4) 1454 Hz

**Ans.** [3]

**Sol.**



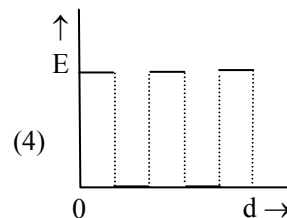
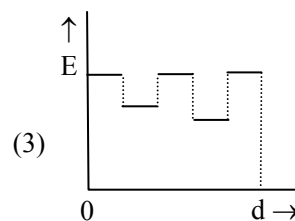
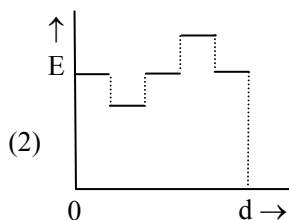
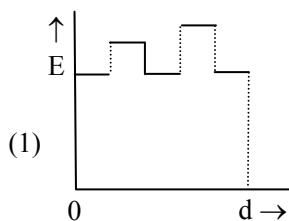
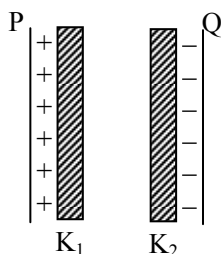
$$n' = n \left( \frac{v + v_0}{v + v_s} \right) \quad \left| \quad \begin{aligned} v_C &= 18 \times \frac{5}{18} = 5 \text{ m/s} \\ v_M &= 36 \times \frac{5}{18} = 10 \text{ m/s} \end{aligned} \right.$$

$$= n \left( \frac{v + v_M}{v + v_C} \right)$$

$$= 1392 \left( \frac{343 + 10}{343 + 5} \right)$$

$$= 1392 \left( \frac{353}{348} \right) = 1412 \text{ Hz}$$

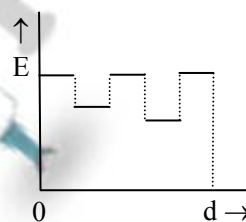
**Q.23** Two thin dielectric slabs of dielectric constants  $K_1$  and  $K_2$  ( $K_1 < K_2$ ) are inserted between plates of a parallel plate capacitor, as shown in the figure. The variation of electric field 'E' between the plates with distance 'd' as measured from plate P is correctly shown by :



**Ans. [3]**

**Sol.**  $E = \frac{\sigma}{\epsilon_0 \epsilon_r} = \frac{Q}{A \epsilon_0 \epsilon_r} \propto \frac{1}{\epsilon_r}$

$E_{\text{air}} > E_1 > E_2$



**Q.24** A conducting sphere of radius  $R$  is given a charge  $Q$ . The electric potential and the electric field at the centre of the sphere respectively are :

(1) Zero and  $\frac{Q}{4\pi\epsilon_0 R^2}$

(2)  $\frac{Q}{4\pi\epsilon_0 R}$  and Zero

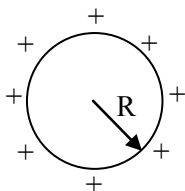
(3)  $\frac{Q}{4\pi\epsilon_0 R}$  and  $\frac{Q}{4\pi\epsilon_0 R^2}$

(4) Both are zero

**Ans.** [2]

**Sol.**

In conducting sphere there no charge in sphere



$$E_{in} = E_{centre} = 0$$

$$V_{in} = V_{centre} = \text{constant} = \frac{KQ}{R} = \frac{Q}{4\pi\epsilon_0 R}$$

**Q.25** In a region the potential is represented by  $V(x, y, z) = 6x - 8xy - 8y + 6yz$ , where  $V$  is in volts and  $x, y, z$  are in meters. The electric force experienced by a charge of 2 coulomb situated at point  $(1, 1, 1)$  is

(1)  $6\sqrt{5}N$  (2)  $30N$

(3)  $24 N$  (4)  $4\sqrt{35}N$

**Ans.** [4]

**Sol.**

$$V = 6x - 8xy - 8y + 6yz$$

$$\vec{E} = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$$

$$\frac{\partial V}{\partial x} = \frac{\partial}{\partial x}(6x - 8xy - 8y + 6yz)$$

$$= (6 - 8y - 0 + 0)_{1,1,1} = -2$$

$$\frac{\partial V}{\partial y} = \frac{\partial}{\partial y}(6x - 8xy - 8y + 6yz)$$

$$= (0 - 8x - 8 + 6z)_{1,1,1} = -10$$

$$\frac{\partial V}{\partial z} = \frac{\partial}{\partial z}(6x - 8xy - 8y + 6yz)$$

$$= (0 - 0 - 0 + 6y)_{1,1,1} = 6$$

$$\vec{E} = 2\hat{i} + 10\hat{j} - 6\hat{k}$$

$$E = \sqrt{(2)^2 + (10)^2 + (6)^2} = \sqrt{4 + 100 + 36}$$

$$= \sqrt{140}$$

$$E = 2\sqrt{35}$$

$$F_e = qE = 2 \times 2\sqrt{35} = 4\sqrt{35}$$

**Q.26** Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volt and the average resistance per km is  $0.5\Omega$ . The power loss in the wire is :

(1) 19.2 W (2) 19.2 kW

(3) 19.2 J (4) 12.2 kW

**Ans.** [2]

**Sol.** CP Students may find similar question in CP Exercise Sheet: [Chapter : EMI, Exercise # 2, Page No. 174, Q. 87]

Total voltage drop across wire =  $150 \times 8$

= 1200 volt

Total resistance of wire

=  $150 \times 0.5 = 75 \Omega$

$\therefore$  current through wire

$$I = \frac{V}{R} = \frac{1200}{75} = 16 \text{ Ampere}$$

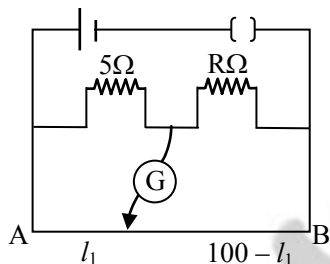
$\therefore$  Power loss =  $I^2 R$

$$= (16)^2 \times 75$$

$$= 19200 \text{ W}$$

$$= 19.2 \text{ kW}$$

- Q.27** The resistance in the two arms of the meter bridge are  $5 \Omega$  and  $R \Omega$ , respectively. When the resistance  $R$  is shunted with an equal resistance, the new balance points is at  $1.6 l_1$ . The resistance 'R', is :



- (1)  $10 \Omega$                       (2)  $15 \Omega$   
(3)  $20 \Omega$                       (4)  $25 \Omega$

**Ans.** [2]

**Sol.**

From balanced wheat stone bridge

$$\frac{P}{Q} = \frac{R}{S}$$

$$\frac{5}{R} = \frac{l_1}{100 - l_1} \quad \dots(1)$$

$$\frac{5}{R/2} = \frac{1.6l_1}{100 - 1.6l_1} \quad \dots(2)$$

by dividing (1) by (2)

$$\frac{1}{2} = \frac{100 - 1.6l_1}{1.6(100 - l_1)}$$

$$160 - 1.6l_1 = 200 - 3.2l_1$$

$$l_1 = 25 \text{ cm}$$

put that value in equation (1)

$$\frac{5}{R} = \frac{25}{100 - 25} \Rightarrow R = 15 \Omega$$

- Q.28** A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4m long. When the resistance,  $R$ , connected across the given cell, has values of.

- (i) infinity                      (ii)  $9.5 \Omega$

the 'balancing lengths', on the potentiometer wire are found to be 3 m and 2.85 m, respectively. The value of internal resistance of the cell is

- (1)  $0.25 \Omega$                       (2)  $0.95 \Omega$   
(3)  $0.5 \Omega$                       (4)  $0.75 \Omega$

**Ans.** [3]

**Sol.**

Internal resistance of cell

$$r = \left( \frac{l_1 - l_2}{l_2} \right) (R)$$

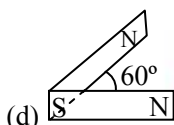
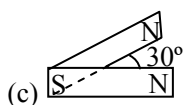
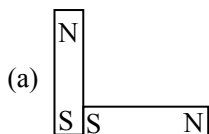
$$= \left( \frac{3 - 2.85}{2.85} \right) (9.5)$$

$$= 0.5 \, \Omega$$

**Ans.** [3]

**Sol.**

- Q.29** Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment  $\vec{m}$ . Which configuration has highest net magnetic dipole moment ?



(1) (a)

(2) (b)

(3) (c)

(4) (d)

**Ans.** [3]

**Sol.**  $M_{\text{net}} = \sqrt{M_1^2 + M_2^2 + 2M_1M_2 \cos \theta}$

when angle ( $\theta$ ) between two vector increases. Resultant vector ( $M_{\text{net}}$ ) decreases so  $M_{\text{net}}$  is max. when angle ( $\theta$ ) is minimum.

- Q.30** In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is  $G$ , the resistance of ammeter will be :

(1)  $\frac{1}{499} G$

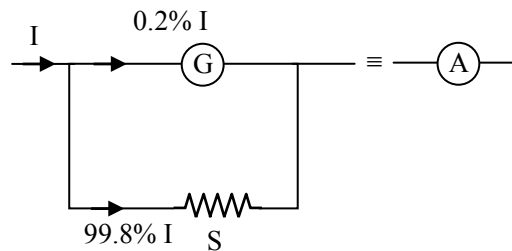
(2)  $\frac{499}{500} G$

(3)  $\frac{1}{500} G$

(4)  $\frac{500}{499} G$

**Ans.** [4]

**Sol.**



In parallel

$$I \propto \frac{1}{R}$$

$$\frac{G}{S} = \frac{99.8}{0.2} \Rightarrow S = \frac{G}{499}$$

$$\therefore R_{(A)} = S \parallel R_g$$

$$= \frac{G}{500}$$

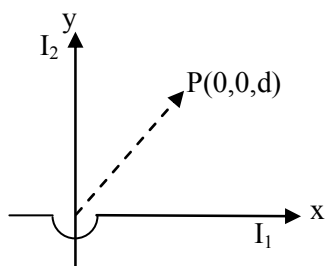
- Q.31** Two identical long conducting wires AOB and COD are placed at right angle to each other, with one above other such that 'O' is their common point for the two. The wires carry  $I_1$  and  $I_2$  currents, respectively. Point 'P' is lying at distance 'd' from 'O' along a direction perpendicular to the plane containing the wires. The magnetic field at the point 'P' will be :

(1)  $\frac{\mu_0}{2\pi d} \left( \frac{I_1}{I_2} \right)$

(2)  $\frac{\mu_0}{2\pi d} (I_1 + I_2)$

(3)  $\frac{\mu_0}{2\pi d} (I_1^2 - I_2^2)$

(4)  $\frac{\mu_0}{2\pi d} (I_1^2 + I_2^2)^{1/2}$

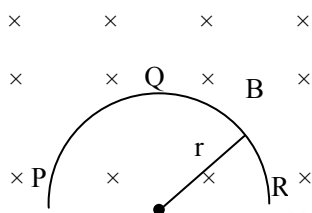


$$\vec{B}_1 = \frac{\mu_0 I_1}{2\pi d} (-\hat{j})$$

$$\vec{B}_2 = \frac{\mu_0 I_2}{2\pi d} (+\hat{i})$$

$$B = \sqrt{B_1^2 + B_2^2} = \frac{\mu_0}{2\pi d} \sqrt{I_1^2 + I_2^2}$$

**Q.32** A thin semicircular conducting ring (PQR) of radius 'r' is falling with its plane vertical in a horizontal magnetic field B, as shown in figure. The potential difference developed across the ring when its speed is v, is :



- (1) Zero
- (2)  $Bv\pi r^2/2$  and P is at higher potential
- (3)  $\pi r B v$  and R is at higher potential
- (4)  $2r B v$  and R is at higher potential

**Ans.** [4]

**Sol.**

$$e = B v (\ell_i - \ell_f)$$

where  $(\ell_i - \ell_f)$  is displacement between end of semicircular ring

$$e = B v (2R)$$

**Q.33**

A transformer having efficiency of 90% is working on 200 V and 3 kW power supply. If the current in the secondary coil is 6A, the voltage across the secondary coil and the current in the primary coil respectively are :

