Question No. 1

Match List–I with List–II.

	List–I		List–II
A.	h (Planck's constant)	i.	$[MLT^{-1}]$
B.	E (kinetic energy)	ii.	$[ML^2T^{-1}]$
C.	V (electric potential)	iii.	$[ML^2T^{-2}]$
D.	P (linear momentum)	iv.	$[ML^2A^{-1}T^{-3}]$

Choose the correct answer from the options given below:

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

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

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

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

$E = \frac{hc}{\lambda}$

$h = \frac{E\lambda}{c}$

$h \rightarrow \frac{M^1L^2T^{-2}L^1}{L^1T^{-1}}$

$h \rightarrow M^1L^2T^{-1}$

$W = q\Delta V$

$\Delta V \rightarrow \frac{W}{q} \rightarrow \frac{M^1L^2T^{-2}}{A^1T^1}$ $M^1L^2T^{-3}A^1$

Question No. 2

Velocity v is given by $v = at^2 + bt + c$, where t is time. What are the dimensions of a, b and c, respectively?

(1) $[LT^{-3}]$, $[LT^{-2}]$ and $[LT^{-1}]$

(2) $[LT^{-1}]$, $[LT^{-2}]$ and $[LT^{-3}]$

(3) $[LT^{-2}]$, $[LT^{-3}]$ and $[LT^{-1}]$

(4) $[LT^{-1}]$, $[LT^{-3}]$ and $[LT^{-2}]$

$L^1T^{-1} \rightarrow a \times T^2$

$a \rightarrow L^1T^{-3}$

$L^1T^{-1} \rightarrow b \times T^1$

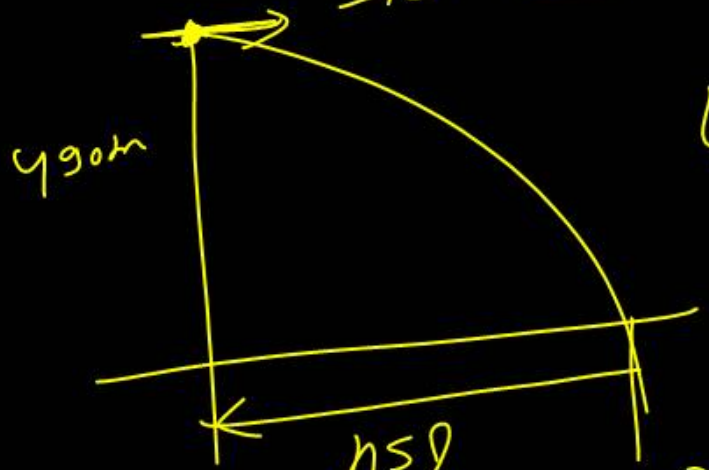
$b \rightarrow L^1T^{-2}$

Question No. 3

An aeroplane flying horizontally with a speed of 360 km h^{-1} releases a bomb at a height of 490 m from the ground. If g = 9.8 ms^{-2}, it will strike the ground at(ground to ground distance)

(1) 10 km (2) 100 km

(3) 1 km (4) 16 km



$360 \times \frac{5}{18} \Rightarrow 100 m/s$

X	Y
$u_x = 100$	$u_y = 0$
$a_x = 0$	$a_y = -9.8$
$x = ?$	$y = -490$

$R = 100 \times 10$

$R = 1000 m$

$-490 = 0 - \frac{1}{2} \times 9.8 \times t^2$

$100 = t^2$

$t = 10$

Question No. 4

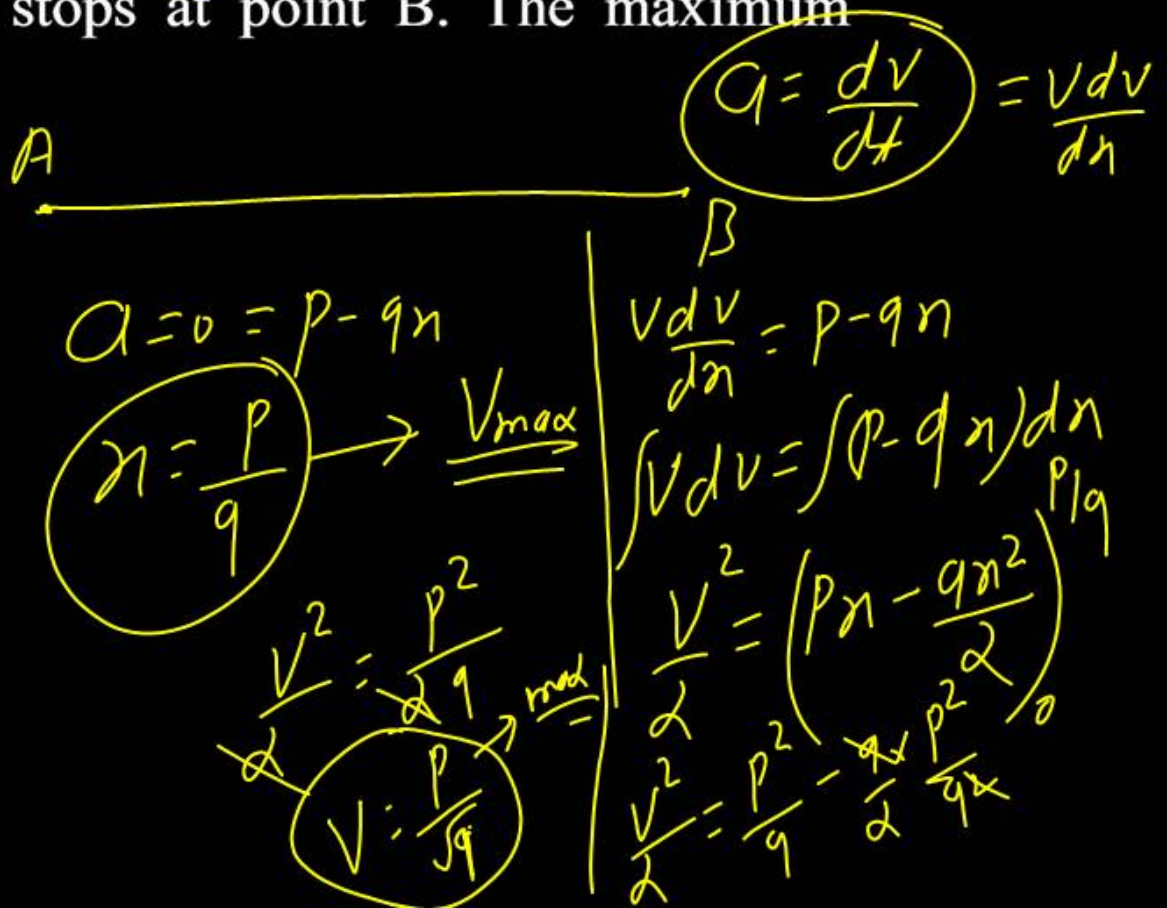
A particle starts from point A moves along a straight line path with an acceleration given by $a = p - qx$ where p, q are constants and x is distance from point A. The particle stops at point B. The maximum velocity of the particle is

(1) $\frac{p}{q}$

(2) $\frac{p}{\sqrt{q}}$

(3) $\frac{q}{p}$

(4) $\frac{\sqrt{q}}{p}$

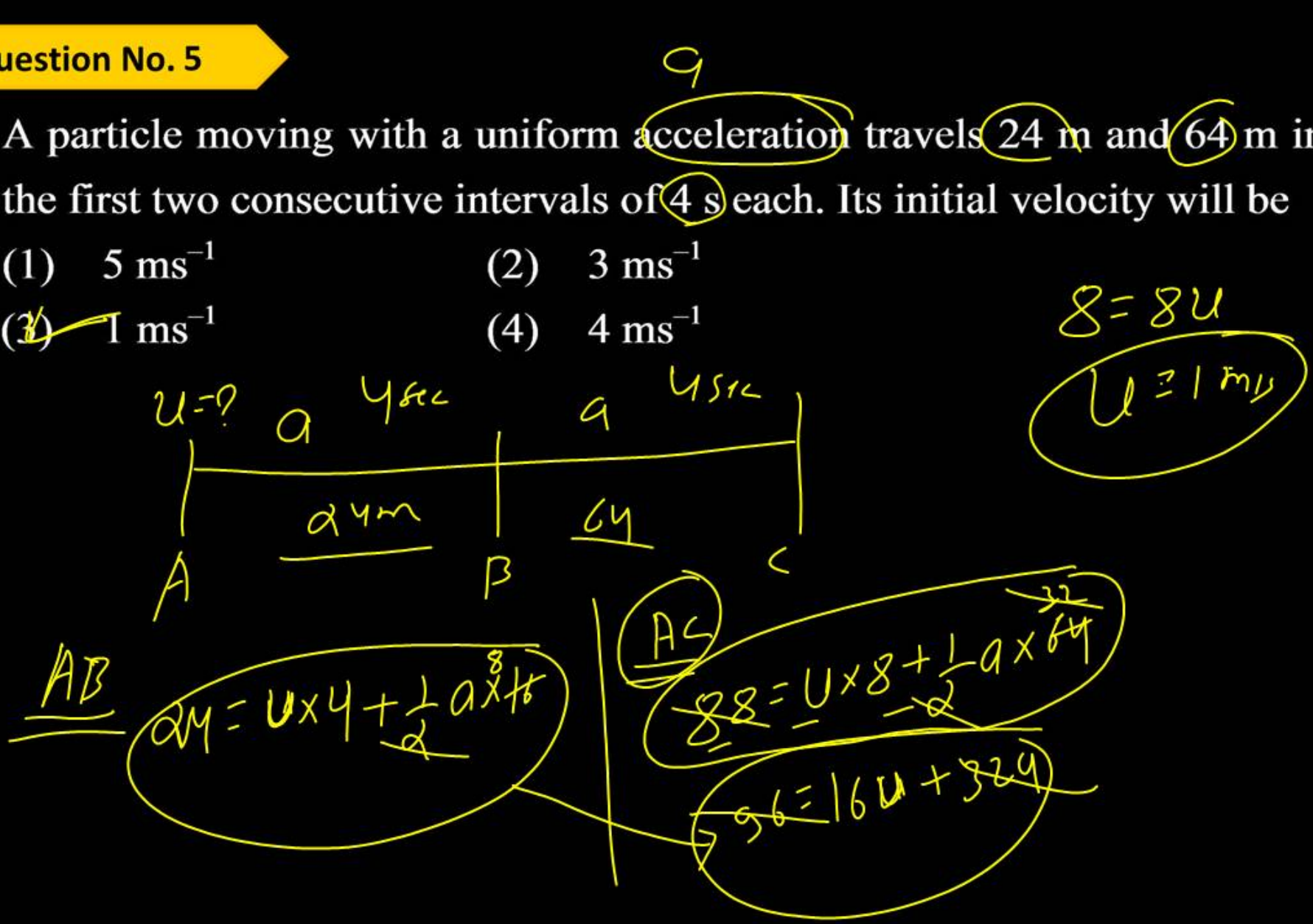


Question No. 5

A particle moving with a uniform acceleration travels 24 m and 64 m in the first two consecutive intervals of 4 s each. Its initial velocity will be

(1) $5\ ms^{-1}$ (2) $3\ ms^{-1}$

(3) $1\ ms^{-1}$ (4) $4\ ms^{-1}$



Question No. 6

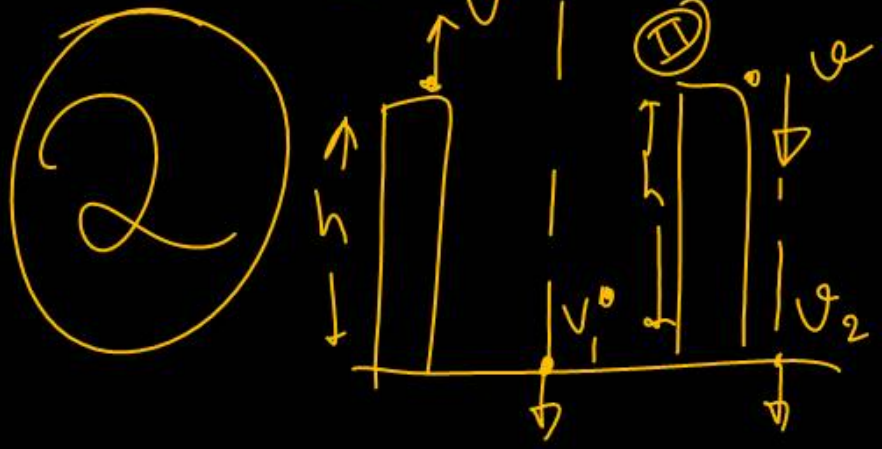
Two stones are thrown from the top of a tower, one vertically upward and other vertically downward with same speed. Ratio of velocity when they hit the ground is

(1) 1 : 2

(2) 1 : 1

(3) 2 : 1

(4) 1 : 9



(I) $mgh + \frac{1}{2}mv^2 = 0 + \frac{1}{2}mv_1^2$

(II) $mgh + \frac{1}{2}mv^2 = 0 + \frac{1}{2}mv_2^2$

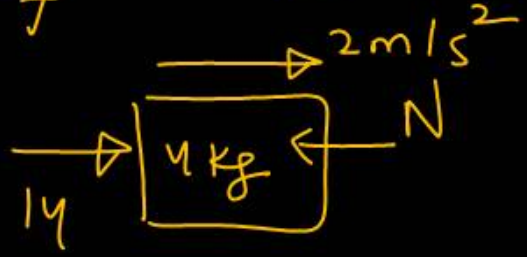
$V_1 = V_2$

Question No. 7

Three blocks of mass 4 kg, 2kg and 1kg respectively are in contact on a frictionless table as shown in the figure. If a force of 14 N is applied on the 4 kg block, the contact force between the 4 kg and the 2 kg block will be

(1) 2 N
(2) 6 N
(3) 8 N
(4) 14 N

$a = \frac{14}{7} = 2\ m/s^2$



$14 - N = 4 \times 2$

$14 - N = 8$

$N = 6$

Question No. 8

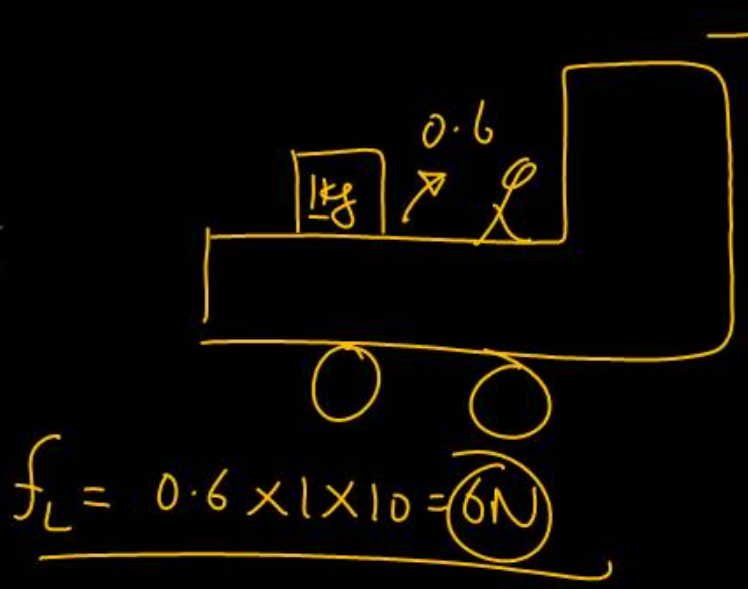
A block of mass 1 kg lies on a horizontal surface in a truck. The coefficient of static friction between the block and the surface is 0.6. If the acceleration of the truck is 5 ms^{-2}. The friction force acting on the block is

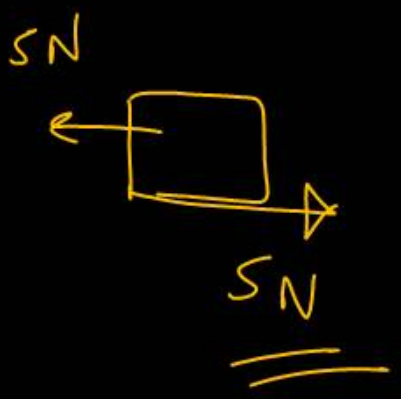
(1) 10 N

(2) 5 N

(3) 2.5 N

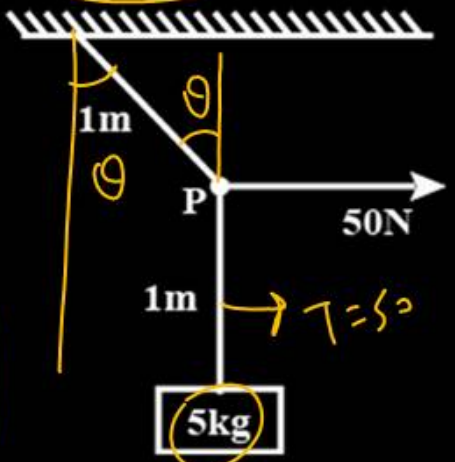
(4) 20 N





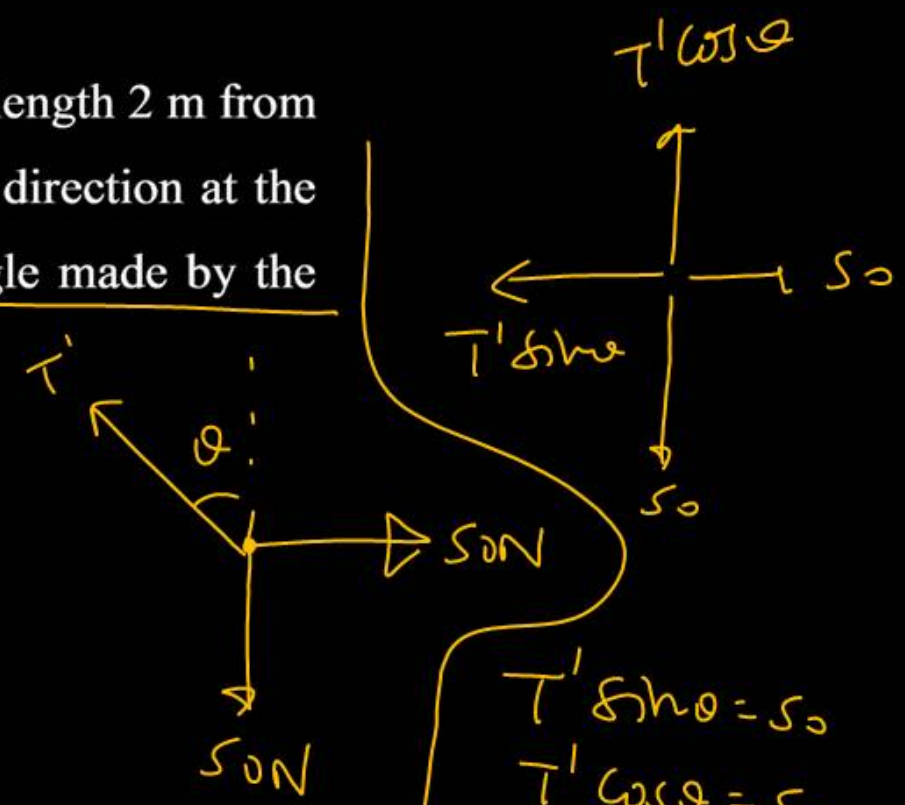
Question No. 9

A block of mass 5 kg is suspended by a massless rope of length 2 m from the ceiling. A force of 50 N is applied in the horizontal direction at the midpoint P of the rope, as shown in the figure. The angle made by the rope with the vertical in equilibrium is (Take $g = 10\ ms^{-2}$)



