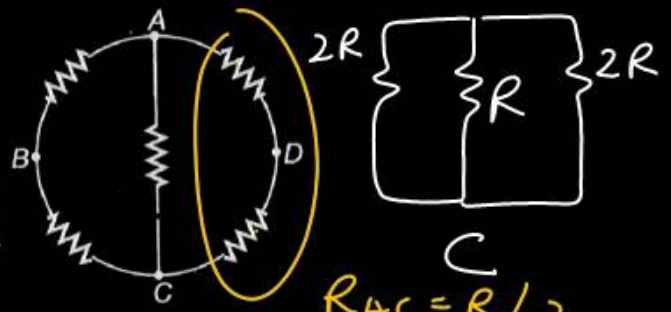
Question no. 1

In the circuit diagram shown in the figure, each resistance is R. Match the following two columns for equivalent resistance.



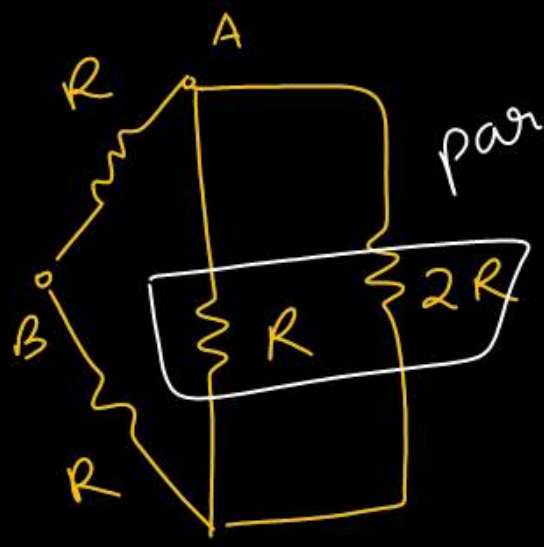
$R_{BD} = R$

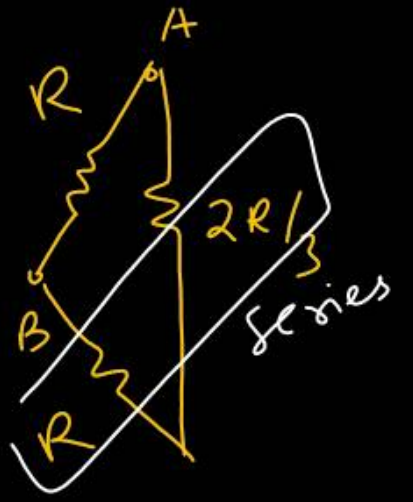
$R_{AC} = R/2$

	Column I		Column II
(A)	Between points A and B	(p)	(B) $\frac{R}{2}$
(B)	Between points A and C	(q)	(C) R
(C)	Between points B and D	(r)	(A) $\frac{5R}{8}$

(1) A – r, B – p, C – q (2) A – p, B – r, C – q

(3) A – r, B – q, C – p (4) A – q, B – r, C – p



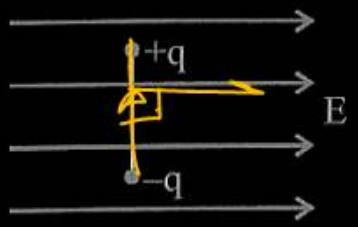


$R_{AB} = \frac{R \times 5R/3}{8R/3} = 5R/8$

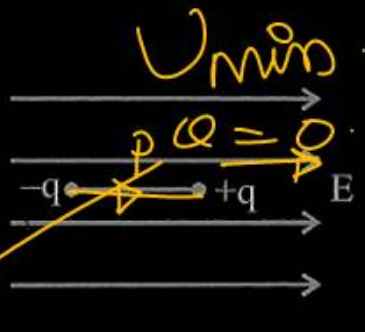
Question no. 2

In which of the following orientation of electric dipole placed in uniform electric field, it is in stable equilibrium?

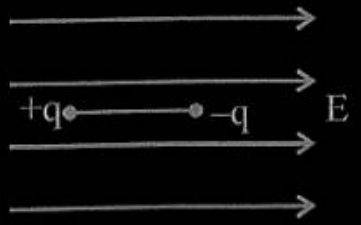
(1)



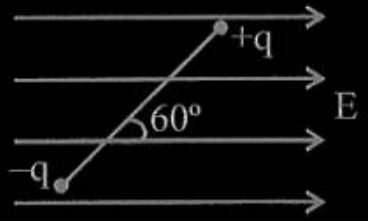
(2)

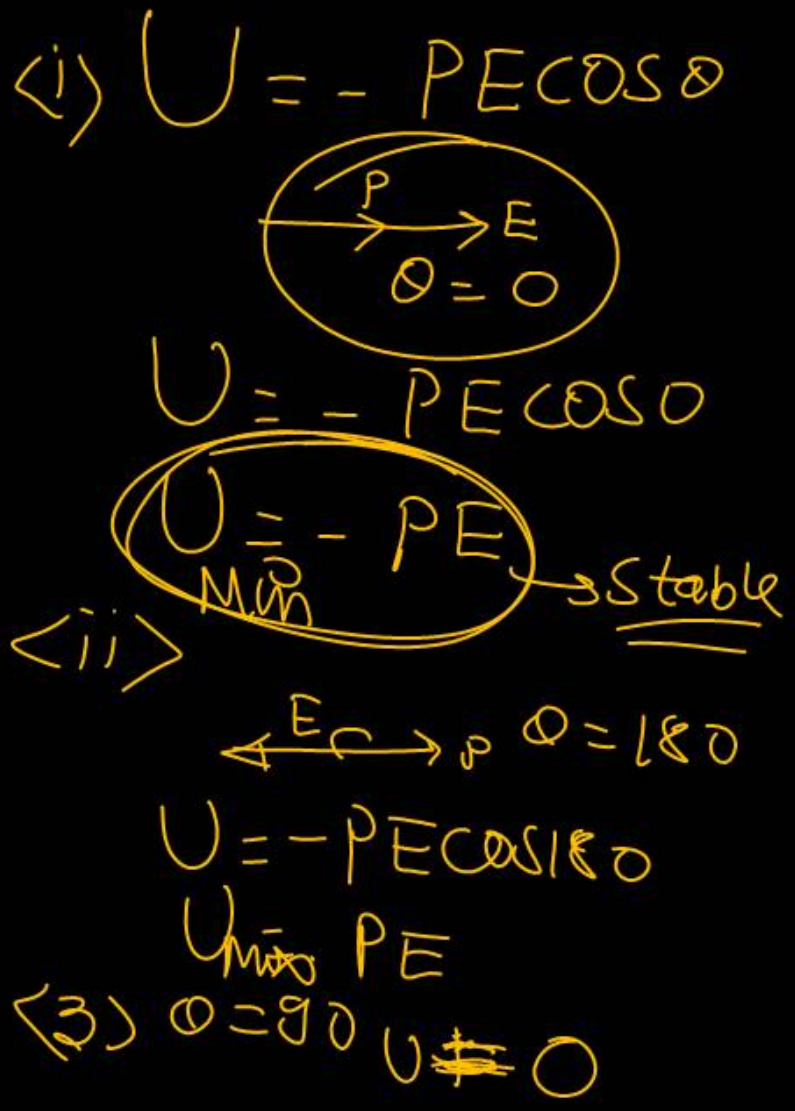


(3)



(4)





Question no. 3

Two opposite and equal charges 4×10^{-8} C when placed 2×10^{-2} cm away form a dipole. If this dipole is placed in an external electric field 4×10^{8} N/C, then value of maximum torque and the work done in rotating it through 180° will be

(1) 64×10^{-4} N-m and 64×10^{-4} J

(2) 32×10^{-4} N-m and 32×10^{-4} J

(3) 64×10^{-4} N-m and 32×10^{-4} J

(4) 32×10^{-4} N-m and 64×10^{-4} J

$\tau = PE\sin\theta$

$\tau_{max} = PE\sin 90$

$\tau_{max} = PE$

$\tau_{max} = q \times d \times E$

$= 4\times10^{-8} \times 2\times10^{-2} \times 10^{-2} \times 4\times10^{8}$

$= 8 \times 4 \times 10^{-12} \times 10^{8}$

$\tau_{max} = 32 \times 10^{-4}\ N.m$

$W = PE(1-\cos\theta)\,180$

$W = 2PE$

$W = 2\tau_{max}$

$W = 2 \times 32 \times 10^{-4} = 64 \times 10^{-4}\ J$

Question no. 4

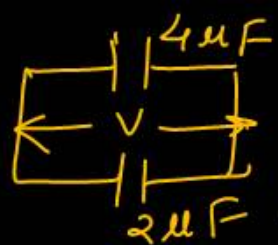
A capacitor 4 μF charged to 50 V is connected to another capacitor of 2 μF charged to 100 V with plates of like charges connected together. The total energy before and after connection in multiples $[10^{-2}\ J]$ is -

(1) 1.5 and 1.33 (2) 1.33 and 1.5

(3) 3.0 and 2.67 (4) 2.67 and 3.0

$U_1 = 5\times10^{-3}$

$U_1 = 0.5\times10^{-2}\ J$



$U_2 = \frac{1}{2}\times2\times10^{-6}\times(100)^2$

$U_2 = 10^{-6}\times10^{4}$

$U_2 = 1\times10^{-2}$

$V = \frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

$V = \frac{200+200}{6}$

$V = \frac{400}{6}$

$V = \frac{200}{3}$ (volt)

$U_i = 0.5\times10^{-2} + 1\times10^{-2}$

$U_i = 1.5\times10^{-2}$

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

$U_f = \frac{1}{2}\times6\times10^{-6}\times\left(\frac{200}{3}\right)^2$

$= \frac{3\times10^{-6}\times4\times10^{4}}{3} = \frac{4}{3}\times10^{-2} = 1.33\times10^{-2}\ J$

$U_f = 1.33\times10^{-2}$

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

Question no. 5

Two charge -4q and q are 30 cm apart. The electric field will be zero at

(1) 30 cm from q (2) 60 cm from q

(3) 15 cm from q (4) 10 cm from q

$$d_{small} = \frac{\gamma}{\sqrt{\frac{Q_{Big}}{Q_{small}}} - 1}$$

$$= \frac{30}{\sqrt{\frac{4q}{q}} - 1}$$

$$= \frac{30}{2 - 1}$$

$$= 30$$

Question no. 6

Two equal positive charges are kept at point A and B. The electric potential at the points between A and B (excluding these points) is studied while moving from A to B. The potential

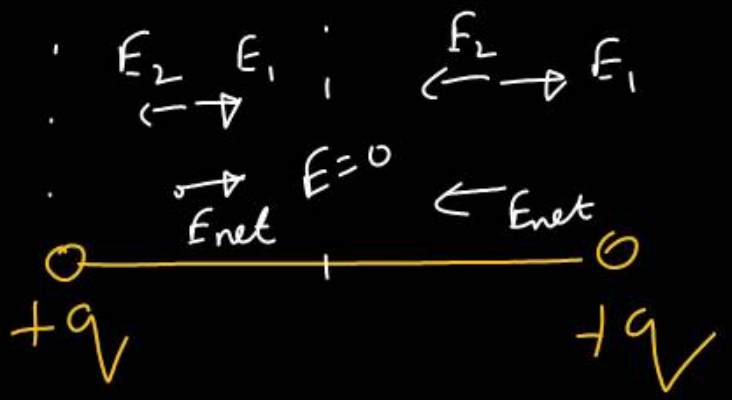
(1) continuously increases

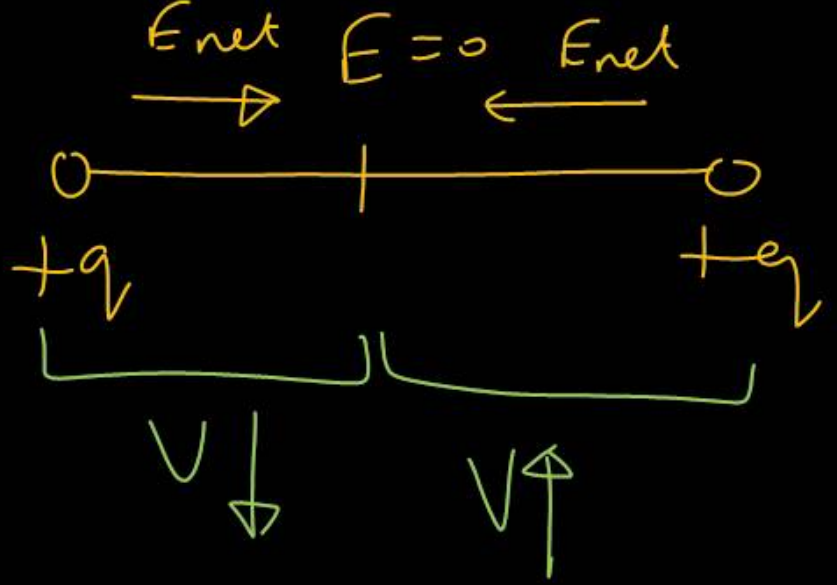
(2) continuously decreases

(3) increases then decreases

(4) decreases then increases

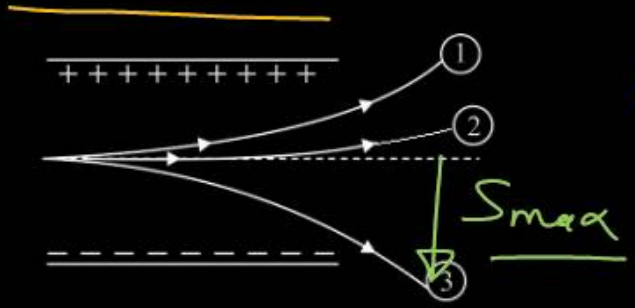
$V \downarrow$ in dir^{n} of E





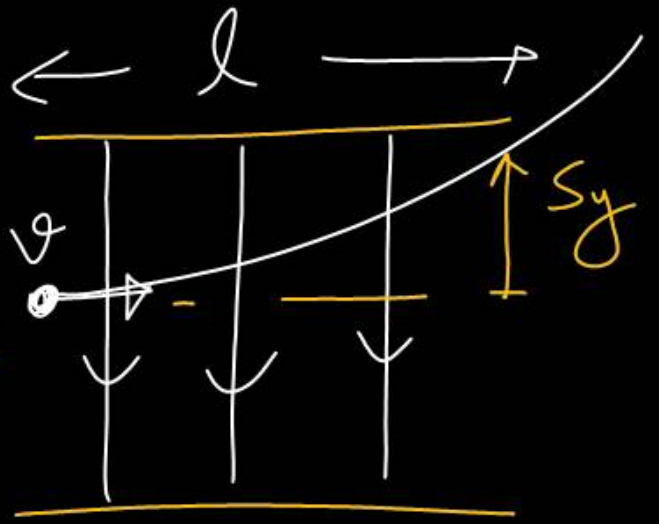
Question no. 7

Figure below shows tracks of three charged particles in a uniform electrostatic field. Which particle has the highest charge to mass ratio?



(1) 1 (2) 2

(3) 3 (4) Insufficent data



$a_y = qE/m$

$t = \frac{\ell}{v}$

$S_y = u_y t + \frac{1}{2} a_y t^2$

$S_y = \frac{1}{2} a_y t^2$

$S_y = \frac{1}{2} \frac{qE}{m} \left(\frac{\ell}{v}\right)^2$

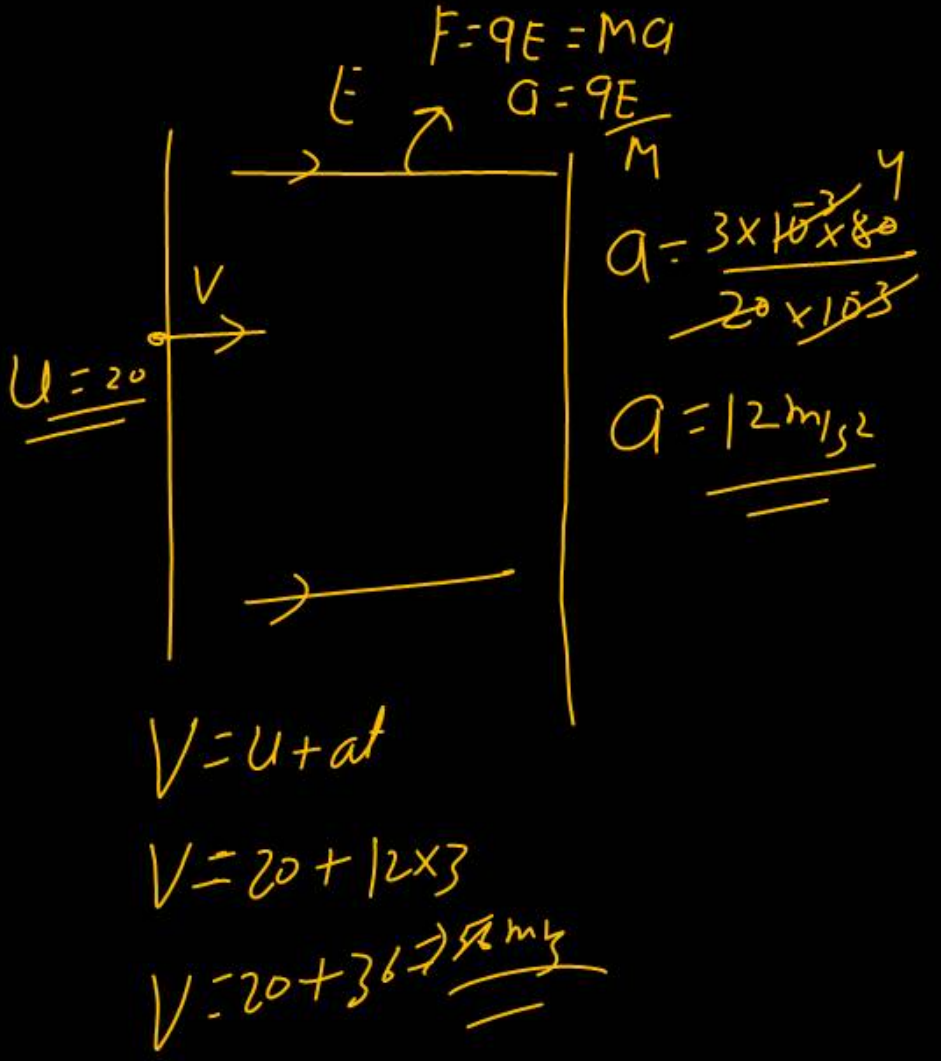
$S_y \propto q/m$

Question no. 8

A mass m = 20g has a charge q = 3.0 mC. It moves with a velocity of 20 m/s and enters a region of electric field of 80 N/C in the same direction as the velocity of the mass. The velocity of the mass after 3 s in this region is

(1) 80 m/s (2) 56 m/s

(3) 44 m/s (4) 40 m/s



Question no. 9

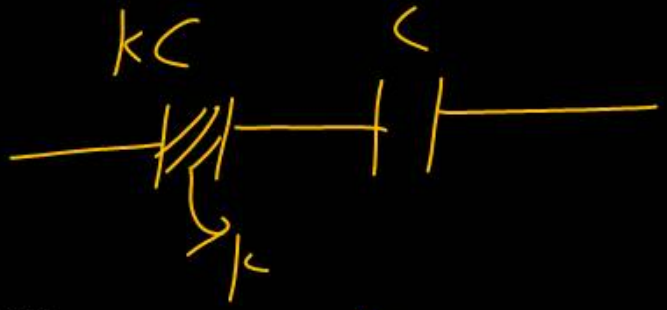
Two capacitors of capacitance C are connected in series. If one of them is filled with dielectric substance K, what is the effective capacitance?

(1) $\frac{KC}{(1+K)}$

(2) C (K + 1)

(3) $\frac{2KC}{1+K}$

(4) None of these



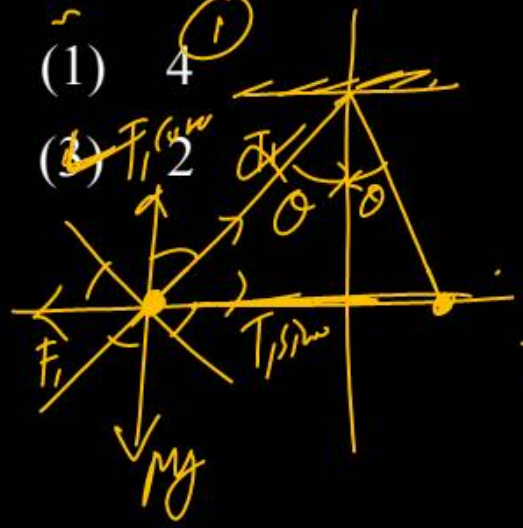
$C_{eq} = \frac{kC \times C}{C(k+1)} = \frac{kC}{k+1}$

Question no. 10

Two identical charged spheres are suspended by strings of equal lengths. The strings make an angle of 30° with each other. When suspended in a liquid of density 0.8 gcm^{-3}, the angle remains the same. If density of the material of the sphere is 1.6 gcm^{-3}, the dielectric constant of the liquid is

(1) 4 (2) 3

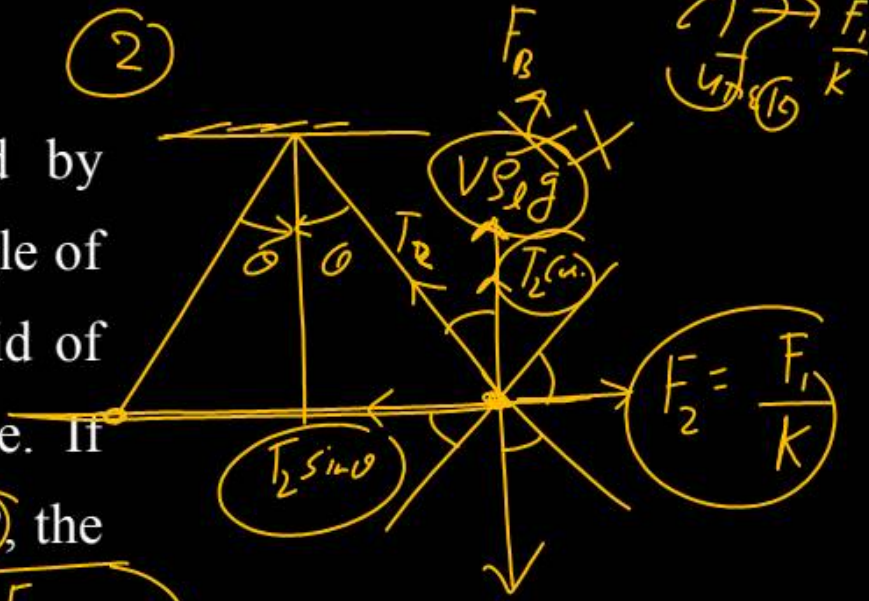
(3) 2 (4) 1



$$T_1\sin\theta = F_1$$

$$T_1\cos\theta = Mg$$

$$\tan\theta = \frac{F_1}{V\rho_s g}$$



$$T_2\sin\theta = F_1/k$$

$$T_2\cos\theta = V\rho_s g - V\rho_l g$$

$$\tan\theta = \frac{F_1}{k(V\rho_s g - V\rho_l g)}$$

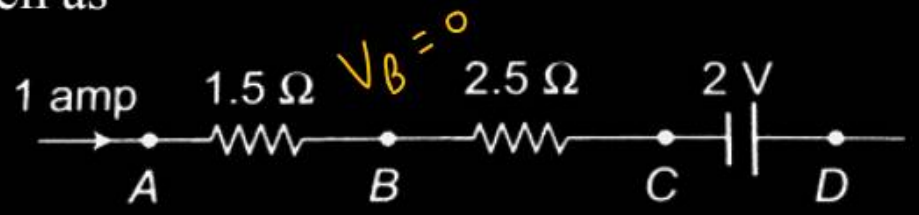
$$Mg - V\rho_s g - V\rho_l g$$

$$k = \frac{\rho_s}{\rho_s - \rho_l}$$

$$k = \frac{1.6}{0.8} = 2$$

Question no. 11

In the circuit element given here, if the potential at point B, $V_B = 0$, then the potentials of A and D are given as



(1) $V_A = -1.5$ V, $V_D = +2$ V

(2) $V_A = -1.5$ V, $V_D = +0.5$ V

(3) $V_A = +1.5$ V, $V_D = +0.5$ V

(4) $V_A = +1.5$ V, $V_D = -0.5$ V

A → B

$V_A - 1 \times 1.5 = 0$

$V_A = 1.5$ volt

B → D

$0 - 2.5 \times 1 + 2 = V_D$

$V_D = -0.5$V

Question no. 12

A charged ball of mass 9 kg is suspended from a string in a uniform electric field $\vec{E} = (3\hat{i} + 5\hat{j}) \times 10^5$ N/C. The ball is in equilibrium with $\theta = 37^\circ$. If direction of electric field is reversed, find the new equilibrium position of the ball. Given your answer in terms of angle made by string with vertical. (Take, $g = 10\ ms^{-2}$).

(1) $\tan^{-1}\left(\frac{3}{4}\right)$

(2) $\cot^{-1}\left(\frac{3}{14}\right)$

(3) $\cot^{-1}\left(\frac{3}{4}\right)$

(4) $\tan^{-1}\left(\frac{3}{14}\right)$

$\frac{T_1 4}{5} + 59 = Mg$

$\frac{T_1 4}{5} = Mg - 59$

$\frac{T_1 x 3}{5} = 39$

$\frac{4}{3} = \frac{Mg - 59}{39}$

$129 = 3Mg - 15g$

$21g = 3Mg$

$g = \frac{Mg}{9}$

$T_2\cos\theta$

T_2

θ

39

$T_2\sin\theta$

Mg

59

$T_2\sin\theta = 39$

$T_2\cos\theta = Mg + 59$

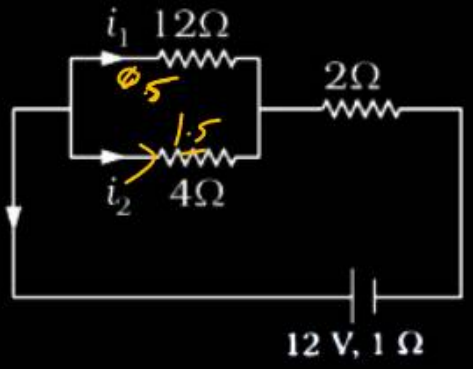
$\tan\theta = \frac{39}{Mg + 59}$

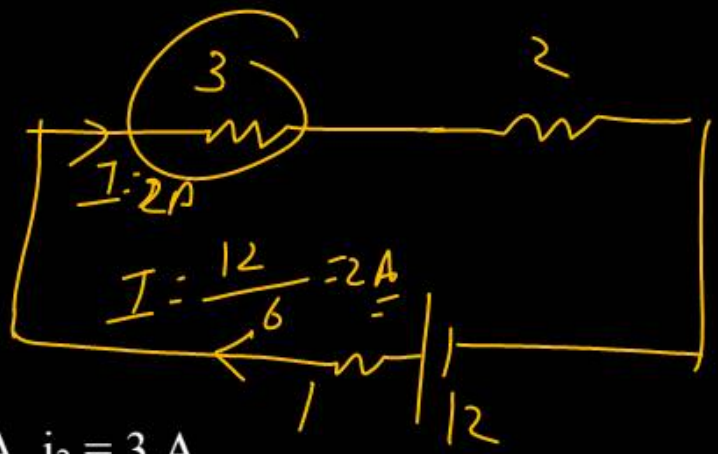
$\tan\theta = \frac{3 \times \frac{Mg}{9} \times 3}{Mg + 5 \times \frac{Mg}{9}} = \frac{\frac{1}{3}}{\frac{14}{9}}$

$\tan\theta = \frac{3}{14}$

Question no. 13

In the circuit shown, the currents i_1 and i_2 are





(1) $i_1 = 3$ A, $i_2 = 1$ A (2) $i_1 = 1$ A, $i_2 = 3$ A

(3) $i_1 = 0.5$ A, $i_2 = 1.5$ A (4) $i_1 = 1.5$ A, $i_2 = 0.5$ A

Question no. 14

Rated power of a bulb at V voltage is P. Now same voltage V is applied in all conditions mentioned in Column I. Match this Column I with Column II in which actual total power consumed is given.