- (1) 300 V, 15 A
- (2) 450 V, 15 A
- (3) 450 V, 13.5 A
- (4) 600 V, 15 A

**Ans.** [2]

**Sol.**

$$\text{Power of primary} = V_p I_p = 3 \text{ kW}$$

$$\Rightarrow I_p = \frac{3000}{V_p} = \frac{3000}{200} = 15 \text{ A}$$

$$\% \eta = \frac{V_s I_s}{V_p I_p} \times 100$$

$$\frac{90}{100} = \frac{V_s I_s}{V_p I_p}$$

$$\Rightarrow V_s = \frac{0.9 V_p I_p}{I_s} = \frac{0.9 \times 3000}{6}$$

$$= 450 \text{ V}$$

**Q.34** Light with an energy flux of  $25 \times 10^4 \text{ W m}^{-2}$  falls on a perfectly reflecting surface at normal incidence. If the surface area is  $15 \text{ cm}^2$ , the average force exerted on the surface is

- (1)  $1.25 \times 10^{-6} \text{ N}$       (2)  $2.50 \times 10^{-6} \text{ N}$   
 (3)  $1.20 \times 10^{-6} \text{ N}$       (4)  $3.0 \times 10^{-6} \text{ N}$

**Ans.** [2]

**Sol.**  $I = 25 \times 10^4 \frac{\text{W}}{\text{m}^2}$

$$A = 15 \text{ cm}^2$$

Pressure exerted on surface if it is perfectly reflecting

$$Pr = 2 \left( \frac{I}{C} \right) = \frac{F}{A}$$

$$F = \frac{2IA}{C} = \frac{2 \times 25 \times 10^4}{3 \times 10^8} \times 15 \times 10^{-4}$$

$$= 2.50 \times 10^{-6} \text{ N}$$

**Q.35**

A beam of light of  $\lambda = 600 \text{ nm}$  from a distant source falls on a single slit  $1 \text{ mm}$  wide and the resulting diffraction pattern is observed on a screen  $2 \text{ m}$  away. The distance between first dark fringes on either side of the central bright fringe is :

- (1)  $1.2 \text{ cm}$                       (2)  $1.2 \text{ mm}$   
 (3)  $2.4 \text{ cm}$                       (4)  $2.4 \text{ mm}$

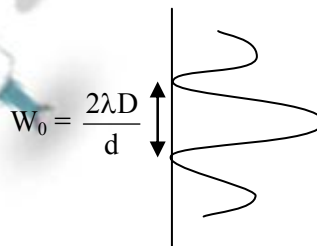
**Ans.** [4]

**Sol.**

$$\text{given } \lambda = 600 \times 10^{-9} \text{ m}$$

$$D = 2 \text{ m}$$

$$d = 1 \text{ mm} = 10^{-3} \text{ m}$$



width of the central maxima

$$W_0 = \frac{2\lambda D}{d} = \frac{2 \times 600 \times 10^{-9} \times 2}{10^{-3}}$$

$$= 2.4 \times 10^{-3} \text{ m}$$

$$= 2.4 \text{ mm}$$

**Q.36**

In the Young's double-slit experiment, the intensity of light at a point on the screen where the path difference is  $\lambda$  is  $K$ , ( $\lambda$  being the wave length of light used). The intensity at a point where the path difference is  $\lambda/4$ , will be

- (1)  $K$                                   (2)  $K/4$   
 (3)  $K/2$                               (4) Zero



**Ans.** [3]

**Sol.**  $\Delta\phi = \frac{2\pi}{\lambda}(\Delta x) = \frac{2\pi}{\lambda}(\lambda) = 2\pi$

\*  $I = I_0 + I_0 + 2\sqrt{I_0 I_0} \cos 2\pi$

$I = 4I_0 = k$

\*  $\Delta\phi = \frac{2\pi}{\lambda}\left(\frac{\lambda}{4}\right) = \frac{\pi}{2}$

$I = I_0 + I_0 + 2\sqrt{I_0 I_0} \cos \pi/2$

$I = 2I_0 = k/2$

**Q.37** If the focal length of objective lens is increased then magnifying power of :

- (1) microscope will increase but that of telescope decrease
- (2) microscope and telescope both will increase
- (3) microscope and telescope both will decrease
- (4) microscope will decrease but that of telescope will increase

**Ans.** [4]

**Sol.** \* For telescope M.P. =  $\frac{f_o}{f_e}$  ( $f_o \uparrow \Rightarrow$  M.P.  $\uparrow$ )

on increasing  $f_o$ , M.P. is  $\uparrow$

\* For microscope M.P.  $\approx \frac{v_o}{u_o} \left(1 + \frac{D}{f_e}\right)$

$\approx \frac{L}{f_o} \left(1 + \frac{D}{f_e}\right)$

on increasing  $f_o$ , M.P. is  $\downarrow$

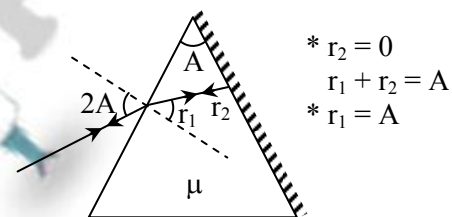
**Q.38**

The angle of a prism is 'A'. One of its refracting surfaces is silvered. Light rays falling at an angle of incident  $2A$  on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index  $\mu$ , of the prism is

- (1)  $2 \sin A$
- (2)  $2 \cos A$
- (3)  $\frac{1}{2} \cos A$
- (4)  $\tan A$

**Ans.** [2]

**Sol.**



(1)  $\sin 2A = \mu \sin A$   
 $2 \sin A \cos A = \mu \sin A$   
 $\mu = 2 \cos A$

**Q.39**

When the energy of the incident radiation is increased by 20%, the kinetic energy of the photoelectrons emitted from a metal surface increased from 0.5 eV to 0.8 eV. The work function of the metal is

- (1) 0.65 eV
- (2) 1.0 eV
- (3) 1.3 eV
- (4) 1.5 eV

**Ans.** [2]

**Sol.** K.  $E_{e^-} = E_{ph} - W$

$0.5 = E - W \quad \dots(i) \times 1.20$

$$0.8 = 1.20E - W \dots(ii) \times 1$$

$$0.6 = 1.2E - 1.2W$$

$$0.8 = 1.2E - W$$

$$-0.2 = -0.2W$$

$$W = 1 \text{ eV}$$

**Ans. [3]**

**Sol.**  $E_{ph} = \frac{12448}{975} \text{ eV}$

$$E_{ph} = 12.75 \text{ V}$$

\* In hydrogen atom energy level of  $e^-$  is = 4

\* If  $e^-$  comes from higher energy level  $n$  to ground state possible value of spectrum line

$$\begin{aligned} \text{is} &= \frac{n(n-1)}{2} \\ &= \frac{4(4-1)}{2} = 6 \end{aligned}$$

**Q.40** If the kinetic energy of the particle is increased to 16 times its previous value, the percentage change in the de-Broglie wavelength of the particle is :

(1) 25 (2) 75

(3) 60 (4) 50

**Ans. [2]**

**Sol.**  $\lambda = \frac{h}{\sqrt{2m_0 K.E}} \propto \frac{1}{\sqrt{K.E}}$

$$\begin{array}{l} K.E_1 = E \\ K.E_2 = 16E \end{array} \quad \left| \begin{array}{l} \frac{\lambda_2}{\lambda_1} = \sqrt{\frac{E}{16E}} \\ \lambda_2 = \frac{\lambda_1}{4} \end{array} \right.$$

$$\% \text{ change} = \frac{\lambda_2 - \lambda_1}{\lambda_1} \times 100\%$$

$$= \frac{\frac{\lambda_1}{4} - \lambda_1}{\lambda_1} \times 100\% = -75\%$$

**Q.41** Hydrogen atom in ground state is excited by a monochromatic radiation of  $\lambda = 975 \text{ \AA}$ . Number of spectral lines in the resulting spectrum emitted will be

(1) 3 (2) 2

(3) 6 (4) 10

**Q.42** The Binding energy per nucleon of  ${}^7_3\text{Li}$  and  ${}^4_2\text{He}$  nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction  ${}^7_3\text{Li} + {}^1_1\text{H} \rightarrow {}^4_2\text{He} + {}^4_2\text{He} + Q$ , the value of energy  $Q$  released is

(1) 19.6 MeV

(2) -2.4 MeV

(3) 8.4 MeV

(4) 17.3 MeV

**Ans. [4]**

**Sol.**  ${}_3\text{Li}^7 + {}_1\text{H}^1 \rightarrow {}_2\text{He}^4 + {}_2\text{He}^4 + Q$

$$Q = 2B.E_{\text{He}} - (B.E_{\text{H}} + B.E_{\text{Li}})$$

$$= 2(4 \times 7.06) - (0 + 7 \times 5.60)$$

$$Q = 17.28 \text{ MeV}$$



**Q.43** A radio isotope 'X' with a half life  $1.4 \times 10^9$  years decays to 'Y' which is stable. A sample of the rock from a cave was found to contain 'X' and 'Y' in the ratio 1 : 7. The age of the rock is

- (1)  $1.96 \times 10^9$  years      (2)  $3.92 \times 10^9$  years  
(3)  $4.20 \times 10^9$  years      (4)  $8.40 \times 10^9$  years

**Ans.** [3]

**Sol.** X : Y = 1 : 7

↑      ↑

Active    stable

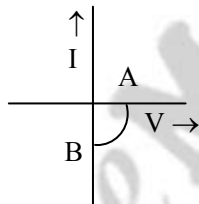
$$\text{Active part of sample A.P.} = \frac{X}{X + Y} = \frac{1}{8}$$

$$* \text{ A.P} = \frac{1}{8} = \frac{1}{2^n}$$

$$* n = 3$$

$$* t = nT_{1/2} = 3 \times 1.4 \times 10^9 \\ = 4.2 \times 10^9 \text{ year}$$

**Q.44** The given graph represents V-I characteristic for a semiconductor device.



Which of the following statement is correct?

- (1) It is V-I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current  
(2) It is for a solar cell and points A and B represent open circuit voltage and current, respectively

(3) It is for a photodiode and points A and B represent open circuit voltage and current, respectively

(4) It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively

**Ans.** [1]

**Sol.** In p-n junction barrier potential is n to p  $\rightarrow$  so it is open circuit voltage when length incident on depletion layer in solar cell then extra charge carrier are generated which flow current p to n. (so it is short circuit current)

**Q.45** The barrier potential of a p-n junction depends on :

- (a) type of semiconductor material  
(b) amount of doping  
(c) temperature

Which one of the following is correct?

- (1) (a) and (b) only  
(2) (b) only  
(3) (b) and (c) only  
(4) (a), (b) and (c)

**Ans.** [4]

**Sol.** (a) Potential barrier for Ge p-n junction is 0.3 V

Potential barrier for Si p-n junction is 0.7 V

- (b) doping increase potential barrier (depletion width) decreases  
(c) temperature increase potential barrier (depletion width) increases



**Q.46** What is the maximum number of orbitals that can be identified with the following quantum numbers  $n = 3$ ,  $\ell = 1$ ,  $m_\ell = 0$

- (1) 1      (2) 2      (3) 3      (4) 4

**Ans.** [1]

**Sol.**

$n = 3$  means 3<sup>rd</sup> shell

$\ell = 1$  means p-subshell

$m_\ell = 0$  means orbital of p-subshell

$\therefore$  Answer is one orbital

**Q.47** Calculate the energy in joule corresponding to light of wavelength 45 nm: (Planck constant  $h = 6.63 \times 10^{-34}$  Js, speed of light  $c = 3 \times 10^8$  ms<sup>-1</sup>)

- (1)  $6.67 \times 10^{15}$       (2)  $6.67 \times 10^{11}$   
(3)  $4.42 \times 10^{-15}$       (4)  $4.42 \times 10^{-18}$

**Ans.** [4]

**Sol.**

$$\text{Energy}(E) = \frac{hc}{\lambda}$$

$$\therefore E = \left( \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{45 \times 10^{-9}} \right) \text{J}$$

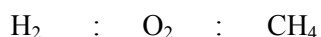
$$E = 4.42 \times 10^{-18} \text{ J}$$

**Q.48** Equal masses of  $\text{H}_2$ ,  $\text{O}_2$  and methane have been taken in a container of volume V at temperature 27°C in identical conditions. The ratio of the volumes of gases  $\text{H}_2 : \text{O}_2 : \text{methane}$  would be:

- (1) 8 : 16 : 1      (2) 16 : 8 : 1  
(3) 16 : 1 : 2      (4) 8 : 1 : 2

**Ans.** [3]

**Sol.**



$$AG^2 = 2a^2 + a^2$$

Assuming weight  $w$                        $w$                        $w$

$$\therefore AG = \sqrt{3}a$$

$$\therefore \text{moles} \quad \frac{w}{2} \quad \quad \frac{w}{32} \quad \quad \frac{w}{16}$$

$$\therefore \text{AI distance} = \frac{AG}{2} = \frac{\sqrt{3}a}{2}$$

$$\text{So mole ratio or volume ratio} \quad \frac{w}{2} : \frac{w}{32} : \frac{w}{16}$$

means                       $16 : 1 : 2$

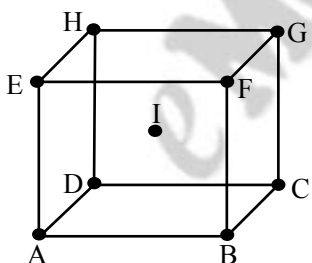
**Q.49** If  $a$  is the length of the side of a cube, the distance between the body centred atom and one corner atom in the cube will be:

- (1)  $\frac{2}{\sqrt{3}}a$                       (2)  $\frac{4}{\sqrt{3}}a$   
 (3)  $\frac{\sqrt{3}}{4}a$                       (4)  $\frac{\sqrt{3}}{2}a$

**Ans.** [4]

**Sol.**

BCC unit cell:



According to  $\triangle ABC$

$$AC^2 = AB^2 + BC^2$$

$$AC^2 = a^2 + a^2$$

$$AC = \sqrt{2}a$$

According to  $\triangle ACG$   $AG^2 = AC^2 + CG^2$

**Q.50** Which property of colloids is not dependent on the charge on colloidal particles ?

- (1) Coagulation                      (2) Electrophoresis  
 (3) Electro-osmosis                      (4) Tyndall effect

**Ans.** [4]

**Sol.**

Theory problem

**Q.51** Which of the following salts will give highest pH in water ?

- (1) KCl                      (2) NaCl  
 (3)  $\text{Na}_2\text{CO}_3$                       (4)  $\text{CuSO}_4$

**Ans.** [3]

**Sol.** CP Students may find same question in CP Exercise Sheet: [Chapter : Ionic Equilibrium, Level # 3(B)-, Page No.167, Q. 9]

$\text{Na}_2\text{CO}_2$  is a salt of weak acid and strong base.

So its pH will be maximum

**Q.52** Of the following 0.10m aqueous solutions, which one will exhibit the largest freezing point depression ?

- (1) KCl                      (2)  $\text{C}_6\text{H}_{12}\text{O}_6$   
 (3)  $\text{Al}_2(\text{SO}_4)_3$                       (4)  $\text{K}_2\text{SO}_4$

**Ans.** [3]

**Sol.**

Colligative properties  $\propto$  Net molality

(1) for KCl Net molality =  $0.1 \times 2 = 0.2$

(2) for Glucose Net molality =  $0.1 \times 1 = 0.1$

(3) for  $\text{Al}_2(\text{SO}_4)_3$  Net molality =  $0.1 \times 5 = 0.5$

(4) for  $\text{K}_2\text{SO}_4$  Net molality =  $0.1 \times 3 = 0.3$

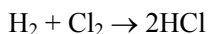
**Q.53** When 22.4 litres of  $\text{H}_2(\text{g})$  is mixed with 11.2 litres of  $\text{Cl}_2(\text{g})$ , each at S.T.P., the moles of  $\text{HCl}(\text{g})$  formed is equal to:

(1) 1 mole of  $\text{HCl}(\text{g})$  (2) 2 mole of  $\text{HCl}(\text{g})$

(3) 0.5 mol of  $\text{HCl}(\text{g})$  (4) 1.5 mol of  $\text{HCl}(\text{g})$

**Ans.** [1]

**Sol.**



$$n_{\text{H}_2} = \frac{22.4}{22.4} = 1; n_{\text{Cl}_2} = \frac{11.2}{22.4} = \frac{1}{2}$$

$\therefore$  To find L.R.

$$\begin{array}{cc} \text{H}_2 & \text{Cl}_2 \\ \frac{1}{1} & \left( \frac{1}{2} \right) \\ & \frac{1}{1} = \frac{1}{2} \end{array}$$

$\therefore \text{Cl}_2$  is L.R.

& by stoichiometric ratio

$$\frac{n_{\text{HCl}}}{2} = \frac{n_{\text{Cl}_2}}{1}$$

$$n_{\text{HCl}} = 2 \times \frac{1}{2} = 1 \text{ mol.}$$

**Q.54** When 0.1 mol  $\text{MnO}_4^{2-}$  is oxidized the quantity of electricity required to completely oxidize  $\text{MnO}_4^{2-}$  to  $\text{MnO}_4^-$  is:

(1) 96500 C

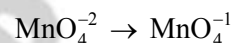
(2)  $2 \times 96500 \text{ C}$

(3) 9650 C

(4) 96.50 C

**Ans.** [3]

**Sol.**



Oxidation no. +6 +7

$\therefore$  change in oxidation number no = 1

So equivalent = mole  $\times$  v.f

=  $0.1 \times 1$

= 0.1

$\therefore$  Charge =  $0.1 \times F$

=  $0.1 \times 96500$

= 9650 C

**Q.55** Using the Gibbs energy change,  $\Delta G^\circ = +63.3 \text{ kJ}$ , for the following reaction,



The  $K_{\text{sp}}$  of  $\text{Ag}_2\text{CO}_3(\text{s})$  in water at  $25^\circ\text{C}$  is:

( $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ )

(1)  $3.2 \times 10^{-26}$

(2)  $8.0 \times 10^{-12}$

(3)  $2.9 \times 10^{-3}$

(4)  $7.9 \times 10^{-2}$

**Ans.** [2]

$$\Delta G^\circ = -2.303 RT \log K_{sp}$$

**Ans.** [2]

$$63.3 \times 1000 = -2.303 \times 8.314 \times 298 \times \log K_{sp}$$

**Sol.**

$$\log K_{sp} = \frac{-63.3 \times 1000}{2.303 \times 8.314 \times 298}$$

$$\log K_{sp} = -11.09$$

$$\therefore K_{sp} = \text{anti log } (-11.09)$$

$$K_{sp} = 8.0 \times 10^{-12}$$



$$\therefore \text{As } \Delta n_g < 0; \text{ then, } \Delta S < 0$$

but  $\Delta H < 0$  because process of adsorption is always exothermic

$$\therefore \Delta S < 0 \text{ \& } \Delta H < 0$$

& for spontaneous process

$$\Delta G < 0$$

$$\text{There fore : } |T\Delta S| < |\Delta H|$$

**Q.56** The weight of silver (at. wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of  $O_2$  at STP will be:

- (1) 5.4 g                      (2) 10.8 g  
(3) 54.0 g                    (4) 108.0 g

**Ans.** [4]

**Sol.**

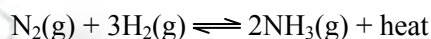
Equivalent volume of  $O_2$  is 5.6 lit

$\therefore$  5.6 lit of  $O_2$  means 1 equivalent of oxygen

& 1 equivalent of any species is displaced by 1 faraday charge

&  $\therefore$  1 equivalent i.e. 108g of Ag is deposited by 1 faraday of charge

**Q.58** For the reversible reaction:

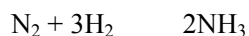


The equilibrium shifts in forward direction:

- (1) by increasing the concentration of  $NH_3(g)$   
(2) by decreasing the pressure  
(3) by decreasing the concentrations of  $N_2(g)$  and  $H_2(g)$   
(4) by increasing pressure and decreasing temperature

**Ans.** [4]

**Sol.**



it is an exothermic reaction so decreasing temperature  $\rightleftharpoons$  is favorable because

$$\text{dissociation (x)} \propto \frac{1}{T}$$

**Q.57** Which of the following statements is correct for the spontaneous adsorption of a gas ?

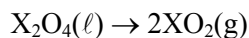
- (1)  $\Delta S$  is negative and, therefore,  $\Delta H$  should be highly positive.  
(2)  $\Delta S$  is negative and therefore,  $\Delta H$  should be highly negative  
(3)  $\Delta S$  is positive and, therefore,  $\Delta H$  should be negative  
(4)  $\Delta S$  is positive and, therefore,  $\Delta H$  should also be highly positive.

$$\& \text{dissociation } x \propto \left(\frac{1}{P}\right)^{\frac{-2}{2}}$$

$$\therefore x \propto P$$

So increasing pressure is favorable for forward reaction

**Q.59** For the reaction:



$$\Delta U = 2.1 \text{ k cal}, \Delta S = 20 \text{ cal K}^{-1} \text{ at } 300 \text{ K}$$

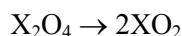
Hence,  $\Delta G$  is:

$$(1) 2.7 \text{ k cal} \quad (2) -2.7 \text{ k cal}$$

$$(3) 9.3 \text{ k cal} \quad (4) -9.3 \text{ k cal}$$

**Ans.** [2]

**Sol.**



$$(\ell) \quad (\text{g}) \quad \Delta n_g = 2 - 0$$

$$\Delta n_g = 2$$

$$\Delta G = \Delta H - T\Delta S$$

So first of all we will calculate  $\Delta H$

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

$$\Delta H = 2.1 + (2) \times \frac{2}{1000} \times 300$$

$$\Delta H = 3.3 \text{ kcal}$$

Now

$$\Delta G = \Delta H - T\Delta S$$

$$= 3.3 - 300 \times \frac{20}{1000} \text{ (in kcal)}$$

$$= -2.7 \text{ kcal}$$

**Q.60**

For a given exothermic reaction,  $K_p$  and  $K'_p$  are the equilibrium constant at temperatures  $T_1$  and  $T_2$ , respectively. Assuming that heat of reaction is constant in temperature range between  $T_1$  and  $T_2$ , it is readily observed that-

$$(1) K_p > K'_p$$

$$(2) K_p < K'_p$$

$$(3) K_p = K'_p$$

$$(4) K_p = \frac{1}{K'_p}$$

**Ans.** [1]

**Sol.**

According to Vant Hoff equation

$$\log \frac{K'_p}{K_p} = \frac{\Delta H}{2.303R} \left[ \frac{T_2 - T_1}{T_1 T_2} \right]$$

for exothermic reaction on increasing temperature equilibrium constant decreases

means  $T_2 > T_1$  then  $K'_p < K_p$

**Q.61**

Which of the following orders of ionic radii is correctly represented ?

$$(1) \text{H}^- > \text{H}^+ > \text{H} \quad (2) \text{Na}^+ > \text{F}^- > \text{O}^{2-}$$

$$(3) \text{F}^- > \text{O}^{2-} > \text{Na}^+ \quad (4) \text{Al}^{3+} > \text{Mg}^{2+} > \text{N}^{3-}$$

**Ans.** [Bonus]

**Sol.**

All option are incorrect order of ionic radius

Ionic radius  $\text{H}^- > \text{H}^+ > \text{H}$

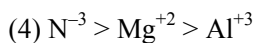
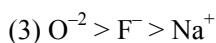
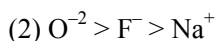
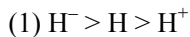
$$\text{Na}^+ > \text{F}^- > \text{O}^{2-}$$

$$\text{F}^- > \text{O}^{2-} > \text{Na}^+$$

$$\text{Al}^{+3} > \text{Mg}^{+2} > \text{N}^{-3}$$



Correct order of ionic radius are



Mg

O<sub>2</sub>

$$\frac{0.042}{2} = 0.021 \quad \frac{0.0175}{1} = 0.0175$$

∴ O<sub>2</sub> is LR & Mg is in excess

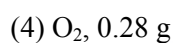
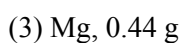
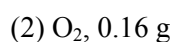
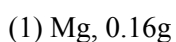
$$\begin{aligned} \text{Now } n_{\text{Mg, reacted}} &= 0.0175 \times 2 \\ &= 0.035 \end{aligned}$$

$$\therefore n_{\text{Mg, unreacted}} = 0.007$$

$$\begin{aligned} \therefore n_{\text{Mg, remained}} &= 0.007 \times 27 \\ &= 0.16\text{g} \end{aligned}$$

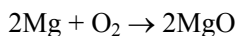
**Q.62** 1.0 g of magnesium is burnt with 0.56g O<sub>2</sub> in a closed vessel. Which reactant is left in excess and how much ?

(At. wt. Mg = 24; O = 16)



**Ans.** [1]

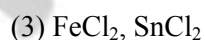
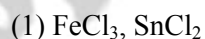
**Sol.**



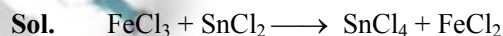
$$n_{\text{Mg}} = \frac{1}{24} \cong 0.042 \quad \& \quad n_{\text{O}_2} = \frac{0.56}{32} = 0.0175$$

To find L.R.