(1) 30° (2) 40°

(3) 60° (4) 45°



$T'\sin\theta = 50$

$T'\cos\theta = 50$

$\tan\theta = 1$

$\theta = 45^\circ$

Question No. 10

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 resistances S_1 and S_2 connected in parallel. The conditiaion 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) $\frac{P}{Q}=\frac{R(S_1+S_2)}{S_1S_2}$

$\frac{P}{Q}=\frac{R}{S}$ $\quad S=\frac{S_1S_2}{S_1+S_2}$

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

Question No. 11

Insemiconductors at a room temperature-

(1) the valence band is partially empty and the conduction band is partially filled

(2) The valence band is completely filled and the conduction band is partially filled

(3) the valence band is completely filled

(4) the conduction band is completely empty

0 K . Valance .
25°C Conduction

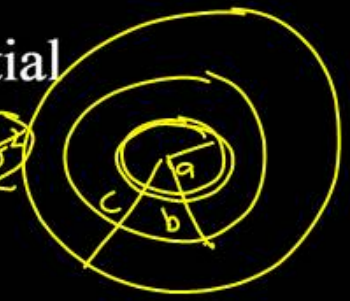
Question No. 12

Three concentric spherical metallic shells A, B and C of radii a,b and c (c > b > a) have charge densities σ, $-\sigma$ and σ, respectively. The potential of shell B is

$\sigma = \frac{q}{A}$

$q = \sigma 4\pi r^2$

$V = \frac{kq}{r} = \frac{q}{4\pi\epsilon_0 r}$



(1) $(a+b+c)\frac{\sigma}{\varepsilon_0}$

(2) $\left(\frac{a^2}{b}-b+c\right)\frac{\sigma}{\varepsilon_0}$

(3) $\left(\frac{a^2}{b}-\frac{b^2}{c}+c\right)\frac{\sigma}{\varepsilon_0}$

(4) $\frac{\sigma c}{\varepsilon_0}$

$a \rightarrow \frac{\sigma 4\pi a^2}{4\pi\epsilon_0 b}$

$b \rightarrow \frac{-\sigma b}{\epsilon_0}$

$c \rightarrow +\frac{\sigma c}{\epsilon_0}$

$V = \frac{\sigma a^2}{b} - \frac{\sigma b}{\epsilon_0} + \frac{\sigma c}{\epsilon_0}$

$V = \left(\frac{a^2}{b} - b + c\right)\frac{\sigma}{\epsilon_0}$

Question No. 13

If velocity [V], time [T] and force [F] are chosen as the base quantities, the dimensions of the mass will be:

(1) $[FT^{-1}V^{-1}]$ (2) $[FTV^{-1}]$

(3) $[FT^{2}V]$ (4) $[FVT^{-1}]$

$F = ma$

$M = \frac{F}{a} \rightarrow \frac{V}{t}$

$M = \frac{F \times t}{V} \rightarrow M \rightarrow F^{1}T^{1}V^{-1}$

Question No. 14

The position of a particles as a funciton of time t, is given by $x(t) = at + bt^2 - ct^3$ where, a,b and c are constants. When the particle attains zero acceleration, then its velocity will be:

(1) $a + \frac{b^2}{4c}$

(2) $a + \frac{b^2}{3c}$

(3) $a + \frac{b^2}{c}$

(4) $a + \frac{b^2}{2c}$

$a = 0$

$v = ?$

$x = at + bt^2 - ct^3$

$v = \frac{dx}{dt} = a + 2bt - 3ct^2$

$a = 0 + 2b - 6ct$

$2b = 6ct$

$t = \frac{2b}{6c} = \frac{b}{3c}$

$v = a + 2b \times \frac{b}{3c} - 3c \times \frac{b^2}{9c^2}$

$v = a + \frac{2b^2}{3c} - \frac{b^2}{3c}$

$v = a + \frac{b^2}{3c}$

Question No. 15

If R and H represent horizontal range and maximum height of the projectile, then the angle of projection with the horizontal is

(1) $\tan^{-1}\left(\frac{H}{R}\right)$ (2) $\tan^{-1}\left(\frac{2H}{R}\right)$

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

$R = \frac{u^2 \times 2\sin\theta\cos\theta}{g}$

$H = \frac{u^2\sin^2\theta}{2g}$

$\frac{R}{H} = \frac{4}{\tan\theta}$

$\tan\theta = \frac{4H}{R}$

$\theta = \tan^{-1}\left(\frac{4H}{R}\right)$

Question No. 16

A particle is projected with a velocity v, so that its horizontal range twice the greatest height attained. The horizontal range is

(1) $\frac{4v^2}{5g}$

(2) $\frac{v^2}{g}$

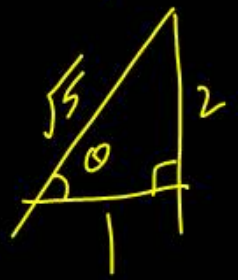
(3) $\frac{v^2}{2g}$

(4) $\frac{2v^2}{3g}$

$R = 2H$

$\frac{u^2 \times 2\sin\theta\cos\theta \times u}{g} = 2 \times \frac{u^2\sin^2\theta}{2g}$

$\tan\theta = 2$



$R = \frac{v^2 \times 2 \times 2 \times 1}{\sqrt{5} \times \sqrt{5} \times g}$

$R = \frac{4v^2}{5g}$

Question No. 17

The coordinates of a moving particle at any time t are given by $x = \alpha t^3$ and $y = \beta t^3$. The speed of the particle at time t is given by

(1) $3t\sqrt{\alpha^2+\beta^2}$

(2) $3t^2\sqrt{\alpha^2+\beta^2}$

(3) $t^2\sqrt{\alpha^2+\beta^2}$

(4) $\sqrt{\alpha^2+\beta^2}$

$V_x = 3\alpha t^2$

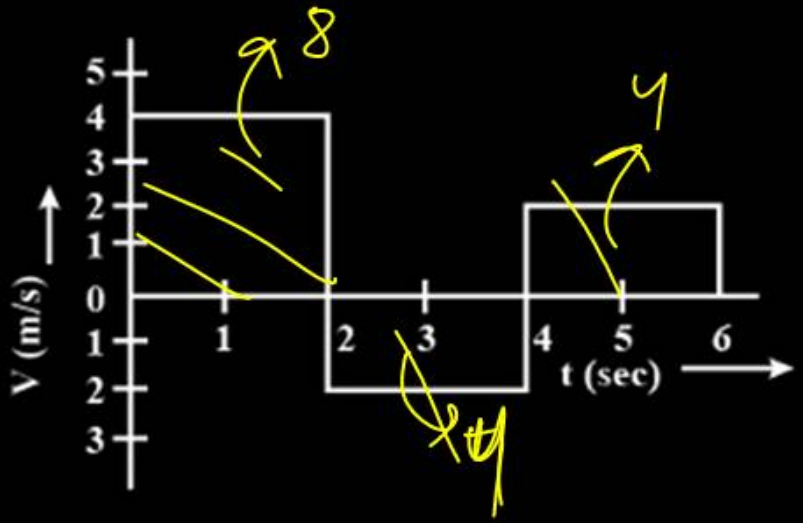
$V_y = 3\beta t^2$

$V = \sqrt{V_x^2 + V_y^2}$

$V = 3t^2\sqrt{\alpha^2+\beta^2}$

Question No. 18

The velocity-time graph of a body moving in straight line is shown in the figure. The displacement and distance travelled by the body in 6 s are respectively.



(1) 8 m, 16 m

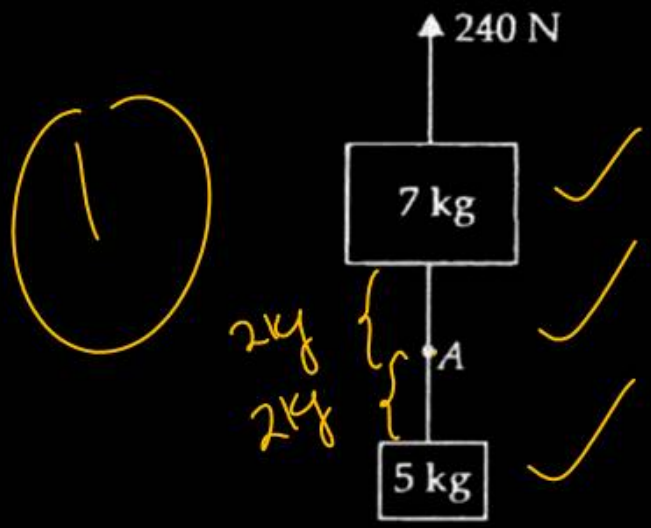
(2) 16 m, 32 m

(3) 16 m, 16 m

(4) 8 m, 8 m

Question No. 19

Two blocks of masses 7 kg and 5 kg are connected by a rope of mass 4 kg. The system is pulled up with a force of 240 N as shown in figure. The tension in the rope at its midpoint A is

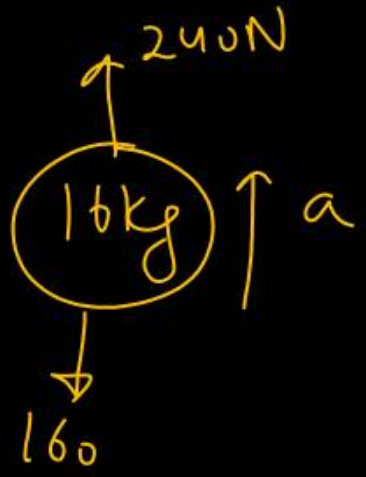


(1) 105 N

(2) 270 N

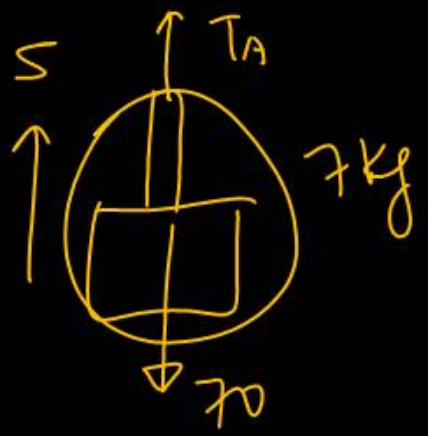
(3) 240 N

(4) 50 N



$$a = \frac{240 - 160}{16}$$

$$a = 5\,m/s^2$$



$$T_A - 70 = 5 \times 7$$

$$T_A = 105\,N$$

Question No. 20

A block of mass M is held against a rough veritcal wall by pressing it with a finger. If the coefficient of friction between the block and the wall is μ and the acceleration due to gravity is g, what is the miniumum force required to be applied by the finger to hold the block against the wall?

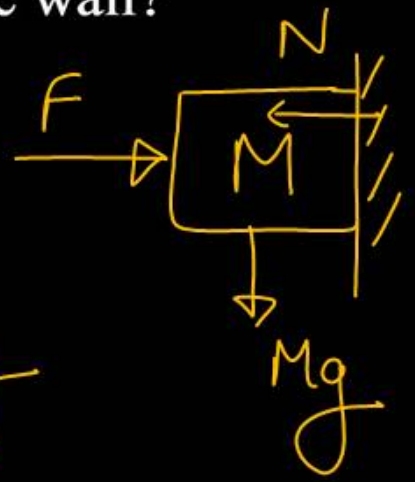
(1) μMg

(2) Mg

(3) $\frac{Mg}{\mu}$

(4) $2\mu Mg$

3



$N = F$

$f_L \geq mg$

$\mu N \geq Mg$

$\mu F \geq Mg$

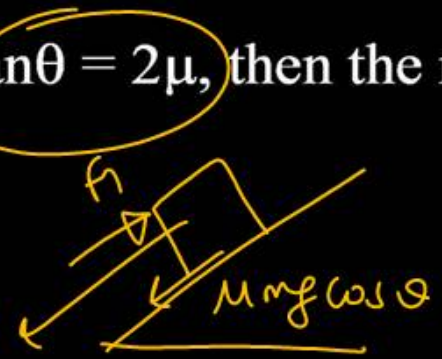
$F \geq mg/\mu$

Question No. 21

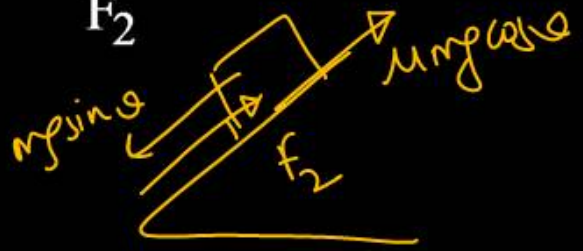
The minimum force required to start pushing a body up a rough (frictional coefficient μ) inclined plane is F_1 while the minimum force needed to prevent it from sliding down is F_2. If the inclined plane makes and angle θ with the horizontal such that $\tan\theta = 2\mu$, then the ratio $\frac{F_1}{F_2}$ is

(1) 4 (2) 1

(3) 2 (4) 3



$F_1 = mg\sin\theta + \mu mg\cos\theta$



$F_2 = mg\sin\theta - \mu mg\cos\theta$

$$\frac{F_1}{F_2} = \frac{\sin\theta + \mu\cos\theta}{\sin\theta - \mu\cos\theta}$$

$$= \frac{\tan\theta + \mu}{\tan\theta - \mu} = \frac{2\mu + \mu}{2\mu - \mu} = \frac{3}{1}$$

Question No. 22

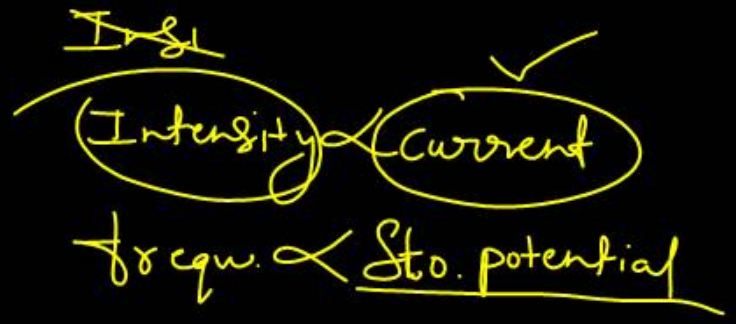
If intensity of incident light is increased in PEE then which of the following is true-

(1) Maximum KE of ejected elctron will increase

(2) Work function will remain unchanged

(3) Stopping potential will discrease

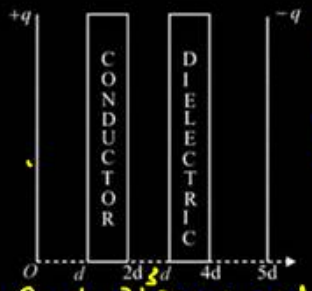
(4) Maximum KE of ejected electron will decrease



$V_S \propto KE$

Question No. 23

The distance between plates of a parallel plate capacitor is 5d. The positively charged plates is at x=0 and 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



$V = d$

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

$E_{med} = \frac{E}{k}$

$0 - d \longrightarrow E = \text{Constant}$

$d - 2d \longrightarrow k = \infty \quad E = 0 \quad V = \text{Const.}$

$2d - 3d \longrightarrow E = \text{Const.} \quad V = -$

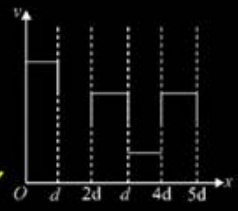
$3d - 4d \Rightarrow E_m = \frac{E}{k} \quad E\downarrow$

$4d - 5d$

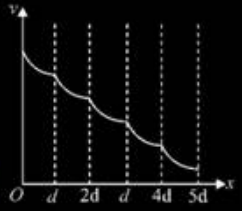
(1)

(2)

(3)



(4)



Question No. 24

A physical quantity X is related to four measurable quantities a, b, c and d as given, $X = a^2b^3c^{5/2}d^{-2}$. The percentage error in the measurement of a, b, c and d are 1%, 2%, 2% and 4% respectively. What is the percentage error in quanitity X?