	Column I		Column II
(A)	Two bulbs are connected in parallel	(p)	P
(B)	Two bulbs are connected in series	(q)	2P
(C)	Two bulbs are connected in parallel and one bulb in series with this combination	(r)	$\frac{P}{2}$
(D)	A group of two-two bulbs in parallel are mutually connected in series	(s)	None

(1) A-r, B-q, C-s, D-p (2) A-q, B-r, C-s, D-p

(3) A-r, B-q, C-p, D-s (4) A-p, B-r, C-s, D-q

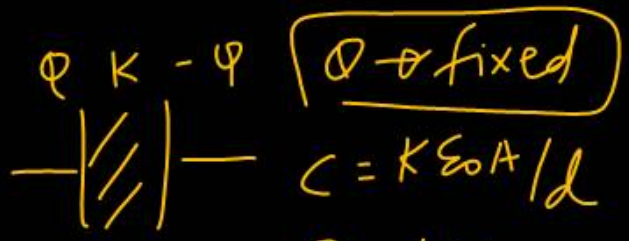
Question no. 15

A parallel plate capacitor filled with a material of dielectric constant K is charged to a certain voltage and isolated. The dielectric material is removed. Then,

1. the capacitance decreases by a factor K.
2. the electric field reduces by a factor K.
3. the voltage across the capacitor increases by a factor K.
4. the charge stored in the capacitor increases by a factor K.

(1) 1 and 2 are true (2) 1 and 3 are true

(3) 2 and 3 are true (4) 2 and 4 are true



Question no. 16

Charge passing through a conductor of cross-section area A= 0.3 m^2 is given by $q = 3t^2 + 5t + 2$ in coulomb, where t is in second. What is the value of drift velocity at t = 2s? (Take, $n = 2 \times 10^{25}/m^3$)

(1) 0.77×10^{-5} m/s (2) 1.77×10^{-5} m/s

(3) 2.08×10^{-5} m/s (4) 0.57×10^{-5} m/s

$I = 6t + 5$

$t = 2sec$

$I = 6 \times 2 + 5$

$I = 17(A)$

$16 \times 6 = 96$

$I = neAV_d$.

$V_d = \frac{I}{neA}$.

$= \frac{1700}{2 \times 10^{25} \times 1.6 \times 10^{-19} \times 0.3}$

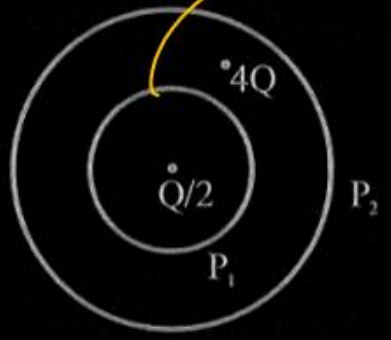
$= \frac{1700}{2 \times 16 \times 3 \times 10^{6}}$

$= \frac{1700}{96 \times 10^{6}}$.

$= 1.77 \times 10^{-5}$ (m/s)

Question no. 17

Two concentric spherical surfaces P_1 and P_2 enclose charges $\frac{Q}{2}$ and $4Q$ as shown in the figure. If ϕ_1 and ϕ_2 are the electric fluxes linked with the surfaces P_1 and P_2 respectively then



$\phi_1 = \frac{Q}{2\varepsilon_0}$

$\phi_2 = \frac{(4Q + \frac{Q}{2})}{\varepsilon_0} = \frac{9Q}{2\varepsilon_0}$

$\frac{\phi_1}{\phi_2} = \frac{1}{9}$

$\phi_2 = 9\phi_1$

(1) $\phi_2 = 9\phi_1$

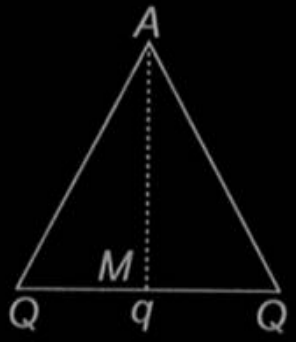
(2) $\phi_1 = 9\phi_2$

(3) $\phi_2 = 2\phi_1$

(4) $\phi_1 = 2\phi_2$

Question no. 18

Two equal charges Q placed at two corners of equilateral traingle and q is placed at mid-point M. If the net electric field at A is zero, then q is equal to

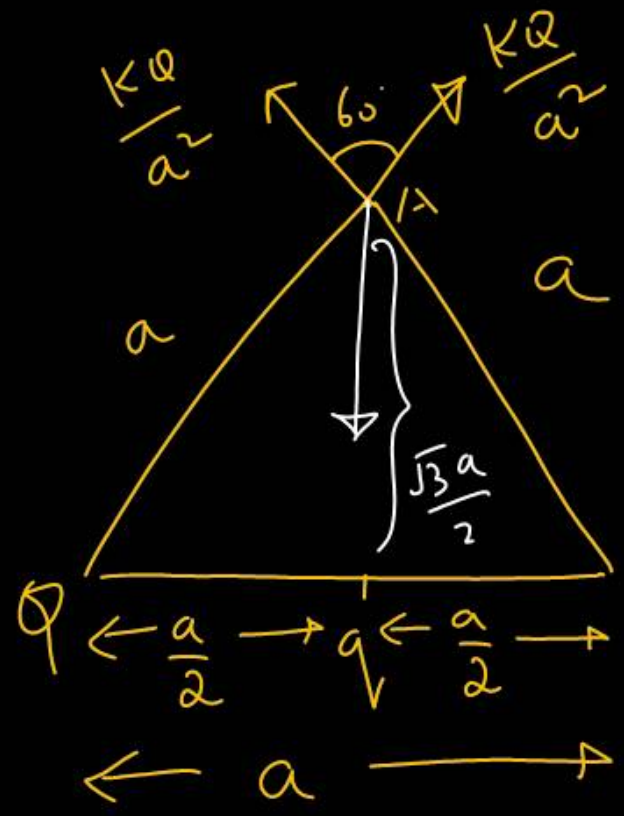


(1) $\frac{3\sqrt{3}}{4}Q$

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

(3) $\frac{Q}{4}$

(4) $-\frac{\sqrt{3}}{4}Q$



$E_A = 0$

$\frac{\sqrt{3}KQ}{a^2} = \frac{4Kq}{3a^2}$

$q = \frac{3\sqrt{3}Q}{4}$

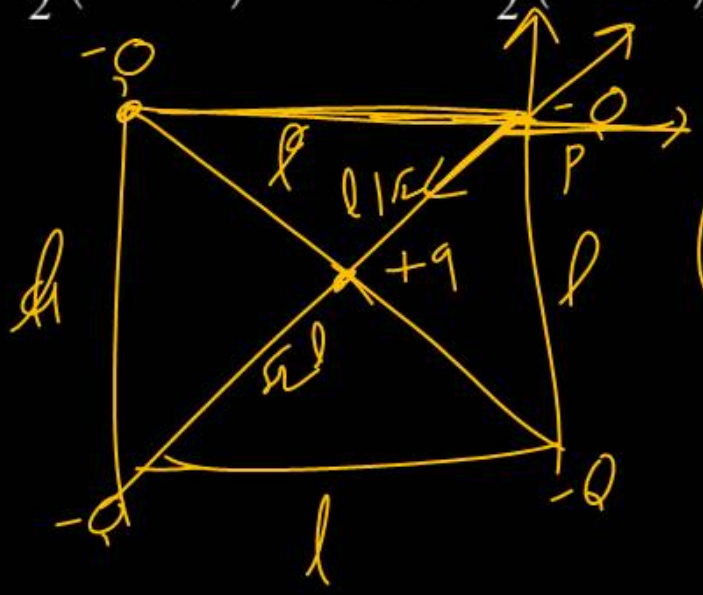
q must be of opp. nature

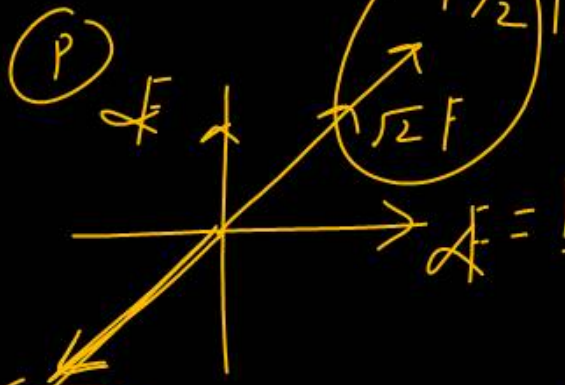
Question no. 19

Four charges equal to –Q each are placed at the four corners of a square and a charge q is at its centre. If the system is in equilibrium, the value of q is:

(1) $-\frac{Q}{4}\left(1+2\sqrt{2}\right)$ (2) $\frac{Q}{4}\left(1+2\sqrt{2}\right)$

(3) $-\frac{Q}{2}\left(1+2\sqrt{2}\right)$ (4) $\frac{Q}{2}\left(1+2\sqrt{2}\right)$





$2q = Q\left(\frac{1}{2}+\sqrt{2}\right)$

$q = \frac{Q}{2}\left(\frac{1}{2}+\frac{\sqrt{2}\times 2}{2}\right)$

$q = \frac{Q}{4}\left(1+2\sqrt{2}\right)$

$F = \frac{kQ^2}{l^2}$

$\frac{2kQq}{l^2} = F\left(\frac{1}{2}+\sqrt{2}\right)$

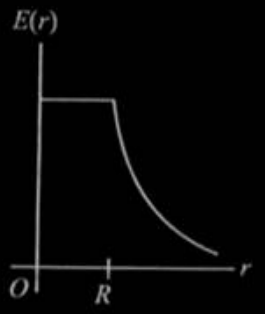
$\frac{2\times kQq}{l^2} = \frac{kQ^2}{l^2}\left(\frac{1}{2}+\sqrt{2}\right)$

$\frac{2\times kQq}{kQ^2}$

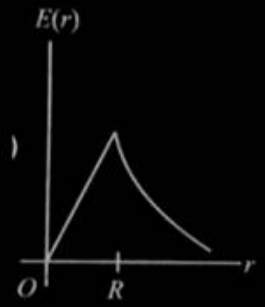
Question no. 20

A thin spherical shell of radius R has charge Q spread uniformly over its surface. Which of the following graphs most closely represents the electric field E(r) produced by the shell in the range $0 < r < \infty$, where r is the distance from the centre of the shell?

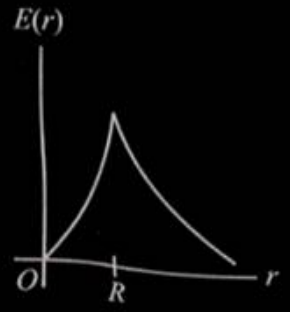
(1)



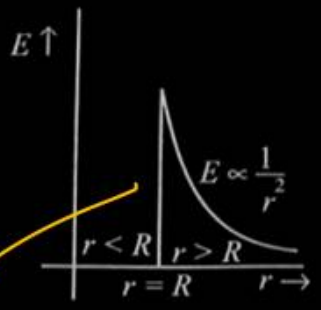
(2)

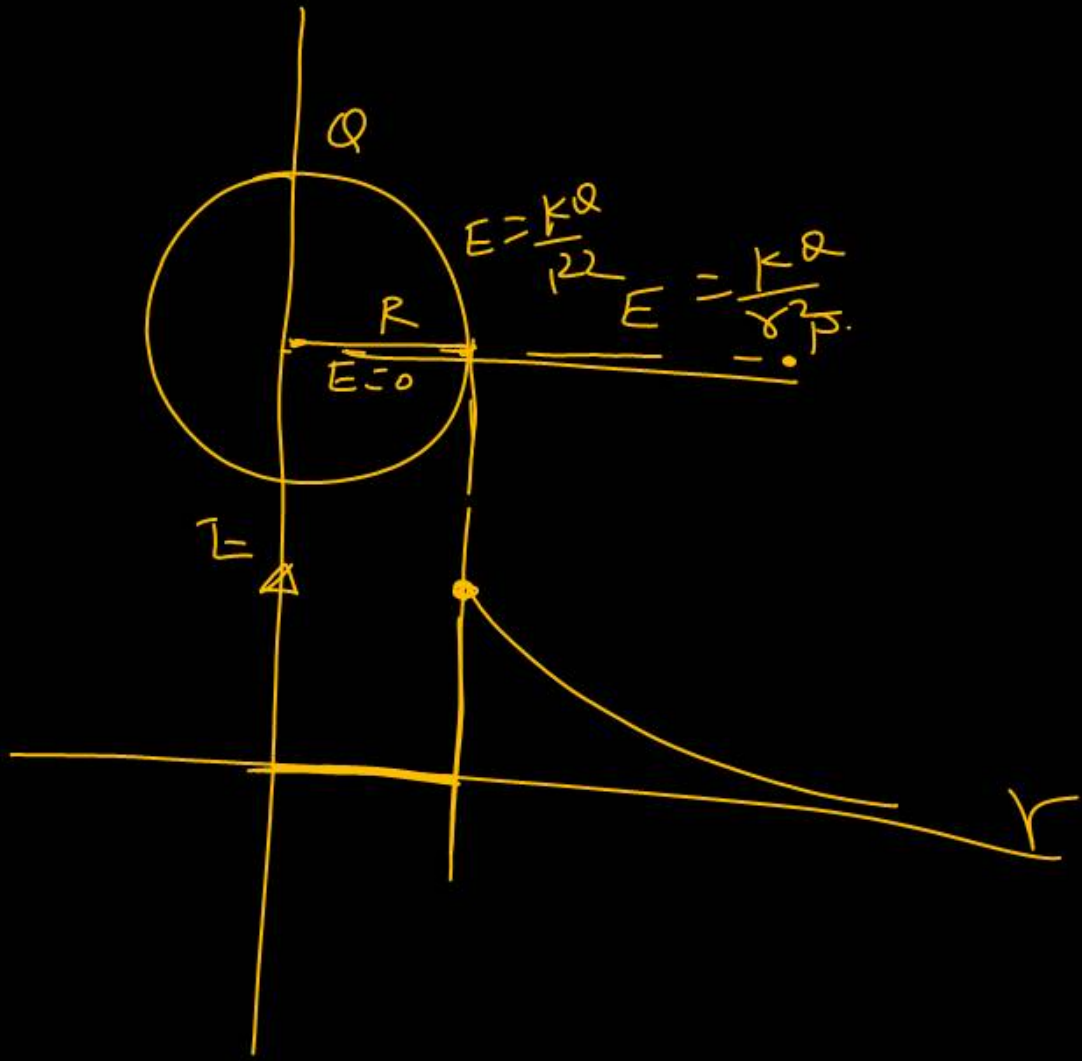


(3)



(4)





Question no. 21

Statement I : For a charged particle moving from point P to point Q, th net work done by an electrostatic field on the particle is indepenent of the path connecting point P to point Q.

Statement II : The net work done by a conservation force on an object moving along a closed loop is zero.

(1) Statement I is true, Statement II is ture; Statement II is the correct explantion of Statement I.

(2) Statement I is true, Statement II is ture; Statement II is not the correct explantion of Statement I.

(3) Statement I is false, Statement II is true.

(4) Statement I is true, Statement II is false.

Question no. 22

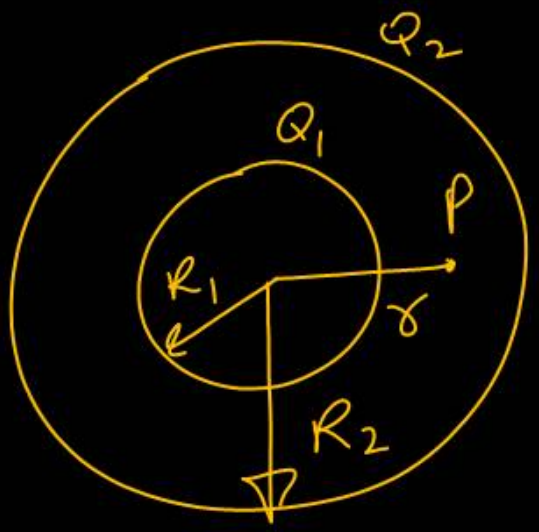
Two thin concentric hollow conducting spheres of radii R_1 and R_2 bear charges Q_1 and Q_2 respectively. If $R_1 < R_2$, then the potential at a point distance r such that $R_1 < r < R_2$ is -

(1) $\frac{1}{4\pi\varepsilon_0}.\frac{Q_1+Q_2}{r}$

(2) $\frac{1}{4\pi\varepsilon_0}.\left(\frac{Q_1}{r}+\frac{Q_2}{R_2}\right)$

(3) $\frac{1}{4\pi\varepsilon_0}.\left(\frac{Q_1}{R_1}+\frac{Q_2}{R_2}\right)$

(4) $\frac{1}{4\pi\varepsilon_0}.\left(\frac{Q_1}{R_1}+\frac{Q_2}{r}\right)$

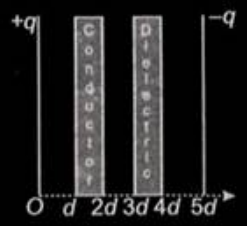


$$V_P = \frac{KQ_1}{r} + \frac{KQ_2}{R_2}$$

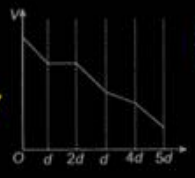
$$= \frac{1}{4\pi\varepsilon_0}\left\{\frac{Q_1}{r}+\frac{Q_2}{R_2}\right\}$$

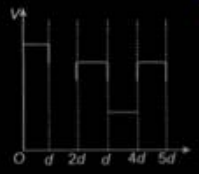
Question no. 23

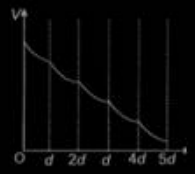
The distance between plates of a parallel plate capacitor is 5d. The positively charged plates is at x = 0 and negatively charged plates is at x = 5d. Two slabs one of conductor and the other of a dielectric of same thickness d are inserted between the plates as shown in the figure. The potential (V) versus distance x graph will be



(1) 

(2) 

(3) 

(4) 

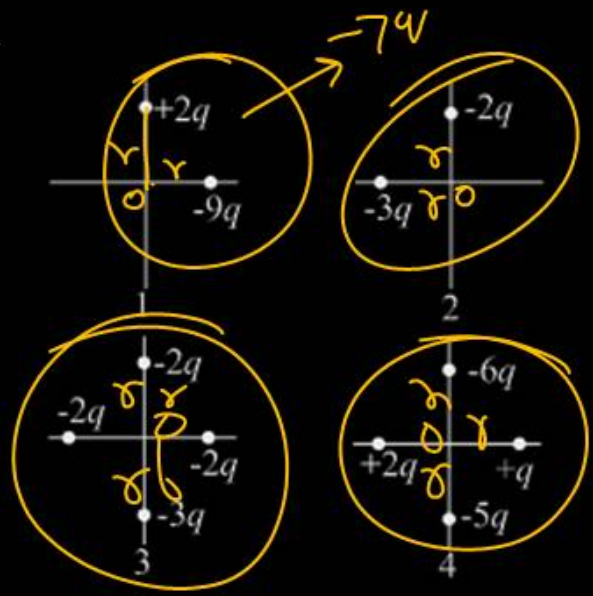
$E = -\frac{dV}{dx}$

$E = -\text{slope}$

slope = −E

Question no. 24

The figure given below shows four arrangements of charged particles, all the same distance from the origin. Rank the situations according to the net electric potentials (V_1, V_2, V_3, V_4) at the origin most positive first.



(1) $V_1 > V_2 > V_3 > V_4$ (2) $V_2 > V_1 > V_3 > V_4$

(3) $V_2 > V_1 > V_4 > V_3$ (4) $V_4 > V_1 > V_3 > V_2$

$V_{net} \propto q_{net}$ $V = \frac{kq}{r}$

$V_1 \rightarrow -7q$

$V_2 \rightarrow -5q$

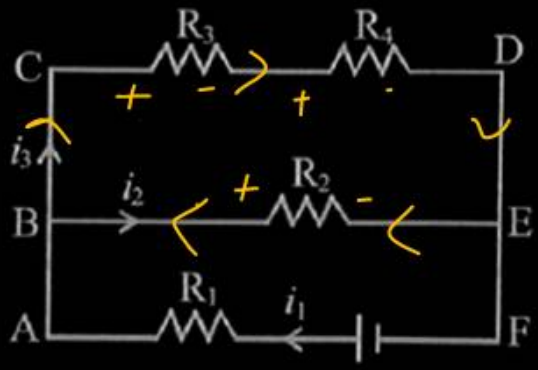
$V_3 \rightarrow -9q$

$V_4 \rightarrow -8q$

$V_2 > V_1 > V_4 > V_3$

Question no. 25

Which of the following is the correct equation when kirchhoff's loop rule is applied to the loop BCDEB in clockwise direction?



$-i_3 \times R_3 - i_3 R_4 + i_2 R_2 = 0$

(1) $-i_3 R_3 - i_3 R_4 - i_2 R_2 = 0$

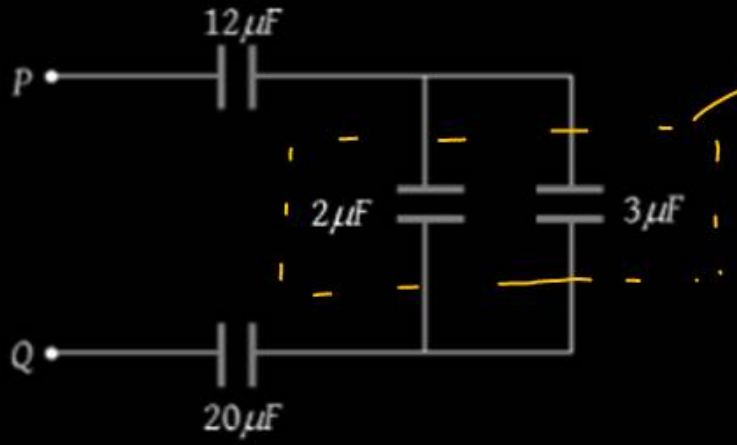
(2) $-i_3 R_3 - i_3 R_4 + i_2 R_2 = 0$

(3) $-i_3 R_3 + i_3 R_4 + i_2 R_2 = 0$

(4) $-i_2 R_4 + i_3 R_4 + i_2 R_2 = 0$

Question no. 26

In the circuit diagram shown in the adjoining figure, the resultant capacitance between P and Q is:

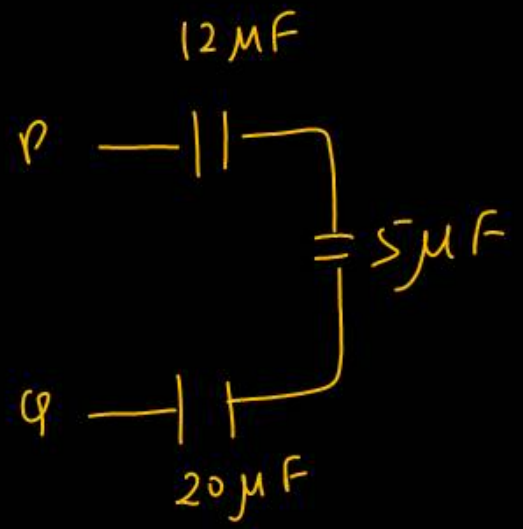


(1) 47 μF

(2) 60 μF

(3) 3 μF

(4) 10 μF



$$\frac{1}{C_{eq}} = \frac{1}{12} + \frac{1}{5} + \frac{1}{20} = \frac{1}{12} + \frac{5}{20}$$

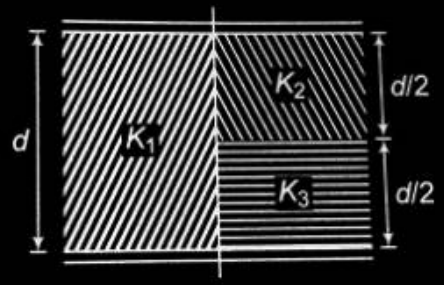
$$= \frac{1}{12} + \frac{1}{4}$$

$$= \frac{4}{12} = \frac{1}{3}$$

$C_{eq} = 3\mu F$

Question no. 27

The equivalent capacitance of the arrangement shown in figure, if A is the area of each plate, is

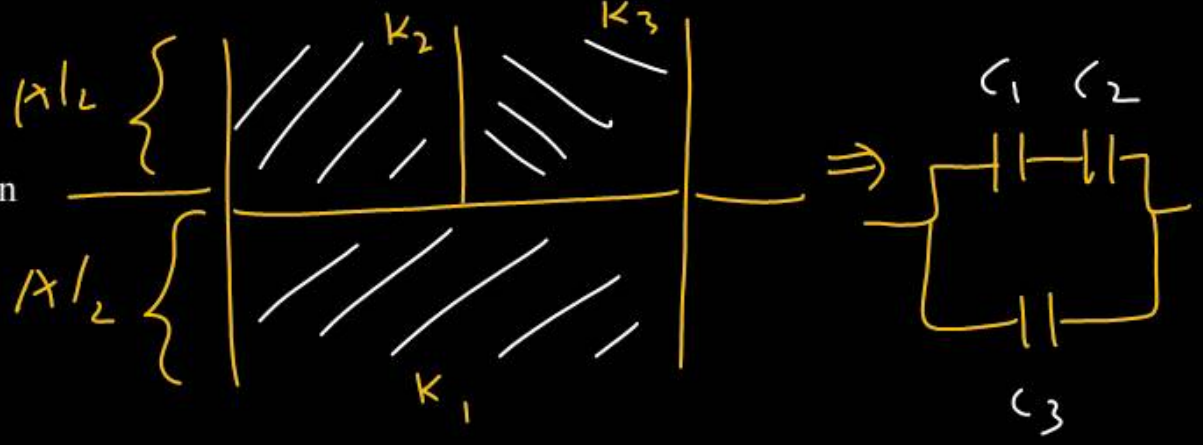


(1) $C = \frac{\varepsilon_0 A}{d}\left[\frac{K_1}{2} + \frac{K_2 + K_3}{K_2 K_3}\right]$

(2) $C = \frac{\varepsilon_0 A}{d}\left[\frac{K_1}{2} + \frac{K_2 K_3}{K_2 + K_3}\right]$

(3) $C = \frac{\varepsilon_0 A}{2d}\left[K_1 + \frac{K_2 K_3}{K_2 + K_3}\right]$

(4) $C = \frac{\varepsilon_0 A}{d}\left[K_1 + \frac{K_2 K_3}{K_2 + K_3}\right]$



$C_1 = K_2 \varepsilon_0 \frac{A/2}{d/2} = K_2 \frac{\varepsilon_0 A}{d} = K_2 C$

$C_2 = K_3 \varepsilon_0 A/d = K_3 C$

$C_3 = K_1 \varepsilon_0 \frac{A/2}{d} = \frac{K_1 C}{2}$

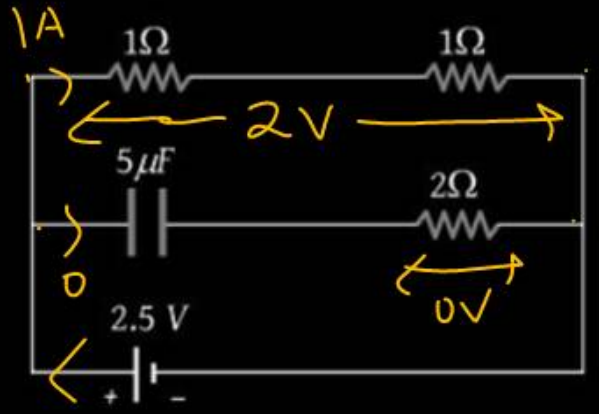
$C_{eq} = \frac{C_1 C_2}{C_1 + C_2} + C_3$

$= \frac{(K_2 C)(K_3 C)}{(K_2 + K_3) C} + \frac{K_1 C}{2}$

$= \left\{\frac{K_2 K_3}{K_2 + K_3} + \frac{K_1}{2}\right\} C \left(\frac{\varepsilon_0 A}{d}\right)$

Question no. 28

A capacitor of capacitance 5 μF is connected as shown in the figure. The internal resistance of the cell is 0.5 Ω. The amount of charge on the capacitor plate is –