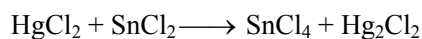
**Q.63** The pair of compounds that can exist together is:



**Ans.** [3]



OA      RA



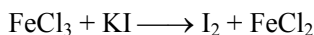
**Q.66** Which one of the following species has plane triangular shape ?

- (1)  $\text{N}_3^-$  (2)  $\text{NO}_3^-$  (3)  $\text{NO}_2^-$  (4)  $\text{CO}_2$

**Ans.** [2]

**Sol.**

OA RA



OA RA

$\text{FeCl}_2$  and  $\text{SnCl}_2$  pair can exist together because  $\text{FeCl}_2$  and  $\text{SnCl}_2$  both are act as reducing agent.

**Q.64**  $\text{Be}^{2+}$  is isoelectronic with which of the following ions ?

- (1)  $\text{H}^+$  (2)  $\text{Li}^+$  (3)  $\text{Na}^+$  (4)  $\text{Mg}^{2+}$

**Ans.** [2]

**Sol.** Isoelectronic species have same number of total electron

$\text{Be}^{+2}$  and  $\text{Li}^+$  contain two electron

**Q.65** Which of the following molecules has the maximum dipole moment ?

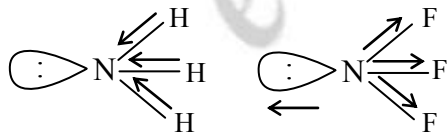
- (1)  $\text{CO}_2$  (2)  $\text{CH}_4$  (3)  $\text{NH}_3$  (4)  $\text{NF}_3$

**Ans.** [3]

**Sol.**

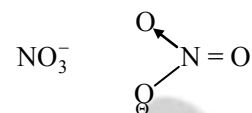
$$\mu = \frac{:\text{NH}_3}{\mu \neq 0} > \frac{\text{CH}_4 = \text{CO}_2}{\mu = 0}$$

$$\mu = \ddot{\text{N}}\text{H}_3 : > :\text{NF}_3$$



← ←  
atomic dipole  
&  
bond dipole  
are in same  
direction

← →  
atomic dipole  
&  
bond dipole  
are in opposite  
direction



Hybridisation :  $\text{sp}^2$

shape :- plane triangular

**Q.67** Acidity of diprotic acids in aqueous solutions increases in the order:

- (1)  $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$   
(2)  $\text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{Te}$   
(3)  $\text{H}_2\text{Te} < \text{H}_2\text{S} < \text{H}_2\text{Se}$   
(4)  $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{S}$

**Ans.** [1]

**Sol.**

Acidic strength of chalcogen hydride increase down the group because bond length increases and dissociation energy decreases

Acidic strength  $\text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$

$\xrightarrow{\text{Bond length } \uparrow}$   
 $\text{Bond dissociation energy } \downarrow$   
 $\text{acidic strength } \uparrow$

**Q.68** (a)  $\text{H}_2\text{O}_2 + \text{O}_3 \rightarrow \text{H}_2\text{O} + 2\text{O}_2$

(b)  $\text{H}_2\text{O}_2 + \text{Ag}_2\text{O} \rightarrow 2\text{Ag} + \text{H}_2\text{O} + \text{O}_2$

Role of hydrogen peroxide in the above reactions is respectively:

(1) oxidizing in (a) and reducing in (b)

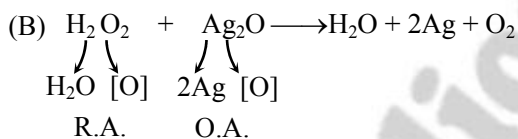
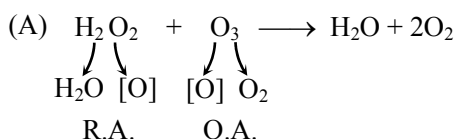
(2) reducing in (a) and oxidizing in (b)

(3) reducing in (a) and (b)

(4) oxidizing in (a) and (b)

**Ans.** [3]

**Sol.** Hydrogen peroxide generally act as an oxidising agent but. In the presence of strong oxidising agent like  $\text{KMnO}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ , Halogen's and ozone, tollens reagent. It is act as a reducing agent.



**Q.69** Artificial sweetner which is stable under cold conditions only is:

(1) Saccharine (2) Sucralose

(3) Aspartame (4) Alitame

**Ans.** [3]

**Sol.**

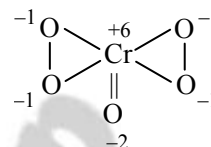
Aspartame is artificial sweetener which is stable only at cold condition because it is unstable at cooking temperature.

**Q.70** In acidic medium,  $\text{H}_2\text{O}_2$  changes  $\text{Cr}_2\text{O}_7^{2-}$  to  $\text{CrO}_5$  which has two  $(-\text{O}-\text{O}-)$  bonds. Oxidation state of Cr in  $\text{CrO}_5$  is:

(1) +5 (2) +3 (3) +6 (4) -10

**Ans.** [3]

**Sol.**  $\text{CrO}_5$  molecule contain two  $(-\text{O}-\text{O}-)$  bond



So oxidation state of Cr in  $\text{CrO}_5$  is +6

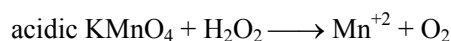
**Q.71** The reaction of aqueous  $\text{KMnO}_4$  with  $\text{H}_2\text{O}_2$  in acidic conditions gives:

(1)  $\text{Mn}^{4+}$  and  $\text{O}_2$  (2)  $\text{Mn}^{2+}$  and  $\text{O}_2$

(3)  $\text{Mn}^{2+}$  and  $\text{O}_3$  (4)  $\text{Mn}^{4+}$  and  $\text{MnO}_2$

**Ans.** [2]

**Sol.** When acidic  $\text{KMnO}_4$  react with  $\text{H}_2\text{O}_2$  purple colour decolourises due to formation of  $\text{Mn}^{+2}$



(purple)

(colourless)

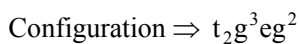
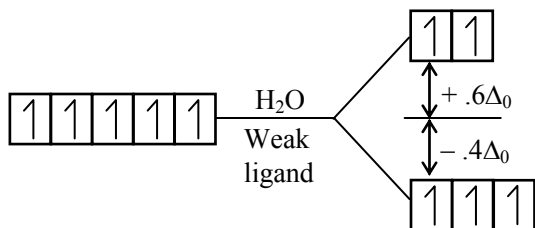
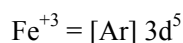
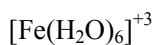
**Q.72** Among the following complexes the one which shows **Zero** crystal field stabilisation energy (CFSE) is:

(1)  $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$  (2)  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

(3)  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  (4)  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

**Ans.** [2]

**Sol.**



$$\text{C.F.S.E.} = (-.4\Delta_0 \times 3) + (+.6\Delta_0 \times 2)$$

$$= -1.2\Delta_0 + 1.2\Delta_0$$

$$\text{C.F.S.E} = 0 \Delta_0$$

**Q.73** Magnetic moment 2.83 BM is given by which of the following ions?

(At. no. Ti = 22, Cr = 24, Mn = 25, Ni = 28)

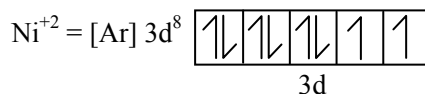
- (1)  $\text{Ti}^{3+}$
- (2)  $\text{Ni}^{2+}$
- (3)  $\text{Cr}^{3+}$
- (4)  $\text{Mn}^{2+}$

**Ans.** [2]

**Sol.**

$$\mu = \sqrt{n(n+2)} \text{ B.M.}$$

$$\mu = 2.83 \therefore n = 2$$



$$n = 2$$

$$\mu = \sqrt{n(n+2)}$$

$$\mu = \sqrt{2(2+2)}$$

$$\mu = \sqrt{8}$$

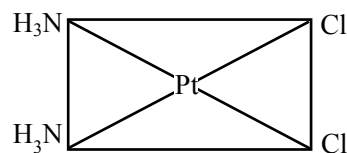
$$\mu = 2.83$$

**Q.74** Which of the following complexes is used to be as an anticancer agent ?

- (1) mer -  $[\text{Co}(\text{NH}_3)_3 \text{Cl}_3]$
- (2) cis -  $[\text{PtCl}_2(\text{NH}_3)_2]$
- (3) cis -  $\text{K}_2[\text{PtCl}_2\text{Br}_2]$
- (4)  $\text{Na}_2\text{CoCl}_4$

**Ans.** [2]

**Sol.**



cis-platin used as anticancer agent

**Q.75** Reason of lanthanoid contraction is :

- (1) Negligible screening effect of 'f' orbitals
- (2) Increasing nuclear charge
- (3) Decreasing nuclear charge
- (4) Decreasing screening effect

**Ans.** [1]

**Sol.**

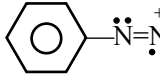
Lanthanoid contraction is due to negligible shielding effect of f-orbitals.

Order of shielding effect =  $s > p > d > f$

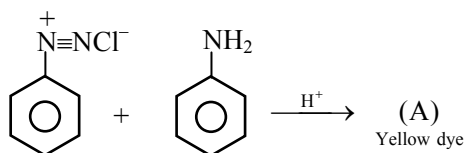
**Q.77** Which of the following will be most stable diazonium salt  $RN_2^+X^-$ ?

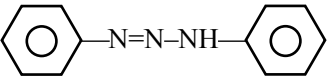
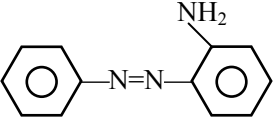
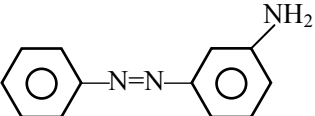
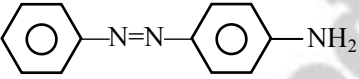
- (1)  $CH_3N_2^+X^-$       (2)  $C_6H_5N_2^+X^-$   
 (3)  $CH_3CH_2N_2^+X^-$       (4)  $C_6H_5CH_2N_2^+X^-$

**Ans.** [2]

**Sol.**  is most stable because benzene ring is involve in resonance.

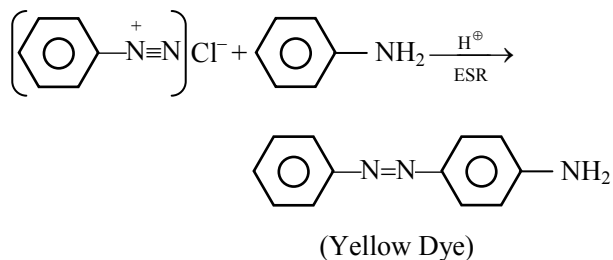
**Q.76** In the following reaction, the product (A) is :



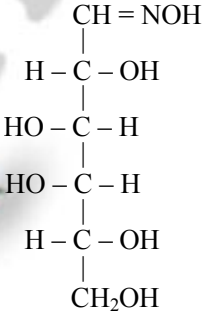
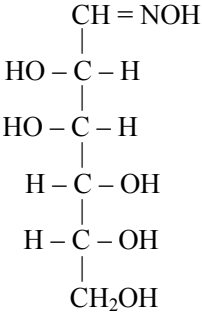
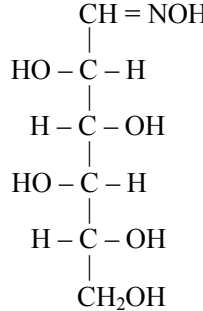
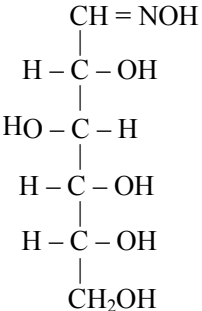
- (1)   
 (2)   
 (3)   
 (4) 

**Ans.** [4]

**Sol.**

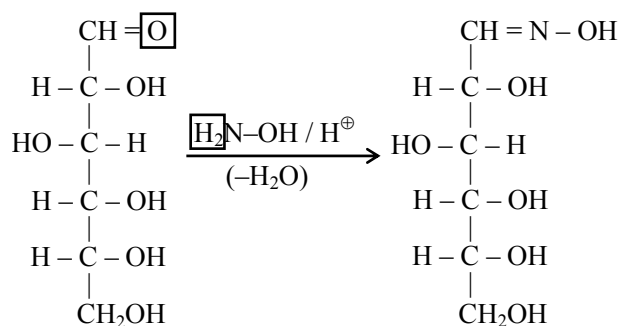


**Q.78** D(+) glucose reacts with hydroxyl amine and yields an oxime. The structure of the oxime would be :

- (1)   
 (2)   
 (3)   
 (4) 

**Ans.** [4]

**Sol.**

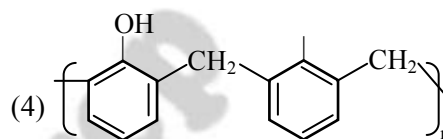
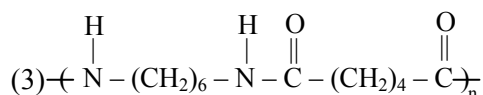
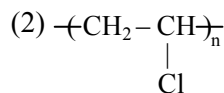
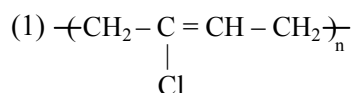


D(+) glucose

D(+) glucosime

Q.80

Which one of the following is an example of a thermosetting polymer ?