(1) 15 %

(2) 17 %

(3) 21 %

(4) 23 %

$\frac{\Delta x}{x} \times 100 = 2\times1 + 6 + \frac{5}{2}\times4 + 8$

$= 21\%$

Question No. 25

A projectile is given an initial velocity of $(\hat{i}+2\hat{j})$ m/s, where $\hat{i}$ is along the ground and $\hat{j}$ is along the vertical. If g = 10 m/s^2, the equation of its trajectory is:

(1) $y = x - 5x^2$

(2) $y = 2x - 5x^2$

(3) $4y = 2x - 5x^2$

(4) $4y = 2x - 25x^2$

$u_x = 1$

$u_y = 2$

X	Y
$a_x = 0$	$a_y = -10$
$x = 1 \times t$	$y = 2 \times t - \frac{1}{2} \times 10 \times t^2$
$x = t$	

$y = 2x - 5x^2$

Question No. 26

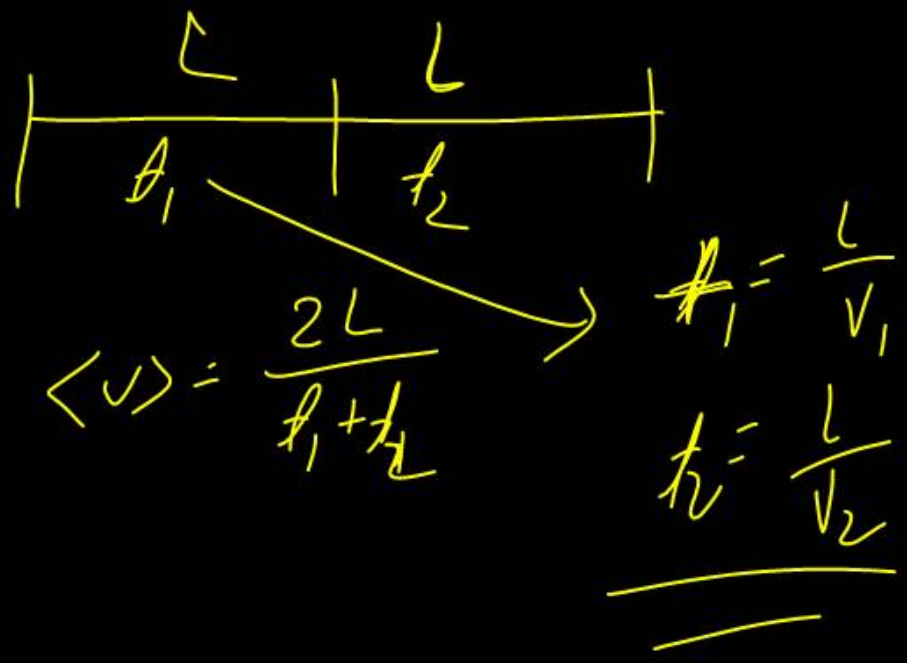
A vehicle travels half the distance L with speed v_1 and the other half with speed v_2, then its average speed is

(1) $\frac{v_1 + v_2}{2}$

(2) $\frac{2v_1 + v_2}{v_1 + v_2}$

(3) $\frac{2v_1 v_2}{v_1 + v_2}$

(4) $\frac{L(v_1 + v_2)}{v_1 v_2}$



Question No. 27

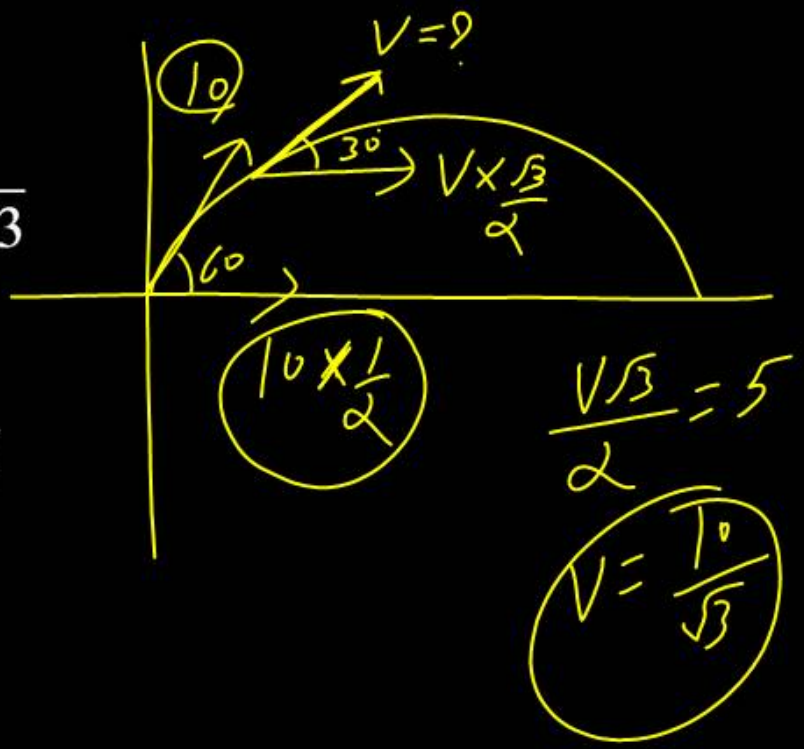
A projectile is projected at 10 ms^{-1} by making an angle of 60° to the horizontal. After some time, its velocity makes an angle of 30° to the horizontal. Its speed at this instant is

(1) $\frac{10}{\sqrt{3}}$

(2) $10\sqrt{3}$

(3) $\frac{5}{\sqrt{3}}$

(4) $5\sqrt{3}$



Question No. 28

A body is projected from the ground with a velocity $\vec{v} = \left(3\hat{i} + 10\hat{j}\right) ms^{-1}$.

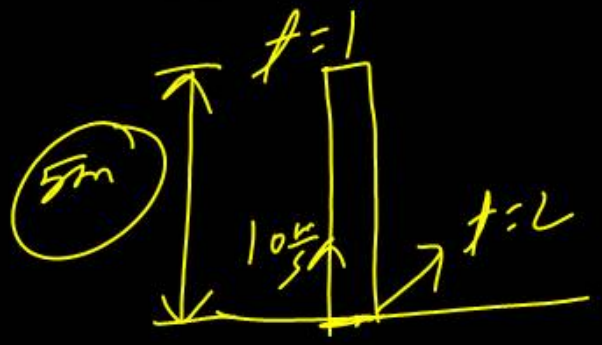
The maximum height attained and the range of the body respectively are (given $g = 10\ ms^{-2}$)

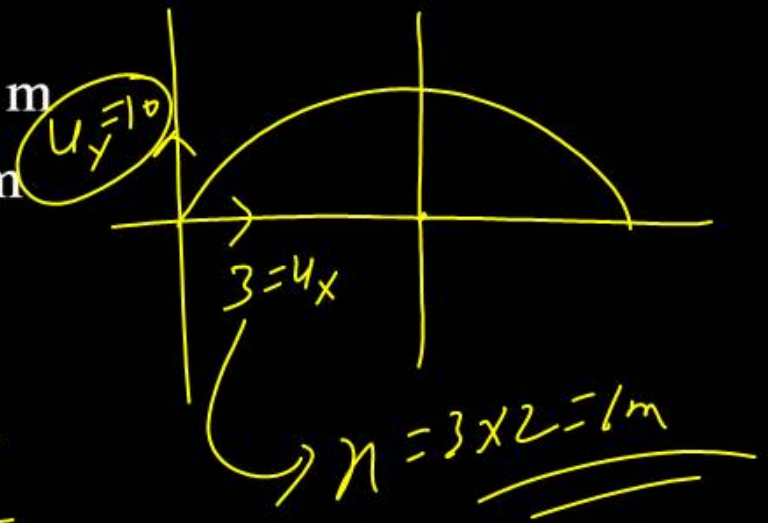
(1) 5 m and 6 m

(2) 3 m and 10 m

(3) 6 m and 5 m

(4) 3 m and 5 m





Question No. 29

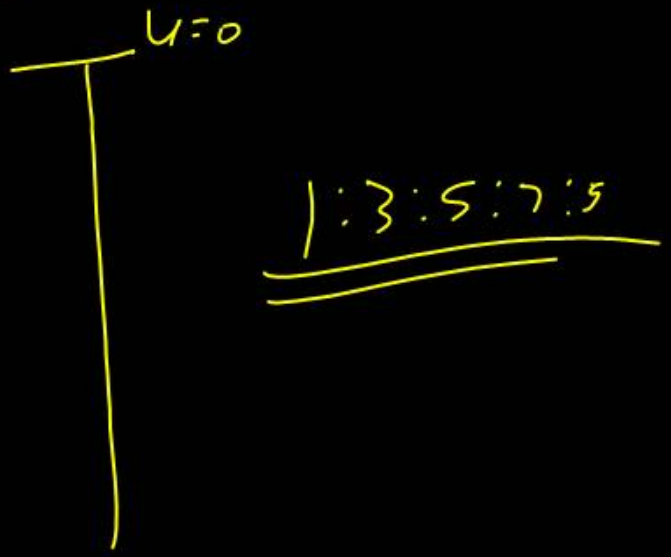
The ratios of the distance traversed, in successive intervals of time by a body, falling from rest, are

(1) 1 : 3 : 5 : 7 : 9 : ...

(2) 2 : 4 : 6 : 8 : 10 : ...

(3) 1 : 4 : 7 : 10 : 13 : ...

(4) None of these

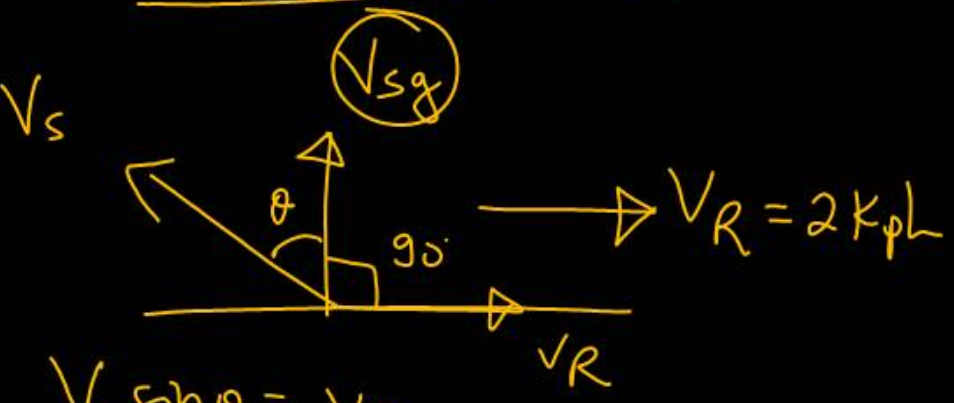


Question No. 30

The stream of a river is flowing with a speed of 2 km/h. A swimmer can swim at a speed of 4 km/h. What should be the direction of the swimmer with respect to the flow of the river to cross the river straight?

(1) 60°
(2) 120°
(3) 90°
(4) 150°

(2)



$V_s \sin\theta = V_R$

$4 \sin\theta = 2$

$\sin\theta = 1/2$

$\theta = 30°$

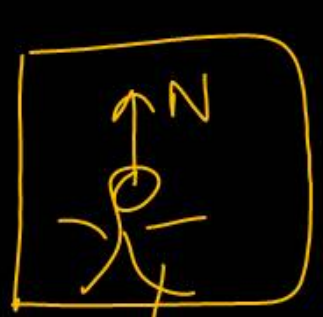
Question No. 31

A person of mass 50 kg stands on a weighing scale on a lift. If the lift is ascending upwards with a uniform acceleration of 9 ms^{-2}, what would be the reading of the weighing scale?

(Take g = 10 ms^{-2})

(1) 50 kg (2) 60 kg

(3) 95 kg (4) 100 kg



9 m/s²

N - mg = m x g

N = 19 m

N = 19 x 50

N = 950 Newton

(3)

Question No. 32

A 2 kg block is placed over a 4 kg block and both are placed on a smooth horizontal surface. The coefficient of friction between the blocks is 0.20. Find the acceleration of the two blocks if a horizontal force of 12 N is applied to the upper block.

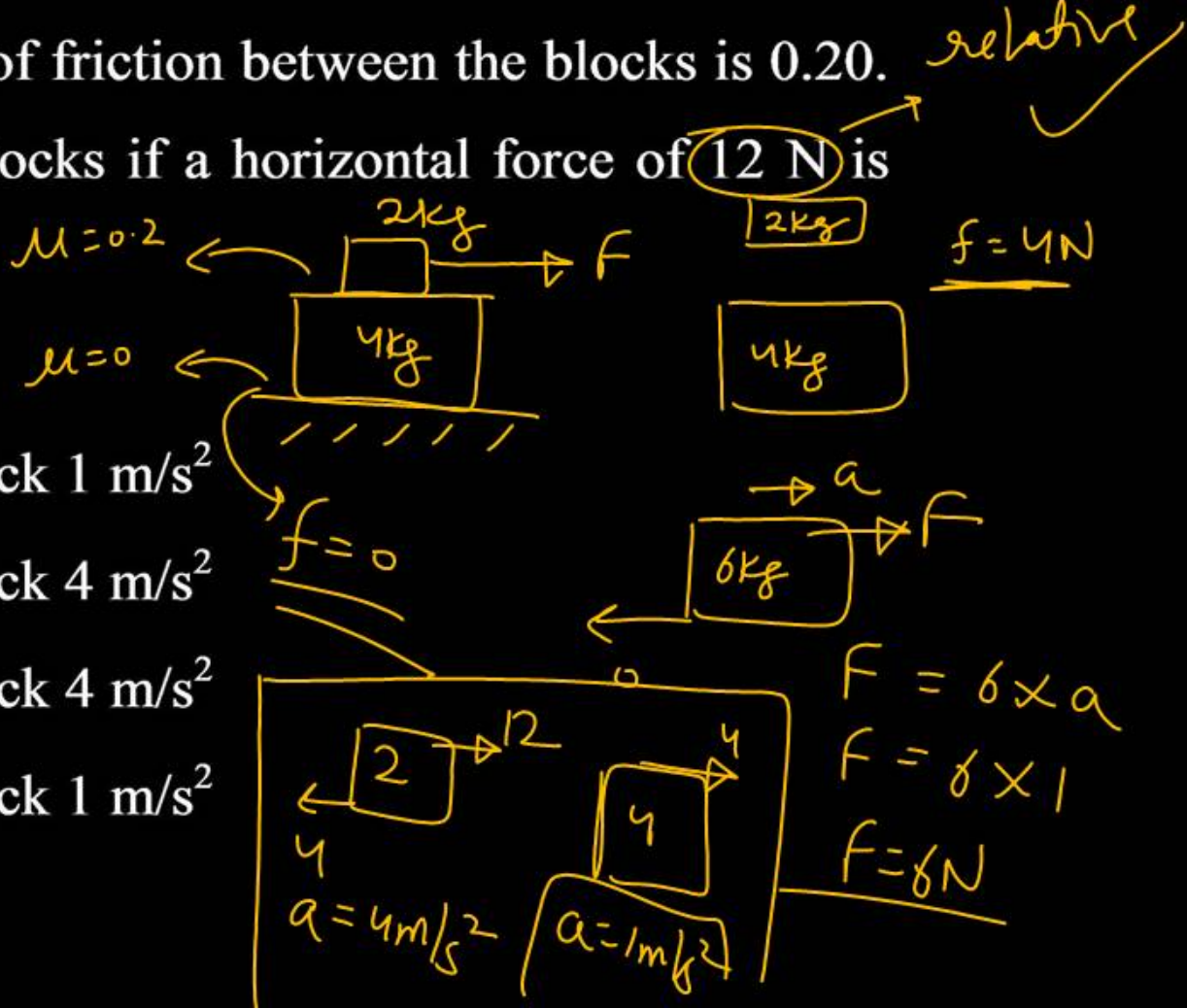
($g = 10\ m/s^2$)

(1) upper block 4 m/s^2, lower block 1 m/s^2

(2) upper block 1 m/s^2, lower block 4 m/s^2

(3) upper block 4 m/s^2, lower block 4 m/s^2

(4) upper block 1 m/s^2, lower block 1 m/s^2



Question No. 33

The power obtained in a reactor using U^{235} disintegration is 1000 kW.

The mass decay of U^{235} per hour is

(1) 20 μg (2) 40 μg

(3) 1 μg (4) 10 μg

$P = 1000\,kW \qquad C = 3\times10^8$

$1\,hr = 3600$

$E = mc^2$

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

$E = Pt$

$Pt = mc^2$

$1000\times1000\times3600 = m\times9\times10^{16}$

$\frac{4\times10^8}{10^{16}} = m$

$m = 40\times10^{-9}$

$m = \frac{40\times10^{7}}{10^{16}} = 40\times10^{-6}\times10^{-3}$

$= 40\,\mu gm$

Question No. 34

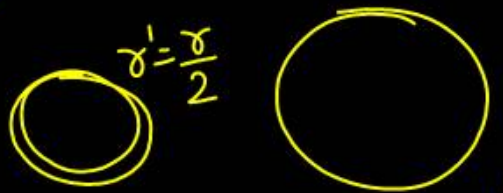
The magnetic field of given length of wire for single turn coil at its centre is 'B' then its value for two turns coil for the same wire is–

(1) $\frac{B}{4}$

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

(3) 4B

(4) 2B



$L = 2\pi r$

1 turn

$B = \frac{\mu_0}{4\pi} \frac{2\pi I}{R}$

$\frac{L}{2} = 2\pi r$ N → turn.

$B' = \frac{\mu_0}{4\pi} \frac{2\pi (N) I}{R'}$

$B' = N^2 B$.

$B' = 2^2 B$

$B' = 4B$

Question No. 35

Which of the following is the most precise instrument for measuring length?

(1) Metre rod of least count 0.1 cm

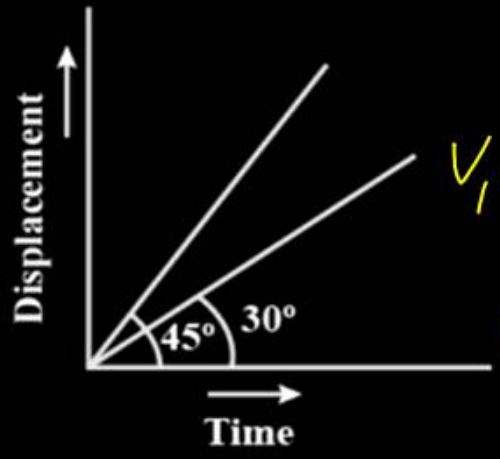
(2) Vernier callipers of least count 0.01 cm

(3) Screw gauge of least count 0.001 cm

(4) None of these

Question No. 36

The displacement–time graph of two moving particles make angles of 30° and 45° with the X–axis. The ratio of their velocities is



$V_1 = \tan 30° = 1/\sqrt{3}$

$V_2 = \tan 45° = 1$

$\frac{V_1}{V_2} = \frac{1}{\sqrt{3}}$

(1) $1:\sqrt{3}$

(2) 1 : 2

(3) 1 : 1

(4) $\sqrt{3}:2$

Question No. 37

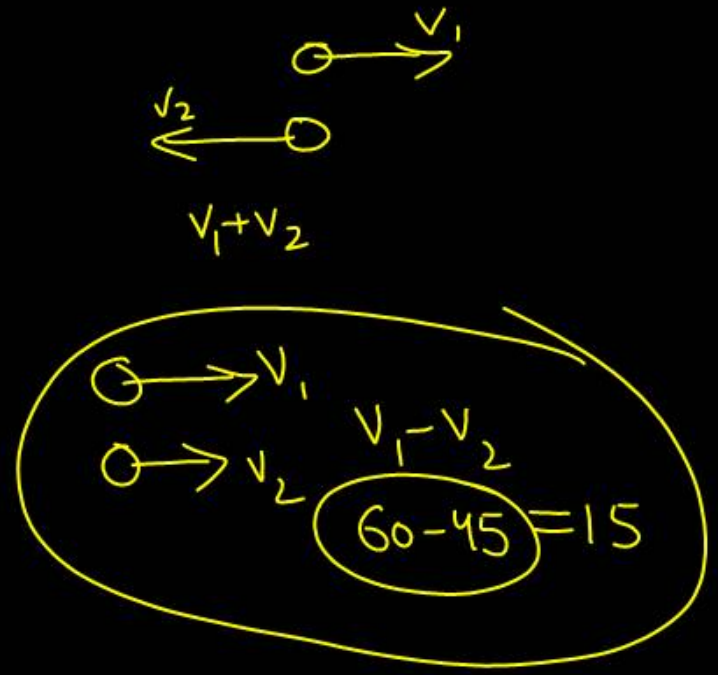
Two cars A and B are running at velocities of 60 km h^{-1} and 45 km h^{-1}. What is the relative velocity of car A with respect to car B, if both are moving eastward?