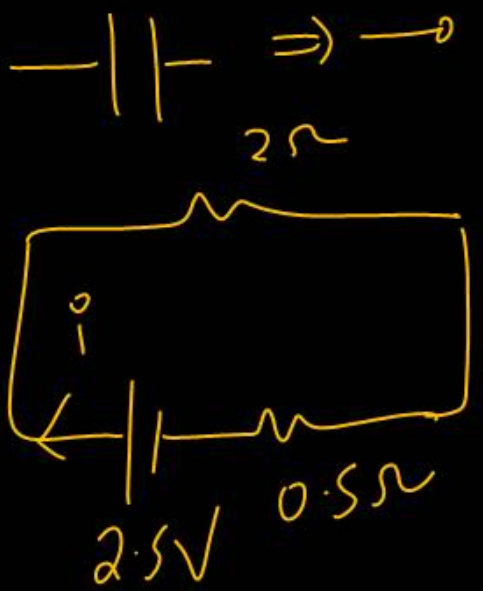
(1) 0 μC

(2) 5 μC

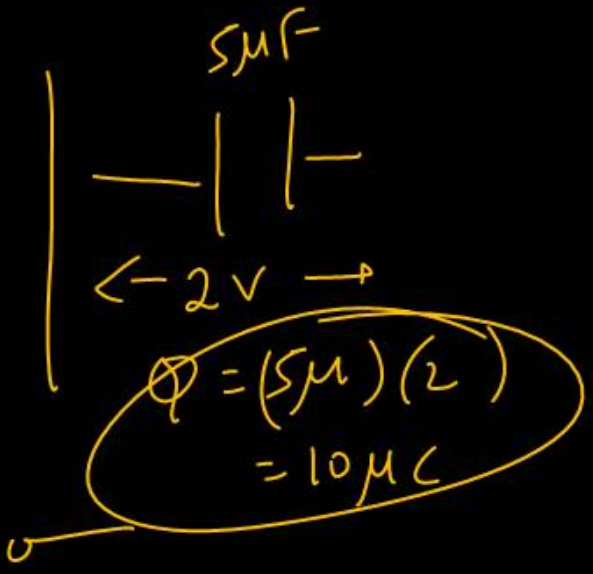
(3) 10 μC

(4) 25 μC

steady state



$i = \frac{2.5}{2.5} = 1A$



Question no. 29

The electric potential at a point (x, y, z) is given by V $= -x^2y - xz^3 + 4$. The electric field E at that point is:

(1) $\vec{E} = \left(2xy + z^3\right)\hat{i} + x^2\hat{j} + 3xz^2\hat{k}$

(2) $\vec{E} = 2xy\hat{i} + \left(x\ 2 + y^2\right)\hat{j} + \left(3xz - y^2\right)\hat{k}$

(3) $\vec{E} = z^3\hat{i} + xyz\hat{j} + z^2\hat{k}$

(4) $\vec{E} = \left(2xy - z^3\right)\hat{i} + xy^2\hat{j} + 3z^2x\hat{k}$

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

$$\frac{\partial V}{\partial x} = -2xy - z^3 + 0$$

$$\frac{\partial V}{\partial y} = -x^2 - 0 + 0$$

$$\frac{\partial V}{\partial z} = 0 - 3xz^2 + 0$$

$$\vec{E} = -(-2xy - z^3)\hat{i} - (-x^2)\hat{j} - (-3xz^2)\hat{k}$$

Question no. 30

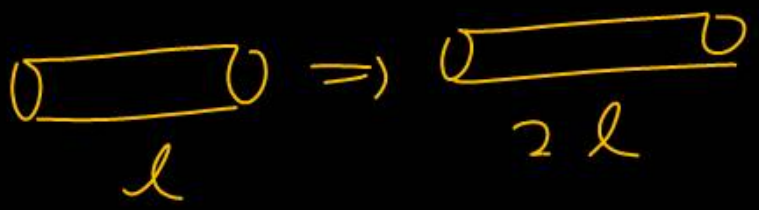
The length of a given cylindrical wire is increased by 100%. Due to the consequent decrease in diameter the change in the resistance of the wire will be

(1) 300%

(2) 200%

(3) 100%

(4) 50%



$n = 2$

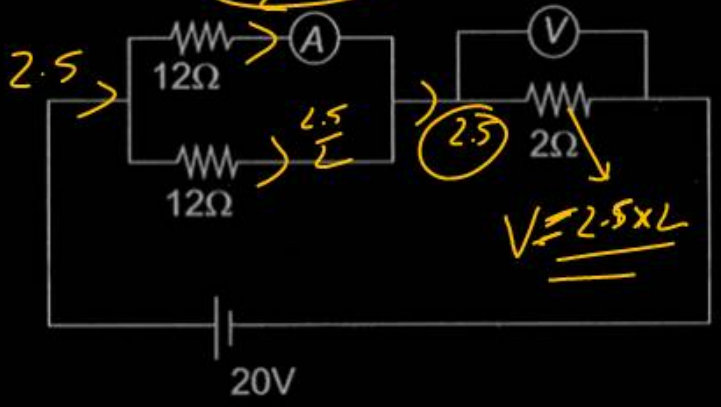
$\%\ \text{change} = (n^2 - 1) \times 100\ \%$

$= (4 - 1) \times 100\ \%$

$= 300\ \%$

Question no. 31

An ideal ammeter and an ideal voltmeter are connected as shown in the figure. The ammeter and voltmeter readings are –



(1) 6.25A, 3.75 V

(2) 1.25A, 5V

(3) 2.5A, 5V

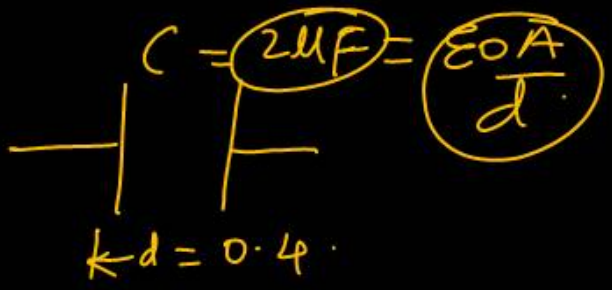
(4) 6.00A, 6.25V

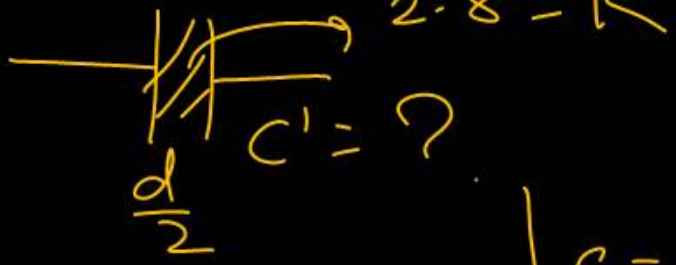
Question no. 32

The capacity of a parallel plate capacitor with no dielectric substance but with a separation of 0.4 cm is 2 μF. The separation is reduced to half and it is filled with a substance dielectric of value 2.8. The new capacity of the capacitor is -

(1) 11.2 μF (2) 15.6 μF

(3) 19.2 μF (4) 22.4 μF





$$C' = \frac{k\varepsilon_0 A}{\frac{d}{2}}$$

$$C' = \frac{2k\varepsilon_0 A}{d}$$

$$= 2kC$$

$$= 2 \times 2.8 \times 2$$

$$C = 4 \times 2.8$$

$$= 11.2 \ \mu F$$

Question no. 33

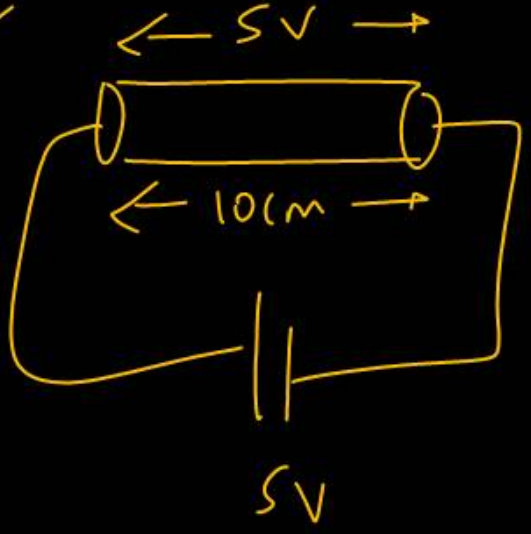
A potential difference of 5V is applied across a conductor of length 10 cm. If drift velocity of electrons is 2.5×10^{-4} m/s, then electron mobility will be

(1) $5 \times 10^{-4}\ m^2\ V^{-1}\ s^{-1}$

(2) $5 \times 10^{-6}\ m^2\ V^{-1}\ s^{-1}$

(3) $5 \times 10^{-5}\ m^2\ V^{-1}\ s^{-1}$

(4) Zero



$$\mu = \frac{V_d}{E} = \frac{V_d}{P.D./l}$$

$$\mu = \frac{l V_d}{P.D.}$$

$$= \frac{10^{-1} \times 2.5 \times 10^{-4}}{5/2}$$

$$= 0.5 \times 10^{-5}$$

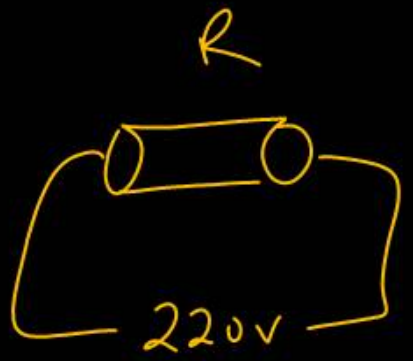
$$= 5 \times 10^{-6}$$

Question no. 34

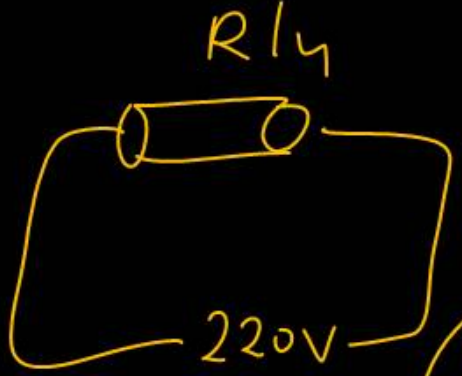
A wire when connected to 220V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2. Then $P_2 : P_1$ is -

(1) 1 (2) 4

(3) 2 (4) 3



$$P_1 = \frac{(220)^2}{R}$$



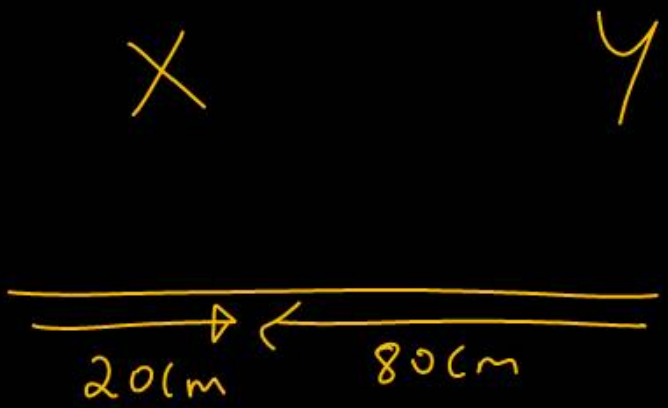
$$P_2 = \frac{(220)^2}{R/4}$$

$$P_2 = 4P_1$$

Question no. 35

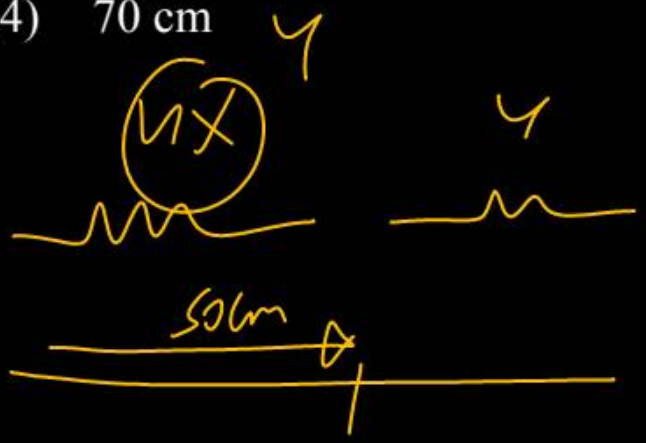
In a meter bridge experiment, null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If X < Y, then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y?

(1) 50 cm
(2) 80 cm
(3) 40 cm
(4) 70 cm



$X \times 80 = Y \times 20$

$Y = 4X$



Question no. 36

$R_2 = 200\Omega$, $\alpha = 0.005$ per °C, $T_1 = 100°C$, $R_1 = 100\Omega$

The resistance of bulb filament is 100 Ω at a temperature of 100°C. If its temperature coefficient of resistance be 0.005 per °C, its resistance will become 200 Ω at a temperature of

$T_2 = ?$

(1) 500°C (2) 200°C

(3) 300°C (4) 400°C

$$R_2 = R_1[1 + \alpha(T_2 - T_1)]$$

$$\frac{R_2}{R_1} = 1 + \alpha(T_2 - T_1)$$

$$\frac{R_2}{R_1} - 1 = \alpha(T_2 - T_1)$$

$$\frac{R_2 - R_1}{R_1} = \alpha(T_2 - T_1)$$

$$\left(\frac{R_2 - R_1}{R_1}\right)\frac{1}{\alpha} + T_1 = T_2$$

$$\frac{200-100}{100} \times \frac{1}{.005} + 100 = T_2$$

$$\frac{1000}{5} + 100 = T_2$$

$$200 + 100 = T_2$$

$$T_2 = 300°C$$

Question no. 37

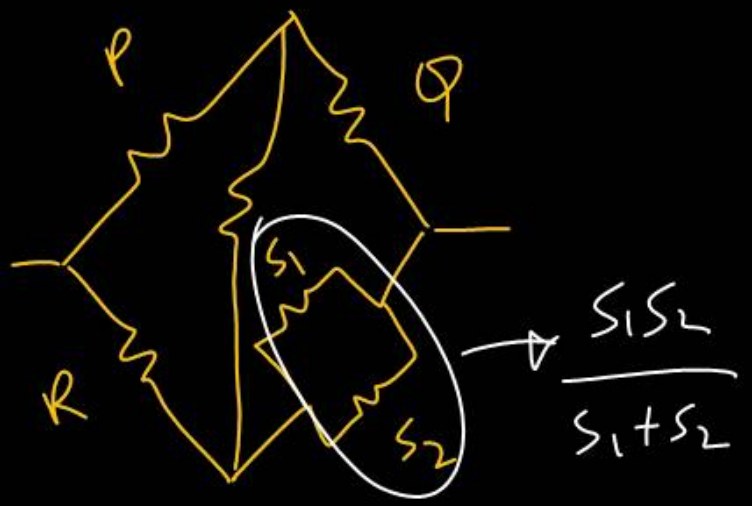
In a Wheatstone's bridge, three resistances P, Q and R are connected in the three arms and the fourth arm is formed by two resistance S_1 and S_2 connected in parallel. The condition for the bridge to be balanced will be -

(1) $\frac{P}{Q}=\frac{R(S_1+S_2)}{2S_1S_2}$

(2) $\frac{P}{Q}=\frac{R}{S_1+S_2}$

(3) $\frac{P}{Q}=\frac{2R}{S_1+S_2}$

(4) $\frac{P}{Q}=\frac{R(S_1+S_2)}{S_1S_2}$



$P\left(\frac{S_1S_2}{S_1+S_2}\right)=QR$

$\frac{P}{Q}=\frac{R(S_1+S_2)}{S_1S_2}$

Question no. 38

A material 'B' has twice the specific resistance of 'A'. A circular wire made of 'B' has twice the diameter of a wire made of 'A'. Then for the two wires to have the same resistance, the ratio ℓ_A / ℓ_B of their respective lengths must be

(1) 2
(2) 1
(3) 1/2
(4) 1/4

$$R_A = R_B$$

$$\frac{\rho l_A}{\pi r^2} = \frac{2\rho \cdot l_B}{\pi (2r)^2}$$

$$l_A = \frac{2 l_B}{4}$$

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

Question no. 39

The Kirchhoff's first law $\left(\sum i = 0\right)$ and second law $\left(\sum iR = 0 = \sum E\right)$, where the symbols have their usual meanings, are respectively based on

(1) Conservatin of charge, conservation of energy.

(2) Conservatin of charge, conservation of momentum.

(3) Conservatin of energy, conservation of charge.

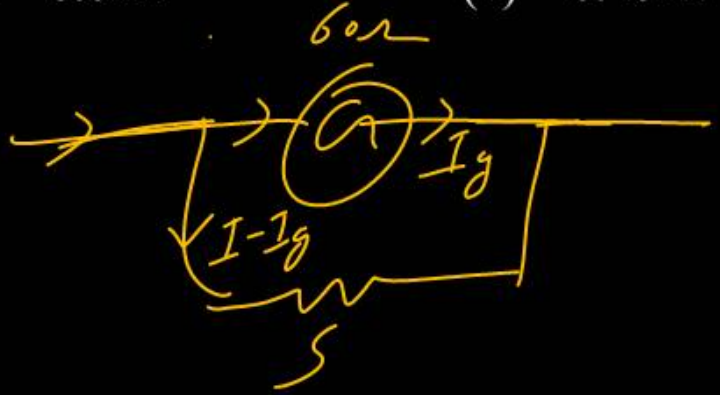
(4) Conservatin of momentum, conservation of charge.

Question no. 40

A galvanometer has a coil of resistance of 60 Ω and shows a full scale deflection for 50 μA current. To convert this galvanometer into an ammeter of ragne 10 mA, required shunt resistance will be -

(1) 0.30 Ω (2) 0.20 Ω

(3) 0.6 Ω (4) 0.40 Ω



$50\times10^{-6}\times60=(10\times10^{-3}-50\times10^{-6})\times S$

$30\times10^{-4}=10\times10^{-3}\times S$

$S=300\times10^{-2}$

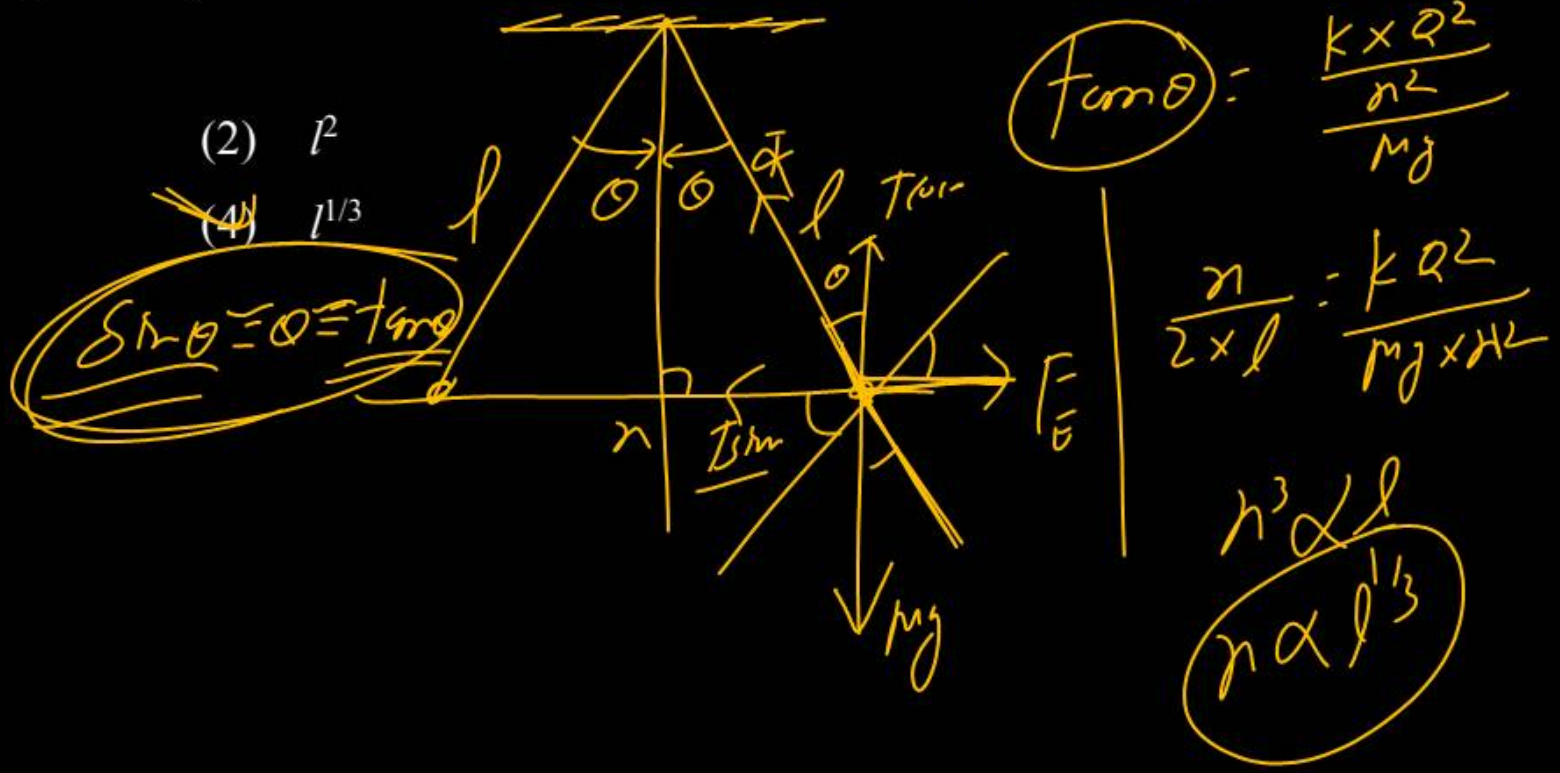
$S=0.3$

Question no. 41

Two balls of same mass and carrying equal charge are hung from a fixed support of length l. At electrostatic equilibrium, assuming that angles made by each thread is small, the separation, x between the balls is proportional to :

(1) l (2) l^2

(3) $l^{2/3}$ (4) $l^{1/3}$



Question no. 42

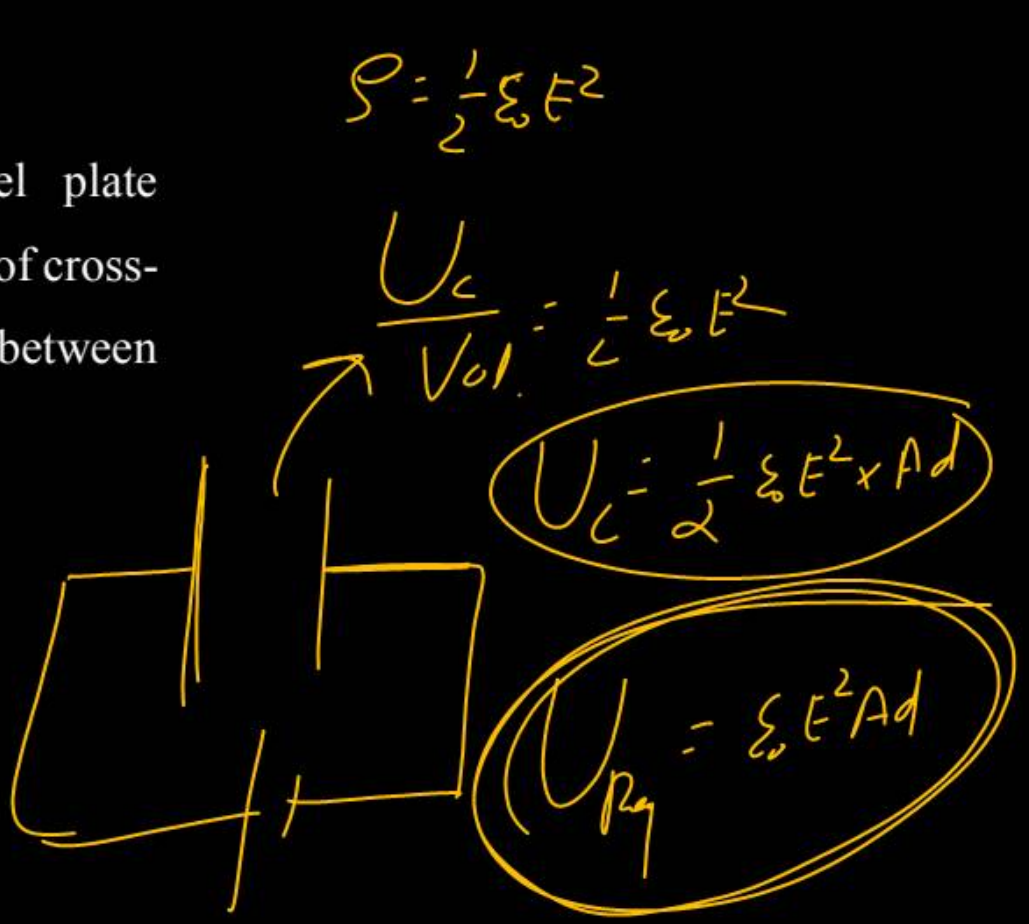
The energy required to charge a parallel plate condenser of plate separation d and plate area of cross-section A such that the uniform electric field between the plates is E, is

(1) $\epsilon_0 E^2 Ad$

(2) $\frac{1}{2}\epsilon_0 E^2 Ad$

(3) $\frac{1}{2}\epsilon_0 E^2 / Ad$

(4) $\epsilon_0 E^2/Ad$



Question no. 43

A cell of internal resistance r is connected across an external resistance nr. Then the ratio of the terminal voltage to the emf of the cell is

(1) $\frac{1}{n}$

(2) $\frac{1}{n+1}$

(3) $\frac{n}{n+1}$

(4) $\frac{n-1}{n}$

$I = \frac{\varepsilon}{nr + r}$

$V = \varepsilon - Ir$

$V = \varepsilon - \frac{\varepsilon}{nr + r} \times r$

$\frac{V}{\varepsilon} = 1 - \frac{1}{n+1} = \frac{n+1-1}{n+1}$

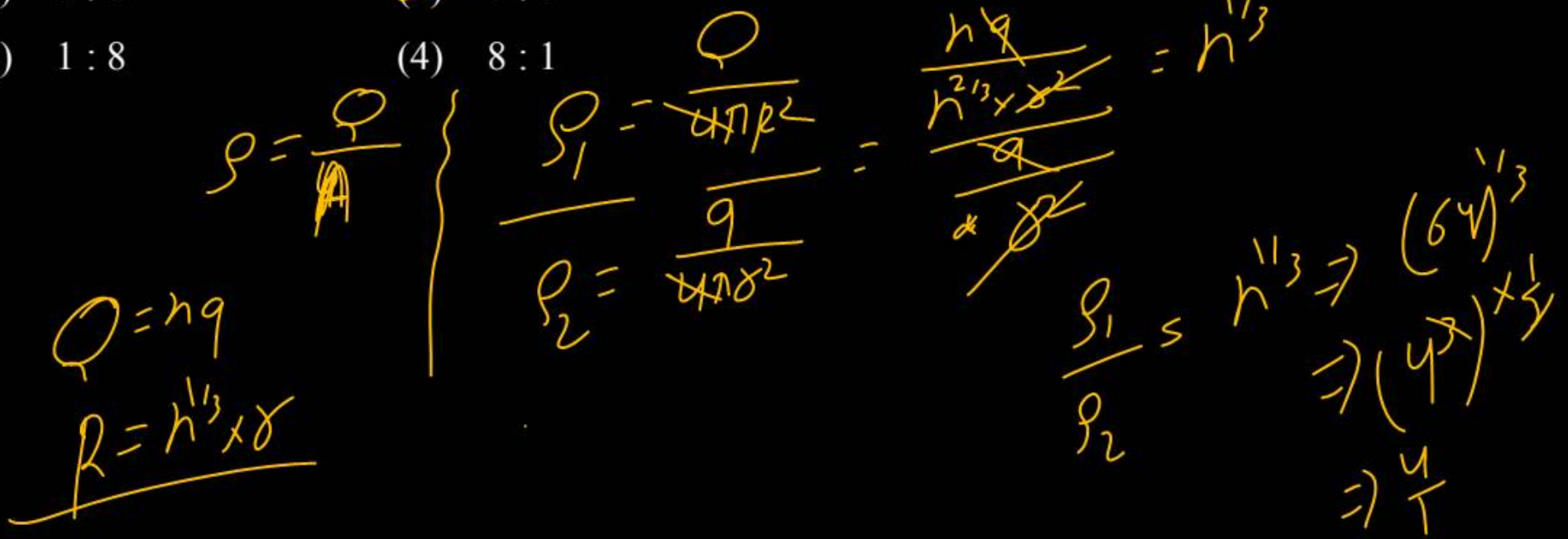
$\frac{V}{\varepsilon} = \frac{n}{n+1}$

Question no. 44

Sixty four conducting drops each of radius 0.02 m and each carrying a charge of 5 μC are combined to form a bigger drop. The ratio of surface charge density of bigger drop to the smaller drop will be:

(1) 1 : 4 (2) 4 : 1

(3) 1 : 8 (4) 8 : 1

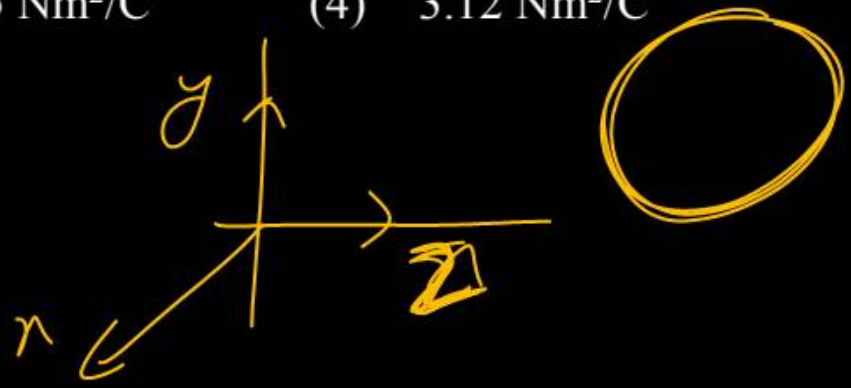


Question no. 45

The electric field in a region of space is given by, $\vec{E} = E_o\hat{i} + 2E_0\hat{j}$ where $E_o = 100$ N/C. The flux for the field through a circular surface of radius 0.02 m parallel to the Y-Z plane is nearly:

(1) 0.125 Nm^2/C (2) 0.02 Nm^2/C

(3) 0.005 Nm^2/C (4) 3.12 Nm^2/C



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

$\vec{A} = A_o\hat{i}$

$\phi = A_o \times E_o + 0$

$= \frac{3.1}{\pi} \times 4 \times 100 \times 100$

$=$

Question no. 46

Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When 0.1 mole of XY_2 weights 10g and 0.05 mole of X_3Y_2 weights 9g, the atomic weights of X and Y are

(1) 40, 30 (2) 60, 40

(3) 20, 30 (4) 30, 20

0.1 mol $XY_2 = 10$ gm

$\therefore$ 1 mol $XY_2 = 100$ gm — (1) → molar mass

0.05 mol $X_3Y_2 = 9$ gm

1 mol $X_3Y_2 = \frac{9}{0.05} = 180$ gm — (2)

$X + 2Y = 100$ — (1)

$3X + 2Y = 180$ — (2)

Eqn (2) − Eqn (1)

$3X + 2Y = 180$

$X + 2Y = 100$

$2X = 80$ $\quad X = 40$

On putting value of X in eqn (1)

$40 + 2Y = 100$

$2Y = 60$

$Y = 30$ $\quad X = 40$

Question no. 47

In which of following options the correct energy order of subshells (for given elements) is given

(1) $E_{2s}(H) = E_{2s}(Li) = E_{2s}(Na) = E_{2s}(K)$

(2) $E_{2s}(H) > E_{2s}(Li) > E_{2s}(Na) > E_{2s}(K)$

(3) $E_{2s}(H) < E_{2s}(Li) < E_{2s}(Na) < E_{2s}(K)$

(4) $E_{2s}(H) > E_{2s}(K) > E_{2s}(Na) > E_{2s}(Li)$

$H_{2s} < Li_{2s} < Na_{2s} < K_{2s}$

(3) $Z \uparrow \Rightarrow$ Energy of subshell $\uparrow$

Question no. 48

Uncertainty in poisition is twice the uncertainty in momentum Ucertainty in velocity is

(1) $\sqrt{\frac{\hbar}{\pi}}$

(2) $\frac{1}{2m}\sqrt{\frac{\hbar}{\pi}}$

(3) $\frac{1}{2m}\sqrt{\hbar}$

(4) $\frac{\hbar}{4\pi}$

$\Delta x \cdot \Delta P \geq \frac{h}{4\pi} \Rightarrow \Delta x \cdot \Delta P = \frac{h}{4\pi}$

$2\Delta P = \Delta x$

$2\Delta P \cdot \Delta P = \frac{h}{4\pi}$

$2m\Delta V \cdot \Delta V m = h/4\pi$

$\Delta V^2 \cdot m^2 = \frac{h}{2\pi \times 4}$

$\Delta V^2 = \frac{h}{2\pi m^2 \times 4}$

$\Delta V = \sqrt{\frac{h}{2\pi \times m^2 \times 4}}$ $\left\{\frac{h}{2\pi} = \hbar\right.$

$\Delta V = \frac{1}{2m}\sqrt{\hbar}$

$\Delta V = \frac{1}{2m}\sqrt{\hbar}$

Question no. 49

If in Bohr's model, for unielectronic atom, time period of revolution is represented as $T_{n,z}$ where n represents shell number and z represents atomic number then the value of $T_{1,2} : T_{2,1}$ will be

(1) 8 : 1 (2) 1 : 8

(3) 1 : 1 (4) None of these

$T_{n,z}$ n = no. of shell, z = atomic No

$T \propto \frac{n^3}{z^2} \Rightarrow \frac{T_1}{T_2} = \left(\frac{n_1}{n_2}\right)^3 \times \left(\frac{z_1}{z_1}\right)^2$

$\frac{T_1}{T_2} = \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^2$

$\frac{T_1}{T_2} = \frac{1}{8} \times \frac{1}{4} = \frac{1}{32}$

$T_{1,2}$ $n_1 = 1, z_1 = 2$

$T_{2,1}$ $n_2 = 2, z_2 = 1$

Question no. 50

What are the value of the orbital angular momentum of an electron in the orbitals 1s, 3s, 3d and 2p?

(1) 0, 0, $\sqrt{6}\hbar$, $\sqrt{2}\hbar$ (2) 1, 1 , $\sqrt{4}\hbar$, $\sqrt{2}\hbar$

(3) 0, 1, $\sqrt{6}\hbar$, $\sqrt{3}\hbar$ (4) 0, 0, $\sqrt{20}\hbar$, $\sqrt{6}\hbar$

s $l = 0$

p $l = 1$

d $l = 2$

f $l = 3$

Orbital angular momentum $= \sqrt{l(l+1)}\frac{h}{2\pi}$

$= \sqrt{l(l+1)}\,\hbar \quad \left\{\hbar = \frac{h}{2\pi}\right\}$

1s $l = 0$ $= 0$

2s $l = 0$ $= 0$

3d $l = 2$ $\sqrt{2(2+1)}\,\hbar = \sqrt{6}\,\hbar$

2p $l = 1$ $\sqrt{1(1+1)}\,\hbar = \sqrt{2}\,\hbar$

Question no. 51

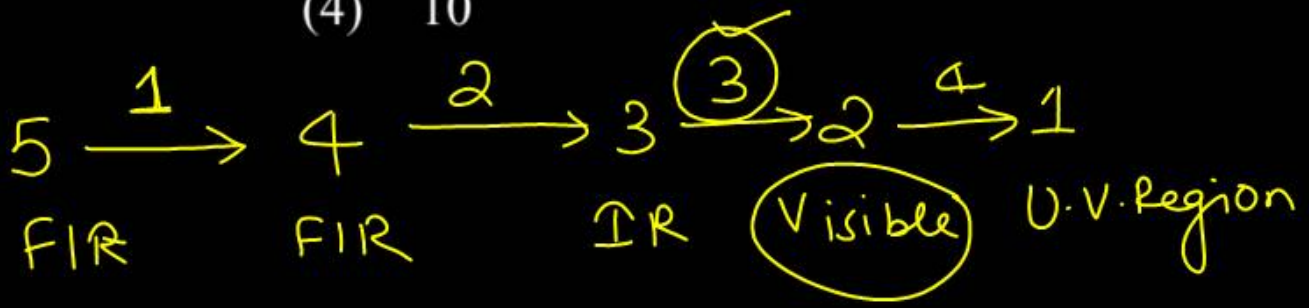
Number of visible lines when an electron returns from fifth orbit to ground state in H spectum is

(1) 5

(2) 4

(3) 3

(4) 10



Question no. 52

Statement 1 : For hydrogen orbital energy increases as $1s < 2s < 2p < 3s < 3p < 3d < 4s < 4p$ .....

Statement 2 : The orbital with lower $(n+l)$ value has lesser energy and hence filled up first.

(1) Statements 1 and 2 are true, Statement 2 is the correct explanation for statement 1.

(2) Statements 1 and 2 are true, Statement 2 is NOT the correct explanation for statement 1.

(3) Statement 1 is true, Statement 2 is false.

(4) Statement 1 is false, Statement 2 is true.

For Hydrogen
↳ Energy of subshell for a particular orbit remain same

$1S < 2S = 2P < 3S = 3P = 3d < 4S = 4P$

$(n+l) \propto$ Energy

Question no. 53

The wavelength of third line of the Balmer series for a H atom is:

(1) $\frac{21}{100R}$

(2) $\frac{100}{21R}$

(3) $\frac{21R}{100}$

(4) $\frac{100R}{21}$

Balmer series $n_1 = 2$

Third line $n_2 = 5$

$$\frac{1}{\lambda} = RZ^2\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$$

$$\lambda = \frac{n_1^2 \times n_2^2}{n_2^2 - n_1^2} \times \frac{1}{RZ^2}$$

$$= \frac{2^2 \times 5^2}{5^2 - 2^2} \times \frac{1}{R \times 1^2}$$

$$= \frac{4 \times 25}{21} \times \frac{1}{R}$$

$$\boxed{\lambda = \frac{100}{21R}}$$

Question no. 54

Which option gives the values of the quantum numbers for the 21st electron of scandium (Z = 21)?

(1) $3, 1, 1, +\frac{1}{2}$

(2) $3, 2, 2, +\frac{1}{2}$

(3) $3, 2, -3, -\frac{1}{2}$

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

$_{21}Sc \rightarrow 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$

21^{st} e^-

3d

$n = 3$

$l = 2$

$m = -2$ or $+2$

$s = +1/2$ or $-1/2$

$m = -l$ to $+l$

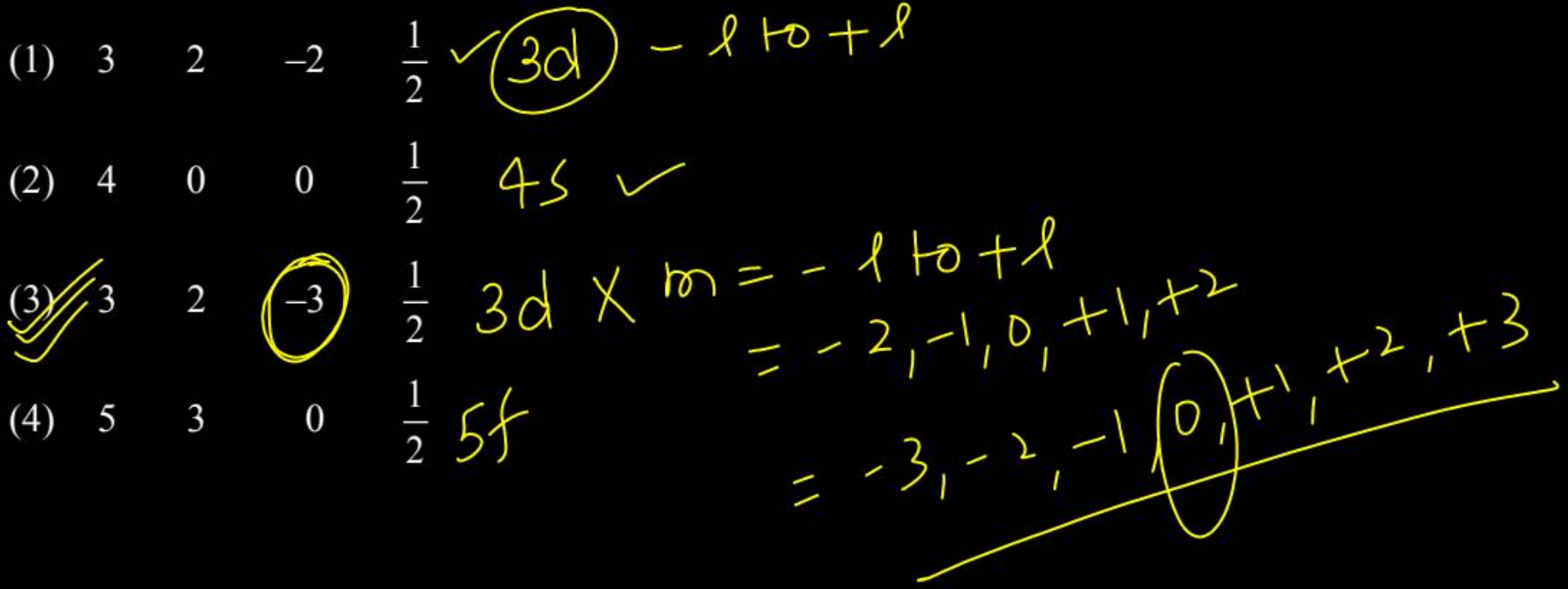
$= -2, -1, 0, +1, +2$

d_{z^2}

Question no. 55

Which of the following sets of quantum numbers represents an impossible arrangement

	n	l	m	s
(1)	3	2	–2	$\frac{1}{2}$
(2)	4	0	0	$\frac{1}{2}$
(3)	3	2	–3	$\frac{1}{2}$
(4)	5	3	0	$\frac{1}{2}$



Question no. 56

Which of the following contains the greatest number of atoms?

(1) 1.0 g of butane C_4H_{10} $\quad mol = \frac{1}{58} \times N_A \times 14 = \text{No. of atom} = \frac{N_A}{4 \cdot 2}$

(2) 1.0 g of nitrogen gas N_2 $\quad mol = \frac{1}{28} \times N_A \times 2 = \frac{N_A}{14}$ atom

(3) 1.0 g of silver $Ag = 108$ $\quad mol = \frac{1}{108} \times N_A \times 1 = \frac{N_A}{108}$ atom

(4) 1.0 g of water $\hookrightarrow H_2O$ $\quad mol = \frac{1}{18} \times N_A \times 3 = \frac{N_A}{6}$

Question no. 57

If the mass of 0.25 moles of an element X is 2.25 g, the mass of one atom of X is about:

(1) 1.5×10^{-24} g (2) 2.5×10^{-23} g

(3) 1.5×10^{-23} g (4) 2.5×10^{-24} g

0.25 mol of X ⟶ 2.25 gm

1 mol of X ⟶ $\frac{2.25}{0.25}$ = 9 gm

(9 ↓ M_w)

1 mol of X ⟶ 9 gm

6.023×10^{23} atom of X ⟶ 9 gm

1 atom of X ⟶ $\frac{9}{6.023\times10^{23}}$

$= 1.5\times10^{-23}$ gm

Question no. 58

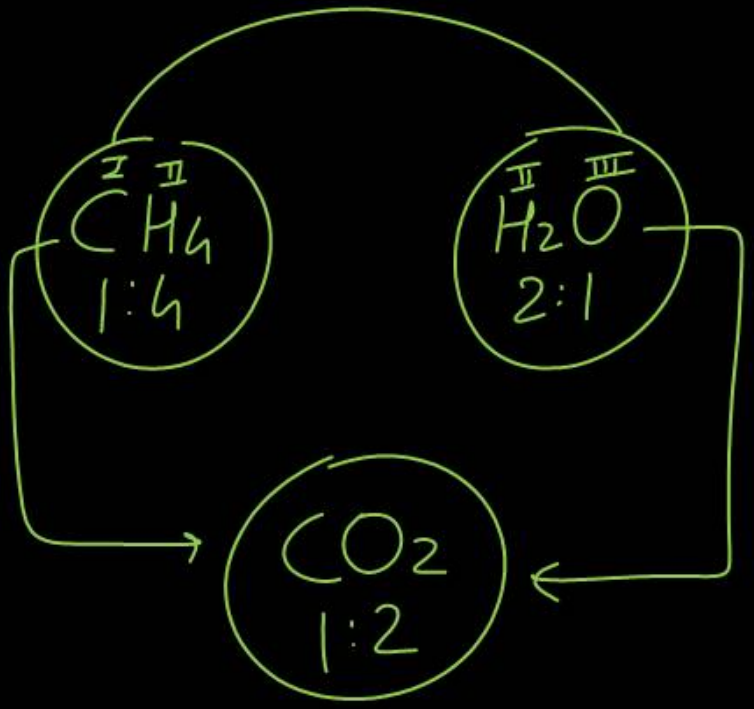
Law of multiple proportion is illustrated by:

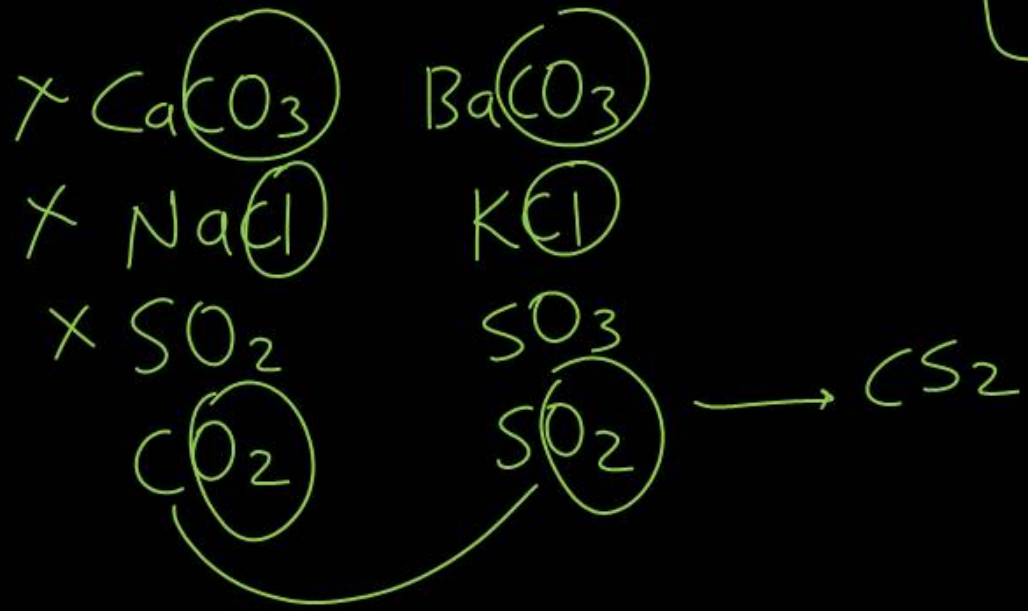
(1) Calcium carbonate and barium carbonate

(2) Sodium chloride and potassium chloride

(3) Sulphur dioxide and sulphur trioxide

(4) Carbon dioxide and sulphur dioxide





Question no. 59

CH_4 $M_w = 16$ C_2H_6 $M_w = 30$

The ratio of the masses of methane and ethane in a gas mixture is 4 : 5. The ratio of number of their molecules in the mixture is :

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

(3) 2 : 3 (4) 5 : 4

mol of methane $= \frac{4}{16} = 1/4 = 0.25$ molecule $= 1/4 \times N_A$

mol of ethane $= \frac{5}{30} = 1/6$ molecule $= 1/6 * N_A$

$$\frac{\text{Methane}}{\text{Ethane}} = \frac{1/4\, N_A}{1/6\, N_A} = \frac{6}{4} = \frac{3}{2} = 3:2$$

Question no. 60

Given that the abundance of isotopes ^{54}Fe, ^{56}Fe and ^{57}Fe are 5%, 90%, and 5%, respectively, the atomic mass of Fe is:

(1) 55.85 (2) 55.95

(3) 55.75 (4) 56.05

$$M_{avg} = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3}{x_1 + x_2 + x_3}$$

$m_1 = 54, \; m_2 = 56, \; m_3 = 57$

$x_1 = 5\%, \; x_2 = 90\%, \; x_3 = 5\%$

$$M_{avg} = \frac{54 \times 5 + 56 \times 90 + 57 \times 5}{5 + 90 + 5}$$

$$M_{avg} = \frac{5595}{100} = 55.95$$

Question no. 61

The ratio of potential energy and total energy of an electron in a Bohr orbit of hydogen like species is:

(1) 2 (2) –2

(3) 1 (4) –1

$$T.E. = -K.E. = \frac{P.E.}{2}$$

-ve +ve -ve

$$T.E. = \frac{P.E.}{2}$$

$$P.E. = 2\,T.E.$$

$$\frac{P.E}{T.E} = \frac{2\,T.E}{T.E} = \frac{2}{1}$$

$$\frac{P.E.}{T.E} = 2:1$$

$T.E. = x$

$x = \frac{P.E.}{2}$

$P.E. = 2x$

$$\frac{P.E.}{T.E} = \frac{2x}{x} = \frac{2}{1} = 2:1$$

Question no. 62

Which of the following reaction involve oxidation and reduction?

(1) $NaBr + HCl \rightarrow NaCl + HBr$ Redox X

(2) $HBr + AgNO_3 \rightarrow AgBr + HNO_3$ Redox X

(3) $H_2 + Br_2 \rightarrow 2\,HBr$ Redox ✓

(4) $Na_2O + H_2SO_4 \rightarrow NaSO_4 + H_2O$ Redox X

3

Question no. 63

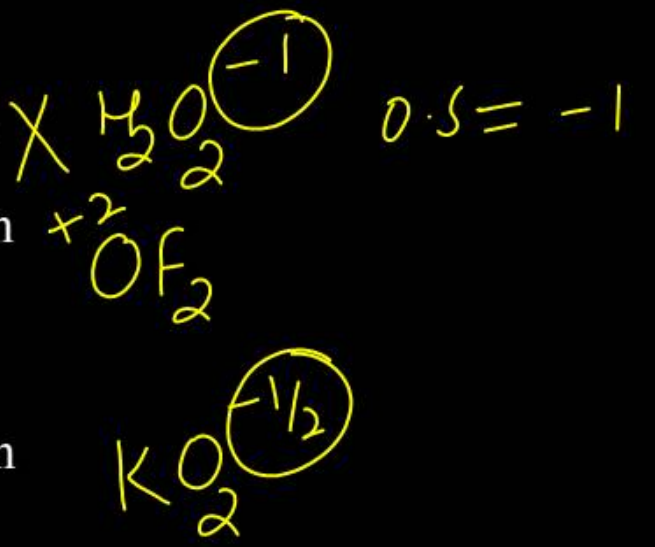
Which statement is wrong?

(1) Oxidation number of oxygen is +1 in peroxides

(2) Oxidation number of oxygen is +2 in oxygen difluoride

(3) Oxidation number of oxygen is $-\frac{1}{2}$ in superoxides

(4) Oxidation number of oxygen is (–2) in most of its compounds



Question no. 64

In which of the following reactions does H_2O_2 acts as a reducing agent?

(1) $2FeCl_2 + 2\,HCl + H_2O_2 \rightarrow 2\,FeCl_3 + 2\,H_2O$

(2) $Cl_2 + H_2O_2 \rightarrow 2\,HCl + O_2$

(3) $2\,HI + H_2O_2 \rightarrow 2\,H_2O + I_2$

(4) $H_2SO_3 + H_2O_2 \rightarrow H_2SO_4 + H_2O$

Reducing Agent
↓
sey oxidation
↓
Other Reduction

Question no. 65

Which ordering of compounds is according to the decreasing order of the oxidation state of nitrogen?

(1) HNO_3, NO, NH_4Cl, N_2

(2) HNO_3, NO, N_2 , NH_4Cl

(3) HNO_3, NH_4Cl,NO, N_2

(4) NO,HNO_3, NH_4Cl, N_2

$HNO_3 < NO < N_2 < NH_4Cl$

Question no. 66

The radius of the second Bohr orbit, in terms of the Bohr radius, a_0, in Li^{2+} is

(1) $\frac{2a_0}{3}$

(2) $\frac{4a_0}{3}$

(3) $\frac{4a_0}{9}$

(4) $\frac{2a_0}{9}$

$$r = 0.529 \times \frac{n^2}{Z} A^\circ$$

$$\frac{r_1}{r_2} = \left(\frac{n_1}{n_2}\right)^2 \times \left(\frac{Z_2}{Z_1}\right)$$

$n_1 = 1$, $Z_1 = 1$

$n_2 = 2$, $Z_2 = 3$

$$\frac{r_1}{r_2} = \left(\frac{1}{2}\right)^2 \times \left(\frac{3}{1}\right)$$

$$\frac{a_0}{r_2} = \frac{1}{4} \times \frac{3}{1}$$

$$r_2 = \frac{4a_0}{3}$$

Question no. 67

If M represents molecular mass of Mn_3O_4 then what will be its equivalent mass if it undergoes disproportionation reaction as shwon:

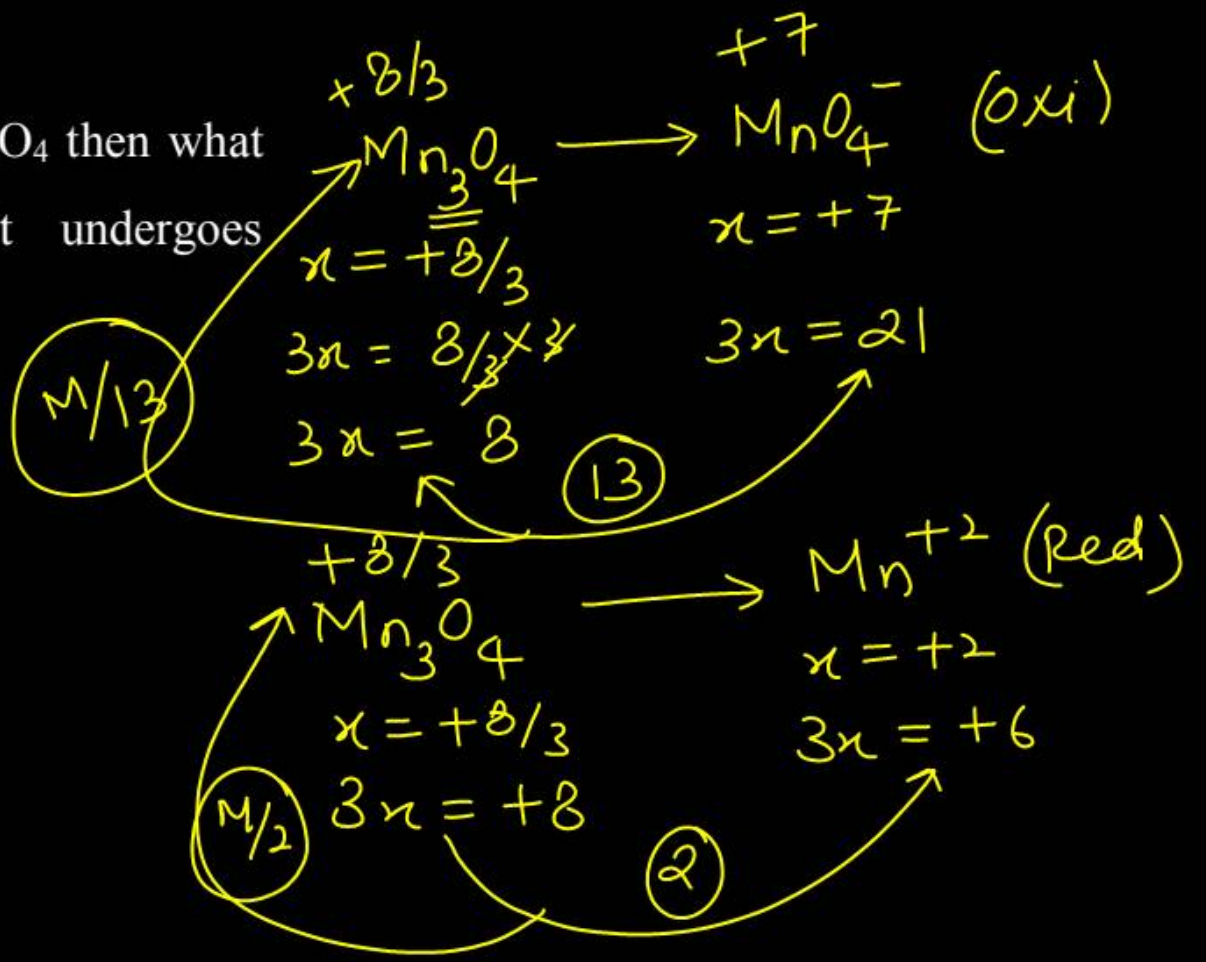
$$Mn_3O_4 \rightarrow MNO_4^- + Mn^{2+}$$

(1) $\frac{M}{13}$

(2) $\frac{M}{2}$

(3) $\frac{15M}{26}$

(4) $\frac{26M}{15}$



$$\text{Meq. wt} = \text{Eq. Red} + \text{Eq. Oxi} = \frac{M}{13} + \frac{M}{2} = \frac{2M + 13M}{26} = \frac{15M}{26}$$

Question no. 68

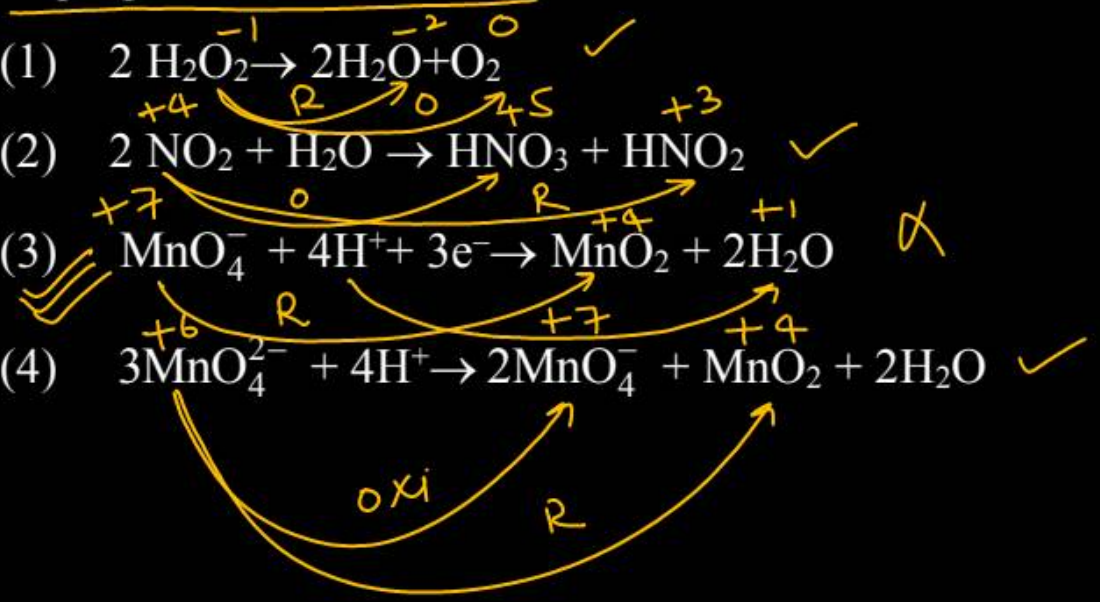
Which of the given reactions is not an example of disproportionation reaction?