Q.79 Which of the following hormones is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings?

- (1) Thyroxin (2) Insulin  
(3) Adrenaline (4) Estradiol

Ans. [4]

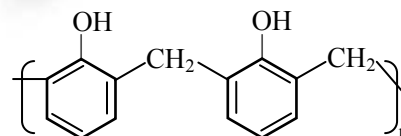
Sol.

Ans. [3]

Sol.

Adrenaline is produced under the condition of stress which stimulates glycogenolysis in the liver of human beings.

Bakelite is a thermosetting polymer which have following structure.



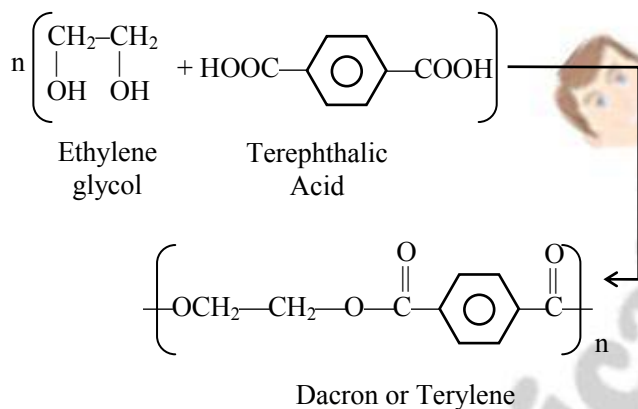


**Q.81** Which of the following organic compounds polymerizes to form the polyester Dacron?

- (1) Propylene and para HO – (C<sub>6</sub>H<sub>4</sub>) – OH
- (2) Benzoic acid and ethanol
- (3) Terephthalic acid and ethylene glycol
- (4) Benzoic acid and para HO – (C<sub>6</sub>H<sub>4</sub>) – OH

**Ans.** [3]

**Sol.**



**Q.82** Which one of the following is not a common component of Photochemical Smog?

- (1) Ozone
- (2) Acrolein
- (3) Peroxyacetyl nitrate
- (4) Chlorofluorocarbons

**Ans.** [4]

**Sol.**

Ozone, Acrolein & PAN are the common components of photo chemical smog. So CFC (Freon) is the answer.

**Q.83** In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1M H<sub>2</sub>SO<sub>4</sub>. The percentage of nitrogen in the soil is :

- (1) 37.33                      (2) 45.33
- (3) 35.33                      (4) 43.33

**Ans.** [1]

**Sol.**

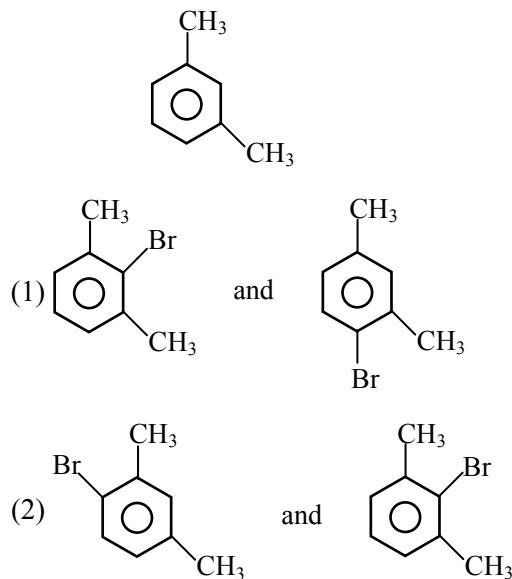
Kjeldahl's method

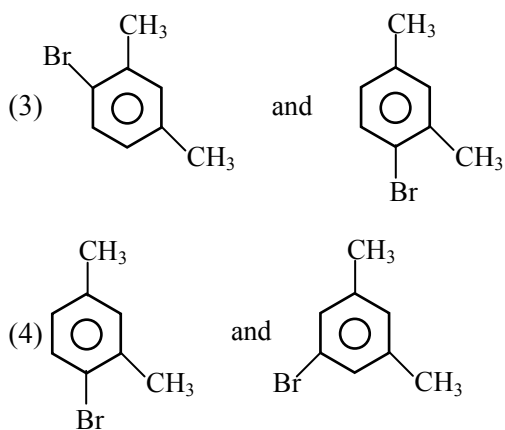
1 M of 10 ml H<sub>2</sub>SO<sub>4</sub> = 1M of 20 ml NH<sub>3</sub>.  
1000 ml of 1M ammonia contains 14 gm nitrogen.

20 ml of 1M ammonia contains  $\frac{14 \times 20}{1000}$  gm nitrogen

$$\% \text{ of nitrogen} = \frac{14 \times 20 \times 100}{1000 \times 0.75} = 37.33\%$$

**Q.84** What products are formed when the following compound is treated with Br<sub>2</sub> in the presence of FeBr<sub>3</sub>?





Ans. [3]

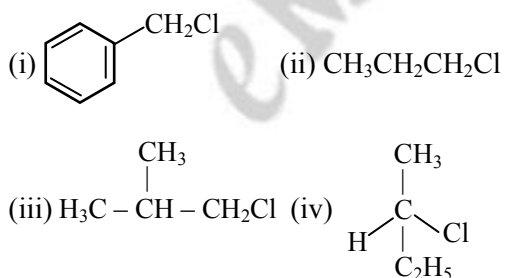
Sol.

Both methyl are o/p – directing groups and at para-position steric hinderance is not applicable therefore 1-bromo-2,4-dimethyl is **exclusive** product.

Remember 2-bromo-1,3-dimethyl benzene is obtained less than 1%.

Hence options (3) is the most appropriate answer.

**Q.85** Which of the following compounds will undergo racemisation when solution of KOH hydrolyses?

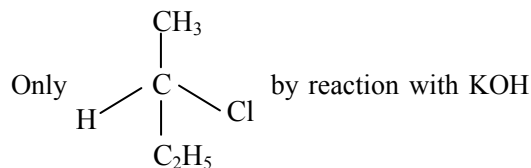


- (1) (i) and (ii) (2) (ii) and (iv)  
(3) (iii) and (iv) (4) (i) and (iv)

Ans. [Bonus]

Sol.

Wrong framing of questions.



undergo reacemisation. But suitable option is absent therefore BONUS.

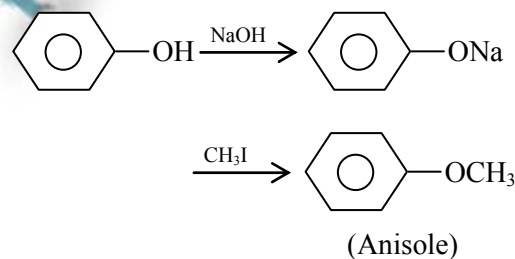
**Q.86** Among the following sets of reactants which one produces anisole ?

- (1)  $\text{CH}_3\text{CHO}$  ;  $\text{RMgX}$   
(2)  $\text{C}_6\text{H}_5\text{OH}$  ;  $\text{NaOH}$  ;  $\text{CH}_3\text{I}$   
(3)  $\text{C}_6\text{H}_5\text{OH}$  ; neutral  $\text{FeCl}_3$   
(4)  $\text{C}_6\text{H}_5-\text{CH}_3$  ;  $\text{CH}_3\text{COCl}$  ;  $\text{AlCl}_3$

Ans.

[2]

Sol.



**Q.87** Which of the following will not be soluble in sodium hydrogen carbonate ?

- (1) 2, 4, 6 – trinitrophenol  
(2) Benzoic acid  
(3) o – Nitrophenol  
(4) Benzenesulphonic acid

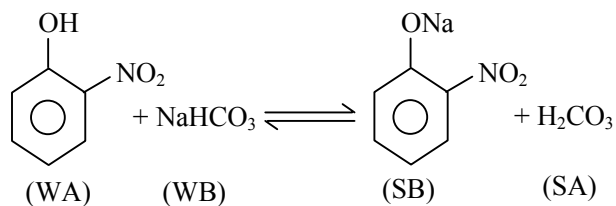
Ans.

[3]



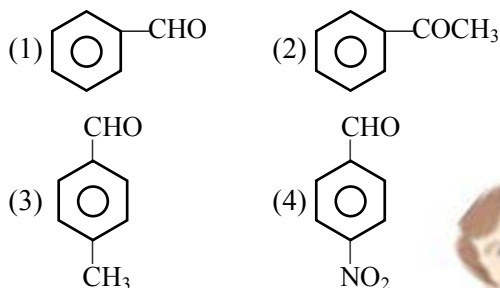


Sol.



Therefore this reaction is not possible in forward direction.

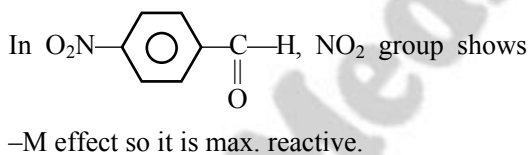
**Q.88** Which one is most reactive towards Nucleophilic addition reaction ?



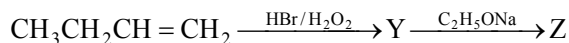
Ans. [4]

Sol.

$$\text{N.A.R.} \propto \oplus \text{ve charge on } sp^2 \text{ carbon} \propto \frac{-I, -M}{+I, +M}$$



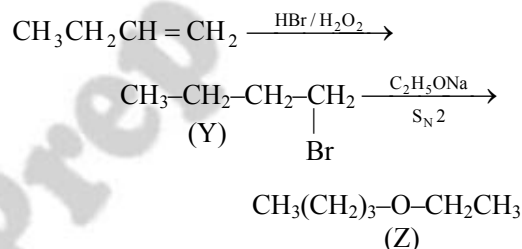
**Q.89** Identity Z in the sequence of reactions :



- (1)  $\text{CH}_3-(\text{CH}_2)_3-\text{O}-\text{CH}_2\text{CH}_3$
- (2)  $(\text{CH}_3)_2\text{CH}_2-\text{O}-\text{CH}_2\text{CH}_3$
- (3)  $\text{CH}_3(\text{CH}_2)_4-\text{O}-\text{CH}_3$
- (4)  $\text{CH}_3\text{CH}_2-\text{CH}(\text{CH}_3)-\text{O}-\text{CH}_2\text{CH}_3$

Ans. [1]

Sol.

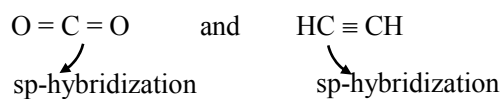


**Q.90** Which of the following organic compounds has same hybridization as its combustion product – ( $\text{CO}_2$ )?

- (1) Ethane
- (2) Ethyne
- (3) Ethene
- (4) Ethanol

Ans. [2]

Sol.





**Q.91** Which one of the following shows isogamy with non-flagellated gametes ?

- (1) *Sargassum*                      (2) *Ectocarpus*  
(3) *Ulothrix*                        (4) *Spirogyra*

**Ans.** [4]

**Sol.**

In spirogyra, non-motile gametes are present, both of the gamete are morphologically same.

**Q.92** Five kingdom system of classification suggested by R.H. Whittaker is not based on -

- (1) Presence or absence of a well defined nucleus  
(2) Mode of reproduction  
(3) Mode of nutrition  
(4) Complexity of body organisation

**Ans.** [1]

**Sol.**

Whittaker five kingdom classification is mainly based on following character

1. Cell structure
2. Thallus organization
3. Mode of Nutrition
4. Mode of reproduction
5. Phylogenetic relationship

**Q.93** Which one of the following fungi contains hallucinogens ?

- (1) *Morchella esculenta*  
(2) *Amantia muscaria*  
(3) *Neurospora* sp.  
(4) *Ustilago* sp.