(1) 15 km h^{-1}

(2) 45 km h^{-1}

(3) 60 km h^{-1}

(4) 105 km h^{-1}



Question No. 38

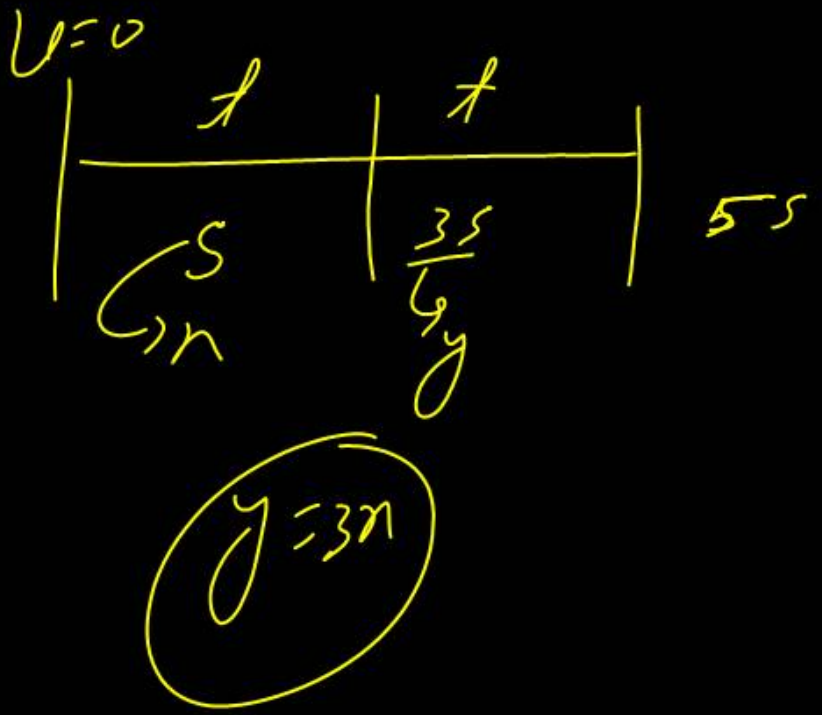
A car accelerate from rest at a constant rate for first 10 s and covers a distance x. It covers a distance y in next 10 s at the same acceleration. Then, which of the following is true?

(1) $x = 3y$

(2) $y = 3x$

(3) $x = y$

(4) $y = 2x$



Question No. 39

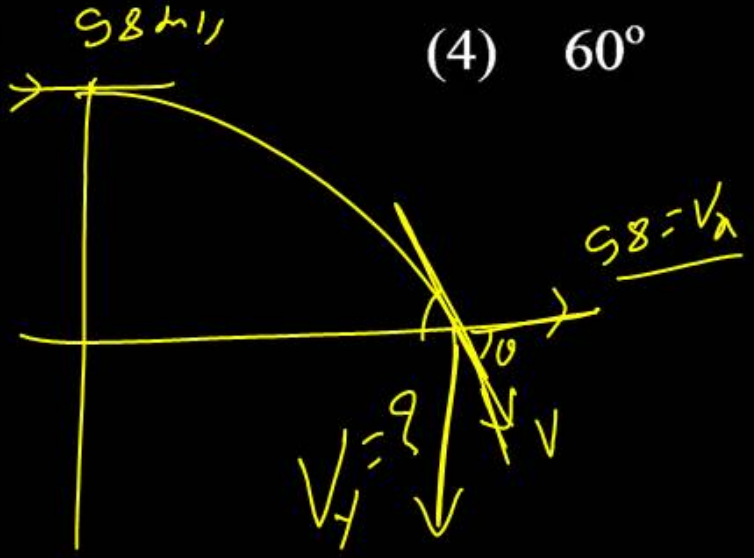
An aeroplane flying horizontally at a speed of 98 ms^{-1} releases an object which reaches the ground in 10 s. The angle made by the velocity of the object with the horizontal at the time of hitting the ground is

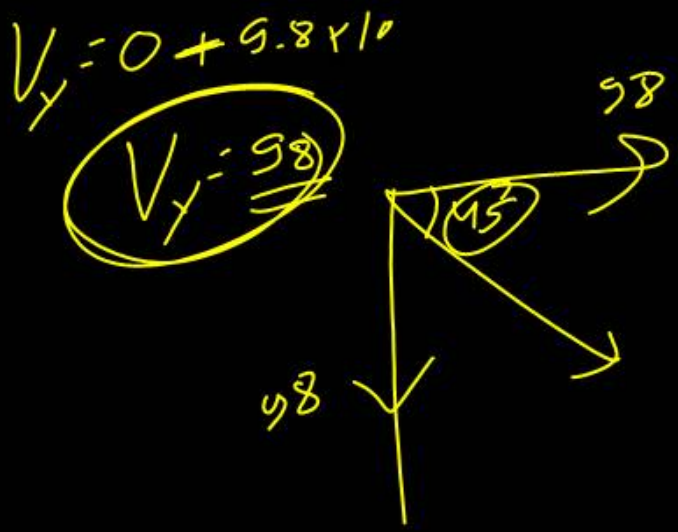
(1) 30°

(2) 45°

(3) 75°

(4) 60°





Question No. 40

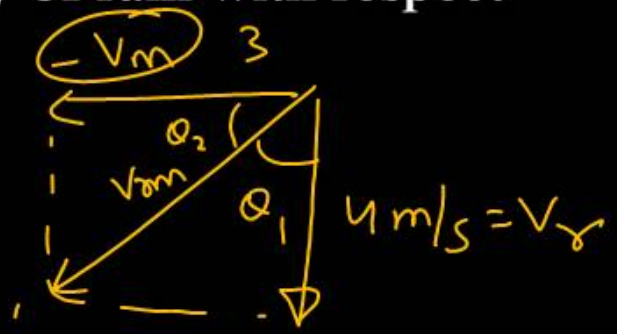
Rain is falling vertically downward with velocity 4 m/s. A man is moving horizontally with velocity 3 m/s, the velocity of rain with respect to man is

(1) 5 m/s at an angle $\tan^{-1}(4/3)$ with horizontal

(2) 5 m/s at an angle $\tan^{-1}(3/4)$ with vertical

(3) 5 m/s at an angle $\tan^{-1}(4/3)$ with vertical

(4) Both (1) and (2)



$\tan\theta_1 = \frac{3}{4}$ V

$\tan\theta_2 = \frac{4}{3}$ 4

$V_{rm} = \sqrt{3^2+4^2}$

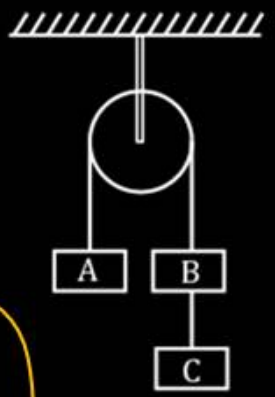
$= 5$ m/s

(1)

Question No. 41

Three equal weights A, B and C of mass 2 kg each are hanging on a string over a fixed frictionless pulley as shown in the figure. The tension in the string

Connecting weight B and C is



(1) zero

(2) 9.8 N

(3) 13.3 N

(4) 19.6 N

$a_{sy} = \frac{4g - 2g}{6} = \frac{2g}{6} = \frac{g}{3} = \frac{10}{3}\ m/s^2$

$10/3\ m/s^2$

$20 - T = 2 \times 10/3$

$20 - T = 20/3$

$\frac{60 - 20}{3} = T$

$T = \frac{40}{3} = 13.33$

Question No. 42

A body takes time t to reach the bottom of an inclined plane of angle θ with the horizontal. If the plane is made rough, time taken now is 2t. The coefficient of friction of the rough surface is

(1) $\frac{3}{4}\tan\theta$

(2) $\frac{2}{3}\tan\theta$

(3) $\frac{1}{4}\tan\theta$

(4) $\frac{1}{2}\tan\theta$

$$X = 0 + \frac{1}{2} g \sin\theta \, t^2$$

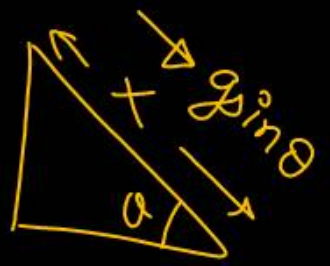
$$X = 0 + \frac{1}{2} g(\sin\theta - \mu\cos\theta)\, 4t^2$$

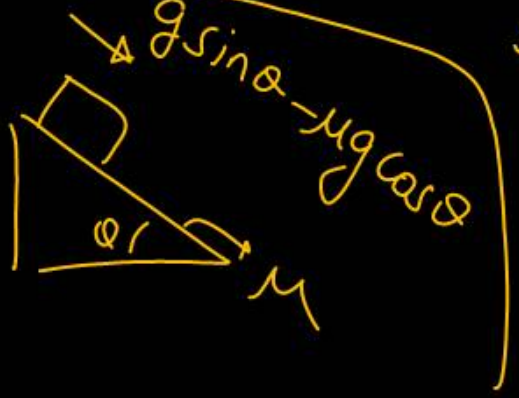
$$\frac{1}{2} g \sin\theta \, t^2 = \frac{1}{2} g \, 4t^2 (\sin\theta - \mu\cos\theta)$$

$$\sin\theta = 4\sin\theta - 4\mu\cos\theta$$

$$4\mu\cos\theta = 3\sin\theta$$

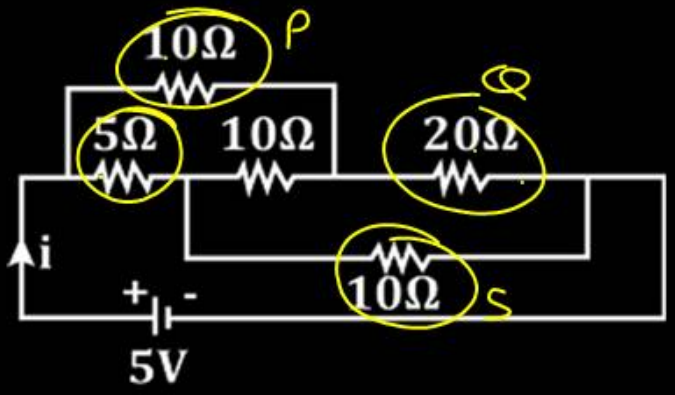
$$\mu = \frac{3\tan\theta}{4}$$

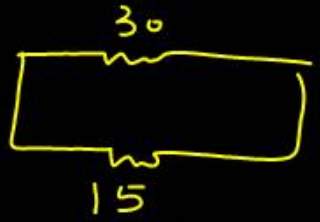




Question No. 43

The current I drawn from the 5 volt source will be





$$R = \frac{15 \times 30}{15 + 30} = \frac{15 \times 30^{10}}{45_{3}} = 10$$

$$I = \frac{V}{R} = \frac{5}{10} = 0.5\,A$$

(1) 0.67 A

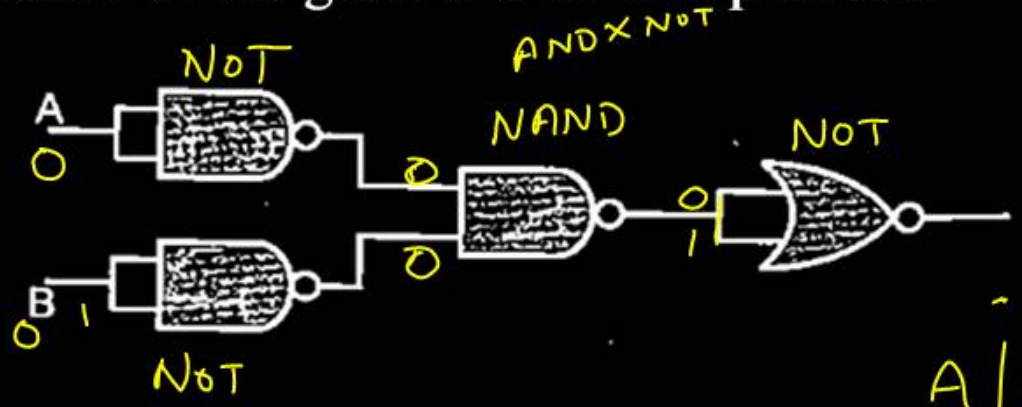
(2) 0.17 A

(3) 0.33 A

(4) 0.5 A

Question No. 44

The combination of the gates shown will produce



2 NOT + NAND = OR + NOT = NOR

(1) OR gate

(2) AND gate

(3) NOR gate

(4) NAND gate

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

NOR

2 NOT + NAND = OR

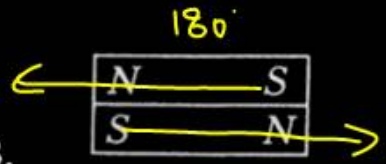
2 NOT + NOR → AND

Question No. 45

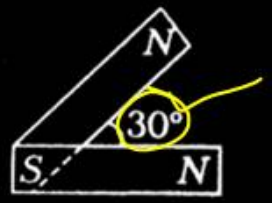
Following figures show the arrangement of bar mantes in different configurations. Each magnet has magnetic dipole moment $\vec{m}$. Which configuration has highest not magnetic dipole moment?

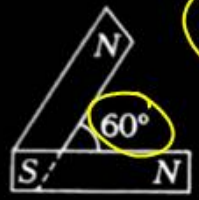
Vector

A. 

B. 

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

C. 

D. 

$M \propto \frac{1}{\theta}$

$M \propto \frac{1}{\theta}$

$\theta \downarrow \; M \uparrow$

(1) A

(2) ~~B~~ $30 < 60 < 90$

(3) ~~C~~

(4) D $180 < 90 < 60 < 30$

Question No. 46

The values of Van't Hoff factors for KCl, NaCl and K_2SO_4, respectively, are _____ .

(1) 2, 2 and 2

(2) 2, 2 and 3

(3) 1, 1 and 2

(4) 1, 1 and 1

$KCl \rightarrow K^+ + Cl^-$ $n=2$ $i=2$

$NaCl \rightarrow Na^+ + Cl^-$ $n=2$ $i=2$

$K_2SO_4 \rightarrow 2K^+ + SO_4^{-2}$ $n=3$ $i=3$

Question No. 47

4 L of 0.02 M aqueous solution of NaCl was diluted by adding one litre of water. The molarity of the resultant solution is _____ .

(1) 0.004

(2) 0.008

(3) 0.012

(4) 0.016

$M_1V_1 = M_2V_2 \quad [V_2 = V_1 + V_w]$

$0.02 \times 4 = M_2[4+1]$

$= 5$

$M_2 = \frac{0.08}{5} = 0.016$

Question No. 48

Density of a 2.05 M solution of acetic acid in water is 1.02 g/mL. The molality of th solution is

CH_3COOH, $M_w = 60$

(1) 1.14 mol kg^{-1}

(2) 3.28 mol kg^{-1}

(3) 2.28 mol kg^{-1}

(4) 0.44 mol kg^{-1}

$$m = \frac{1000 \times M}{1000 \times d - M M_B}$$

M_B → Mw of solute

$$= \frac{1000 \times 2.05}{1000 \times 1.02 - 2.05 \times 60}$$

$$= \frac{2050}{1020 - 1230}$$

$$= \frac{2050}{897}$$

$$= 2.28$$

1020
123
897

Question No. 49

1.00 g of a non-electrolyte solute (molar mass 250 g mol^{-1}) was dissolved in 51.2 g of benzene. If the freezing point depression constant, K_f of benzene is 5.12 K kg mol^{-1}, the freezing point of benzene will be lowered by :

(1) 0.5 K

(2) 0.2 K

(3) 0.4 K

(4) 0.3 K

i = no mole / i = 1

$\Delta T_f = K_f \times m$

$= 5.12 \times \frac{1 \times 1000}{250 \times 51.2} = \frac{10}{25} = 0.4$

Question No. 50

Which one of the following equations is correct for the reaction :

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$?

$$-\frac{dN_2}{dt} = -\frac{1}{3}\frac{dH_2}{dt} = +\frac{1}{2}\frac{dNH_3}{dt}$$

(1) $\frac{1}{3}\frac{d[NH_3]}{dt} = \frac{1}{2}\frac{d[H_2]}{dt}$

(2) $\frac{1}{2}\frac{d[NH_3]}{dt} = \frac{1}{-3}\frac{d[H_2]}{dt}$

(3) $\frac{1}{2}\frac{d[NH_3]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt}$

(4) $\frac{1}{3}\frac{d[NH_3]}{dt} = \frac{1}{-2}\frac{d[H_2]}{dt}$

Question No. 51

When initial concentration of the reactant is doubled, the half-life period of a zero order reaction

(1) is tripled

(2) is doubled

(3) is halved

(4) remains unchanged

$t_{1/2} \propto a_0$ zero order

Double Double

Question No. 52

Which of the following statements are incorrect?

A. Specific conductance increases with dilution.

B. Equivalent conductance decreases with dilution.

C. The conductance of all electrolytes increases with temperature

(1) A and B

(2) A and C

(3) B and C

(4) A, B and C

Question No. 53

The standard reduction potentials of $Zn^{2+}|Zn$ and $Cu^{2+}|Cu$ are -0.76 V and $+0.34$ V respectively. What is the cell emf (in V) of the following cell?

$$Zn|Zn^{2+}\ (0.05\ M)||Cu^{2+}\ (0.005\ M)|Cu$$

(1) 1.1295

(2) 1.0705

(3) 1.1

(4) 1.041

$E^{\circ}_{cell} = (0.34) - (-0.76)$

$= 1.10$ V

$E_{cell} = 1.10 - \frac{0.059}{2} \log \frac{0.050}{0.005}$

$= 1.10 - 0.02955$

$= 1.07$

Question No. 54

Consider the following half-reactions :

$Cu^{+}_{aq} + e^{-} \longrightarrow Cu_{(s)},\ E^{o} = 0.52V$

$Cu^{2+}_{aq} + e^{-} \longrightarrow Cu^{+}_{aq}\ E^{o} = 0.16V$

$E^{o}_{cell} = 0.52 - 0.16$

$= 0.36\ V$

$n = 1$

$E^{o}_{cell} = \frac{0.059}{n} \log K_c$

The value of euilibrium constant at 298 K for this reaction is?

K_c

$2Cu^{+}_{aq} \longrightarrow Cu_{s} + Cu^{2+}_{aq}$

$\frac{0.36 \times 1}{0.059} = \log K_c$

(1) 6×10^{-5}

(2) 6×10^{6}

(3) 1.2×10^{6}

(4) 6×10^{-6}

$6.10 = \log K_c$

$\times 10^{6}$

Question No. 55

The last element of the p-block in 6^{th} period is represented by the outermost electronic configuration.

(1) $7s^2\ 7p^6$

(2) $5f^{14}\ 6d^{10}\ 7s^2\ 7p^0$

(3) $4f^{14}\ 5d^{10}\ 6s^2\ 6p^6$

(4) $4f^{14}\ 5d^{10}\ 6s^2\ 6p^4$

3

$ns^2\ np^{1-6}$

$ns^2\ np^6$

$6s^2 \quad 6p^6$

$6s^2 \rightarrow 4f^{14}\ 5d^{10} \rightarrow 6p^6$

He –

Ne –

Ar –

Kr –

Xe –

Rn

Question No. 56

Which of the following are non-polar?