(1) $2\,H_2O_2 \rightarrow 2H_2O + O_2$

(2) $2\,NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

(3) $MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$

(4) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$



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Question no. 69

For which of the following transitions would a hydrogen atom absorb a photon with longest wavelength?

(1) n = 1 to n = 2 (2) n = 3 to n = 2

(3) n = 5 to n = 6 (4) n = 7 to n = 6

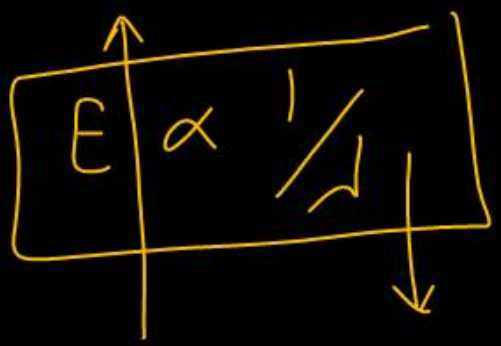
Energy absorb

↓

Low Energy level

↓

High Energy level



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Question no. 70

The angular momentum of electron in an excited H atoms is $\frac{h}{\pi}$. The P.E. of electron will be:

(1) 6.8 eV (2) 3.4 eV

(3) –6.8 eV (4) –3.4 eV

$n = 3$

$mvr = \frac{nh}{2\pi}$

Ang. Mom. $= \frac{nh}{2\pi}$

$\frac{h}{\pi} = n\frac{h}{2\pi}$

$n = 2$

Second orbit = T.E. = -3.4 eV

$T.E. = \frac{P.E.}{2}$

$P.E. = T.E \times 2$

$= -3.4 \times 2$

$= -6.8$ eV

Question no. 71

The ratio of wavelength of photon corresponding to the α-line of Lyman series in H-atom and β-line of Balmer series in He^+ is:

(1) 1 : 1 (2) 1 : 2

(3) 1 : 4 (4) 3 : 16

Lyman series $n_1 = 1$ } H-atom
α-line $= n_2 = 2$ }

Balmer series $n_1 = 2$ } He^+ atom
β-line $= n_2 = 4$ }

$$\frac{\lambda_H}{\lambda_{He^+}} = \frac{n_1^2 \times n_2^2/n_2^2 - n_1^2 \times \frac{1}{Rz^2}}{n_1^2 \times n_2^2/n_2^2 - n_1^2 \times 1/Rz^2}$$

$$\frac{\lambda_H}{\lambda_{He^+}} = \frac{1 \times 2^2/2^2 - 1^2 \times \frac{1}{R \times 1^2}}{2^2 \times 4^2/4^2 - 2^2 \times 1/R \times 2^2}$$

$$\frac{\lambda_H}{\lambda_{He^+}} = \frac{4}{3} \Big/ \frac{64}{12} \times \frac{1}{4}$$

$$\frac{\lambda_H}{\lambda_{He^+}} = \frac{4/3}{4/3} = 1:1$$

Question no. 72

Which of the following relationships of Heisenberg, are correct?

I. $\Delta P \cdot \Delta x \geq \frac{h}{4\pi}$ ✓

II. $\Delta E \cdot \Delta t \geq \frac{h}{4\pi}$ ✓

III. $\Delta\lambda \cdot \Delta x \leq \frac{-\lambda^2}{4\pi}$ ✗

IV. $\Delta V \cdot \Delta x \geq \frac{h}{4\pi m}$ ✓

(1) I and IV only

(2) I, II and IV only

(3) II and III only

(4) I, II, III and IV

$\Delta x \cdot \Delta P \geq \frac{h}{4\pi}$

$\Delta x \cdot m\Delta V \geq \frac{h}{4\pi}$

$\Delta x \cdot \Delta V \geq \frac{h}{4\pi m}$

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

$\frac{d\lambda}{dP} = h\frac{d}{dP}\left(\frac{1}{P}\right)$

$\frac{d\lambda}{dP} = \frac{-h}{P^2}$ → $\frac{1}{P}$ Power inverse

$\frac{\Delta\lambda}{\Delta P} = \frac{h}{P^2}$

$\Delta P = \frac{\Delta\lambda P^2}{h}$

$\Delta x \cdot \Delta P \geq \frac{h}{4\pi}$

$\Delta x \cdot \frac{\Delta\lambda P^2}{h} \geq \frac{h}{4\pi}$

$\Delta x \cdot \Delta\lambda P^2 \geq \frac{h^2}{4\pi}$

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

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

$\Delta x \cdot \Delta\lambda \geq \frac{h^2}{4\pi P^2}$

$\Delta x \cdot \Delta\lambda \geq \frac{h^2}{4\pi \times h^2/\lambda^2}$

$\Delta x \cdot \Delta\lambda \geq \frac{\lambda^2}{4\pi}$

$\Delta x \cdot \Delta\lambda \geq \frac{\lambda^2}{4\pi}$

Question no. 73

An organic compound contains C, H and S. The minimum molecular weight of the compound containing 8% sulphur is (atomic weight of S=32 amu)

(1) 600 g mol^{-1} (2) 200 g mol^{-1}

(3) 400 g mol^{-1} (4) 300 g mol^{-1}

$$\% \text{ Element} = \frac{\text{Mw of element}}{\text{Mw of Compound}} \times 100$$

$$8 = \frac{32}{Mw} \times 100$$

$$\text{Mw of Comp} = 400$$

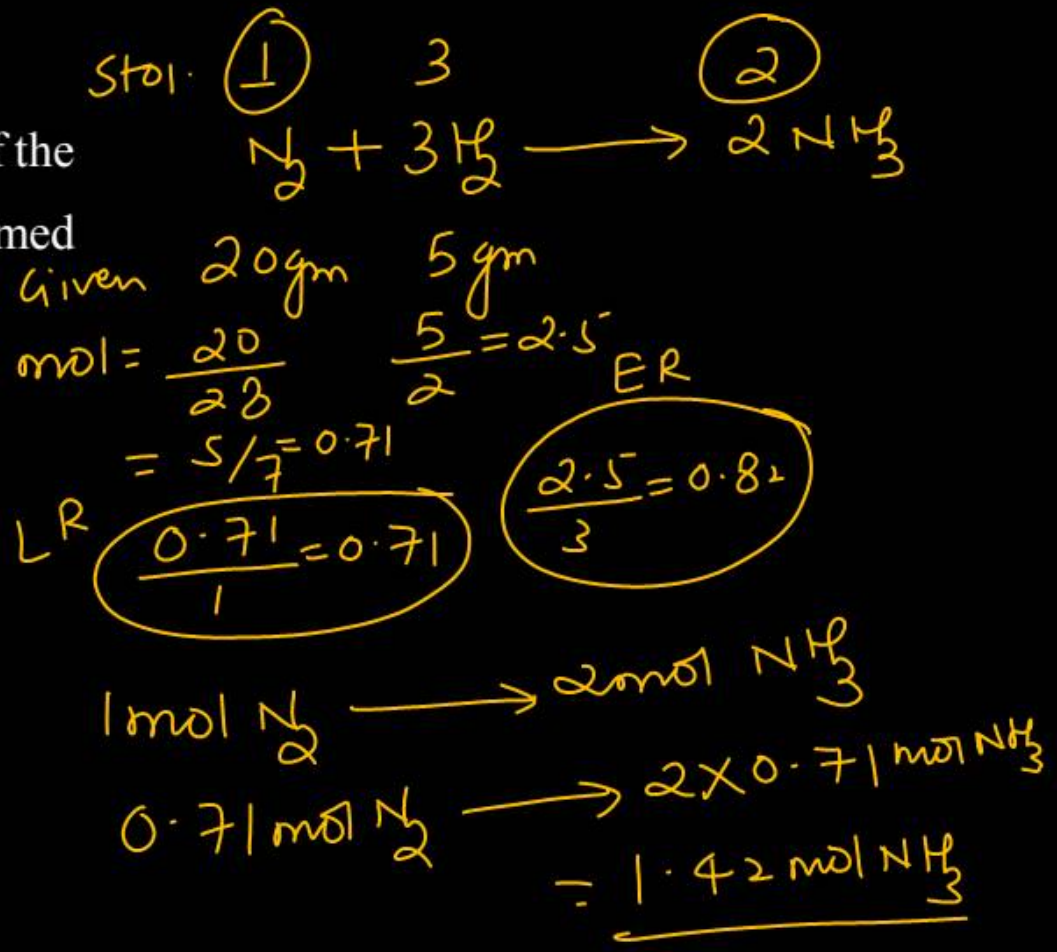
Question no. 74

Consider the above reaction, the limiting reagent of the reaction and number of moles of NH_3 formed respectively are

$$\underset{20g}{N_{2(g)}} + 3\underset{5g}{H_{2(g)}} \square \; 2NH_{3(g)}$$

(1) H_2, 1.42 moles (2) H_2, 0.71 moles

(3) N_2, 1.42 moles (4) N_2, 0.71 moles



Question no. 75

Consider the following statements:

(A) The principal quantum number 'n' is a positive integer with values of n = 1, 2, 3…

(B) The azimuthal quantum number 'l' for a given 'n' (principal quantum number) can have values as $l = 0, 1, 2 \ldots n$.

(C) Magnetic orbital quantum number 'm_l' for a particular 'l' (azimuthal quantum number) has $(2l + 1)$ values.

(D) $\pm 1/2$ are the two possible orientations of electron spin.

(E) For $l = 5$, there will be a total of 9 orbital.

Which of the above statements are correct?

(1) ~~(A), (B) and (C)~~

(2) ~~(A), (C), (D) and (E)~~

(3) (A), (C) and (D)

(4) ~~(A), (B), (C) and (D)~~

$l = (n-1)$ to 0

$n = 3, \; l = 2, 1, 0$

$2l+1 = 2(0)+1 = 1$

$2(1)+1 = 3$

$2(2)+1 = 5$

s	$l = 0$
p	$l = 1$
d	$l = 2$
f	$l = 3$

$m = 0$ (one)

$m = -1, 0, +1$ (three)

$m = -2, -1, 0, +1, +2$ (five)

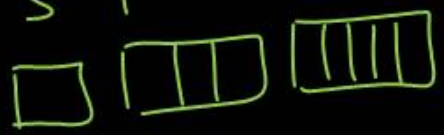
$m = -3, \ldots, +3$

$l = 4$ g

$l = 5$ h

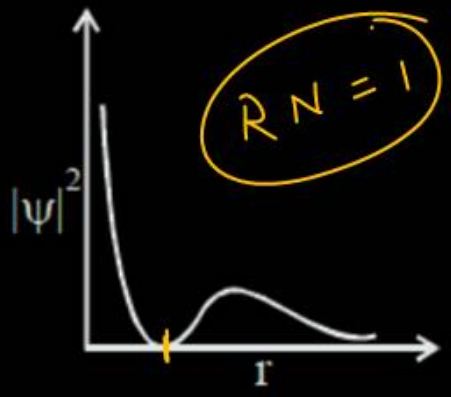
$l = 5$

l	0	1	2	3	4	5
	s	p	d	f	g	h



Question no. 76

The graph between $|\Psi|^2$ and r (radial distance) is shown below. This represents

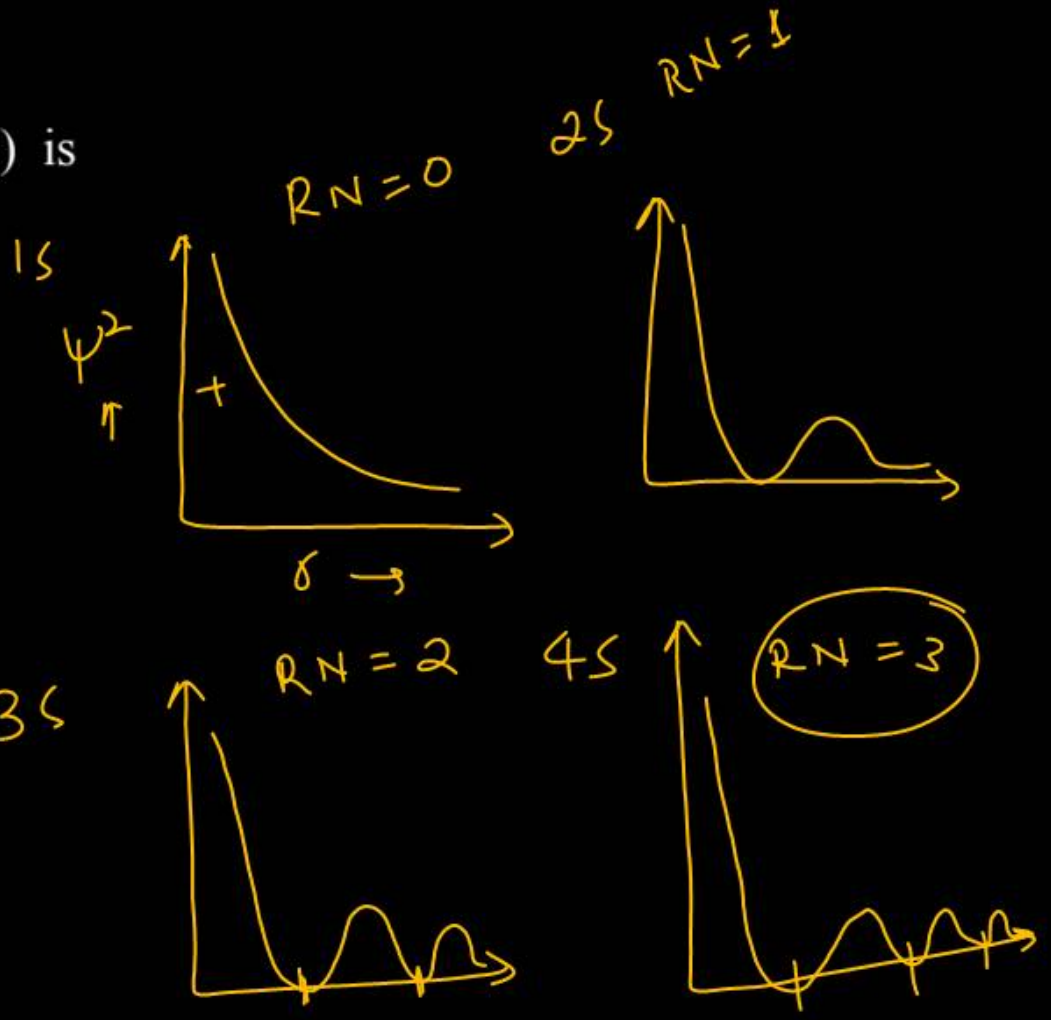


(1) 3s orbital

(2) 2p orbital

(3) 1s orbital

(4) 2s orbital



Question no. 77

$n = 5$
$m = +1$

Given :

(A) $n = 5,\ m_l = 1$

(B) $n = 2,\ l = 1,\ m_l = -1,\ m_s = -1/2$

The maximum number of electron(s) in an atom that can have the quantum numbers as given in (A) and (B) are respectively

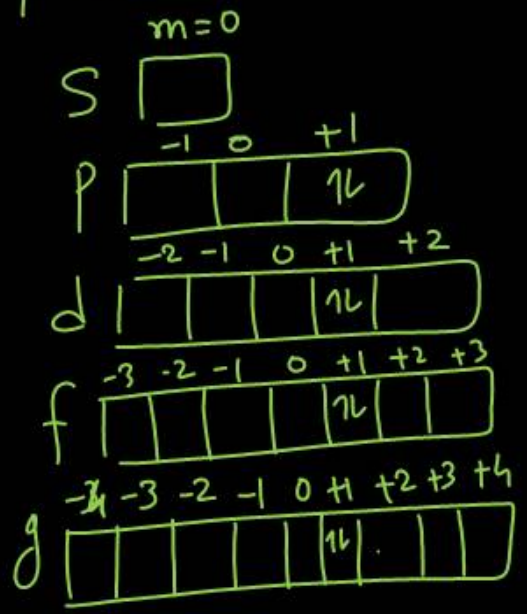
(1) 25 and 1

(2) 8 and 1

(3) 2 and 4

(4) 4 and 1

$n = 5.$
$l = 4, 3, 2, 1, 0$
g f d p s



Question no. 78

Chlorine undergoes disproportionation in alkaline medium as shown below:

$$aCl_{2(g)} + bOH^-_{(aq)} \rightarrow cClO^-_{(aq)} + dCl^-_{(aq)} + eH_2O_{(l)}$$

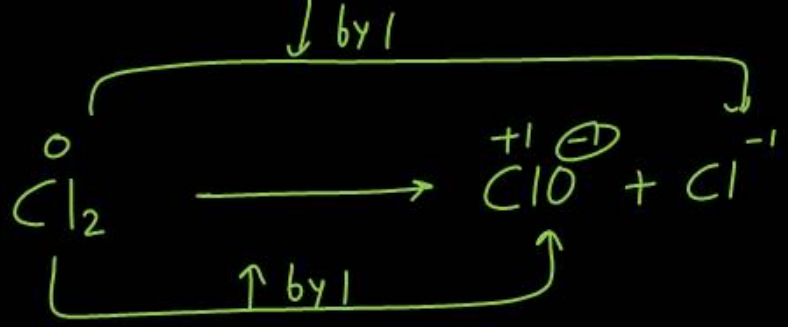
The values of a, b, c and d in a balanced redox reaction are resepctively

(1) 1, 2, 1 and 1

(2) 2, 4, 1 and 3

(3) 3, 4, 4 and 2

(4) 2, 2, 1 and 3



$Cl_2 + H_2O + 2OH^- \rightarrow ClO^- + Cl^- + 2H^+ + 2OH^-$

$Cl_2 \quad 2OH^- \rightarrow ClO^- + Cl^- + H_2O$

$Cl_2 + 2OH^{-1} + H_2O \rightarrow ClO^- + Cl^- + 2H_2O$

$Cl_2 + 2OH^{-1} \rightarrow ClO^- + Cl^- + H_2O$

Question no. 79

In which one of the following sets all species show disproportionation reaction?

(1) $\overset{+7}{ClO_4^-}, \overset{+7}{MnO_4^-}, \overset{+3}{ClO_2^-}$ and $\overset{0}{F_2}$

(2) $\overset{+7}{MnO_4^-}, ClO_2^-, Cl_2$ and Mn^{3+}

(3) $\overset{+}{Cr_2O_7^{2-}}$, ~~$MnO_4^-, ClO_2^-$ and Cl_2~~

(4) ~~$ClO_2^-, \overset{0}{F_2}, \overset{+7}{MnO_4^-}$ and $\overset{+6}{Cr_2O_7^{2-}}$~~

Disproportionation — Same Element

oxidation — Reduction

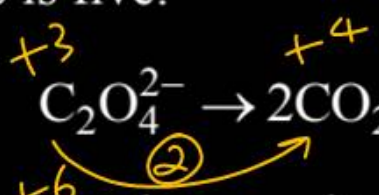
Element → Highest O.S. → Reduction

Element → Lowest O.S. → oxidation

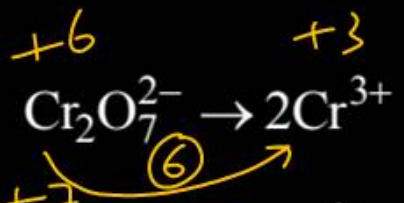
Question no. 80

Identify the process in which change in the oxidation state is five.

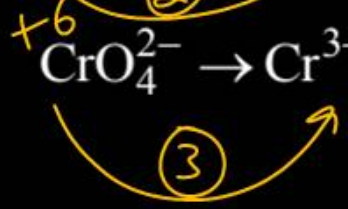
(1) $C_2O_4^{2-} \rightarrow 2CO_2$



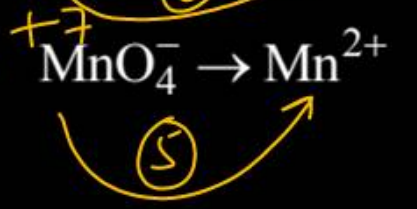
(2) $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$



(3) $CrO_4^{2-} \rightarrow Cr^{3+}$



(4) $MnO_4^- \rightarrow Mn^{2+}$



Question no. 81

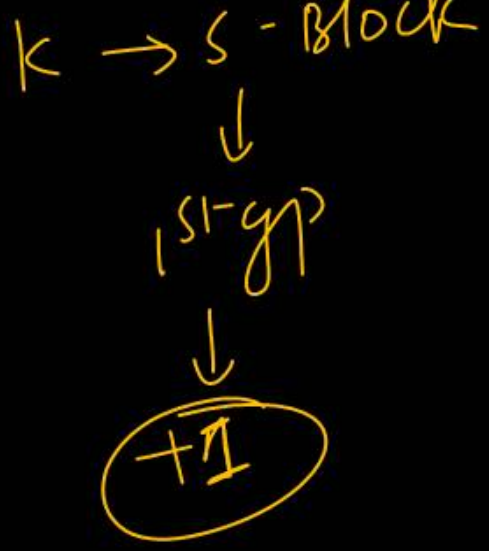
Oxidation number of potassium in K_2O, K_2O_2 and KO_2, respectively, is

(1) +1, +1 and +1

(2) +2, +1 and $+\frac{1}{2}$

(3) +1, +2 and +4

(4) +1, +4 and +2



Question no. 82

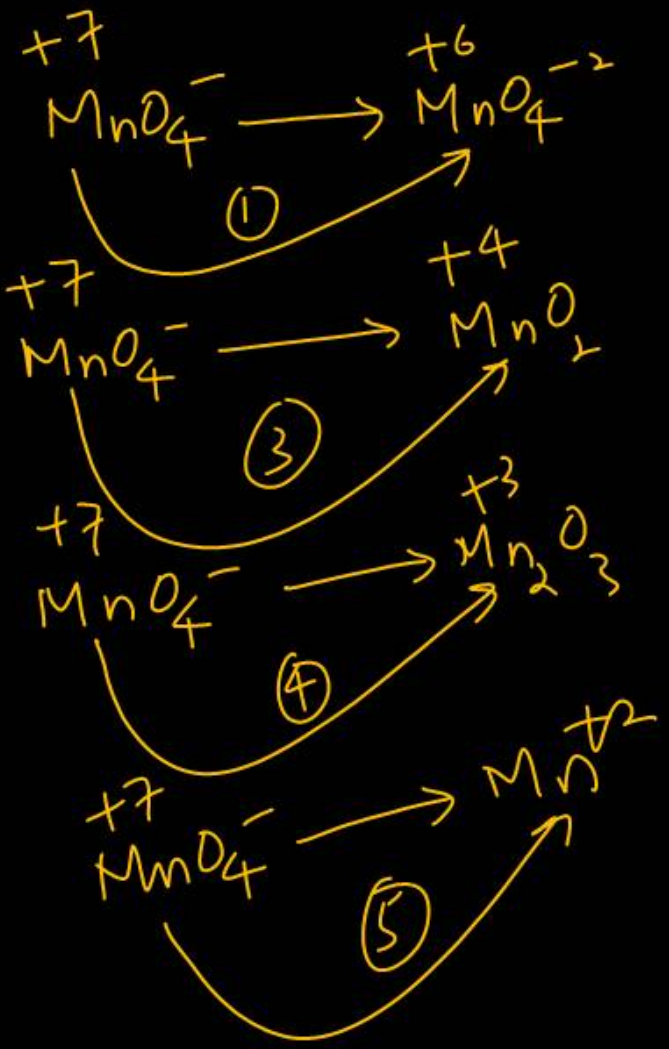
When $KMnO_4$ acts as an oxidising agent and ultimately forms $[MnO_4]^{2-}$, MnO_2, Mn_2O_3, Mn^{2+} then the number of electrons tranferred in each case respectively is

(1) 4, 3, 1, 5

(2) 1, 5, 3, 7

(3) 1, 3, 4, 5

(4) 3, 5, 7, 1



Question no. 83

The incorrect postulates of the Dalton's atomic theory are:

(1) Atoms of different elements differ in mass.

(2) Matter consists of divisible atoms.

(3) Compounds are formed when atoms of different element combine in a fixed ratio.