**Ans.** [2]

**Sol.** *Amanita muscaria* is a hallucinogenic fungi *Amanita muscaria* have pschycoactive agent muscimol.

**Q.94** Archaeobacteria differ from eubacteria in -

- (1) Cell membrane structure  
(2) Mode of nutrition  
(3) Cell shape  
(4) Mode of reproduction

**Ans.** [1]

**Sol.**

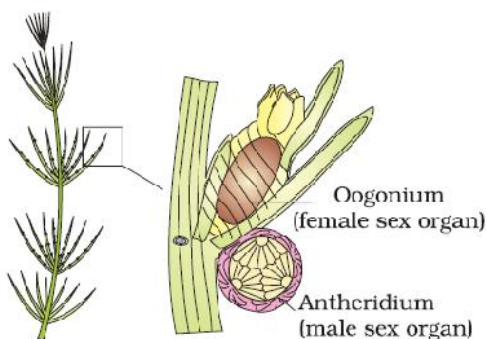
In archaeobacteria cell membrane is made up of single layer of branched chain lipid molecule, while in eubacteria it is made up of unbranched phospholipids bilayer

**Q.95** Which one of the following is **wrong** about *Chara* ?

- (1) Upper oogonium and lower round antheridium  
(2) Globule and nuclue present on the same plant  
(3) Upper antheridium and lower oogonium  
(4) Globule is male reproductive structure

**Ans.** [3]

**Sol.** Anthredium is present towards lower side and oogonium present towards the upper surface on same plant.



**Ans.** [2]

**Sol.**

In Imbricate aestivation margins of sepal or petal overlap one another without any particular direction.

**Q.96** Which of the following is responsible for peat formation ?

- (1) *Marchantia*                      (2) *Riccia*  
(3) *Funaria*                          (4) *Sphagnum*

**Ans.** [4]

**Sol.**

Peat is formed by sphagnum.

**Q.99** You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will you use to distinguish between the two ?

- (1) Secondary xylem  
(2) Secondary phloem  
(3) Protoxylem  
(4) Cortical cells

**Ans.** [3]

**Sol.**

On the basis of position of Protoxylem, root can be differentiated from shoot. In root xylem is exarch i.e. protoxylem is towards periphery while in shoot xylem is endarch i.e. protoxylem is towards centre.

**Q.97** Placenta and pericarp are both edible portions in -

- (1) Apple                              (2) Banana  
(3) Tomato                          (4) Potato

**Ans.** [3]

**Sol.**

Placenta and pericarp both are edible in tomato.

**Q.98** When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as -

- (1) Vexillary                          (2) Imbricate  
(3) Twisted                          (4) Valvate

**Q.100** Which one of the following statements is correct ?

- (1) The seed in grasses is not endospermic  
(2) Mango is a parthenocarpic fruit  
(3) A proteinaceous aleurone layer is present in maize grain  
(4) A sterile pistil is called a staminode

**Ans.** [3]

**Sol.**

Maize seed is endospermic seed, having outermost layer of endosperm aleuron, which is rich in protein.

**Ans. [4]**

**Sol.**

Mesosomes are involved in aerobic respiration in bacteria.

**Q.101** Tracheids differ from other tracheary elements in -

- (1) having casparian strips
- (2) being imperforate
- (3) lacking nucleus
- (4) being lignified

**Ans. [2]**

**Sol.**

Tracheids have pitted end wall while vessels are perforated end wall.

**Q.104** The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as -

- (1) Microtubules
- (2) Microfilaments
- (3) Intermediate filaments
- (4) Lamins

**Ans. [2]**

**Sol.** Microfilament are made up of 2 molecules of 6 nm actin protein. Microtubule are 25 nm hollow tube like structure while intermediate filament are 10 nm and lamins are nuclear proteins.

**Q.102** An example of edible underground stem is -

- (1) Carrot                      (2) Groundnut
- (3) Sweet potato            (4) Potato

**Ans. [4]**

**Sol.**

Potato tuber is edible underground stem.

**Q.105** The osmotic expansion of a cell kept in water is chiefly regulated by -

- (1) Mitochondria            (2) Vacuoles
- (3) Plastids                    (4) Ribosomes

**Ans. [2]**

**Sol.**

Vacuole is involved in osmoregulation in plant cell.

**Q.103** Which structures perform the function of mitochondria in bacteria ?

- (1) Nucleoid                    (2) Ribosomes
- (3) Cell wall                    (4) Mesosomes

**Q.106** During which phase(s) of cell cycle, amount of DNA in a cell remains of 4C level if the initial amount is denoted as 2C ?

- (1)  $G_0$  and  $G_1$                     (2)  $G_1$  and S
- (3) Only  $G_2$                         (4)  $G_2$  and M

**Ans.** [4]

**Sol.**

$G_2$  and M in 'S' phase DNA duplication occur. This leads to increase in 2C concentration to 4C concentration, which decreases to 2C at the end of M phase.

- (1) It made possible the isolation and exact identification of auxin
- (2) It is the basis for quantitative determination of small amounts of growth-promoting substances
- (3) It supports the hypothesis that IAA is auxin
- (4) It demonstrated polar movement of auxins

**Q.107** Match the following and select the **correct** answer :

- |                 |                                   |
|-----------------|-----------------------------------|
| (a) Centriole   | (i) Infoldings in mitochondria    |
| (b) Chlorophyll | (ii) Thylakoids                   |
| (c) Cristae     | (iii) Nucleic acids               |
| (d) Ribozymes   | (iv) Basal body cilia or flagella |

- | (a)      | (b)   | (c)  | (d)   |
|----------|-------|------|-------|
| (1) (iv) | (ii)  | (i)  | (iii) |
| (2) (i)  | (ii)  | (iv) | (iii) |
| (3) (i)  | (iii) | (ii) | (iv)  |
| (4) (iv) | (iii) | (i)  | (ii)  |

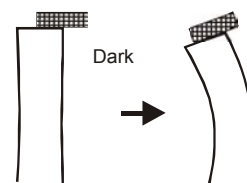
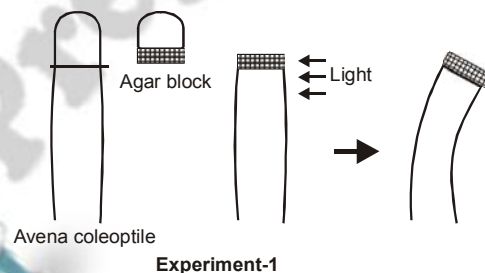
**Ans.** [1]

- Sol.**
- |                 |                                   |
|-----------------|-----------------------------------|
| (a) Centriole   | (iv) Basal body cilia or flagella |
| (b) Chlorophyll | (ii) Thylakoids                   |
| (c) Cristae     | (i) Infoldings in mitochondria    |
| (d) Ribozymes   | (iii) Nucleic acids               |

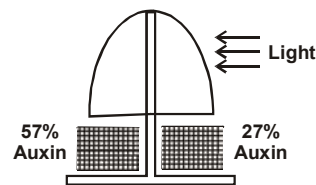
**Q.108** Dr. F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. of what significance is this experiment ?

**Ans.** [4]

**Sol.**



\*This experiment of f.w. Went proves that transport of auxin is polar and basipetal.



F.W. went have performed 3 main experiment given in diagrams. On the basis of these 3 experiments he gave 3 conclusions respectively –

- (1) Growth is directly proportional to conc. of auxin in Agar block. On basis of Exp.-1 (in fig.)
- (2) Transport of auxin is polar and basipetal. On basis of Exp.-2 (in fig.)
- (3) High conc. of auxin towards dark side (57%) and less auxin conc. towards light side (27%) rest 16% is photooxidised. On basis of Exp.-3. (in fig.)

\*In given question Exp.-2 is asked.

**Q.109** Deficiency symptoms of nitrogen and potassium are visible first in -

- (1) Senescent leaves
- (2) Young leaves
- (3) Roots
- (4) Bunds

**Ans.** [1]

**Sol.**

Nitrogen and potassium are mobile elements. Deficiency symptoms of mobile elements first appears in older or mature plant parts as older parts acts as source of mobile elements.

**Q.110** In which one of the following processes CO<sub>2</sub> is not released ?

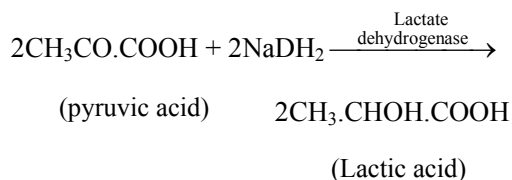
- (1) Aerobic respiration in plants
- (2) Aerobic respiration in animals
- (3) Alcoholic fermentation
- (4) Lactate fermentation

**Ans.** [4]

**Sol.**

Lactic acid fermentation.

Biochemical reaction



**Q.111** Anoxygenic photosynthesis is characteristic of-

- (1) *Rhodospirillum*
- (2) *Spirogyra*
- (3) *Chlamydomonas*
- (4) *Ulva*

**Ans.** [1]

**Sol.**

*Rhodospirillum* in non-oxygenic photosynthetic bacteria.

**Q.112** A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them ?

- (1) Mutated                      (2) Embolised
- (3) Etiolated                      (4) Defoliated

**Ans.** [3]

**Sol.**

Etiolation lack of chlorophyll pigments due to deficiency of sunlight. So plant get etiolated.

**Q.113** Which one of the following growth regulators is known as 'stress hormone' ?

- (1) Abscissic acid      (2) Ethylene  
(3) GA<sub>3</sub>                      (4) Indole acetic acid

**Ans.** [1]

**Sol.**

Abscissic acid (ABA) is considered as "Stress hormone" of plants as it protects plants from various kinds of stresses.

**Q.114** Geitonogamy involves -

- (1) Fertilization of a flower by the pollen from another flower of the same plant  
(2) Fertilization of a flower by the pollen from the same flower  
(3) Fertilization of a flower by the pollen from a flower of another plant in the same population  
(4) Fertilization of a flower by the pollen from a flower of another plant belonging to a distant population

**Ans.** [1]

**Sol.**

Geitonogamy – pollination between two flowers of same plant.

**Q.115** Male gametophyte with least number of cells is present in -

- (1) *Pteris*                      (2) *Funaria*  
(3) *Lilium*                      (4) *Pinus*

**Ans.** [3]

**Sol.**

Most reduced male gametophyte or minimum no. of cell in male gametophyte is present in angiosperm (3 celled male gametophyte). *Lilium* is angiosperm.

**Q.116** An aggregate fruit is one which develops from-

- (1) Multicarpellary syncarpous gynoecium  
(2) Multicarpellary apocarpus gynoecium  
(3) Complete inflorescence  
(4) Multicarpellary superior ovary

**Ans.** [2]

**Sol.**

Aggregate fruit is developed from multicarpellary apocarpous gynoecium.

**Q.117** Pollen tablets are available in the market for -

- (1) In vitro fertilization  
(2) Breeding programmes  
(3) Supplementing food  
(4) *Ex situ* conservation

**Ans.** [3]

**Sol.**

Pollen tablets and syrups are used as supplementary food as rich in nutrients.



**Q.118** Function of filiform apparatus is to -

- (1) Recognize the suitable pollen at stigma
- (2) Stimulate division of generative cell
- (3) Produce nectar
- (4) Guide the entry of pollen tube

**Ans.** [4]

**Sol.**

Filiform apparatus present in synergid cells helps in guiding pollen tube into embryo sac.

**Q.119** Non-albuminous seed is produced in -

- (1) Maize                      (2) Castor
- (3) Wheat                    (4) Pea

**Ans.** [4]

**Sol.**

Pea is a non-endospermic/Non-albuminous seed, as endosperm consumed during embryo development.

**Q.120** Which of the following shows coiled RNA strand and capsomeres ?

- (1) Polio virus
- (2) Tobacco mosaic virus
- (3) Measles virus
- (4) Retrovirus

**Ans.** [2]

**Sol.**

Tobacco mosaic virus has single stranded coiled RNA and protein capsid.

**Q.121** Which one of the following is **wrongly** matched ?

- (1) Transcription – Writing information from DNA to t-RNA
- (2) Translation – Using information in m-RNA to make protein
- (3) Repressor protein – Binds to operator to stop enzyme synthesis
- (4) Operon – Structural genes, operator and promoter



**Ans.** [1]

**Sol.** Transcription is writing information from DNA to m-RAN not DNA from m-RNA.

**Q.122** Transformation was discovered by -

- (1) Meselson and Stahl
- (2) Hershey and Chase
- (3) Griffith
- (4) Watson and Crick

**Ans.** [3]

**Sol.**

Transformation was discovered by Griffith in *Pneumococcus pneumoniae* bacteria.