Dipole moment = 0

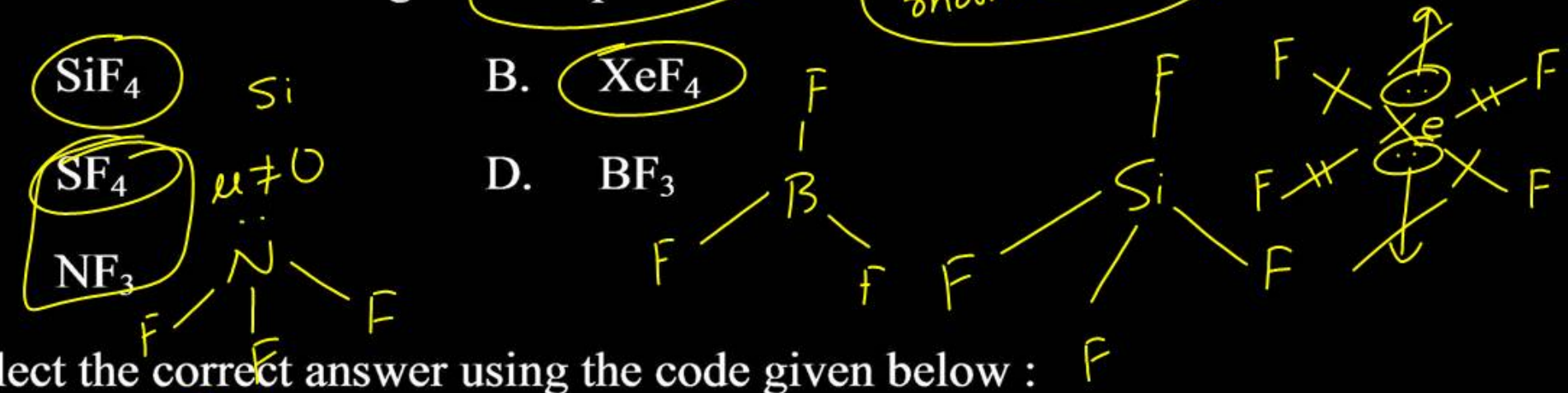
A. SiF_4

B. XeF_4

C. SF_4

D. BF_3

E. NF_3



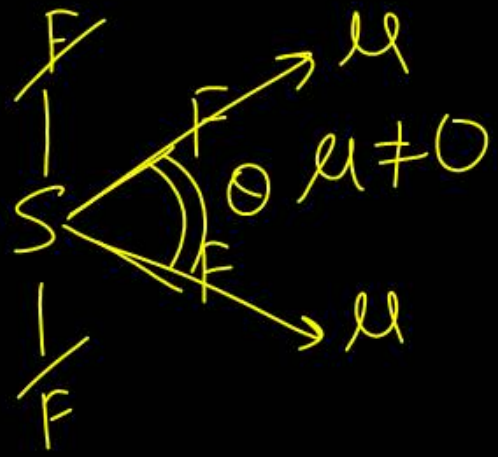
Select the correct answer using the code given below :

(1) A, B and D

(2) C, D and E

(3) B, C and D

(4) A, C and D



Question No. 57

Which set represents the correct set of statements?

(i) In Br_3O_8 the oxidation states of Bromine are +6, +4, +6.

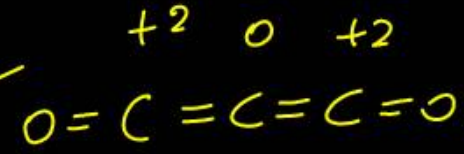
(ii) In C_3O_2 the oxidation states of carbon are +2, 0, +2.

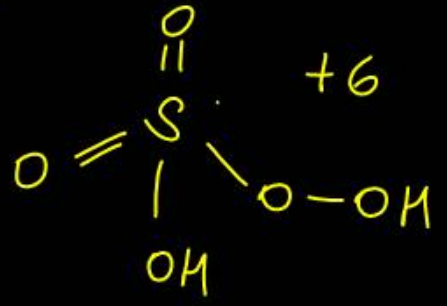
(iii) Oxidation number of sulphur in H_2SO_5 is +8.

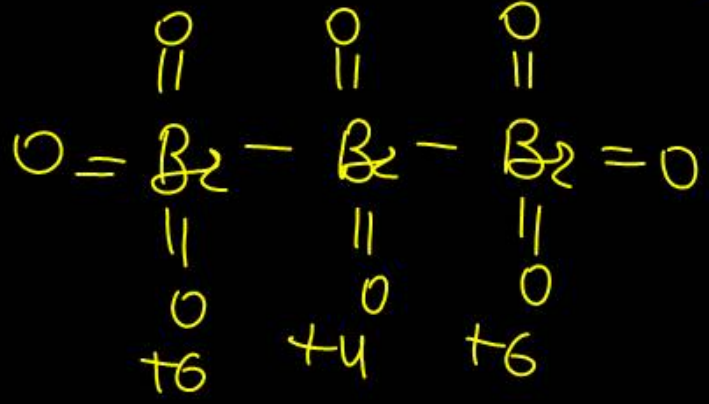
(iv) Oxidation number of chromium in CrO_5 is +6.

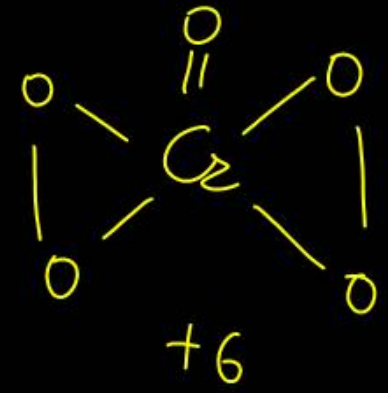
(1) (i), (ii) (2) (i), (iii)

(3) (i), (ii), (iii) (4) (i), (ii), (iv)









Question No. 58

The value of Henry's constant K_H is _____ .

(1) Greater for gases with solubility.

(2) Greater for gases with lower solubility.

(3) Constant for all gases.

(4) Not related to the solubility of gases.

$$\text{solubility gas} \propto \frac{1}{K_H} \propto \frac{1}{\text{Temp}} \propto P$$

$K_H \uparrow$ solubility $\downarrow$

Question No. 59

A 5.25% solution of a substance is isotonic with a 1.5% solution of urea in the same solvent. If the densities of both the solutions are assumed to be equal to 1.0 g cm^{-3}, molar mass of the substanc will be :

(1) 115.0 g mol^{-1} (2) 105.0 g mol^{-1}

(3) 210.0 g mol^{-1} (4) 752.0 g mol^{-1}

$$\frac{\%\ w/v}{M_B} = \frac{\%\ w/v}{M_B}$$

$$\frac{5.25}{M_B} = \frac{1.5\%}{60\ 40}$$

$$M_B = 40 \times 5.25$$

$$= 210$$

Question No. 60

Which of the following liquid pairs shows a positive deviation from Raoult's law?

C_6H_6 + Alcohol

(1) Water – hydrocloric acid

(2) Benzene - methanol

(3) Water – nitric acid

(4) Acetone – chloroform

Question No. 61

A first-order reaction is 50% completed in 30 minutes at 27°C. Its rate constant is :

(1) $2.31 \times 10^{-2}\ \text{min}^{-1}$ (2) $3.21 \times 10^{-3}\ \text{min}^{-1}$

(3) $4.75 \times 10^{-2}\ \text{min}^{-1}$ (4) $1.33 \times 10^{-3}\ \text{min}^{-1}$

$t_{1/2} = 30\ \text{min}$

$t_{1/2} = \frac{0.693}{k}$

$k = \frac{0.693}{t_{1/2}}$

$= \frac{0.693}{30}$

$= 0.0231$

$= 2.31 \times 10^{-2}$

Question No. 62

For a reaction A + B → C + D if the concentration of A is doubled without altering the concentration of B, the rate gets doubled. If the concentration ofB is increased by nine times without altering the concentration of A, the rate gets tripled. The order of the reaction is :

(1) 2

(2) 1

(3) 3/2

(4) 4/3

Rate = $k[A]^1[B]^{1/2}$

Order = $1 + 1/2$

$= 3/2$

Rate $\propto$ (Conc)$^{\text{order}}$

$2^1 \propto (2)^n$ $\quad n = 1$

$3 = (9)^n$

$3^1 = (3)^{2n}$

$2n = 1$

$n = 1/2$

Question No. 63

Match the following :

	List – I		List – II
A.	Zero order reaction	(i)	$mole^{-1}\ L\ sec^{-1}$
B.	First order reaction	(ii)	$mol^{-2}\ L^{2}\ sec^{-1}$
C.	Second order reaction	(iii)	$mol\ L^{-1}\ sec^{-1}$
D.	Third order reaction	(iv)	sec^{-1}

(1) A – i, B – ii, C – iii, D – iv

(2) A – iii, B – iv, C – i, D – ii

(3) A – ii, B – iii, C – iv, D – i

(4) A – iii, B – iv, C – ii, D – i

Zero → $mol\ lit^{-1}\ sec^{-1}$

1st → sec^{-1}

2nd → $mol^{-1}\ lit\ sec^{-1}$

3rd → $mol^{-2}\ lit^{2}\ sec^{-1}$

A – III

B – IV

C = I

D = II

Question No. 64

Specific conductance of 0.01 N solution of an electronlyte is 0.00419 mho cm^{-1}. The equivalent conductance of this solution will be:

(1) 4.19 mho cm^2 (2) 419 mho cm^2

(3) 0.0419 mho cm^2 (4) 0.209 mho cm^2

$$\Lambda_{eq} = \frac{k \times 1000}{N} \; S cm^2 eq^{-1}$$

$$= \frac{0.00419 \times 1000}{0.01} = 419$$

Question No. 65

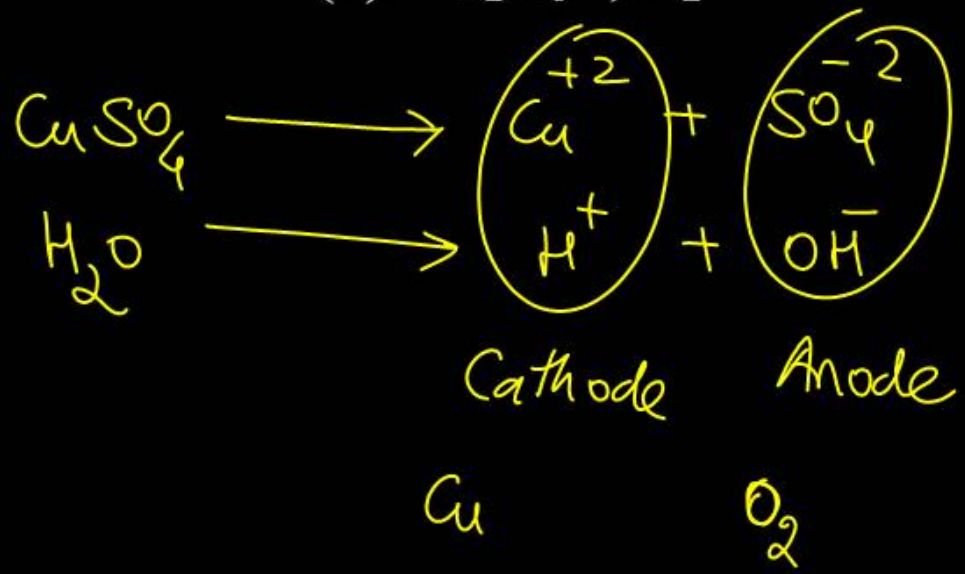
A dilute aqueous solution of $CuSO_4$ is electrolyzed using platinum electrodes. The product at the anode and cathode are :

(1) O_2, Cu

(2) $S_2O_8^{2-}$, Cu

(3) O_2, H_2

(4) $S_2O_8^{2-}$, H_2



Question No. 66

When during electrolysis of a solution of $AgNO_3$, 9650 coulombs of charge pass through the electroplating bath, the mass of silver deposited on the cathode will be

(1) 1.08 g

(2) 10.8 g

(3) 21.6 g

(4) 108 g

$$m = \frac{GAM \times q}{n\text{-factor} \times 96500}$$

$$= \frac{108 \times 9650}{1 \times 96500} = 10.8 \text{ gm}$$

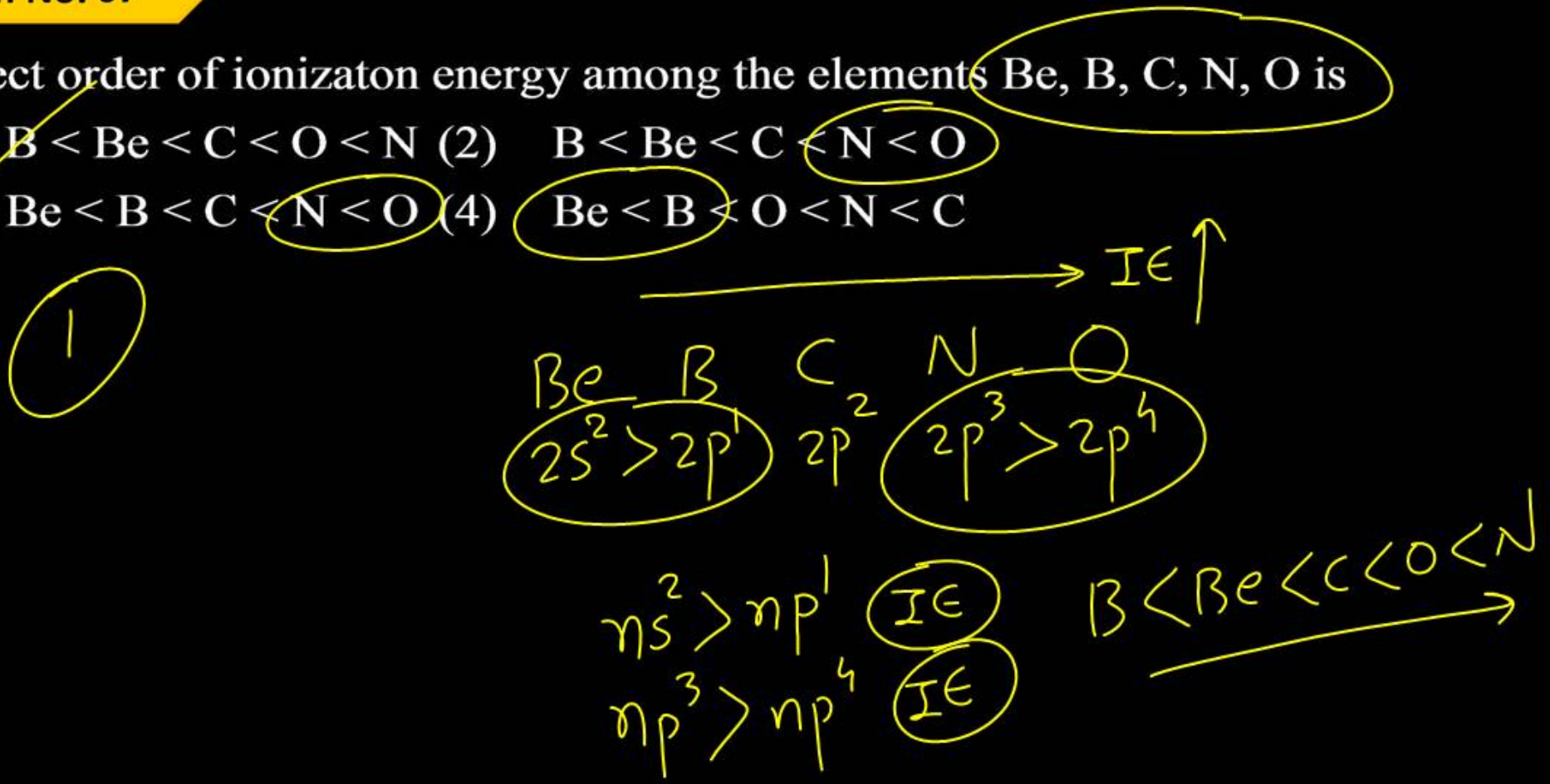
$$10$$

Question No. 67

Correct order of ionizaton energy among the elements Be, B, C, N, O is

(1) $B < Be < C < O < N$ (2) $B < Be < C < N < O$

(3) $Be < B < C < N < O$ (4) $Be < B < O < N < C$



Question No. 68

Increasing order of bond stregnth of O_2, O_2^-, O_2^{2-} and O_2^+ is

(2) (1.5) (1) (2.5)

(1) $O_2^+ < O_2 < O_2^- < O_2^{2-}$

(2) $O_2^- < O_2^+ < O_2 < O_2^{2-}$

(3) $O_2^- < O_2^{2-} < O_2^+ < O_2$

(4) $O_2^{2-} < O_2^- < O_2 < O_2^+$

1 1.5 2 2.5

Bond strength $\propto$ B.O.

4

Question No. 69

We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentrations 0.1 M, 0.01M and 0.001M, respectively. The value of van't Hoff factor for these solutions will be in the order ____ .

(1) $i_A < i_B < i_C$

(2) $i_A > i_B > i_C$

(3) $i_A = i_B = i_C$

(4) $i_A < i_B > i_C$

A B C

$NaCl \longrightarrow Na^+ + Cl^-$

$n = 2$

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

$A = B = C$

Question No. 70

Two liquids having vapour pressrues P_1^0 and P_2^0 in pure state in the ratio of 2 : 1 are mixed in a molar ratio of 1 : 2. The ratio of their mole in the vapour state can be:

(1) 2 : 1

(2) 1 : 2

(3) 1 : 1

(4) 2 : 3

$P_A^\circ = 2 \quad P_B^\circ = 1$

$n_A = 1 \quad n_B = 2$

$$\frac{Y_A}{Y_B} = \frac{P_A^\circ n_A}{P_B^\circ n_B}$$

$$\frac{Y_A}{Y_B} = \frac{2 \times 1}{1 \times 2} = \frac{1}{1}$$

$Y_A = \frac{1}{2}$

$Y_B = \frac{1}{2}$

$\frac{Y_A}{Y_B} = \frac{1/2}{1/2} = 1:1$

Question No. 71

KBr is 80% dissociated in aquesou solution of 0.5 M concentration. (Given K_f for water = 1.86K kg mol^{-1}). The solution freezes at :

(1) 271.326 K (2) 272 K

(3) 270.5 K (4) 268.5 K

$\alpha = 0.8$ $KBr \rightarrow K^+ + Br^-$ $n=2$

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

$i = (1-0.8) + 2 \times 0.8 = 1.8$

$\Delta T_f = i K_f \times m$

$= 1.8 \times 1.86 \times 0.5$

$\Delta T_f = 1.674$

$f.p. = 0 - 1.674$

$= -1.674°C$

0.9

$1.8 \times 1.86 \times 1/2$

$= 1.674$

$0°C = 273K$

$-1.674 =$ 271.326

Question No. 72

In the first-order reaction, half of the reaction is completed in 100 seconds.The time for 99% reaction to occur will be :

(1) 664.64 s
(2) 646.6 s
(3) 660.9 s
(4) 654.5 s

$t_{1/2} = 100$ sec

$t_{99\%} = \frac{20}{3} t_{1/2}$

$= \frac{20}{3} \times 100$

$= 664.64$ sec

Question No. 73

For the non-stoichiometirc reaction : $2A + B \rightarrow C + D$, the following kinetic data were obtained in three separate experiments, all at 298 K.