(4) All the atoms of given element have different properties including mass.

atom is indivisible → a/c to dalton

2, 4

Question no. 84

For the redox reaction

$$MnO^-_{4(aq)} + Br^-_{(aq)} + H_2O(\ell) \rightarrow$$

$$MnO_2(s) + BrO^-_{3(aq)} + 2OH^-_{(aq)}$$

The correct coefficients of the reactants for the balance reaction are

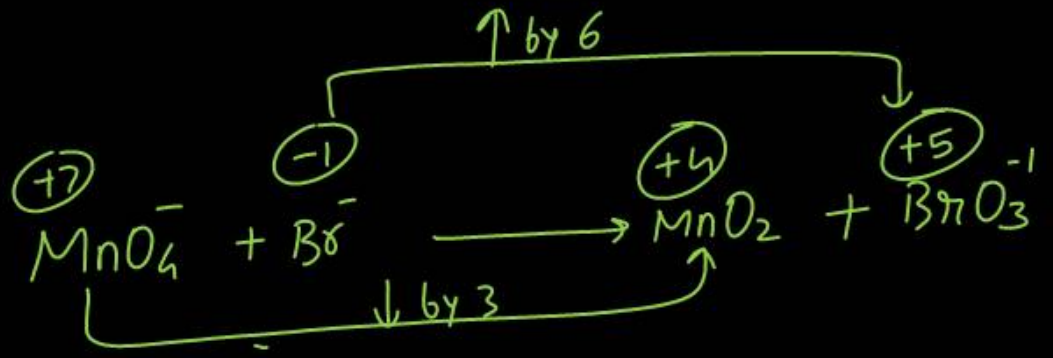
$Mn\,O_4^-\;Br^-\;H_2O$

(A) 211

(B) 212

(C) 121

(D) 231



$$6MnO_4^- + 3Br^- \rightarrow 6MnO_2 + 3BrO_3^-$$

$6H^+$ $6OH^-$

$+ 3H_2O$ $+ 6OH^-$

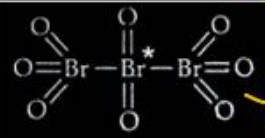
$3 \cancel{6} H_2O$

$$6\,MnO_4^- + 3Br^- + 3H_2O \rightarrow 6MnO_2 + 3BrO_3^- + 6OH^-$$

$$2\,MnO_4^- + Br^{-1} + H_2O \rightarrow 2MnO_2 + BrO_3^- + 2OH^-$$

Question no. 85

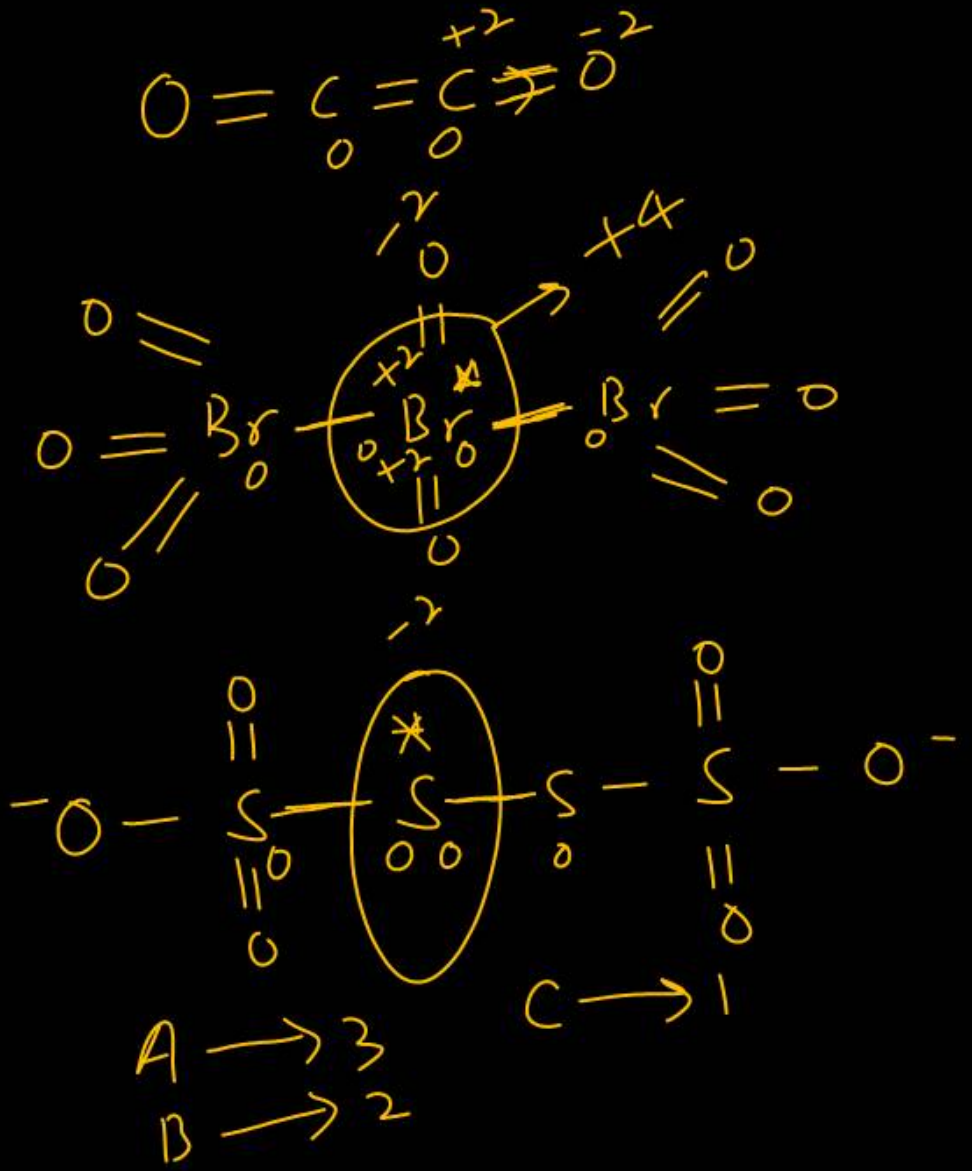
Match the Column I with column II and select the correct option from the codes given below.

Column I (Species)		Column II (Oxidation number of element marked with asterisk)	
A.	$O=\overset{*}{C}=C=O$	1.	0
B.		2	+4
C.		3.	+2
		4.	+6

Codes

	A	B	C
(A)	2	3	1
(B)	3	2	1
(C)	1	2	4
(D)	3	1	4

B



Question no. 86

A compound contains 54.55% carbon, 9.09% hydrogen and 36.36% oxygen. The empirical formula of this compound is

(1) C_3H_5O (2) $C_4H_8O_2$

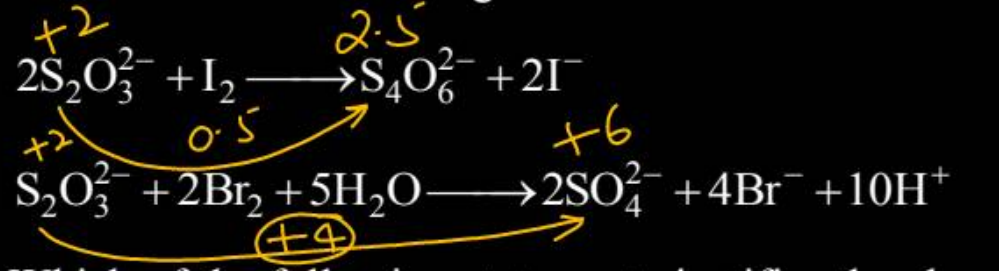
(3) $C_2H_4O_2$ (4) C_2H_4O

C	54.55	54.55/12 = 4.5	4.5/2.2 = 2	→ 2
H	9.09	9.09/1 = 9.09	9.09/2 = 4	→ 4
O	36.36	36.36/16 = 2.2	2.2/2.2 = 1	→ 1

C_2H_4O

Question no. 87

Thiosulphate reacts differnetly with iodine and bromine in the reactions given below.



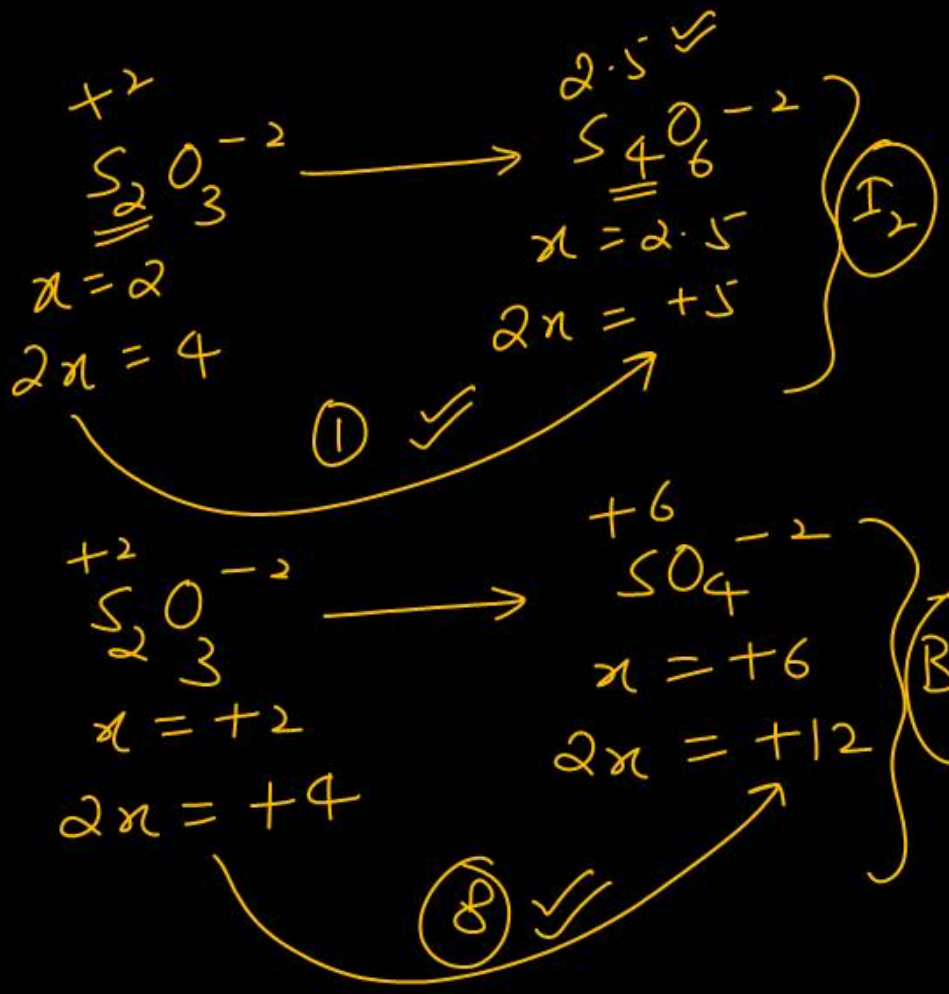
Which of the following statements justifies the above dual behaviour of thiosulphate?

(A) Bromine is a stronger oxidant than iodine

(B) Bromine is a weaker oxidant than iodine

(C) Thiosulphate undergoes oxidation by bromine and reduction by iodine in these reactions

(D) Bromine undergoes oxidation and iodine undergoes reduction in these reactions



Question no. 88

Match List-I with List-II.

	List-I		List-II
A.	Is	i.	Angular node = 2
B.	2s	ii.	Angular node = 1
C.	2p	iii.	Radial node = 1
D.	3d	iv.	No node

(1) A – i, B – iii, C – ii, D – iv

(2) A – iv, B – iii, C – ii, D – i

(3) A – iii, B – iv, C – ii, D – i

(4) A – iv, B – i, C – ii, D – iii

AN = ℓ

R.N = $n - \ell - 1$

1s = $1 - 0 - 1 = 0$

2s = $2 - 0 - 1 = 1$

2p = $\ell = 1$

3d = $\ell = 2$

A → 4

B → 3

C → 2

D → 1

Question no. 89

Match List – I with List – II.

List – I		List – II	
A.	88 g of CO_2	i.	0.25
B.	6.022×10^{23} molecules of H_2O	ii.	2 mol
C.	5.6 litres of O_2 at STP	iii.	1 mol
D.	96 g of O_2	iv.	3 mol

(1) A – (ii), B – (iii), C – (i), D – (iv)

(2) A – (iii), B – (ii), C – (i), D – (iv)

(3) A – (ii), B – (i), C – (iii), D – (iv)

(4) A – (ii), B – (iii), C – (iv), D – (i)

A → 2
B → 3
C → 1
D → 4

(A) $\text{mol} = \frac{88}{44} = 2$

(B) $\text{mol} = \frac{N}{N_A} = \frac{6.023 \times 10^{23}}{6.023 \times 10^{23}} = 1$

(C) $\text{mol} = \frac{V \text{ lit}}{22.4} = \frac{5.6}{22.4} = 1/4 = 0.25$

(D) $\text{mol} = \frac{96}{32} = 3$

Question no. 90

From 392 mg of H_2SO_4, 1.204×10^{21} molecules of H_2SO_4 are removed. How many moles of H_2SO_4 are left?

(1) 2×10^{-3} (2) 1.2×10^{-3}

(3) 4×10^{-3} (4) 1.5×10^{-3}

$$\text{mol} = \frac{392 \times 10^{-3}}{98} = 4 \times 10^{-3}$$

$$\text{molecule} = \text{mol} \times N_A = 4 \times 10^{-3} \times 6 \times 10^{23}$$

$$= 24 \times 10^{+20} = 2.4 \times 10^{21} \text{ molecule}$$

Remove $= 1.204 \times 10^{21}$

$= 2.4 \times 10^{21} - 1.204 \times 10^{21}$

$= 1.2 \times 10^{21}$ Remain

$$\text{mol} = \frac{N}{N_A} = \frac{1.2 \times 10^{21}}{6.023 \times 10^{23}}$$

$= 0.2 \times 10^{-2}$

$= 2 \times 10^{-3}$ mol Remain

Question no. 91

The cytoplasm of animal and plant cells is transvered by a network of tiny tubular membrane system that divides the intracellular space into two compartiments (luminal inside the membrance system) and extraluminal (Cytoplasm) compartment.

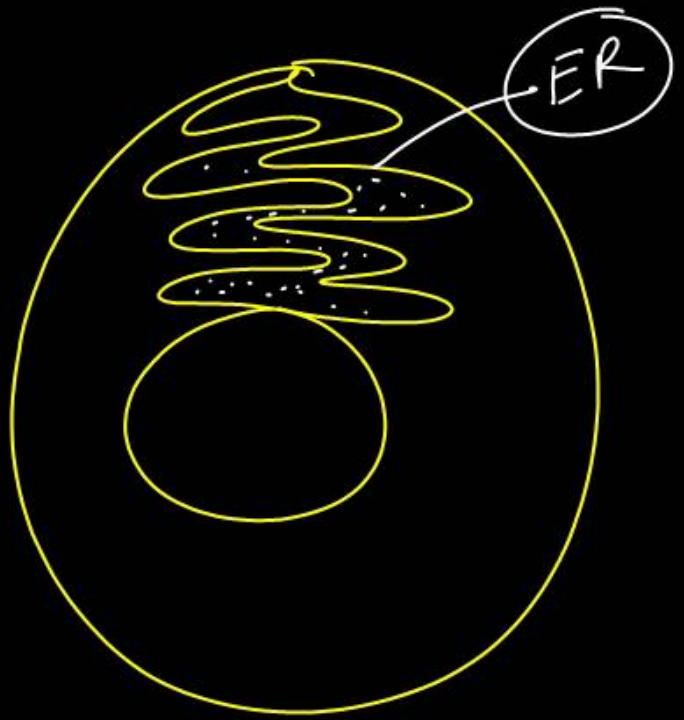
The above statement is attribuited to

(1) Vacuoles

(2) Golgi appartus

(3) Endoplasmic reticulum

(4) nuclear membrane



Question no. 92

Which of the following are not considered as the part of endomembrane system?

A. ~~Mitochondria~~
B. endoplasmic reticulum
C. ~~Chloroplast~~
D. Golgi complex
E. ~~Peroxisomes~~

ER
GB
Lysosome
Vacuole

Choose the most appropriate answer from the options given below.

(1) A, C and E
(2) A and D
(3) A, D and E
(4) B and D

1

Question no. 93

Which of the following features is common to prokaryotes and many eukaryotes?

(1) Chromatin material present ×

(2) Cell wall present

(3) Nuclear membrane present ×

(4) Membrane-bound subcellular organelles present ×

2

Question no. 94

Read the statements and select the correct option.

Statement I : Inclusion bodies are non-membrane bound, store reserve bodies in prokaryotic cells.

Statement II : Flagella, pili, and fimbriae are surface structures of bacteria which play role in motility.

(1) Both statements are true.

(2) Both statements are false.

(3) Statement I is true, Statement II is false.

(4) Statement II is true, Statement I is false.

Question no. 95

Match column-I with column-II and choose the correct option.

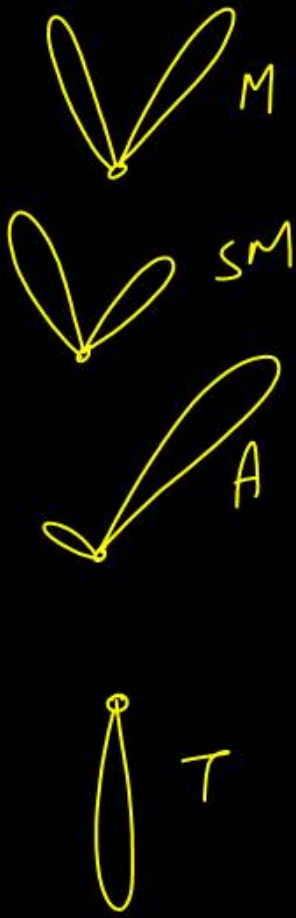
	Column-I (Chromosome)		Column-II (Position of Centromer)
A	Metacentric	i	At the tip
B	Submetacentric	ii	Almost near the tip
C	Acrocentric	iii	At the middle
D	Telocentric	iv	Slightly away from the middle

(1) A-(iii),B-(iv),C-(ii),D-(i)

(2) A-(iv),B-(iii),C-(ii),D-(i)

(3) A-(i),B-(ii),C-(iii),D-(iv)

(4) A-(iv),B-(iii),C-(ii),D-(i)



Question no. 96

Integral cell membrane protiens

(1) are partially embedded in lipid layers

(2) are completely embedded in lipid layers

(3) show lateral but not vertical movementswithin the bilayer of lipid

(4) All of these

4

Question no. 97

Which of the following is correct about the outer and inner membrane of chloroplast?

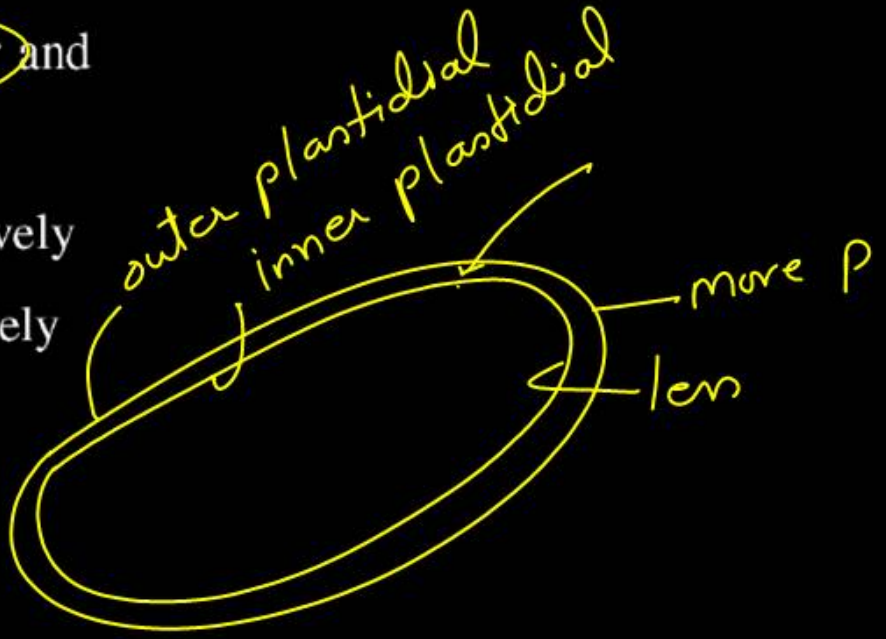
(1) Less permeable & more permeable, respectively

(2) More permeable & less permeable, respectively

(3) Both are equally permeable

(4) Both are equally impermeable

2



Question no. 98

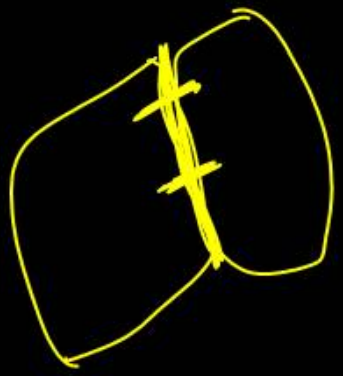
A structure that connect the cytoplasm of neighbouring cells, and another which holds or glues the different neighbouring cell together. These are

(1) Cell wall and middle lamella respectively

(2) Plasmodesmata and middle lamella respectively

(3) Middle lamella and desmosomes respectively

(4) Middle lamella and plasmodesmata respectively



2

Question no. 99

The main difference between Gram (+) and Gram (–) bacteria lies in their

(1) Cell wall composition

(2) Nucleoid

(3) Shape and size

(4) Type of ribosomes

Question no. 100

Plastids differ from mitochondria on the basis of which of the following features?

(1) Presence of two layers of membrane

(2) Presence of ribosome 70S

(3) Presence of thylakoids

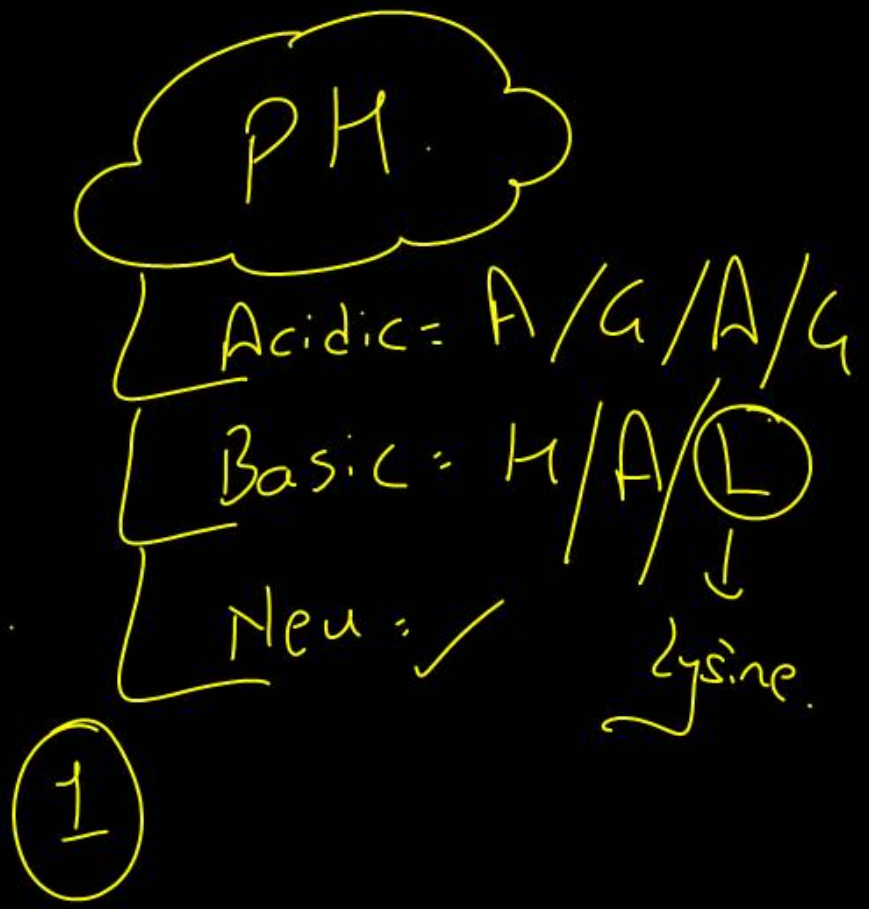
(4) Presence of DNA

3

Question no. 101

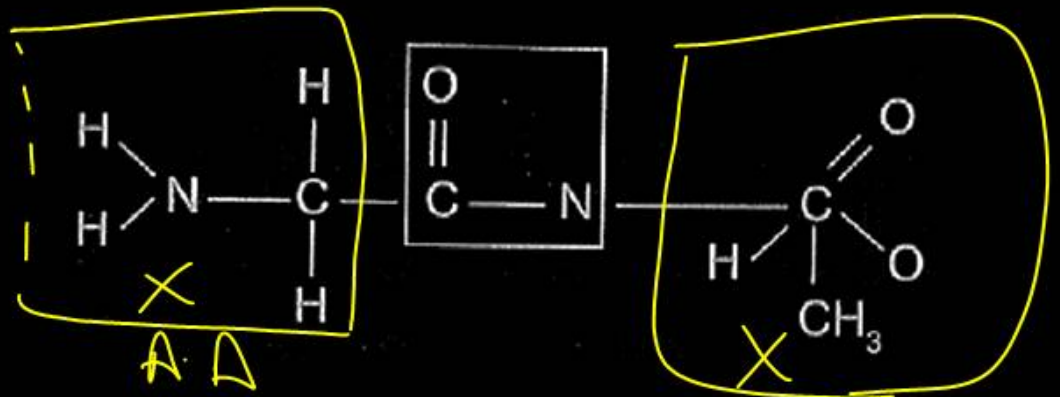
Which of the following is correct?

	Acidic Amino Acids	Basic Amino Acids	Neutral Amino Acids
(1) ✓	Glutamic acid	Lysine	Valine
(2) ✗	Lysine	Valine	Glutamic acid
(3)	Glutamic acid	Valine	Lysine
(4) ✗	Lysine	Glutamic acid	Valine



Question no. 102

What is the structure enclosed by a box?



(1) Amino acid

(2) Peptide bond

(3) Glycosidic bond

(4) Zwitier ion

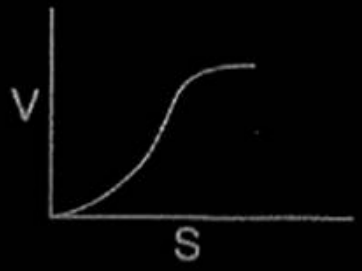
Peptide linkage

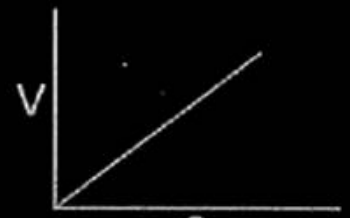
2

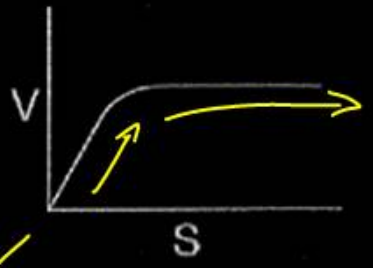
Question no. 103

Which one of the following graphs show the relationship between the rate of an enzymatic activity and substrate conc.(S)

(1) 

(2) 

(3) 

(4) 

4

Question no. 104

Which of the following group represents only primary metabolities?

(1) Glucose, ribose, glycine, alanine, chloesterol

(2) Lecithin, serine, glycerol, palmitic acid, nucleotide

(3) Adenosine, nucleosides, nitrogen bases, adenylic acid, triglyceride

(4) All of these

4

Question no. 105

Match List-I with List-II.

	List-I (Proteins)		List-II (Functions)
A.	Collagen	i.	Glucose transport
B.	Trypsin	ii.	Hormone
C.	Insulin	iii.	Intercellular ground substance
D.	GLUT-4	iv.	Enzyme

Choose the correct answer from the options given below:

(1) A – iii, B – iv, C – ii, D – i

(2) A – iv, B – i, C – ii, D – iii

(3) A – ii, B – iv, C – i, D – iii

(4) A – iii, B – iv, C – i, D – ii

Question no. 106

Select the incorrect statement.

(1) Palmitic acid had 18 carbons including carboxyl carbon

(2) Unsaturated fatty acids have one or more double bonds

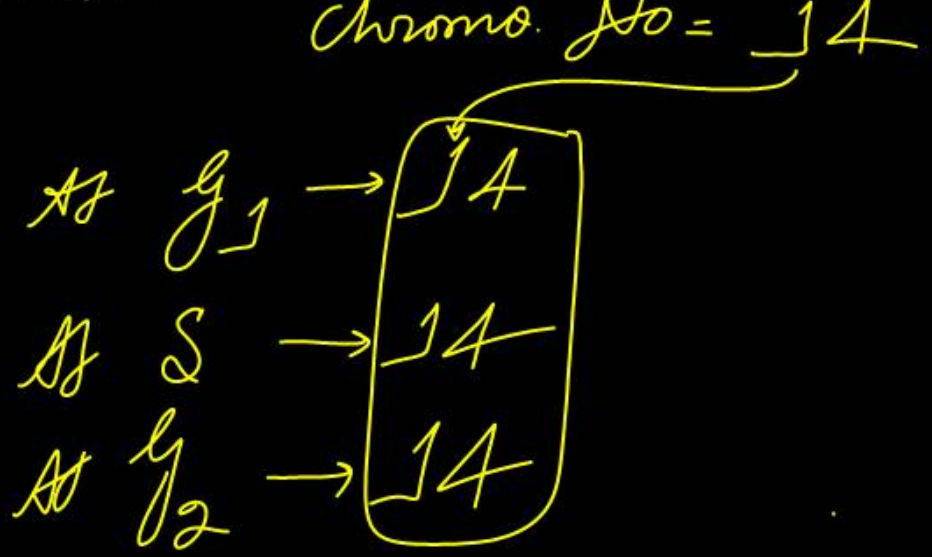
(3) Monoglyceride has single fatty acid esterified with glycerol

(4) Arachidonic acid is an unsaturated fatty acid with four double bonds

Question no. 107

Cells of root tip of onion have 14 chromosomes in each cell, how many chromosomes will the cell have at G_1-phase, after S-phase, and after M-phase respectively?