**Q.123** Fruit colour in squash is an example of -

- (1) Recessive epistasis
- (2) Dominant epistasis
- (3) Complementary genes
- (4) Inhibitory genes

**Ans.** [2]

**Sol.**  $F_2$  phenotype ratio in this gene interaction is 12 : 3 : 1 which represent dominant epistasis.

**Q.124** Viruses have -

- (1) DNA enclosed in a protein coat
- (2) Prokaryotic nucleus
- (3) Single chromosome
- (4) Both DNA and RNA

**Ans.** [1]

**Sol.**

Viruses are having either RNA or DNA encapsulated by protein capsid.

**Q.125** The first human hormone produced by recombinant DNA technology is -

- (1) Insulin
- (2) Estrogen
- (3) Thyroxin
- (4) Progesterone

**Ans.** [1]

**Sol.**

First human hormone produced by recombinant technology is insulin by Eli Lilly an American company in 1983.

**Q.126** An analysis of chromosomal DNA using the Southern hybridization technique **does not** use-

- (1) Electrophoresis
- (2) Blotting
- (3) Autoradiography
- (4) PCR

**Ans.** [4]

**Sol.** CP Students may find this concept in CP Ex : Sheet: [Chapter : Genetics, Page No. 53]

This is a technique of detecting DNA by using a DNA probe in this technique DNA is separated by gel electrophoresis and then transferred from the gel to membrane by blotting. The DNA was detected from membrane with a DNA probe to complementary bind to DNA the probe was labelled by radio active  $^{32}P$  the labeled probes hybridise target DNA present in blot this probe is detect by auto radiography. So PCR is not included in it.

**Q.127** In vitro clonal propagation in plants is characterized by -

- (1) PCR and RAPD
- (2) Northern blotting
- (3) Electrophoresis and HPLC
- (4) Microscopy

**Ans.** [1]

**Sol.** PCR (Polymerase chain reaction) and RAPD (Randomly Amplified Polymorphic DNA) are used to detect variations among and within the species and clones of a plant.

RAPD also used to evaluate the genetic stability of micropropagated plants.

**Q.128** An alga which can be employed as food for human being is -

- (1) *Ulothrix*                      (2) *Chlorella*  
(3) *Spirogyra*                      (4) *Polysiphonia*

**Ans.** [2]

**Sol.**

Chlorella is a green algae which can be used as food supplement or food.

**Q.129** Which vector can clone only a small fragment of DNA ?

- (1) Bacterial artificial chromosome  
(2) Yeast artificial chromosome  
(3) Plasmid  
(4) Cosmid

**Ans.** [3]

**Sol.**

Plasmid can clone only a small fragment of DNA (0.5-8 kb) other can clone large fragment of DNA like.

Cosmid (30 - 45 kb)

BAC (50 - 300 kb)

YAC (1000 - 2500 kb)

**Q.130** An example of *ex situ* conservation is -

- (1) National Park  
(2) Seed Bank  
(3) Wildlife Sanctuary  
(4) Sacred Grove

**Ans.** [2]

**Sol.**

Seed bank is example of *ex-situ* conservation.

**Q.131** A location with luxuriant growth of lichens on the trees indicates that the -

- (1) trees are very healthy  
(2) trees are heavily infested  
(3) location is highly polluted  
(4) location is not polluted

**Ans.** [4]

**Sol.**

Lichens not grow in polluted habitat Lichens are sensitive to oxides of sulphur, so a habitat with luxuriant growth of lichens on trees indicates non-polluted habitat..

**Q.132** Match the following and select the **correct** option :

- |                |                         |
|----------------|-------------------------|
| (a) Earthworm  | (i) Pioneer species     |
| (b) Succession | (ii) Detritivore        |
| (c) Ecosystem  | (iii) natality service  |
| (d) Population | (iv) Pollination growth |

- |     | (a)   | (b)  | (c)   | (d)   |
|-----|-------|------|-------|-------|
| (1) | (i)   | (ii) | (iii) | (iv)  |
| (2) | (iv)  | (i)  | (iii) | (ii)  |
| (3) | (iii) | (ii) | (iv)  | (i)   |
| (4) | (ii)  | (i)  | (iv)  | (iii) |

**Ans.** [4]

**Sol.** This is a direct theory based question.

**Q.135** The organization which publishes the Red List of species is -

- |           |          |
|-----------|----------|
| (1) ICFRE | (2) IUCN |
| (3) UNEP  | (4) WWF  |

**Ans.** [2]

**Sol.**

IUCN publishes red data book.

**Q.133** A species facing extremely high risk of extinction in the immediate future is called -

- (1) Vulnerable
- (2) Endemic
- (3) Critically Endangered
- (4) Extinct

**Ans.** [3]

**Sol.**

Critically endangered species means species facing an extremely high risk of extinction in wild in immediate future.

**Q.136** Select the Taxon mentioned that represent both marine and fresh water species -

- |                     |                |
|---------------------|----------------|
| (1) Echinoderms     | (2) Ctenophora |
| (3) Cephalochordata | (4) Cnidaria   |

**Ans.** [4]

**Sol.**

Phylum cnidaria includes both fresh water and marine species where as Echinoderms, Ctenophores and Cephalochordates are exclusively marine.

**Q.134** The zone of atmosphere in which the ozone layer is present is called -

- |                  |                 |
|------------------|-----------------|
| (1) Ionosphere   | (2) Mesosphere  |
| (3) Stratosphere | (4) Troposphere |

**Ans.** [3]

**Sol.** Ozone is present in stratosphere.

**Q.137** Which one of the following living organisms completely *lacks* a cell wall ?

- (1) Cyanobacteria
- (2) Sea-fan (*Gorgonia*)
- (3) *Saccharomyces*
- (4) Blue-green algae

**Ans.** [2]

**Sol.**

Sea fan is an animal belonging to phylum coelenterata, that does not have cell wall where as cyanobacteria, saccharomyces (fungus) and blue-green algae have cell wall.

**Q.138** *Planaria* possesses high capacity of -

- (1) Metamorphosis
- (2) Regeneration
- (3) Alternation of generation
- (4) Bioluminescence

**Ans.** [3]

**Sol.**

Areolar tissue is the kind of loose connective tissue. Such type of tissues have less connective tissue cell and more intercellular space.

**Ans.** [2]

**Sol.**

*Planaria* (*Dugesia*) has the power of regeneration (*morphallaxis*) means it can regenerate the entire body with lost body part.

(Translation of option (2) in Hindi is wrong, so we have considered English option)

**Q.139** A marine cartilaginous fish that can produce electric current is -

- (1) *Pristis*                      (2) *Torpedo*
- (3) *Trygon*                      (4) *Scoliodon*

**Q.141** Choose the correctly matched pair -

- (1) Inner lining of salivary ducts – Ciliated epithelium
- (2) Moist surface of buccal cavity – Glandular epithelium
- (3) Tubular parts of nephrons – Cuboidal epithelium
- (4) Inner surface of bronchioles – squamous epithelium

**Ans.** [3]

**Sol.**

Tubular part of nephron and mostly duct of glands are lined by cuboidal epithelium.

**Ans.** [2]

**Sol.**

*Torpedo* (electric ray) produces electric current with the help of specialized muscles. Where as *Pristis* is Saw fish, *Trygon* is Sting ray, *Scoliodon* is Dog fish.

**Q.140** Choose the correctly matched pair -

- (1) Tendon – Specialized connective tissue
- (2) Adipose tissue – Dense connective tissue
- (3) Areolar tissue – Loose connective tissue
- (4) Cartilage – Loose connective tissue

**Q.142** In 'S' phase of the cell cycle -

- (1) Amount of DNA-doubles in each cell
- (2) Amount of DNA remains same in each cell
- (3) Chromosome number is increased
- (4) Amount of DNA is reduced to half in each cell

**Ans.** [1]

**Sol.**

DNA duplication occur in S phase.

**Q.143** The motile bacteria are able to move by -

- (1) Fimbriae                      (2) Flagella  
(3) Cilia                            (4) Pili

**Sol.**

Sucrose is non reducing disaccharide.

**Ans.** [2]

**Sol.**

Motile bacteria show flagellary movement.

**Q.146** The enzyme recombinase is required at which stage of meiosis -

- (1) Pachytene                      (2) Zygotene  
(3) Diplotene                      (4) Diakinesis

**Q.144** Select the option which is **not correct** with respect to enzyme action -

- (1) Substrate binds with enzyme at its active site  
(2) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate  
(3) A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate  
(4) Malonate is a competitive inhibitor of succinic dehydrogenase

**Ans.** [1]

**Sol.**

Recombinase enzyme is involved in process of crossing over which occur in pachytene stage.

**Q.147** The initial step in the digestion of milk in humans is carried out by -

- (1) Lipase                            (2) Trypsin  
(3) Rennin                           (4) Pepsin

**Ans.** [2]

**Sol.**

Inhibition of enzyme succinic dehydrogenase by malonate is example of competitive reversible inhibition. So if substrate succinate concentration is increased, it will remove malonate from active site and reaction becomes normal, so succinate reverse the inhibition of succinic dehydrogenase.

**Ans.** [3]

**Sol.**

Initial step in the digestion of milk is carried out by rennin. Because of rennin coagulates the milk in stomach.

**Q.145** Which one of the following is a non-reducing carbohydrate ?

- (1) Maltose  
(2) Sucrose  
(3) Lactose  
(4) Ribose 5-phosphate

**Ans.** [2]

**Q.148** Fructose is absorbed into the blood through mucosa cells of intestine by the process called -

- (1) active transport
- (2) facilitated transport
- (3) simple diffusion
- (4) co-transport mechanism

**Ans.** [2]

**Sol.**

Absorption of fructose by blood through mucosa cell of intestine by facilitated transport because of in this type of absorption  $\text{Na}^+$  is used.

**Q.149** Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs -

- (1) as bicarbonate ions
- (2) in the form of dissolved gas molecules
- (3) by binding of R.B.C.
- (4) as carbamino-haemoglobin

**Ans.** [1]

**Sol.** 70 % of  $\text{CO}_2$  is transported in the form of bicarbonate due to presence of carbonic anhydrase enzyme inside RBC.

**Q.150** Person with blood group AB is considered as universal recipient because he has -

- (1) both A and B antigens on RBC but no antibodies in the plasma
- (2) both A and B antibodies in the plasma.
- (3) no antigen on RBC and no antibody in the plasma.
- (4) both A and B antigens in the plasma but no antibodies.

**Ans.** [1]

**Sol.**

AB blood group individual contain both antigen A and B on its surface it does not cause antigenesis by entry of A and B antigen.

**Q.151** How do parasympathetic neural signals affect the working of the heart ?

- (1) Reduce both heart rate and cardiac output
- (2) Heart rate is increased without affecting the cardiac output
- (3) Both heart rate and cardiac output increase
- (4) Heart rate decreases but cardiac output increases.

**Ans.** [1]

**Sol.**

Parasympathetic nerve vagus reduces the heart rate, this in turn reduces the cardiac output also.

**Q.152** Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule -

- (1) Increase in aldosterone levels
- (2) Increase in antidiuretic hormone levels
- (3) Decrease in aldosterone levels
- (4) Decrease in antidiuretic hormone levels

**Ans.** [1]

**Sol.**

Aldosterone causes increase in  $\text{Na}^+$  reabsorption from DCT by active process.

**Q.153** Select the correct matching of the type of the point with the example in human skeletal system -

Type of joint	Example
(1) Cartilaginous joint	between frontal and parietal
(2) Pivot joint	between third and fourth cervical vertebrae
(3) Hinge joint	between humerus and pectoral girdle
(4) Gliding joint	between carpals

**Ans.** [4]

**Sol.**

Gliding/plain synovial joint can be found in between carpals of hand.

**Q.154** Stimulation of a muscle fiber by a motor neuron occurs at -

- (1) the neuromuscular junction
- (2) the transverse tubules
- (3) the myofibril
- (4) the sarcoplasmic reticulum

**Ans.** [1]

**Sol.**

During muscle contraction motor nerve secrete Acetylcholine neurotransmitter which goes on the muscle fibre through diffusion. Relation of motor nerve and muscle is called as neuromuscular junction.





**Q.155** Injury localized to the hypothalamus would most likely disrupt -

- (1) short-term memory
- (2) co-ordination during locomotion
- (3) executive functions, such as decision making
- (4) regulation of body temperature

**Ans.** [4]

**Sol.**

Thermoregulation centre of body is present in hypothalamus of brain.

**Q.157** Identify the hormone with its **correct** matching of source and function -

- (1) Oxytocin-posterior pituitary, growth and maintenance of mammary glands.
- (2) Melatonin-pineal gland, regulates the normal rhythm of sleep-wake cycle
- (3) Progesterone-corpora-luteum, stimulation of growth and activities of female secondary sex organs.
- (4) Atrial natriuretic factor-ventricular wall increases the blood pressure.