Initial concentartion [A]	Initial concentration [B]	Initial rate of formation of C ($mol\,L^{-1}\,s^{-1}$)
0.1 M	0.1 M	1.2×10^{-3}
0.1 M	0.2 M	1.2×10^{-3}
0.2 M	0.1 M	2.4×10^{-3}

The rate law for the formation of C is

(1) $\frac{dC}{dt} = k[A]$

(2) $\frac{dC}{dt} = k[A][B]$

(3) $\frac{dC}{dt} = k[A]^2[B]$

(4) $\frac{dC}{dt} = k[A][B]^2$

Question No. 74

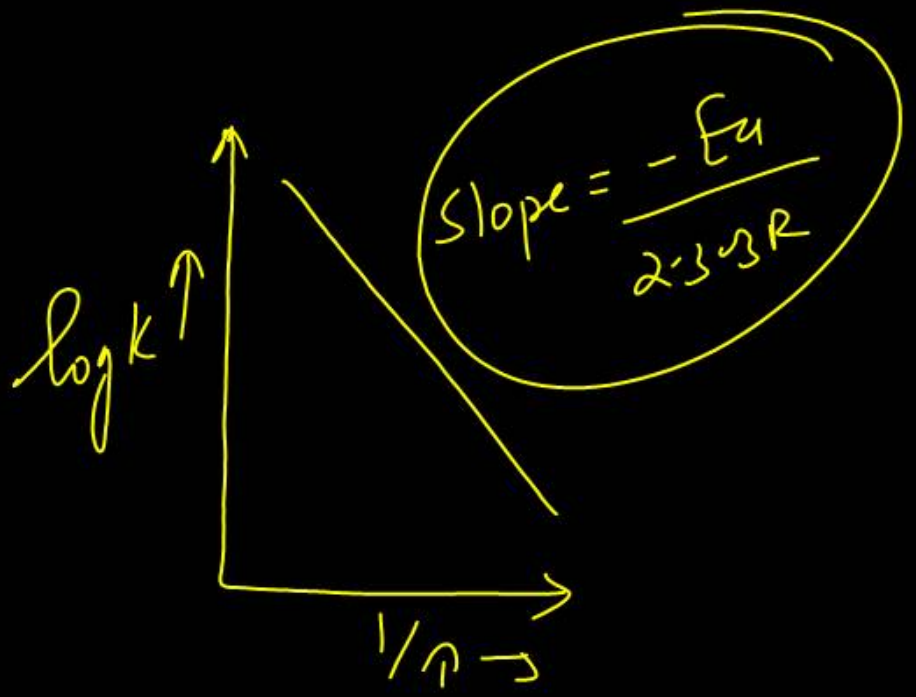
According to Arrhenius equation, the slope of $\log k$ Vs $\frac{1}{T}$ plot is.

(1) $\frac{-E_a}{2.303R}$

(2) $\frac{-E_a}{2.303}$

(3) $\frac{-E_a}{2.303RT}$

(4) $\frac{E_a}{2.303RT}$



Question No. 75

The limiting molar conductivities Λ° for NaCl, KBr and KCl are 126, 152 and 150 S cm^2 mol^{-1} respectively. The Λ° for NaBr is :

(1) 278 S cm^2 mol^{-1} (2) 178 S cm^2 mol^{-1}

(3) 128 S cm^2 mol^{-1} (4) 306 S cm^2 mol^{-1}

$NaBr + KCl \longrightarrow NaCl + KBr$

$\Lambda^\circ_{m\,NaBr} = \Lambda^\circ_{m\,NaCl} + \Lambda^\circ_{m\,KBr} - \Lambda^\circ_{m\,KCl}$

$= 126 + 152 - 150$

$= 128$

Question No. 76

The hydrogen electrode is dipped in a solution of

pH = 3.0 at 25°C. The potential of hydrogen electrode would be:

(1) – 0.177 V

(2) 0.177V

(3) 1.77 V

(4) 0.277 V

$H^+ + e^- \longrightarrow \frac{1}{2} H_2$

$[H^+] = 10^{-pH}$

$2H^+ + 2e^- \longrightarrow H_2$

$E_{cell} = 0 - \frac{0.059}{2} \log \frac{1}{[H^+]^2}$

$E_{cell} = -\frac{0.059}{2} \log \frac{1}{10^{-6}} \Rightarrow E_{cell} = -\frac{0.059}{2} \times 6 \log 10$

$= -0.177$

Question No. 77

The decomposition of a certain mass of $CaCO_3$ gave 11.2 dm^3 of CO_2 gas at STP. The mass of KOH required to completely neutralize the gas is :

(1) 56 g

(2) 28 g

(3) 42 g

(4) 20 g

$CaCO_{3(s)} \longrightarrow CaO_{(s)} + CO_{2(g)}$

$n = \frac{11.2}{22.4} = \frac{1}{2}$

$KOH + CO_2 \longrightarrow KHCO_3 + H_2O$

56 g — 1 — 1

28 g — ½ — ½

Question No. 78

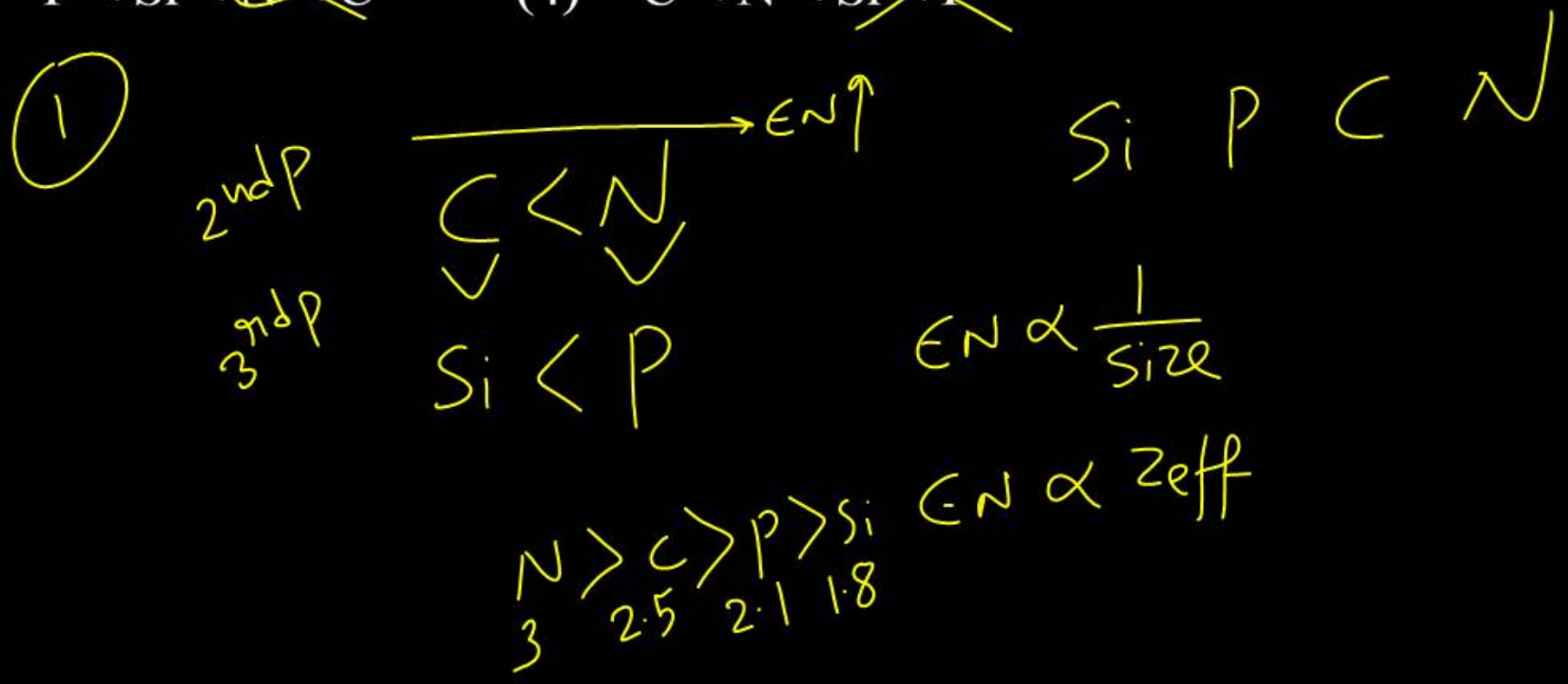
The electronegativtiy of the following elemetns increases in the order :

(1) Si < P < C < N

(2) N < Si < C < P

(3) P < Si < N < C

(4) C < N < Si < P



Question No. 79

Match the following :

	List – I (Compound)		List – II (Structure)
A.	ClF_3	(i)	Square planar
B.	PCl_5	(ii)	Tetrahedral
C.	IF_5	(iii)	Trigonal bipyramidal
D.	CCl_4	(iv)	Square pyramidal
E.	XeF_4	(v)	T-shaped

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

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

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

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

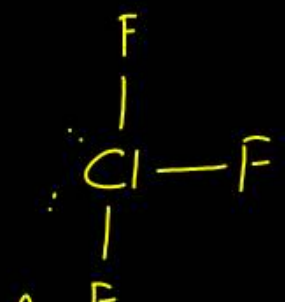
2

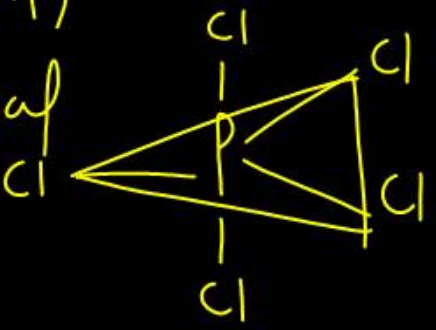
A – v
B – iii
C – iv
D – ii
E – (i)

ClF_3 sp^3d AB_3 Tshape

PCl_5 sp^3d AB_5 Trigonal bipyramidal

IF_5 sp^3d^2 AB_5 Sq. pyramidal





Question No. 80

On the basis of information given below mark the correct option.

Information :

A. In bromoethane and chloroethane mixture inter- molecular interactions of A-A and B-B type are nearly same as A-B type interactions.

B. In ethanol and acetone mixture A-A or B-B type intermolecular interactions are stronger than A-B type interactions.

C. In chloroform and acetone mixture A-A or B-B type intermolcular interactions are weaker than A-B type interactions.

(1) Solution (B) and (C) will follow Raoult's law.

(2) Solution (A) will follow Raoult's law.

(3) Solution (B) will show negative deviation from Raoult's law.

(4) Solution (C) will show positive deviation from Raoult's law.

Question No. 81

A 5.2 molal aqueous solution of methyl alcohol, CH_3OH, is supplied.

What is the mole fraction of methyl alcohol in the solution?

(1) 0.100 (2) 0.190

(3) 0.086 (4) 0.050

5.2 molal = 5.2 mol solute in 1 kg solvent

n_B (methyl) = 5.2 n_A (solvent) = $\frac{1000}{18}$ = 55.55

$$X_B = \frac{n_B}{n_A + n_B} = \frac{5.2}{5.2 + 55.5}$$

$$= 0.086$$

Question No. 82

Van't Hoff factor of aqueous solution of X, Y and Z are 2.8, 1.8 and 3.5 respectively, which of the following match is correct?

(1) Boilling point of solution $\rightarrow X < Y < Z$

(2) Freezing point of solution $\rightarrow Z < X < Y$

(3) Osmotic pressure $\rightarrow X = Y = Z$

(4) Vapour pressure of solution $\rightarrow Y < X < Z$

$X = 2.8$

$Y = 1.8$

$Z = 3.5$

$Y < X < Z$

$i \uparrow \quad C.P. \uparrow$

$f.P. \quad Z < X < Y$

Question No. 83

The rate of a reaction is triped, when temperature changes from 20°C to 50°C. The energy of activation for the reaction is

(1) 20.8 kJ/mol (2) 23.8 kJ/mol

(3) 24.8 kJ/mol (4) 28.8 kJ/mol

$T_1 = 293\ K$

$T_2 = 323\ K$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

$$\log \frac{3}{1} = \frac{E_a}{2.303R}\left[\frac{1}{293} - \frac{1}{323}\right]$$

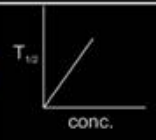
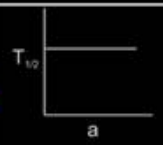
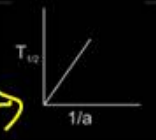
$$0.5 = \frac{E_a}{2.303R}\left[\frac{323 - 293}{293 \times 323}\right]$$

$$E_a = \frac{0.5 \times 2.303R \times 293 \times 323}{30}$$

$$E_a = \frac{0.5 \times 8.314 \times 2.303 \times 293 \times 323}{30 \times 1000}$$

Question No. 84

Match the following :

	List – I (Order of reaction)		List – II (Plots of $T_{1/2}$ Vs conc.)
A.	Zero	(i)	
B.	First	(ii)	
C.	Second	(iii)	
D.	Third	(iv)	

(1) A – ii, B – iii, C – iv, D – i

(2) A – iii, B – ii, C – iv, D – i

(3) A – iii, B – ii, C – i, D – iv

(4) A – ii, B – iii, C – i, D – iv

Zero $t_{1/2} \propto a_0$

1st $t_{1/2} \propto (a_0)^0$

2nd $t_{1/2} \propto 1/a_0$

3rd $t_{1/2} \propto \frac{1}{(a_0)^2}$

$t_{1/2} \propto (a_0)^{1-n}$

A → ii

B → iii

C → iv

D → i

(A) option

Question No. 85

The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is _____ .

(1) 1F

(2) 6F

(3) 3F

(4) 2F

Al^{+3}

$$\text{mole} = \frac{q_{(F)}}{\text{n-factor}}$$

$$1 = \frac{q_{(F)}}{3}$$

3F

Question No. 86

SRP

Standard reduction electrode potentials of three metals A, B and C are +0.5 V, –3.0 V and –1.2 V respectively. The reducing power of these metals are :

(1) B > C > A

(2) A > B > C

(3) C > B > A

(4) A > C > B

SRP :-

A > C > B

SOP :-

B > C > A

Question No. 87

The emf of the following three galvanic cellsare respectively by E_1, E_2 and E_3 then, which of the following options is correct?

I. $Zn|Zn^{2+}(1\ M) \parallel Cu^{2+}(1\ M)|Cu$

II. $Zn|Zn^{2+}(0.1\ M) \parallel Cu^{2+}(1\ M)|Cu$

III. $Zn|Zn^{2+}(1\ M) \parallel Cu^{2+}(0.1\ M)|Cu$

(1) $E_2 > E_1 > E_3$ (2) $E_3 > E_2 > E_1$

(3) $E_1 > E_2 > E_3$ (4) $E_3 > E_1 > E_2$

1.10

$[R] = [P]$ $E_{cell} = E^\circ_{cell}$

$[R] > [P]$ $E_{cell} > E^\circ_{cell}$

$[R] < [P]$ $E_{cell} < E^\circ_{cell}$

$E_2 > E_1 > E_3$

Question No. 88

Match the following :

	List – I		List – II
A.	energy of ground state of He^+	(i)	6.04 eV
B.	Potential energy of 1st orbit of H atom	(ii)	–27.2 eV
C.	Kinetic energy of 2nd excited state of He^+	(iii)	54.4 eV
D.	Ionization potential of He^+	(iv)	–54.4 eV

(1) A – i, B – ii, C – iii, D – iv

(2) A – iv, B – iii, C – ii, D – i

(3) A – iv, B – ii, C – i, D – iii

(4) A – ii, B – iii, C – i, D – iv

$$E_n = \frac{-13.6\,Z^2}{n^2}$$

$$KE = \frac{+13.6Z^2}{n^2}$$

$$E_1 = \frac{-13.6 \times 4}{1} = -54.4$$

$$P.E. = -27.2$$

$$KE. = +\frac{13.6 \times 4}{9} = \frac{54.4}{9}$$

$$\Delta E = 13.6 \times 4 = 54.4$$

Question No. 89

The IUPAC names of an element with atomic number 119 is :

(1) Unununnium 111 (2) Ununoctium 118

(3) Ununennium 119 (4) Unnilennium 109

(3)

119 → un - un - enn - ium

uue

8 = oct = o

9 = enn = e

Suffix - "ium"

0 = nil = n

1 = un = u

2 = bi = b

3 = tri = t

4 = quad = q

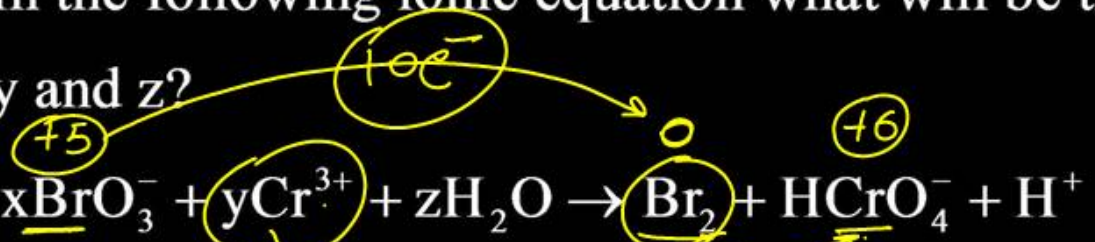
5 = pent = p

6 = hex = h

7 = sept = s

Question No. 90

In the following ionic equation what will be the correct coefficients for x, y and z?

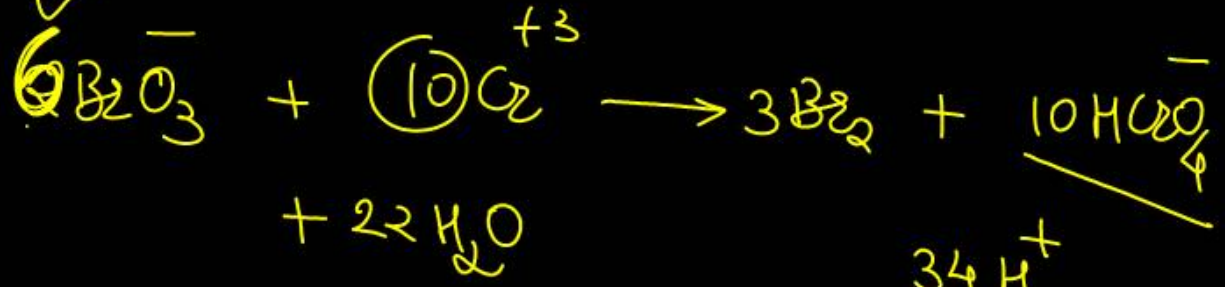


(1) x = 6, y = 8, z = 10

(2) x = 10, y = 6, z = 22

(3) x = 6, y = 8, z = 10

(4) x = 6, y = 10, z = 22



$x = 6 \quad y = 10 \quad z = 22$

Question no. 91

Which stage of Plasmodium parasite is infective for human?