(1) 7, 14, 14
(2) 14, 28, 28
(3) 14, 14, 14
(4) 7, 28, 14



Question no. 108

Select the correct sequence of events occurring during Prophase-I of Meiosis-I:

A. Nuclear envelope breakdown

B. Synaptonemal complex formation

C. Compaction of chromosomes

D. Termination of chiasmata

E. Crossing over

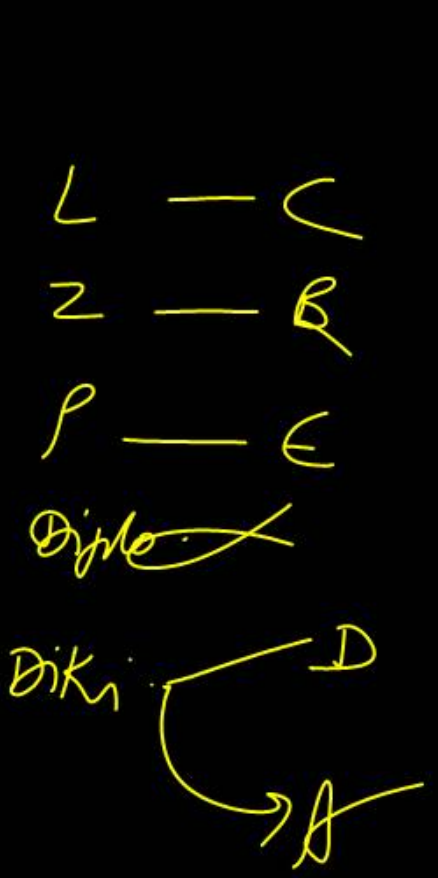
Choose the most appropriate answer from the options given below:

(1) C → A → B → E → D

(2) C → B → E → D → A

(3) C → A → B → D → E

(4) B → C → A → D → E



Question no. 109

Read the following statements and select the correct option:

Statement I : In animals without any excpetion, mitotic cell division is only seen in diploid somatic cells.

Statement II : Plants can show mitotic divisions in both haploid and diploid cells.

(1) Statement I is correct but statement II is incorrect.

(2) Statement I is incorrect but statement II is correct.

(3) Both statement I and statement II are correct.

(4) Both statement I and statement II are incorrect.

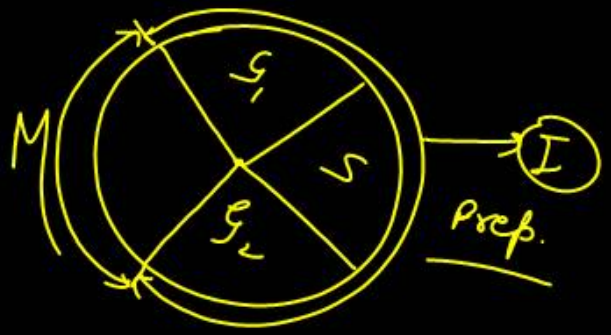
Question no. 110

Read the following statements about cell division and select the correct statements.

(i) M phase represents the phase when actual cell division occurs and Interphase represents the phase between two successive M phase.

(ii) In the 24 hours, average duration of cell cycleof a human cell, cell division proper lasts foronly about an hour.

(iii) M phase constitutes more than 95% of the duration of cell cycle.



(1) (i) and (ii)
(2) (ii) and (iii)
(3) (i) and (iii)
(4) (i), (ii) and (iii)

Question no. 111

Cytokinesis in animal cell takes place by___,in ___ direction while in plant cell by __, in___ direction.

(1) furrowing, centrifugal, cell plate, centripetal

(2) furrowing, centripetal, cell plate, Centrifugal

(3) cell plate, centrifugal,furrowing, centripetal

(4) cell plate, centripetal, furrowing, centrifugal

Question no. 112

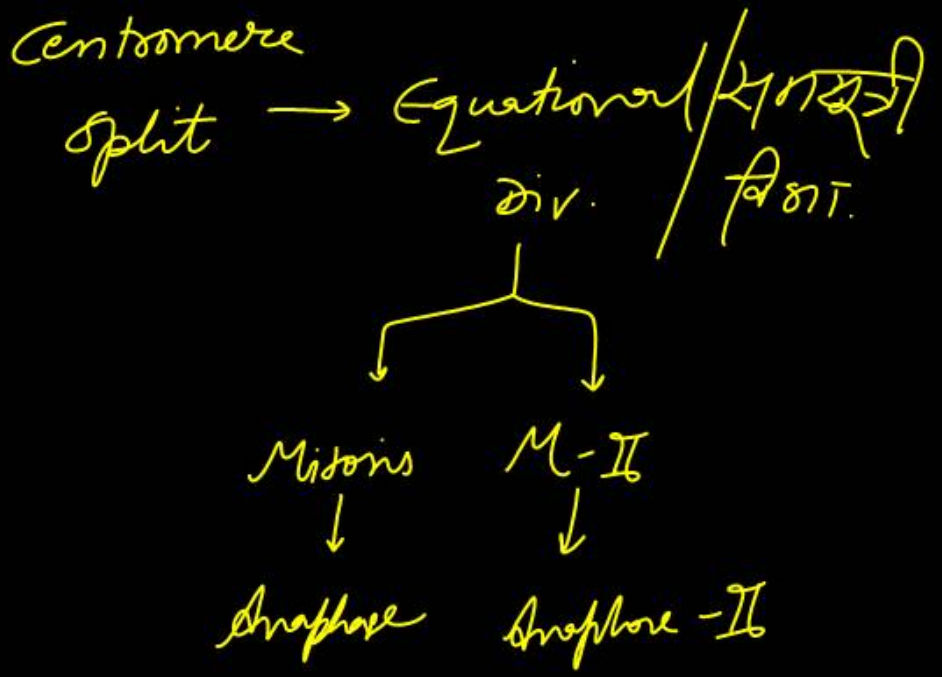
During which stages of mitosis and meiosis, respectively does the centromere of each chromosome split?

(1) telophase, Anaphase I

(2) Anaphase, Anaphase II

(3) Metaphase, Metaphase II

(4) prophase, Telophase I



Question no. 113

In meiosis,

(1) First division is reductional, and second division is equational

(2) First division is equational, and second division is reductional

(3) Both divisions are reductional

(4) Both divisions are equational

M-I → Reduc.

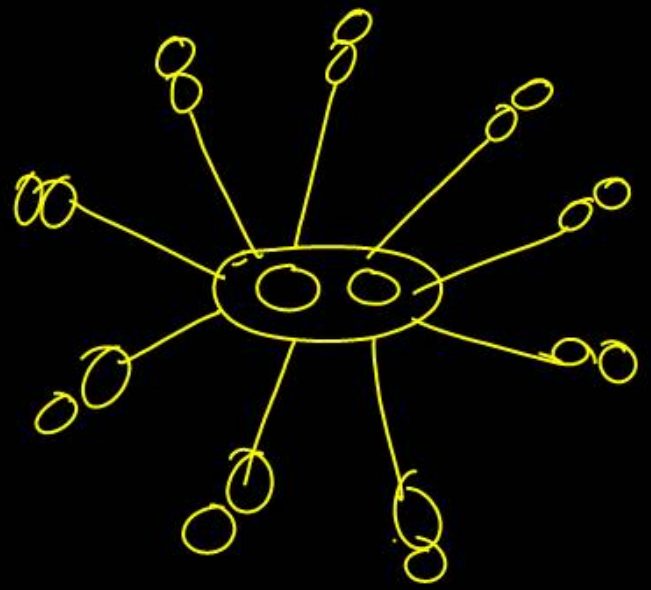
M-II → Eq.

Question no. 114

Which of the following option is correct sectional view of cilia/flagella –

	Peripheral microtubules (Doublet)	Central microtubules (Singlet)	Radial spoke	Central sheath
(1)	9 + 0	2	8	1
(2)	9 + 0	9 + 0	9	1
(3)	9	2	9	1
(4)	3	6	9	1

3



Question no. 115

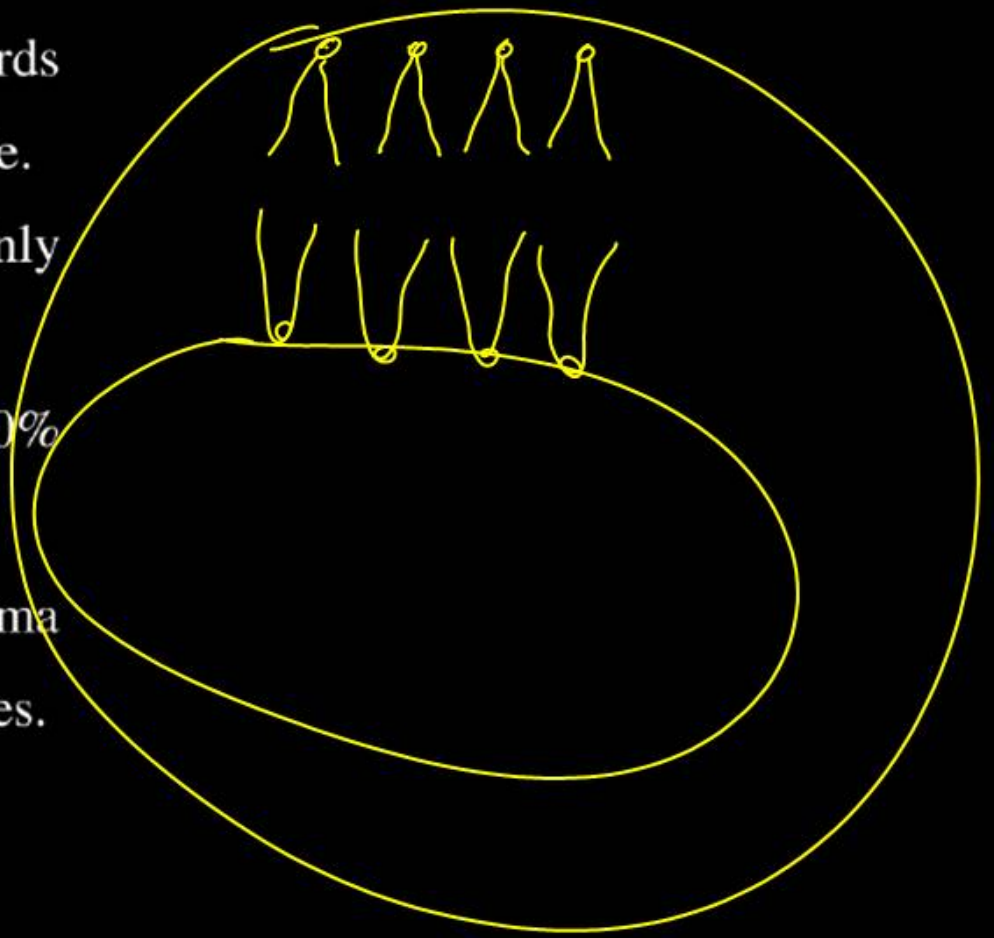
Select the correct statement w.r.t. plasma membrane:

(1) Lipids are arranged with polar head towards inner side and non-polar tail towards outer side.

(2) The lipid component of the membrane mainly consist of phosphoglycerides.

(3) RBC of human beings approximately has 40% protein and 52% lipid.

(4) The ratio of protein and lipid in the plasma membrane is almost same in different cell types.



2

Question no. 116

In prokaryotes, chromatophores are

(1) Specialized granules responsible for nitrogen fixation of cells.

(2) Structures responsible for organizing the shape of the organism.

(3) Inclusion bodies lying free inside the cells for carrying out various metabolic activities.

(4) Internal membrane system which becomes extensive and complex in photosynthetic bacteria.

4

Question no. 117

The concentration of a number of ions and other materials is higher in vacuoles than those in cytoplasm, why?

(1) Tonoplast has a number of active transport system that pumps ions into vacuoles from the cytoplasm

(2) Through osmosis, a large amount of ions go continuoulsly to vacuole from the cytoplasm

(3) Cytoplasmic ions enter the vacuole through osmotic flow of water

(4) Vacuole is always engaged in the hydrolysis of salts into their ions

Question no. 118

Arrange the steps of catalytic action of an enzyme in order and choose the correct option.

I. The enzyme releases the products of the reaction and gets free for another substrate.

II. The binding of substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.

III. The active site of enzyme is in close proximity of the substrate and breaks chemical bonds of the substrate.

IV. The substrate binds to the active sites of the enzyme, fitting into the active sites.

(1) IV → II → III → I

(2) III → II → I → IV

(3) IV → II → I → III

(4) II → I → IV → III

E + S = Active site

Question no. 119

Which of the following structures are nucleo protein-aceous in nature –

Nucleic Acid + protein (DNA/RNA)

A. Virus
B. ~~Centriole~~
C. Chromosomes
D. Ribosomes
E. Prions

or RNA + protein

(1) A, B, C and D only
(2) A, C and D only
(3) A, D and E only
(4) A, B, C, D and E

2

Question no. 120

Which one of the following does not differ in E.coli and Chlamydomonas?

Eukaryote

Prokaryote

(1) Ribosomes ✓

(2) Chromosomal organization ✓

(3) Cell wall ×

(4) Cell membrane

unit memb.

4

Question no. 121

In an experiment, a human cell and a yeast cell divide simultaneously. After 48 hours what will be the ratio of number of cell cycles completed by yeast cell : Human cell ?

(1) 32 : 1

(2) 1 : 1

(3) 16 : 1

(4) 2 : 32

Human cell → 24 hrs → 1 cycle

48 hrs → 2 cycle

Yeast cell.

1 cycle = 90 min

$\frac{60 \times 24}{90}$ hrs. = 16 cycles

48 hrs → 32 cycles

Yeast : Human

after 48 hrs → 32 : 2

16 : 1

Question no. 122

How many of the given structures are non-membrane bound.

Centriole, Mitochondria, Ribosome, Peroxisome, Nucleolus, Lysosome, Vacuole, Golgi apparatus

(1) Two
(2) Four
(3) Onle
(4) Three

4

Ribosome
Centrosome
Nucleolus

Question no. 123

Match List-I with List-II.

	List-I (Category)		**List-II (Secondary metabolites)**
A.	Pigments	i.	Concanavalin A
B.	Terpenoides	ii.	Monoterpenes, Diterpenes
C.	Alkaloids	iii.	Morphine, Codeine
D.	Lectins	iv.	Carotenoids,Anthocyanin

Choose the correct answer from the options given below:

(1) A – iv, B – ii, C – iii, D – i

(2) A – iv, B – iii, C – ii, D – i

(3) A – i, B – iv, C – iii, D – ii

(4) A – i, B – iii, C – ii, D – iv

Question no. 124

What is the formula of a polypeptide consisting of 10 glycine molecules? If the formula of glycine is $C_2H_5O_2$.

(1) $C_6H_{12}O_0$ (2) $C_{20}H_{32}O_{11}$

(3) $C_{30}H_{16}O_6$ (4) $C_{25}H_{16}O_6$

2

$C_2 H_5 O_2$

For 1 peptide bond 1 molec. of water is Removed?

= A.A = 10 glycine

= Peptide = 9 X H_2O molecule

X 10

C_{20} H_{50} O_{20}

$-18 \cdot 9$

Question no. 125

In which method of transport in plasma membrane does not require carrier molecule?

(1) Active transport (2) Facilitated diffusion

(3) Simple diffusion (4) $Na^+ - K^+$ pump

3

Carrier prot. ✗ ✓ ✓

ATP ✗ ✗ ✓

Simple diff
f. diffu
Active

Question no. 126

Which of the following combinations is correct?

(1) Metal ions loosely attached with apoenzyme— Activators

(2) Non-protein organic part attached to apoenzyme firmly—Prosthetic group

(3) Non-protein organic part attached loosely to apoenzyme— Coenzyme

(4) All of the above

Inactive.

4

Question no. 127

Acid insoluble classes of compunds generally are polymeric substances but their exception is:

(1) Protein
(2) Polysaccharides
(3) Nucleic acids
(4) Lipids

Cl_3CCOOH.

4

Question no. 128

Which of the following statements are correct.

(i) Proteins, are homopolymers containing strings of amino acids.

(ii) Biologists describe the protein structure at four levels.

(iii) In secondary structure of protein only left handed helices are observed.

(iv) Secondary structure of protein is absolutely necessary for many biological activities of proteins.

(v) The long protein chain is also folded upon itself like a hollow woolen ball, giving rise to the tertiary structure.

(1) Only (ii) and (iii)

(2) Only (ii) and (v)

(3) Only (i) and (v)

(4) All of them are correct

Question no. 129

Read the following statements and choose the correct option.

Statement I : Amino acids are called alpha-amino acids because they are substituted methanes.

Statement II : Secondary metabolites have identifiable functions and play known roles in normal physiological processes.

(1) Both statements are correct.

(2) Both statements are incorrect.

(3) Only statements I is correct.

(4) Only statements II is incorrect.

Question no. 130

Given:

(a) Chromatid

(b) Monod

(c) Dyad

(d) Daughter chromosome

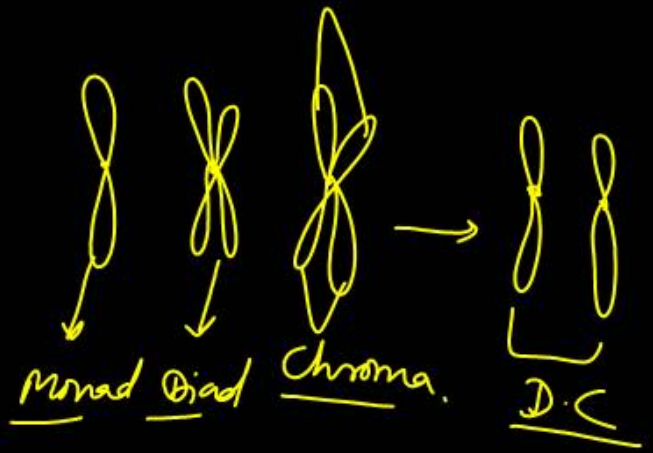
The correct sequence in cell division is

(1) a, b, c, d

(2) b, c, a, d

(3) c, b, a, d

(4) d, c, b, a



Question no. 131

Which of the events listed below is not observed during mitosis?

(1) Chromatin condensation

(2) Movement of centrioles to opposite poles → Prophase

(3) Appearance of chromosomes with two chromatids joined together at the centromere

(4) Crossing over

Question no. 132

Which one is correct about bivalent?

A. Bivalent are tetrads.

B. A bivalent means 4 chromatids and 2 centromere.

C. One bivalent consists of 2 homologous chromosomes and 4 sister chromatids.

D. Bivalents formation occurs in zygotene.

(1) A, B, C and D (2) C only

(3) C and D only (4) D only

Question no. 133

In oocyte, which phase of prophase I can last for months or years

(1) Diakinesis

(2) Diplotene

(3) Zygotene

(4) Pachytene

Question no. 134

If egg of an organism has 5 pg of DNA in itsnucleus. How much DNA would a diploid cell ofsame organism have in G2 phase of meiosis?

(1) 10 pg
(2) 5pg
(3) 20pg
(4) 40pg

egg → n = 5 pg.

2n = 10 pg $\xrightarrow{G_1}$ 10 $\xrightarrow{S}$ 20 $\xrightarrow{G_2}$ 20.

Question no. 135

Consider the following statements:

I. Quasi-fluid nature of lipid enable lateral movement of proteins within the bilayer.

II. The fluid nature of membrane is important for cell growth and division.

III. Polar molecules can easily pass through the polar lipid bilayer.

IV. All ions molecules are transported across the membrane against their concentration gradient.

Which of the above statements are incorrect?

(1) III and II
(2) II and IV
(3) I and III
(4) III and IV

Question no. 136

Indentify the correct type of ribosomes present in RER, Prokaryotic cytoplasm, Mitochondria and Plastids respectively:

(1) 80S, 80S, 70S, 70S

(2) 70S, 70S, 80S, 80S

(3) 80S, 70S, 70S, 70S

(4) 70S, 80S, 70S, 70S

RER – 80S

Proka – 70S

mito – 70S

plast – 70S

3

Question no. 137

Read the following statements and identify the correct option.

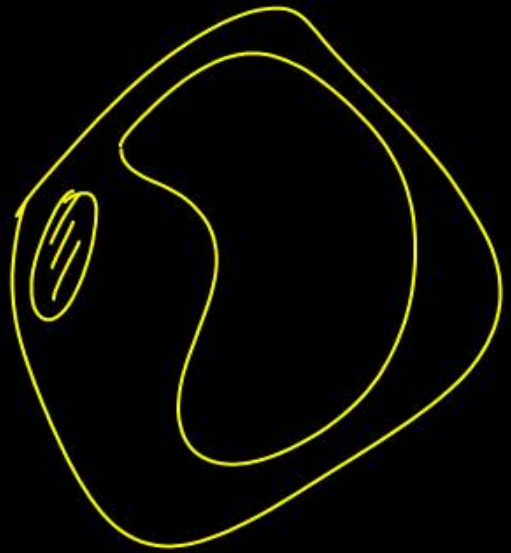
(i) Contractile vacuole takes part in osmoreulation and excretion.

(ii) Food vaculoe is formed by engulfing the food particles.

(iii) The vacuole is bound by a double membrane called tonoplast.

(iv) Vacuole can occupy upto 90 percent of the volume of the plant cell.

(1) (i) and (ii)
(2) (ii) and (iv)
(3) (i), (ii) and (iv)
(4) None of these

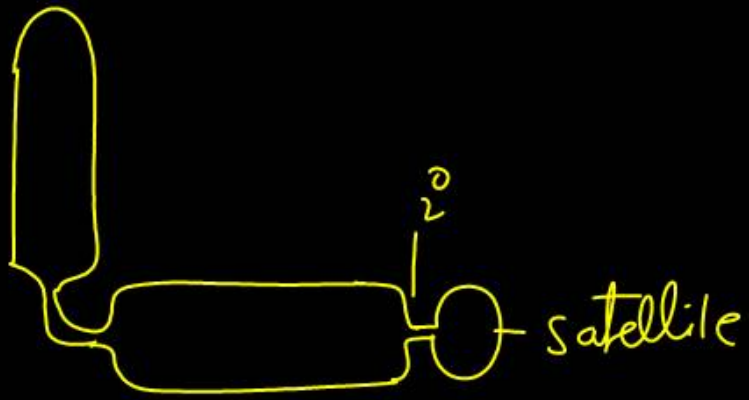


Question no. 138

Parts of chromosome after secondaryconstriction is called

(1) Chromomere
(2) Telomere
(3) Satellite
(4) Primary constriction

3



Question no. 139

According to the fluid mosaic model of the cell membrane, the proteins are located-

(1) As a continuous layer over the outer surface of the membrane only

(2) As a continuous layer only the inner surface of membrane only

(3) On the surface (as peripheral proteins) and embedded or buried in the membrane (as integral proteins)

(4) In the middle of the membrane, between the lipid layers only

3

Question no. 140

The key features of metaphase are

(1) Spindle fibres attach to kinetochores of chromosomes

(2) Chromosomes are moved to spindle equator and get aligned along metaphase plate

(3) Splitting of centromere

(4) Both A and B

ANAPHASE

Question no. 141

"Omnis cellula-e cellula" means

(1) All animal and plants are made up of cells.

(2) Cells are structural and functional unit of life.

(3) New cells are formed from pre-existing cells.

(4) All of these

3

Question no. 142

Given below are two statements one is labelled Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Mitochondria and chloroplats are semi autonomous organelles.

Reason (R) : They are formed by division of pre-exisiting organelles as well as contain DNA & also have protein synthesising machinery.

In the light of the above statements, choose the correct answer from the options given belwo:

(1) (A) is correct, but (R) is not corrcet.

(2) (A) is not correct, but (R) is correct.

(3) Both (A) and (R) are correct, and (R) is the correct explanation of (A).

(4) Both (A) and (R) are correct, But (R) is not the correct explanation of (A).

Question no. 143

How many of the following statements about the nucleolus are correct?

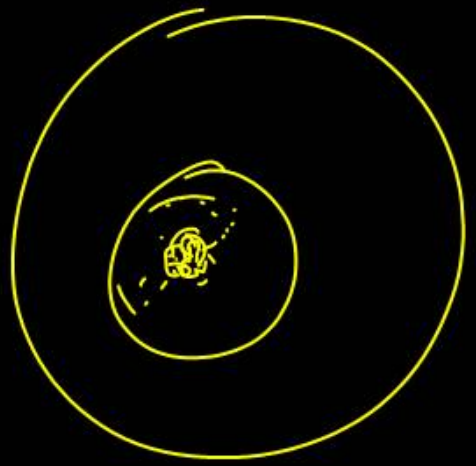
A. Content of the nucleolus is continuous with the rest of the nucleoplasm.

B. It is the site of ribosomal RNA synthesis.

C. Smaller and few nucleoli are present in cells actively carrying out protein synthesis.

D. It is involved in lipid synthesis.

(1) One
(2) Two
(3) Three
(4) Four



Question no. 144

Inhibition of succinic dehydrogenase by malonate is an example of

(1) allosteric inhibition

(2) negative feedback

(3) competitive inhibition ✓

(4) non-competitive inhibition

3

Question no. 145

Read the given statements and select the correct option.

A. Right end of a polysaccharide chain is called reducing and while left end is called non-reducing end.

B. Starch can hold iodine molecules in its helical secondary structure but cellulose being non-helical, cannot hold iodine.

C. Starch and glycogen are branched molecules.

D. Starch and glycogen are the reserve food materials of plants and animals, respectively.

(1) Statement A and B are correct

(2) Statement B and C are correct

(3) Only statement D is correct

(4) All statement are correct

Starch - Blue
Cellulose ✗

Question no. 146

left

N-terminal.

C-terminal.

(1) X is C-terminal amino acid and Y is N-terminal amino acid

(2) Both X and Y are C-terminal amino acids

(3) X is N-terminal amino acid and Y is C-terminal amino acids

(4) Both X and Y are N-terminal amino acids

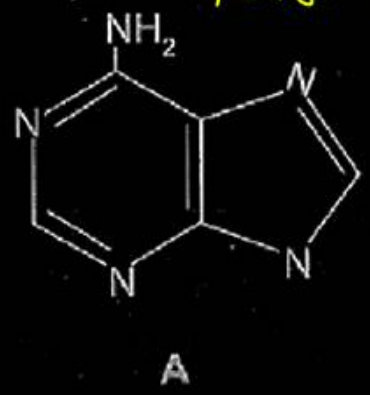
3

Question no. 147

The below diagram represent the nitrogenousbases.

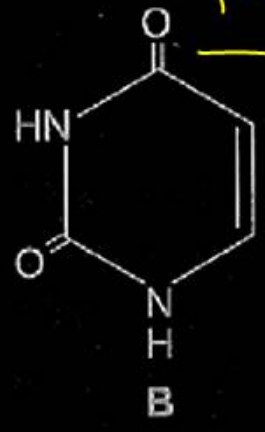
Identify the correct combination.

Purine.



A

Pyrimidine.