**Ans.** [2]

**Sol.**

Melatonin is released from pineal gland. Activity of pineal is regulated by light. Melatonin regulates diurnal rhythm.

**Q.156** Which one of the following statement is not correct ?

- (1) Retinal is the light absorbing portion of visual photopigments.
- (2) In retina the rods have the photopigment rhodopsin while cones have three different photopigments
- (3) Retinal is derivative of Vitamin C
- (4) Rhodopsin is the purplish red protein present in rods only

**Ans.** [3]

**Sol.**

In this question **not correct** statement was asked. Retinal is derivative of vitamin 'A' not vitamin 'C'.

**Q.158** Fight-or-flight reaction cause activation of -

- (1) the parathyroid glands, leading to increased metabolic rate
- (2) the kidney, leading to suppression of renin-angiotensin-aldosterone pathway
- (3) the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine
- (4) the pancreas leading to a reduction in the blood sugar levels

**Ans.** [3]

**Sol.**

During fight or flight reaction sympathetic neurons activate adrenal medulla to produce adrenaline & noradrenaline.



**Q.159** The shared terminal duct of the reproductive and urinary system in the human male is -

- (1) Urethra                      (2) Ureter
- (3) Vas deferens              (4) Vasa efferentia

**Ans.** [1]

**Sol.**

**Q.160** The main function of mammalian corpus luteum is to produce -

- (1) estrogen only
- (2) progesterone
- (3) human chorionic gonadotropin
- (4) relaxin only

**Ans.** [2]

**Sol.** Corpus luteum secretes pregnancy hormone progesterone.

**Q.161** Select the correct option describing gonadotropin activity in a normal pregnant female -

- (1) High level of FSH and LH stimulates the thickening of endometrium
- (2) High level of FSH and LH facilitate implantation of the embryo
- (3) High level of hCG stimulates the synthesis of estrogen and progesterone
- (4) High level of hCG stimulates the thickening of endometrium

**Ans.** [3]

**Sol.**

HCG is released by placenta which helps in sustaining the level of sex hormones to support pregnancy.

**Q.162** Tubectomy is a method of sterilization in which-

- (1) small part of the fallopian tube is removed or tied up
- (2) ovaries are removed surgically
- (3) small part of vas deferens is removed or tied up
- (4) uterus is removed surgically

**Ans.** [1]

**Sol.**

Tubectomy is a method of female sterilisation.

**Sol.**

Zygote intrafallopian transfer or ZIFT is the technique, which is referred in the questions.

**Q.165** A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind ?

- (1) 25 %
- (2) 0 %
- (3) 50 %
- (4) 75 %

**Ans.** [3]

**Sol.**

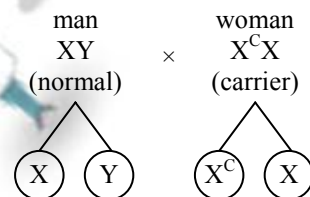
**Q.163** Which of the following is a hormone releasing Intra Uterine Device (IUD) ?

- (1) Multiload 375
- (2) LNG-20
- (3) Cervical cap
- (4) Vault

**Ans.** [2]

**Sol.**

LNG-20 is a levonorgestrel releasing IUD.



Man is normal, his father is colourblind (x-linked) but x chromosome is not transmitted from his father, woman is carrier b/c her mother is colourblind.

	X	Y
X <sup>C</sup>	X <sup>C</sup> X carrier	X <sup>C</sup> Y colourblind
X	XX Normal	XY Normal

So 50 % male child will be colourblind.

**Q.164** Assisted reproductive technology, IVF involves transfer of -

- (1) Ovum into the fallopian tube
- (2) Zygote into the fallopian tube
- (3) Zygote into the uterus
- (4) Embryo with 16 blastomeres into the fallopian tube

**Ans.** [2]

**Q.166** In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is -

- (1) 0.4
- (2) 0.5
- (3) 0.6
- (4) 0.7

**Ans.** [3]

**Ans. [1]**

**Sol.**

hardy weinbergh law

$$p^2 + 2pq + q^2 = 1$$

(AA)      (Aa)      (aa)

360      480      160

$A \rightarrow p$

$a - q$

$(p + q = 1)$

$aa = 160$

$$aa = \frac{160}{1000} \times 100 = 16 \%$$

$$q^2 = 0.16$$

$$q = 0.4 \quad (p + q = 1)$$

$$\text{so } p = 0.6$$

**Q.167** A human female with Turner's syndrome -

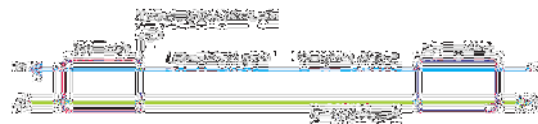
- (1) has 45 chromosomes with XO
- (2) has one additional X chromosome
- (3) exhibits male characters
- (4) is able to produce children with normal husband

**Ans. [1]**

**Sol.**

**Q.168** Select the correct option -

	Direction of RNA synthesis	Direction of reading of the template DNA strand
(1)	5' — 3'	3' — 5'
(2)	3' — 5'	5' — 3'
(3)	5' — 3'	5' — 3'
(4)	3' — 5'	3' — 5'



So direction of RNA synthesis in 5' → 3'

and direction of reading of template DNA strand.

**Q.169** Commonly used vectors for human genome sequencing are -

- (1) T-DNA
- (2) BAC and YAC
- (3) Expression Vectors
- (4) T/A Cloning Vectors

**Ans. [2]**

**Sol.**

**Q.170** Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of-

- (1) Analogous organs
- (2) Adaptive radiation
- (3) Homologous organs
- (4) Convergent evolution

**Ans. [3]**

**Sol.**

They are the organs with common origin but perform different function.

**Q.171** Which one of the following are analogous structures ?

- (1) Wings of Bat and Wings of Pigeon
- (2) Gills of Prawn and Lungs of Man
- (3) Thorns of Bougainvillea and Tendrils of Cucurbita
- (4) Flippers of Dolphin and legs of Horse

**Ans.** [1]

**Sol.**

Bat wings and bird wings are Analogous as flight strictures. Their structure and function have evolved by different routes from a flightless reptilian ancestor.

**Q.172** Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below ?



- (1) Hallucinogen
- (2) Depressant
- (3) Stimulant
- (4) Pain-killer

**Ans.** [1]

**Sol.**

This is flowering branch of Datura having halucinogenic properties.

**Q.173** At which stage of HIV infection does one usually show symptoms of AIDS ?

- (1) Within 15 days of sexual contact with an infected person

(2) When the infected retro virus enters host cells

(3) When HIV damages large number of helper T-Lymphocytes

(4) When the viral DNA is produced by reverse transcriptase

**Ans.** [3]

**Sol.**

When HIV damage T-helper T-lymphocyte, person become immunodeficient so immunodeficient symptoms appear in the phage.

**Q.174** To obtain virus-free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken ?

- (1) Apical meristem only
- (2) Palisade parenchyma
- (3) Both apical and axillary meristems
- (4) Epidermis only

**Ans.** [3]

**Sol.** In plant tissue culture virus free plants can be obtained by both apical and axillary meristems as rate of division of meristemetic tissue is faster than the rate of reproduction of virus.

**Q.175** What gases are produced in anaerobic sludge digesters ?

- (1) Methane and CO<sub>2</sub> only
- (2) Methane, hydrogen sulphide and CO<sub>2</sub>
- (3) Methane, Hydrogen sulphide and O<sub>2</sub>
- (4) Hydrogen sulphide and CO<sub>2</sub>

**Ans.** [2]

**Sol.**

In anaerobic sludge digester, due to activity of anaerobic bacteria like Methanomonas & Sulphur bacteria the gases like CH<sub>4</sub>, H<sub>2</sub>S & CO<sub>2</sub> are produced.

Options :

	A	B	C	D
(1)	Rock minerals	Detritus	Litter fall	Producers
(2)	Litter fall	Producers	Rock minerals	Detritus
(3)	Detritus	Rock minerals	Producers	Litter fall
(4)	Producers	Litter fall	Rock minerals	Detritus

**Q.176** Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to -

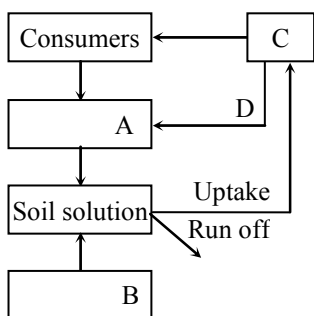
- (1) Western Ghat
- (2) Meghalaya
- (3) Corbett National Park
- (4) Keolado National Park

**Ans.** [4]

**Sol.**

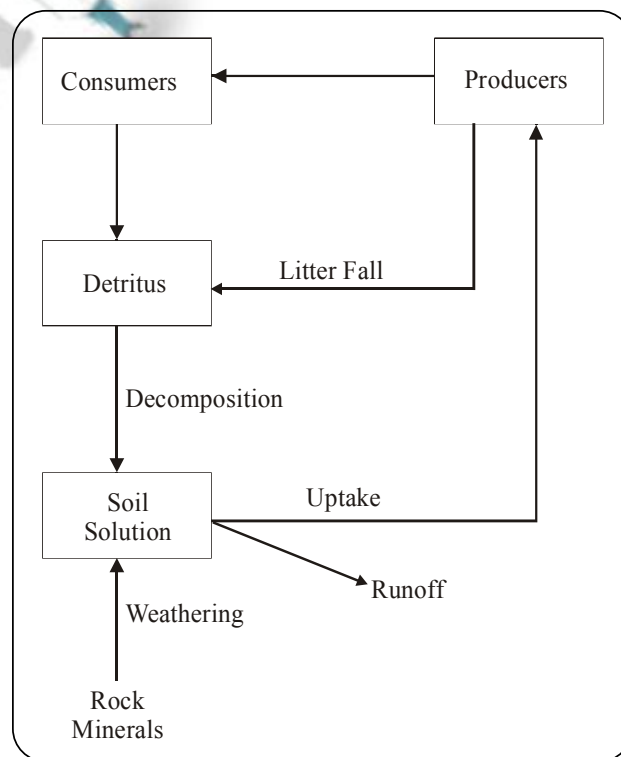
Migratory birds from Sibaria are Generally migrates at Keolado National park Bharatpur during winter season.

**Q.177** Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D). Identify the blanks.



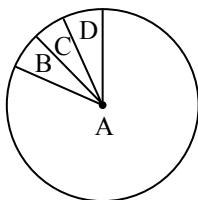
**Ans.** [3]

**Sol.**



- A – Detritous  
 B – Rock minerals  
 C – Produces  
 D – Litter fall

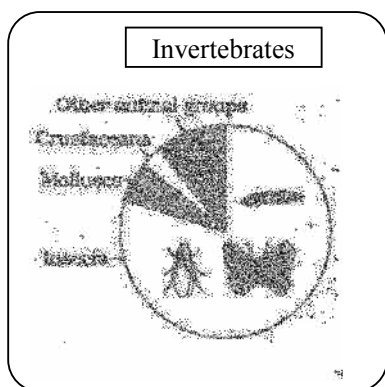
**Q.178** Given below is the representation of the extent of global diversity of invertebrates. What groups the four portions (A-D) represent respectively ?



	A	B	C	D
(1)	Insects	Crustaceans	Other animal groups	Molluscs
(2)	Crustaceans	Insects	Molluscs	Other animals groups
(3)	Molluscs	Other animals group	Crustaceans	Insects
(4)	Insects	Molluscs	Crustaceans	Other animal groups

**Ans.** [4]

**Sol.**



**Q.179** A scrubber in the exhaust of a chemical industrial plant removes -

- (1) gases like sulphur dioxide
- (2) particulate matter of the size 5 micrometer or above
- (3) gases like ozone and methane
- (4) particular matter of the size 2.5 micrometer or less

**Ans.** [1]

**Sol.**

Scrubber in chemical industries are used to remove SPM gases like sulphur dioxides.

**Q.180** If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain ?

plant → mice → snake → peacock

- (1) 0.02 J
- (2) 0.002 J
- (3) 0.2 J
- (4) 0.0002 J

**Ans.** [1]

**Sol.** CP Students may find similar question in CP Exercise Sheet: [Chapter : Ecology (Ecosystem), Level # 2, Page No. 124, Q. 52]

This is based on Lindemann's 10 percent Law so if plant trapped 20 Joule energy then

Plant → mice → snake → peacock

20 J    2 J    0.2 J    0.02 J

So energy available for Peacock is 0.02 J.