(1) Schizont

(2) Gametocytes

(3) Sporozoite

(4) Merozoites

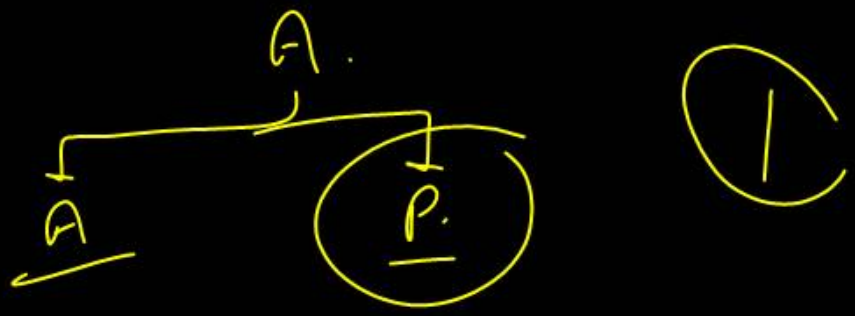
3

Question no. 92

Immunity acquired after an infection is

(1) Active immunity (2) Passive immunity

(3) Innate immunity (4) Both 2 and 3



Question no. 93

Select the mismatch from among the following

(1) AIDS – ELISA test (Diagnosis)

(2) Filariasis – Wuchereria (Causative organism)

(3) Malaria – Anopheles mosquito (Causative organism)

(4) Ringworm – Dry, Scaly lesions on skin (Symptoms)

Test

3

Question no. 94

Find the incorrect match among the following.

(1) Coke – CNS depressant drug also known as smack

(2) Heroin – CNS depressant which slow down body functions

(3) Morphine – Opioids which is an effective sedative and painkiller

(4) Charas-hallucinogenic chemicals obtained from Cannabis sativa

Question no. 95

Which of the following is responsible for cellular immunity?

(1) B-lymphocyte
(2) T-lymphocyte
(3) Erythrocytes
(4) Thrombocytes

2

Question no. 96

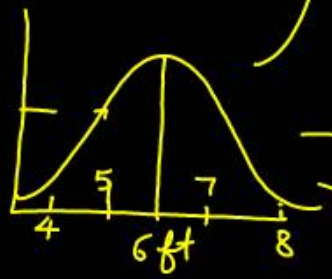
Natural selection in which more individuals acquire peripheral character value at both the ends of the distribution curve, is

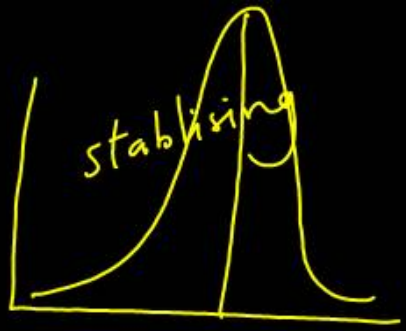
(1) ~~Stabilising natural selection~~

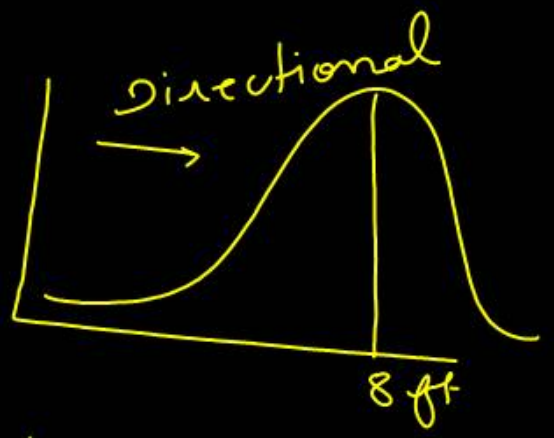
(2) Disruptive natural selection

(3) ~~Directional natural selection~~

(4) The curve never shows the formation of two peaks







Question no. 97

Genetic drift operates in

(1) Large isolated population

(2) Small isolated population

(3) fast reproductive population

(4) Slow reproductive population

Question no. 98

The most significant trend in the evolution of modern man (Homo sapiens) from his ancestors is

(1) Upright posture

(2) Shortening of jaws

(3) Binocular vision

(4) Increasing brain capacity

Question no. 99

Industrial melanism is an example of

(1) Natural selection (2) Mutation

(3) Neo Lamarckism (4) neo Darwinisn

Question no. 100

The diploid stages in spermatogenesis is

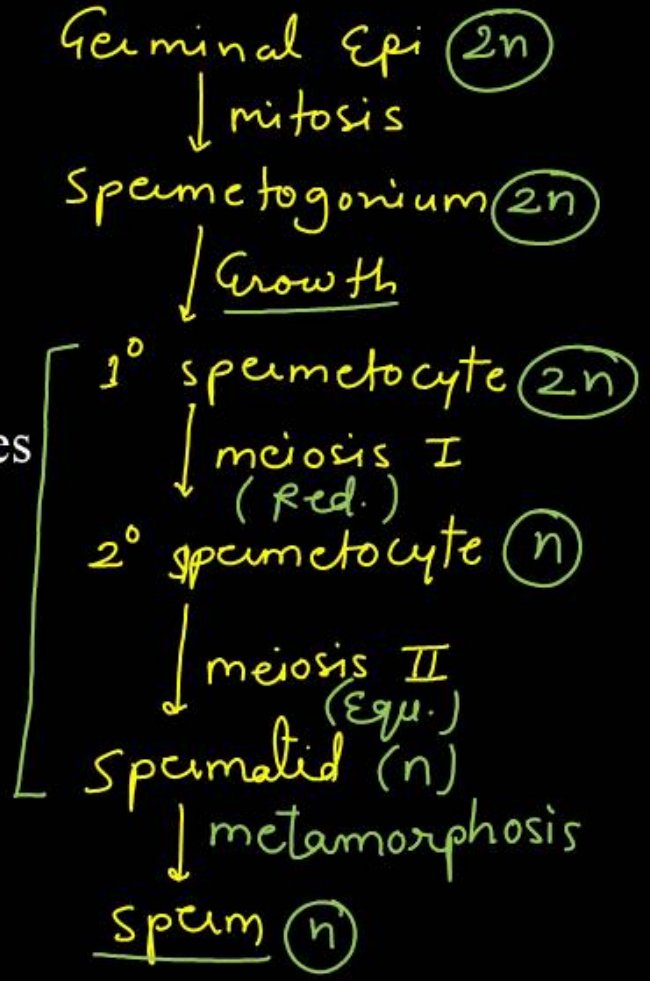
(1) Spermatogonia and spermatids

(2) Spermatogonia and primary spermatocytes

(3) Spermatogonia and Secondary spermatocytes

(4) Primary & secondary spermatocytes

2



Question no. 101

Which hormone is essential for maintenance of the endometrium?

(1) FSH

(2) LH

(3) Progesterone

(4) Testosterone

× Male Sex hor.

3

F.S.H
L.H
>> Ovarian Changes

Question no. 102

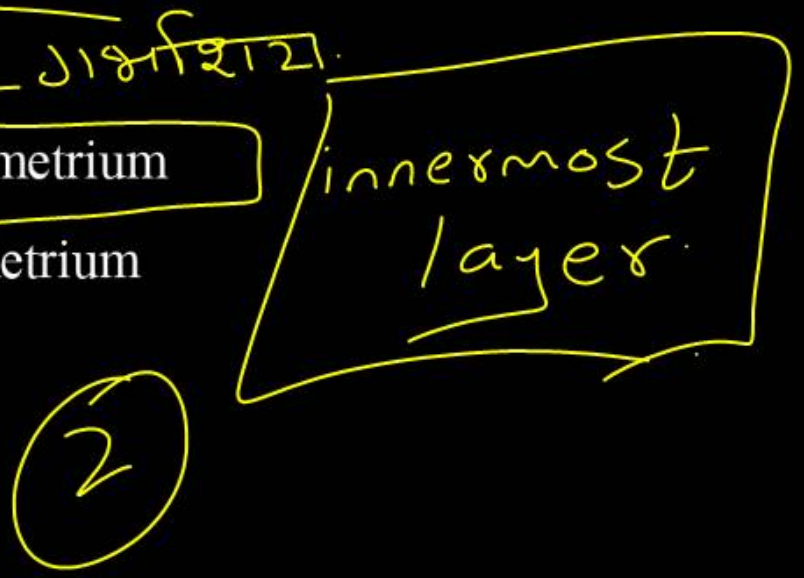
During implantation, the blastocyst becomes embedded in which layer of uterus.

(1) Trophoblast

(2) Endometrium

(3) Myometrium

(4) Perimetrium



Question no. 103

The hormones that are produced in women only during pregnancy is

(1) Estrogen, human chorionic gonadotropins, human placental lactogen

(2) Estrogen, progesterone, oxytocin

(3) human placental lactogen, human chorionic gonadotropin, relaxin

(4) human placental lactogen, human chorionic gonadotropin, thyroxine

3

Question no. 104

Which of the following is correct with respect to the sperms of fertile males?

(1) At least 40% of sperms must have a normal shape and size

(2) At least 60% of sperms must have motility

(3) At least 60% of sperms must have a normal shape and size

(4) Both (1) and (2)

Question no. 105

Arrange the components of mammary gland (from proximal to distal).

start end

(a) Mammary duct
(b) Lactiferous duct
(c) Alveoli
(d) Mammary ampulla
(e) Mammary tubules

Choose the most appropriate answer from the options given below:-

(1) c, a, d, e, b
(2) b, c, e, d, a
(3) c, e, a, d, b
(4) e, c, d, b, a

3

(c) Alveoli.
↓
(e) Mammary Tubules.
↓
(a) Mammary duct
↓
(d) Ampulla.
↓
(b) Lactiferous Duct

Question no. 106

Among the following methods of contraception which one has the highest failure rate?

(1) Diaphragm with spermicide

(2) Condom

(3) Intrauterine device

(4) Rhythm method

IUD

4

Natural method 11-17th Day

Question no. 107

Which of the following assisted reproductive techniques is used in the test-tube baby programme?

(1) Zygote intra fallopian transfer (ZIFT)

(2) Gamete intra fallopian transfer (GIFT)

(3) Artificial Insemination (AI)

(4) Intrauterine insemination (IUI)

A.R.T.

Fertilization outside body.

1

Question no. 108

Which of the following STDs are not curable?

(1) Gonorrhoea, Trichomoniasis, Hepatitis-B

(2) Genital herpes, Hepatitis B, HIV infection

(3) Chlamydiasis, Syphilis, Genital warts

(4) HIV, Gonorrhoea, Trichomoniasis

2

उपचार नहीं है।

Sexually Transmitted Diseases

Question no. 109

The hormone playing very important role in regulation of 24-hour (diurnal) rhythm of our body is

(1) Melanin
(2) Thymosin
(3) Thyroxine
(4) Melatonin

Biological
24h

A

Question no. 110

Production, secretion and ejection of milk by mammary gland requires synergistic action of the following hormones, except

(1) Progesterone
(2) Prolaction
(3) Oxytocin
(4) Parathyroid hormone

Question no. 111

Which of the following pair does not represent antagonistic set of hormones?

(1) Parathormone and thyrocalcionin PTH : TCT

(2) Insulin and glucagon

(3) Epinephrine and norepinephrine 3F

(4) Gastrin and enterogastrone

In Blood Ca^{+2} level.

TCJ $\propto \frac{1}{PTH}$

3

Question no. 112

In which of the following, both pairs have correct combination?

(1) In situ conservation : National Park
Ex situ conservation : Tissue culture

(2) In situ conservation : Tissue culture
Ex situ conservation : Sacred groves

(3) In situ conservation : National Park
Ex situ conservation : Botanical Garden

(4) In situ conservation : Cryopreservation
Ex situ conservation : Wildlife Sanctuary

Question no. 113

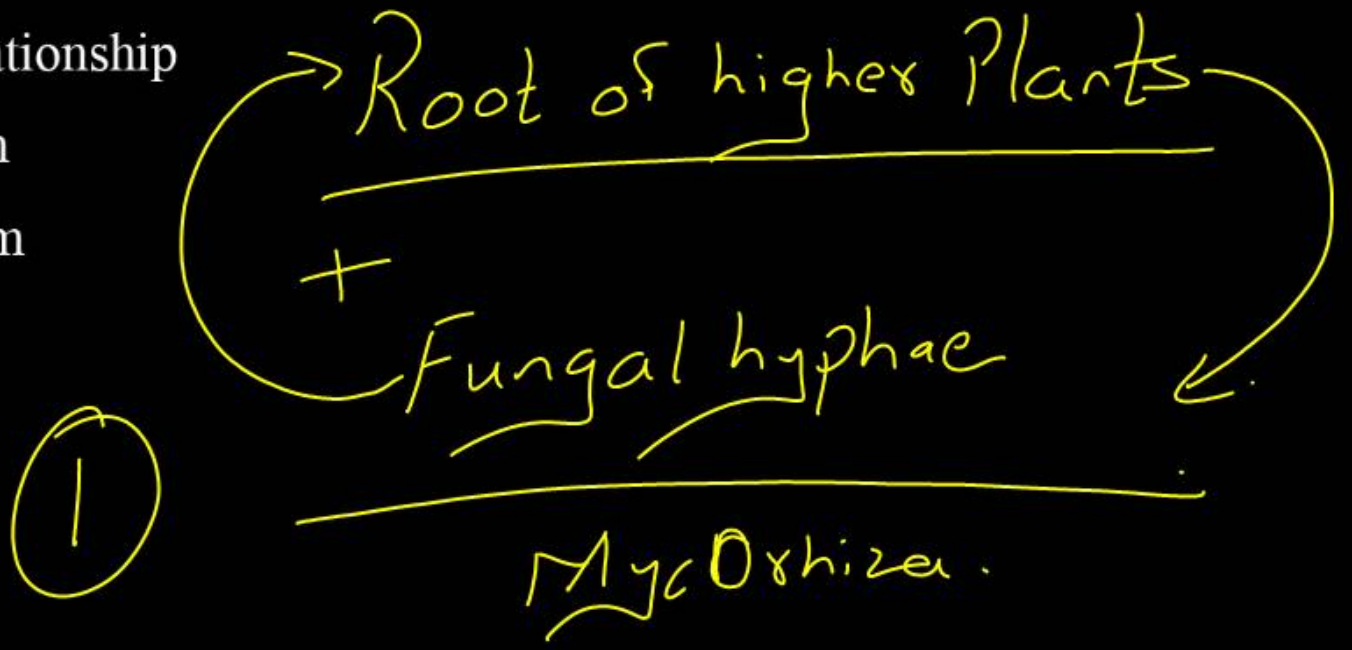
Mycorrhiza is an example of

(1) ✓symbiotic relationship

(2) ectoparasitism

(3) endoparasitism

(4) decomposers



Question no. 114

Which of the following is not an infectious disease?

(1) AIDS

(2) cancer

(3) hepatitis-B

(4) Typhoid

2

Question no. 115

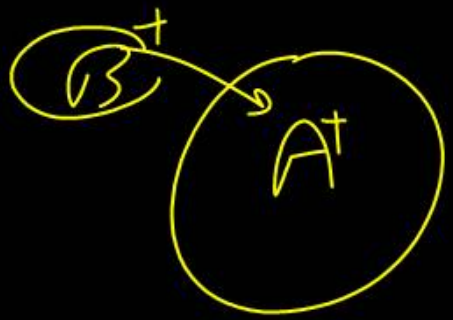
In higher vertebrates, the immune system can distinguish self-cell and non-self. If this property is lost due to genetic abnormality and it attacks self-cells, then it leads to

(1) Autoimmune disease

(2) Cancer

(3) Allergic response

(4) Graft rejection



Question no. 116

Which of the following statements about HIV is/are correct?

a. HIV makes a copy of DNA from its RNA genome using enzyme reverse transcriptase.

b. HIV kills the macrophages it infects

c. The genome of HIV comprises of two single-stranded RNA.

d. HIV causes depletion of helper T-lymphocytes, due to which the person starts suffering from infections that would have been otherwise overcomed; such as those due to bacteria Mycobacterium and other parasites

(1) a and b (2) a, b and c

(3) a, c and d (4) a, b, c and d

Question no. 117

To which type of barriers under innate immunity do saliva in mouth and tears from eyes belong?

(1) Physiological barriers

(2) Physical barriers

(3) Cytokine barriers

(4) Cellular barriers

Question no. 118

Match the causative organisms with their diseases.

	Column I		Column II
A.	Haemophilus influenzae	1.	Malignant malaria
B.	Entamoeba histolytica	2.	Elephantiasis
C.	Plasmodium falciparum	3.	Pneumonia
D.	Wuchereria bancrofti	4.	Typhoid
E.	Salmonella typhi	5.	Amoebiasis

	A	B	C	D	E
(1)	1	5	3	2	4
(2)	3	5	1	2	4
(3)	5	1	3	4	2
(4)	1	3	5	2	4

Question no. 119

Hardy-Weinberg equilibrium is not affected by which of the following factors?