B

3

(1) A = Adenine; B = Thymine

(2) A = Guanine; B = Thymine

(3) A = Adenine; B = Uracil

(4) A = Guanine; B = Uracil

Question no. 148

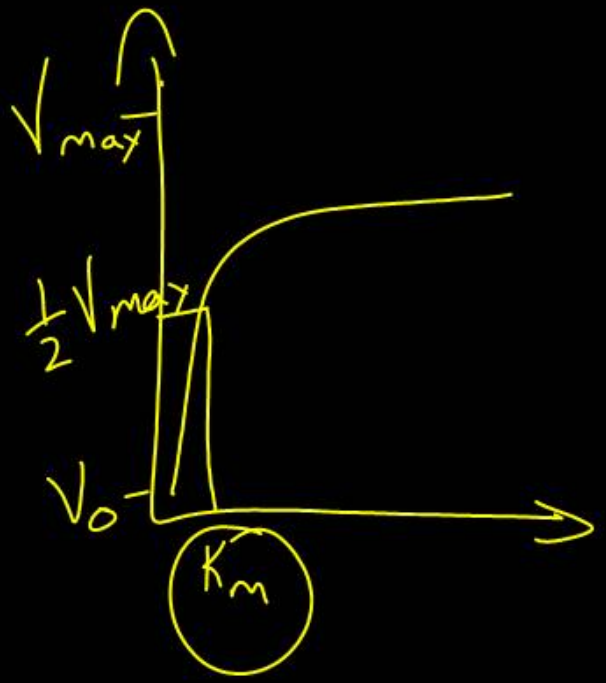
Choose the correct statement(s).

(1) K_m (Michaelis-Menten) constant is the substrate concentration at which the enzymatic reaction attains half of its maximum velocity (1/2 V_{max})

(2) At lower K_m higher the substrate affinity for enzyme

(3) V_{max} is reached when all the active sites ofan enzyme are saturated with substrate

(4) All of these



Question no. 149

Which one is correct about S-phase (synthetic phase)?

I. It occurs between G_1 and G_2

II. It marks the period during which DNA replicates

III. At the end of this phase, DNA is doubled but the number of chromosomes remains undchanged

IV. As the DNA is doubled in this phase number of chromosomes is also doubled.

V. Centrioles replicate in this phase

VI. Amount of DNA changes from 2C to 4C

VII. It is pre-G_2 and post –G_1 phase.

(1) I, II, IV, V, VI, VII are correct

(2) I, II, III, V, VI, VII are correct

(3) All is correct

(4) Only IV is correct

Question no. 150

In the composition of cellular mass, arrange the components- proteins(P), carbohydrates(C), Lipids(L) and Nucleic acids(N) in decreasing order of mass percentage

(1) C > N > P > L

(2) P > N > C > L

(3) P > C > L > N

(4) P > N > L > C

Question no. 151

Four different steps that occur during meiosis are given in the following list:

i. Complete separation of chromatids. → A-II

ii. Pairing of homologous chromosomes. → Z

iii. Lining up of paired chromosomes on equator. → M

iv. Crossing over between chromatids. P

These steps would occur in the order.

(1) i, ii, iv, iii

(2) iii, ii, iv, i

(3) ii, iv, iii, i

(4) ii, i, iii, iv

Question no. 152

Match column I (function) with column II (Types of enzymes) and select the correct option.

	Column-I (Functions)		Column-II (Types of enzymes)
A.	Enzymes that catalyse removal of groups from substrates	i.	Isomerases
B.	Enzyme catalyzing interconversion of optical or positional isomers	ii.	Oxidoreductase
C.	Enzymes which catalyse oxidoreduction	iii.	Ligases
D.	Enzyme catalysing the linking together of 2 compounds	iv.	Lyases

(1) A-I, B-IV, C-III, C-II

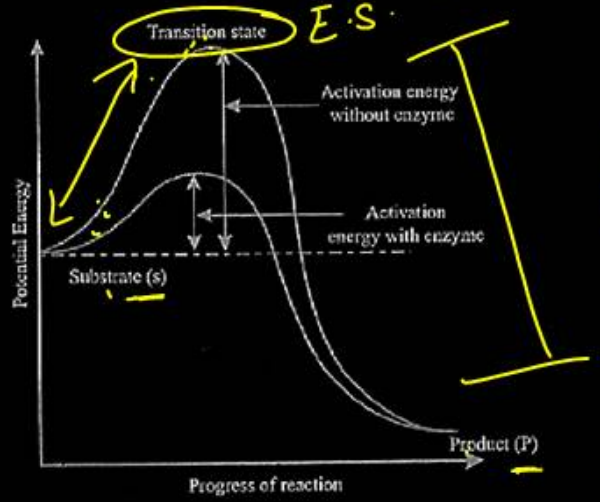
(2) A-1, B-IV, C-II, C-III

(3) A-1V, B-I, C-II, C-III

(4) A-1V, B-I, C-III, C-II

Question no. 153

Consider the graph and choose the incorrect option;



(1) A transition state structure is formed during conversion of substrate to product.

(2) The difference in average energy content of product and that of transition state is called activation energy.

(3) If 'P' is at lower level that 'S', the reaction is exothermic.

(4) Enzymes bring down the activation energy barrier making the transition of 'S' to 'P' more easy.

Question no. 154

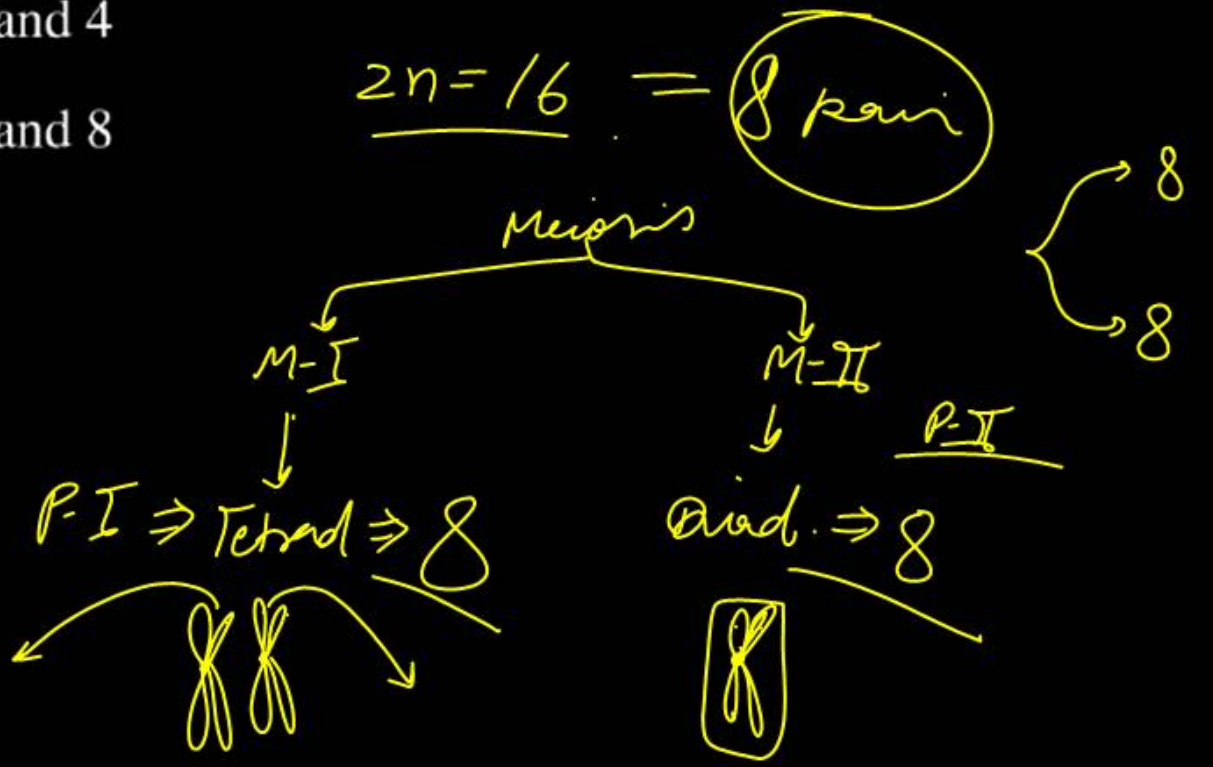
If for a species 2n = 16, then during Ist prophase and IInd prophase of meiotic division of a cell, how many tetrads and diads will be formed respectively ?

(1) 4 and 4

(2) 8 and 4

(3) 8 and 8

(4) 4 and 8



Question no. 155

Consider the following statements :

I. Plant cells have centrioles which are absent in almost all animal cells

II. Ribosomes are the site of protein synthesis

III. The middle lamella is the layer mainly of calcium carbonate which holds the different neighburing cells together

IV. In animal cells lipid like steroidal hormones are synthesized by smooth endoplasmic reticulum.

Of the above statements.

(1) I and II only are correct

(2) I and IV are only correct

(3) II and IV only are correct

(4) III and IV only are correct

Question no. 156

. Match the terms (given in column I) with their explanation (given in column II) and choose the correct combination from the options given below:

	Column I (Terms)		Column II (Explanation)
A.	Terminalization	i.	Pairing of homologous chromosomes
B.	Synapsis	ii.	Point of attachment between homologous chromosomes
C.	Chiasmata	iii.	Nuclear protein complexthat helps in adherence of sister chromatids and then homologus chromosomes
D.	Synaptonemal	iv.	Shifting of chiasmata complex, outwards towards theends of a bivalent.

A - IV

B - I

C - II

D - III

(1) A-(iv),B-(i),C-(ii),D-(iii)

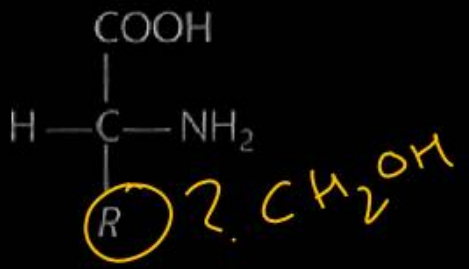
(2) A-(ii), B-(iii), C-(iv), D-(i)

(3) A-(ii), B-(iv), C-(iii), D-(i)

(4) A-(iv),B-(i),C-(iii),D-(ii)

Question no. 157

Which of the following amino acid is formed when the hydroxyl methyl (CH_2OH) is substituted from the R–group in the given formula?



(1) Tryptophan

(2) Valine

(3) Serine

(4) Alanine

Question no. 158

The daughter cells produced after meiosis I

(1) Are genetically similar to each other

(2) Are genetically similar to parent cell

(3) Are genetically dissimilar to each other

(4) Have same ploidy level as that of parent cell

Question no. 159

Choose the correct one for the chromosome given below:

3

	Number of chroma-tids	Number of arms	Number of centro-mere	Number of kineto-chore	Number of telomere
(A)	4	2	2	4	2
(B)	2	2	1	4	4
(C)	2	4	1	2	4
(D)	2	4	2	4	2

Question no. 160

Which stages of cell division do the followingfigures A and B represent, respectively?

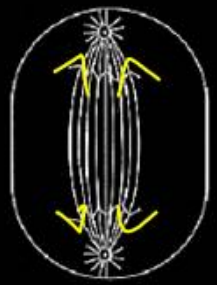


Figure (A)

Figure (B)

	Figure (A)	Figure (B)
I.	Prophase	Anaphase
II.	Metaphase	Telophase
III.	Telophase	Metaphase
IV.	Late Anaphase	Prophase

(1) I

(2) II

(3) III

(4) IV

Question no. 161

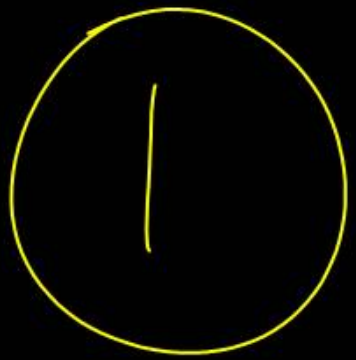
Which one of the following differentiates plant cells from animal cells?

(1) Large vacuole, plastid and cell wall

(2) Cell wall, plastid and centriole

(3) Cell wall, plastid and contractile vacuole

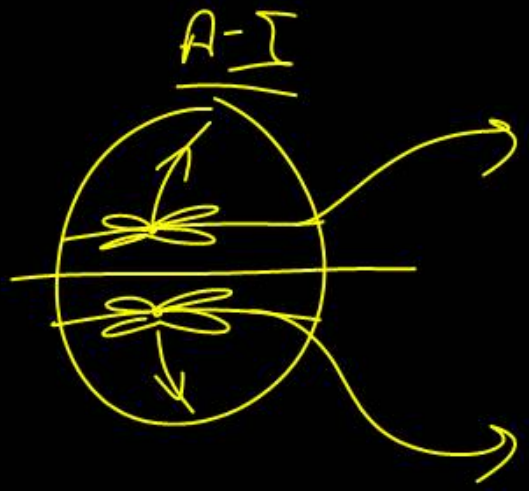
(4) Cell membrane, plastid and cell wall



Question no. 162

In meiosis, haploid condition is realized by which stage?

(1) Anaphase I
(2) Anaphase II
(3) Metaphase I
(4) Metaphase II



Question no. 163

The bacterial cell envelope consisting of a tightly bound three layered structure from outside to inside is:

(1) Cell wall → Glycocalyx → Plasma membrane

(2) Plasma membrane → Glycocalyx → Cell wall

(3) Glycocalyx → Cell wall → Plasma membrane

(4) Glycocalyx → Plasma membrane → Cell wall

3

Glyc
↓
cell wall
↓
cell membra

Question no. 164

Match column I (cell type) with column II (size) and choose the correct option.

	Column-I (Cell type)		Column-II (size)
A.	Viruses	i.	1-2 μm
B.	PPLO (mycoplasma)	ii.	10-20 μm
C.	Eukaryotic cell	iii.	About 0.1 μm
D.	Bacterium	iv.	~~0.02-0.2 μm~~

A - iv
B - iii
C - ii
D - i

(1) A-(i),B-(ii),C-(iii), D-(iv)

(2) A-(iv),B-(iii),C-(ii), D-(i)

(3) A-(i), B-(iii), C-(ii), D-(iv)

(4) A-(iv),B-(ii), C-(iii),D-(i)

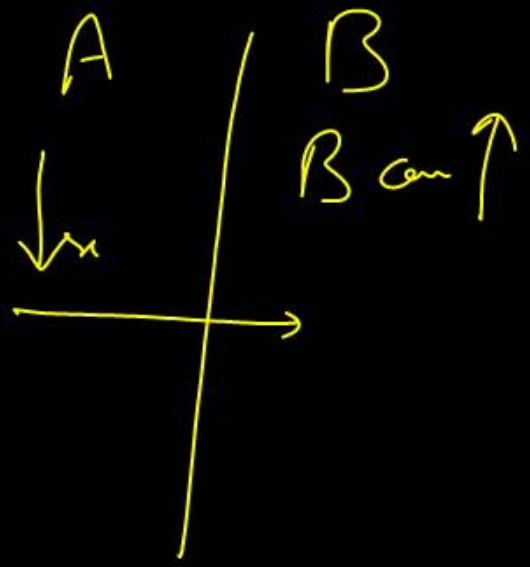
2

Question no. 165

A student wants to study the transport of some ions from side A to side B which are separated by a selectively permeable membrane. The concentration of this ion is more on side B than side A. Which type of transport was he probably looking for?

(1) Simple diffusion (2) Facilitated diffusion

(3) Active transport (4) Passive transport



3

Question no. 166

Of the following organelles, which group isinvolved in the manufacturing substances neededby a cell?

(1) Lysosomes, vacuoles and ribosomes

(2) Vacuoles, RER and SER

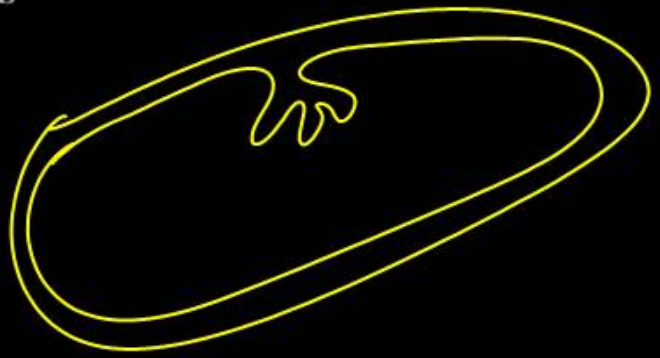
(3) Ribosomes, RER and SER

(4) RER, Lysosomes and vacuoles

Question no. 167

A specialised extension of prokaryotic cell membrane which help in respiration and secretion process is called

(1) Chromatophores
(2) Capsule
(3) Mesosome
(4) Glycocalyx



3

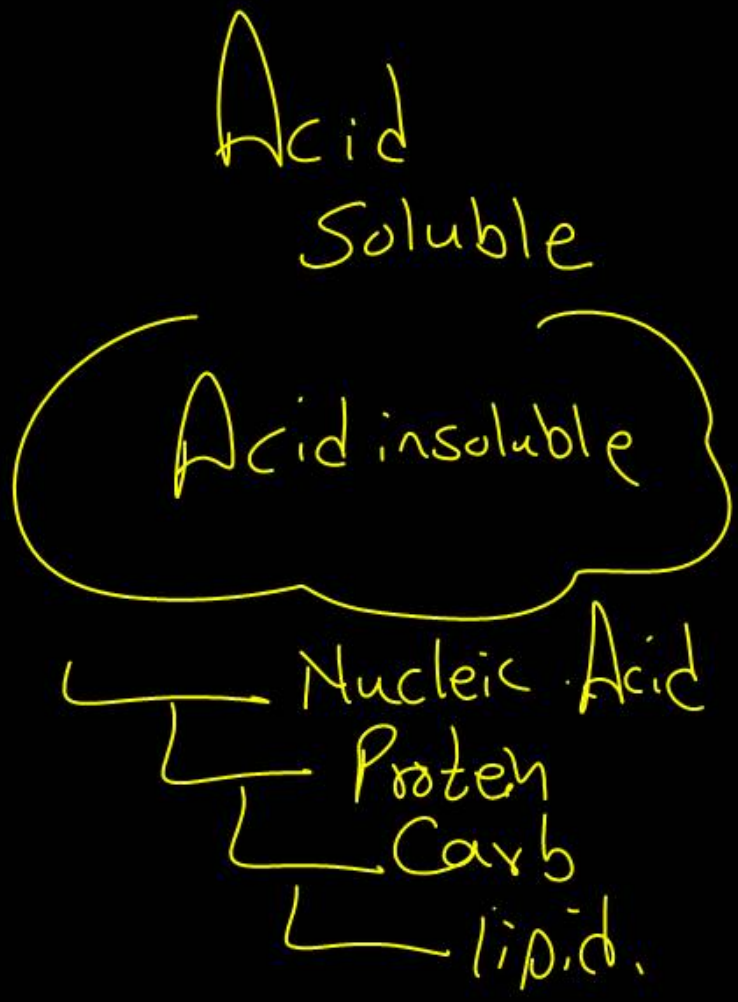
Question no. 168

Which of the following organic compounds are found in acid insoluble fraction?

A. Proteins
B. Nucleic acids
C. Polysaccharides
D. Lipids

(1) A, B & C Only
(2) A, C & D Only
(3) A & C Only
(4) A, B, C & D ✓

4



Question no. 169

In animal world, the most abundant protein is___ while in the whole biosphere the mostabundant protein is ____.

(1) antibody, collagen (2) collagen, RuBisCo

(3) RuBisCo, collagen (4) collagen, oxidase

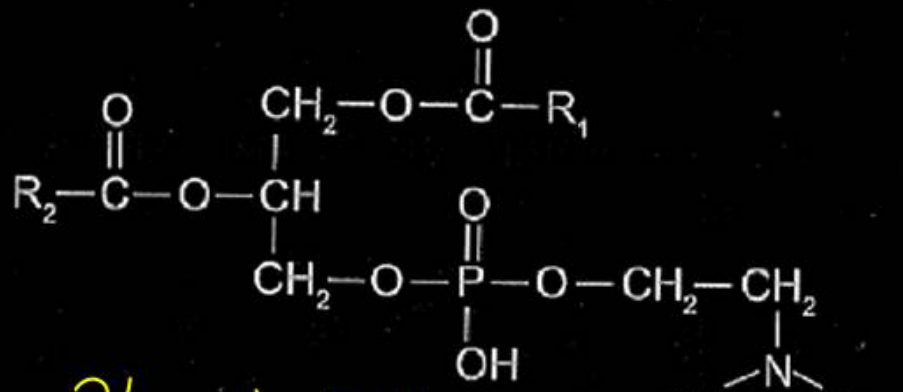
collagen

Rubisco.

2

Question no. 170

The diagrammatic representation is the formula of



Phospholipid

(1) Lecithin

(2) Cholesterol

(3) Uridylic acid

(4) Phosphatic acid

Question no. 171

Which of the following statement is correct?

(1) Enzymes generally function in a narrow range of temperature and pH.

(2) Enzymes show maximum activity at optimum temperature and optimum pH.

(3) Enzymes remain in temporary inactive state at low temperature but high temperature destroys enzymatic activity due to denaturation of proteins

(4) All of these

Question no. 172

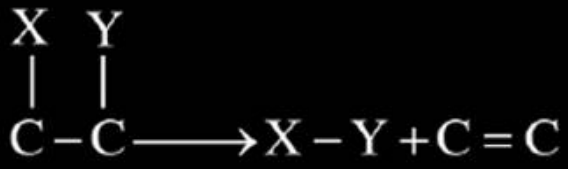
Some proteins are an assembly of more than one polypeptide or subunits. The manner in which these individuals respect to each other is the architecture of a protein otherwise called the

(1) Primary structure (2) Secondary structure

(3) Tertiary structure (4) Quaternary structure

Question no. 173

The reaction given below represents activity of which class of enzymes-



(1) Lyases
(2) Transferases
(3) Hydrolases
(4) Ligases

Question no. 174

Which of the following is true for crossing over?

i. Crossing over is the exchange of genetic material between two homologous chromatids.

ii. Crossing over is an enzyme-mediated process and the enzyme involved is called recombinase.

iii. Crossing over leads to recombination of genetic material on the two chromosomes.

iv. Recombination between homologous chromosomes is completed by the end of diplotene.

v. Crossing over started in pachytene.

vi. It is responsible for variation in organism.

(1) i, ii, iii and v

(2) ii, iii iv and v

(3) i, ii, iii and iv

(4) ii, iii, v and vi

Question no. 175

Given below are two statements:

Statement I : Meiosis involves pairing of homologous chromosomes and recombination between them.

Statement II : Meiosis involves two sequential cycle of nuclear and cell division called meiosis I and meiosis II, but only a single cycle of DNA replication.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both statement I and statement II are correct.

(2) Both statement I and statement II are incorrect.

(3) Statement I is correct but statement II is incorrect.

(4) Statement I is incorrect but statement II is correct.

Question no. 176

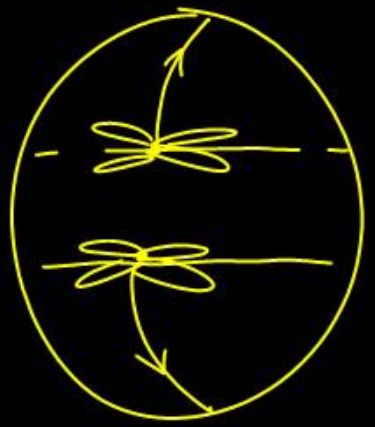
Read the following statements with respect fo meiosis and selsct the correct option stating which ones are true and which ones are false:

A. Meiosis increases genetic variability in the population which is essential for evolution

B. Synaptonemal complexdevelops between two synapsed homologous chromosomes

C. Each chromosome of a bivalent attaches with two poles in metaphases I

D. At anaphase I, the centromere splits but sister chromatids do not separate



(1) TTFF (2) FTTF

(3) FFTT (4) TFFT

Question no. 177

Which one is correct for G_0 stage?

I. It is a quiescent stage

II. In this phase, cell cycle stopped

III. G_0 cells in this stage do not grow or proliferate but are metabolically active

IV. G_0 cells can divide in response to some stimulus

(1) All is correct

(2) I, II, III are correct

(3) I, II are correct

(4) Only I and IV are correct

Question no. 178

The formation of recombination nodules and terminalisation occur respectively during:

(1) Pachytene and diakinesis

(2) Leptotene and zygotene

(3) Zygotene and diakinesis

(4) Diplotene and diakinesis

Question no. 179

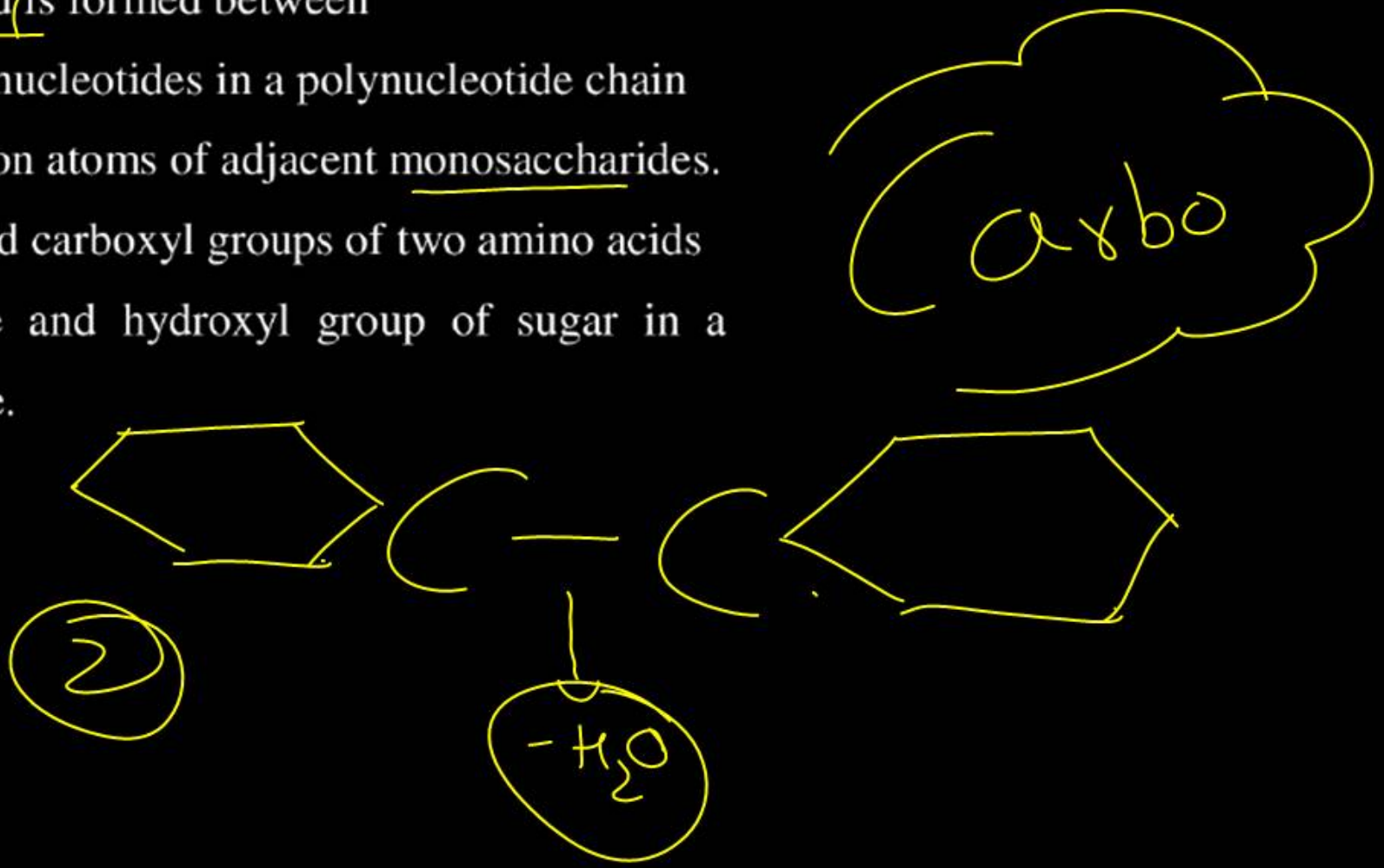
Glycosidic bond is formed between

(1) Adjacent nucleotides in a polynucleotide chain

(2) Two carbon atoms of adjacent monosaccharides.

(3) Amino and carboxyl groups of two amino acids

(4) Phosphate and hydroxyl group of sugar in a nucleotide.



Question no. 180

Chromosomal disjunction is

(1) Chromosomal aberration involving translocation

(2) Separation of homologous Chromosomes at anaphase

(3) Deletion of gene during crossing over

(4) Movements of chromosomes towards equator