(1) Random mating

(2) Genetic recombination during gametogenesis

(3) Natural selection

(4) Variations due to mutation

1

Mutation
Natural selection
migration
recombination

Question no. 120

Appearance of dark-colored peppered moths among the light-colored ones as a result of increased industrial pollution is an example of

(1) Disruptive selection

(2) Stabilising selection

(3) Directional selection

(4) None of the above

3

Question no. 121

The classical example of adaptive radiation during formation of new species is

(1) Australian Marsupials

(2) Darwin's finches

(3) Both (1) and (2)

(4) None of the above

3

Question no. 122

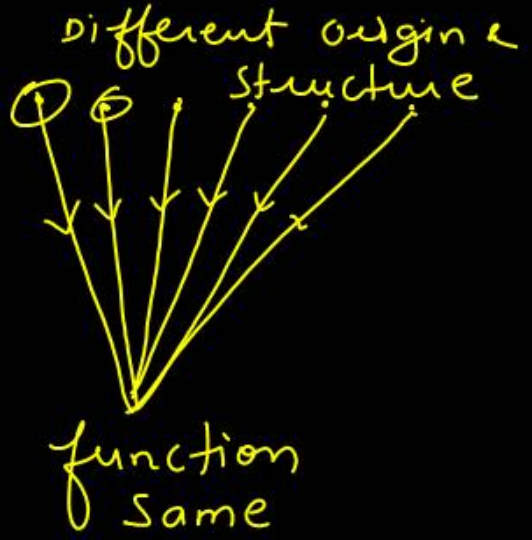
The wings of a bird and the wings of insect are

(1) Analogous structures and represent convergent evolution

(2) Phylogenetic structures and represent divergent evolution

(3) homologous structures and represent convergent evolution

(4) Homologous structures and represent divergent evolution



Analogous organs

Question no. 123

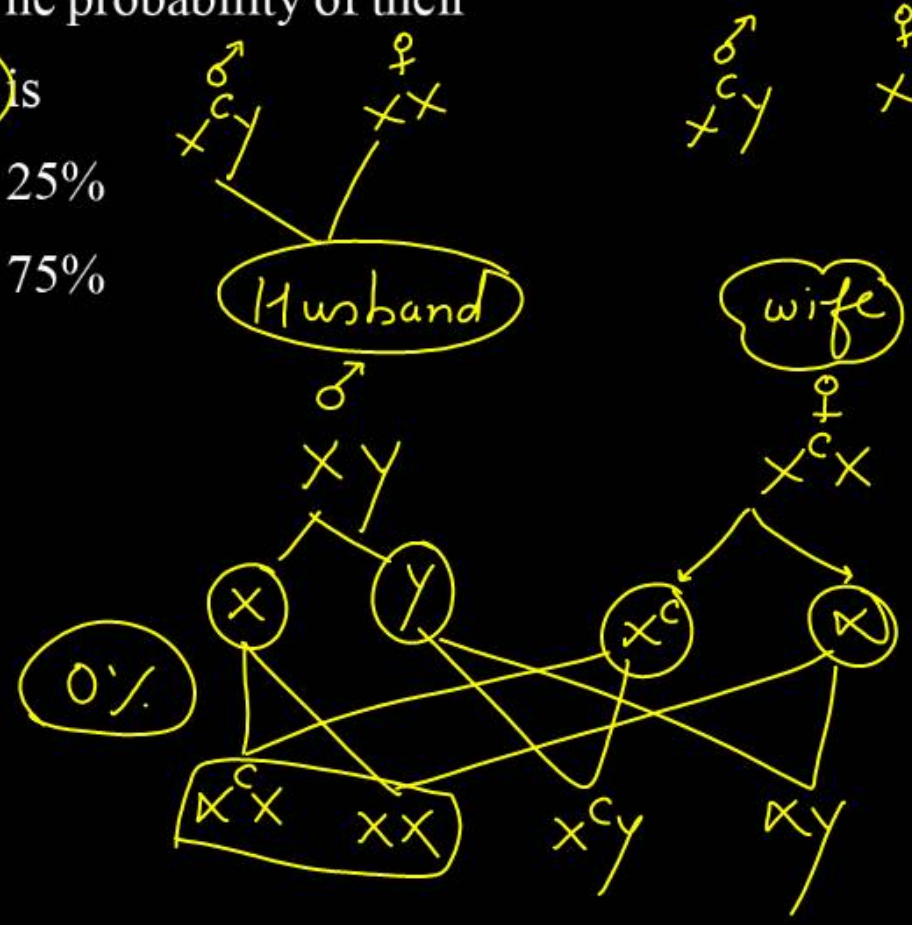
Both husband and wife have normal vision though their fathers were colour blind. The probability of their daughter becoming colour blind is

(1) 0%

(2) 25%

(3) 50%

(4) 75%

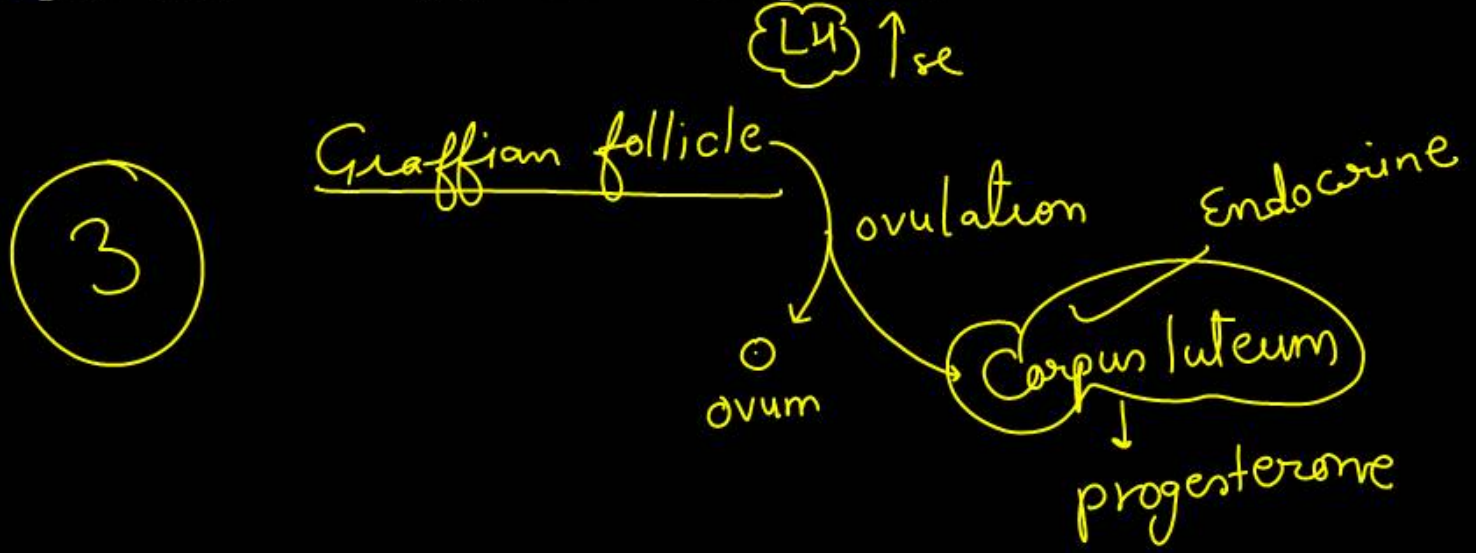


Question no. 124

The part of the ovary in mammals which acts as an endocrine gland after ovulation is

(1) Vitelline membrane (2) Graffian follicle

(3) Corpus luteum (4) Germinal epithelium



Question no. 125

Pick the hormone which is not secreted by human placenta.

Ant. pitu.

(1) Prolactin

(2) hCG

(3) Estrogen

(4) hPL

1

Question no. 126

Which layer of uterus exhibits strong contraction during parturition?

(1) Perimetrium
(2) Myometrium
(3) Endometrium
(4) Mesovarium

2

Question no. 127

Signals from the fully developed foetus and placenta ultimately lead to parturition which requires the release of

(1) Estrogen from placenta

(2) Oxytocin from foetal pituitary

(3) Oxytocin from maternal pituitary

(4) Relaxin from placenta

3

Question no. 128

Which of the following statements are correct?

(i) Family planning programmes were initiated in 1951.

(ii) According to WHO, reproductive health means total well being in the physical, social, behavioural and emotional aspects of reproduction.

(iii) 'Saheli' was developed at CDRI in Lucknow.

(iv) Amniocentesis should not be banned as it is a foetal sex determination test.

(1) (i) and (ii) (2) (ii) and (iii)

(3) (i), (ii) and (iii) (4) (iii) and (iv)

Question no. 129

Use of which of the following contraceptive device has increased in recent years due to its additional benefit of protecting the user from contracting STDs and AIDS?

(1) Diaphragms and cervical caps

(2) IUDs

(3) Condoms

(4) Contraceptive Pills

Question no. 130

Which one of the following is the most widely used method of contraception by females in India?

(1) Oral contraceptive pills

(2) Condoms

(3) IUDs

(4) Sterilisation

3

Question no. 131

Which hormone is not an amino acid derivative?

(1) Adrenaline

(2) Dopamine

(3) Tertaiodothyronine

(4) Progesterone

T4

Steroid

4

Question no. 132

Which of the following is incorrect with respect to the functions of thyroid gland?

(1) Regulation of basal metabolic rate

(2) Support the process of erythrocyte formation

(3) Producing anti-inflammatory reaction and suppressing the immune response

(4) Maintenance of water and electrolyte balance

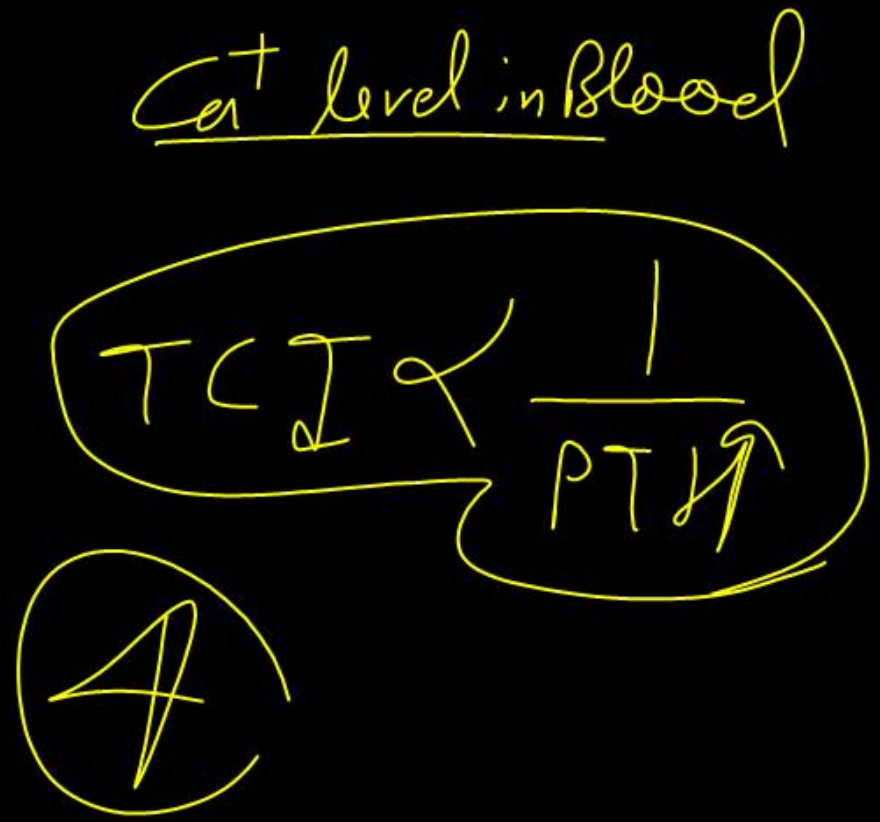
Question no. 133

Match the following :

	Column - I		Column - II
A.	Hyperglycemic hormone	i.	PTH
B.	Hypoglycemic hormone	ii.	Insulin
C.	Hypercalcemic hormone	iii.	Glucagon
D.	Hypocalcemic hormone	iv.	Calcitonin

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

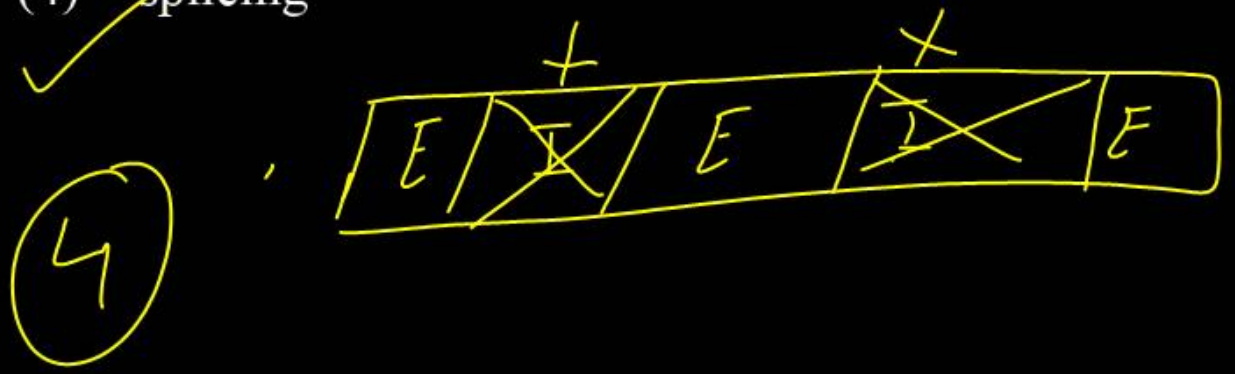
(3) A-iii, B-ii, C-iv, D-i (4) A-iii, B-ii, C-i, D-iv



Question no. 134

Removal of introns and joining the exons in a defined order in a transcription unit is called

(1) tailing
(2) transformation
(3) capping
(4) splicing



Question no. 135

In an experiment, a human cell and yeast cell divide simultaneously after 40 hours. What will be the ratio of numbers of cell cycles shown by yeast cell and Human cell?

(1) 32 : 1

(2) 2 : 32

(3) 1 : 1

(4) 16 : 1

Yeast = 90 min.

4

Question no. 136

How many hotspots of biodiversity in the world have been identified till date by Norman Mayers?

(1) 17

(2) 25

(3) 34

(4) 43

3

Question no. 138

Which of the following is an autoimmune disease?

(1) Rheumatoid arthritis (2) Grave's disease

(3) Hashimoto's disease (4) All of the above

Question no. 139

The genetic material of HIV virus comprises of

(1) One single-stranded RNA

(2) One double stranded RNA

(3) Two single-stranded RNA

(4) Two single-stranded DNA

3

SS-RNA
2 threads

Question no. 140

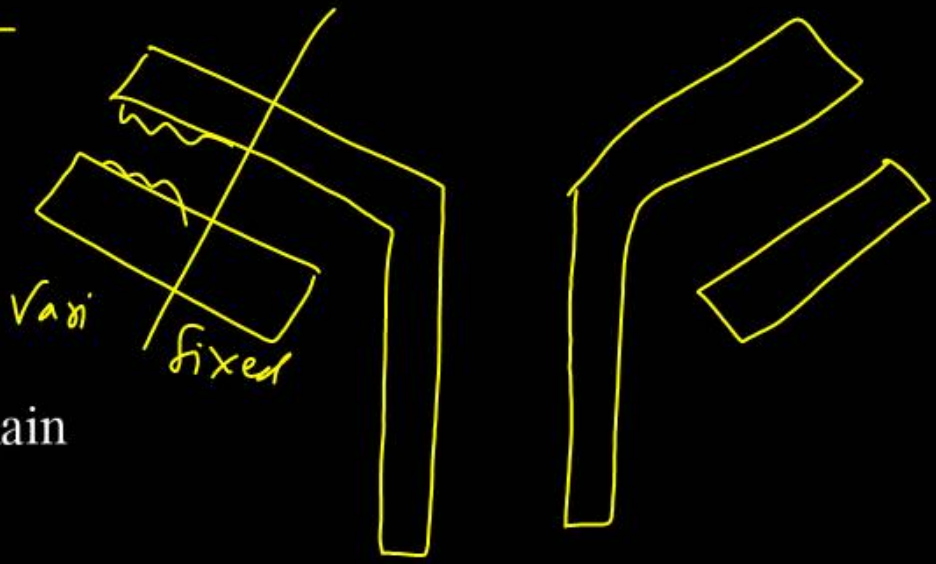
Each immunoglobin has two heavy chains and two light chains. The antigen binding site is found in between -

(1) Variable region of heavy chain

(2) Variable region of light chain

(3) Constant region of light chain

(4) Variable region of both heavy and light chain



A

Question no. 141

Which of the following techniques is safest for the detection of cancer?

(1) Magnetic resonance imaging

(2) Radiography

(3) Computed tomography

(4) Histopathological study

MRI

1

Question no. 142

In population 'X', proportion of gene 'M' is 60% and gene 'm' is 40%, then what wil be the percentage of heterozygous genotype in the population?

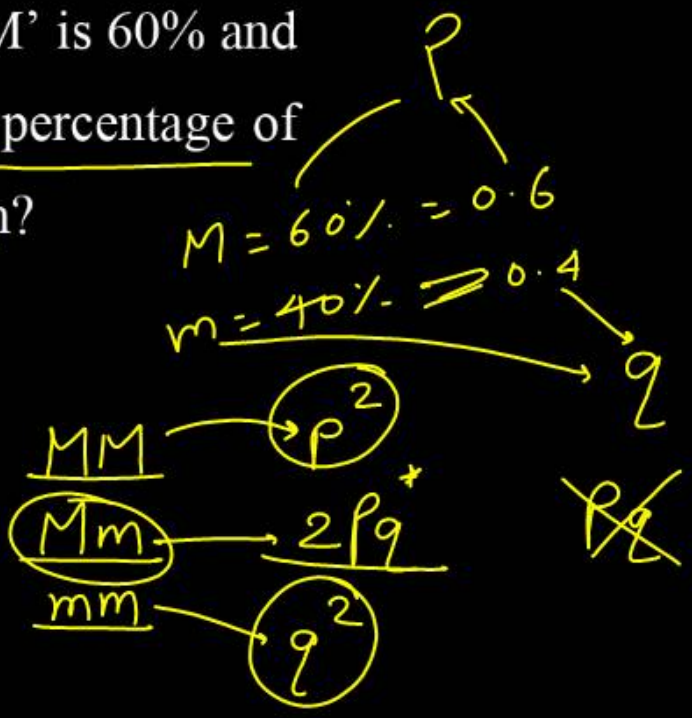
(1) 48%
(2) 36%
(3) 16%
(4) 20%

$2pq$

$2 \times 0.6 \times 0.4$

0.48

48%



Question no. 143

The most primitive ancestor of man is

(1) Ramapithecus

(2) Australopithecus

(3) Homo habilis

(4) homo neanderthalensis

Question no. 144

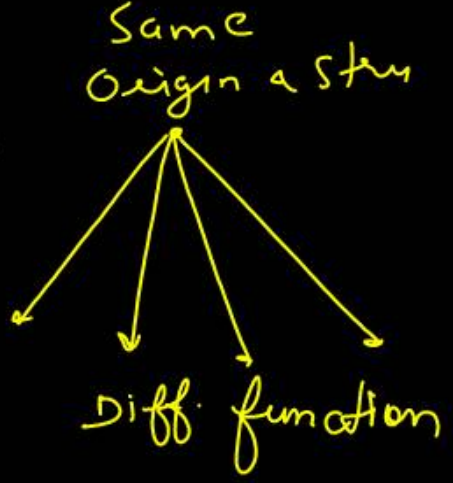
Which of the following is not an example of homologous organ?

(1) Vertebrate hearts or brains

(2) Thorns of Bougainvillea and tendrils of cucurbit

(3) Leg of cheetah, and flipper of whale

(4) Eye of octopus and of mammals



Question no. 146

Which one of the following does not follow the central dogma of molecular biology?

(1) Pea

(2) Mucor

(3) Chlamydomonas

(4) HIV

Question no. 147

In the stage of development of ovum which one is released from the ovary?

(1) Secondary oocyte stage

(2) Primary oocyte stage

(3) Oogonial stage

(4) Mature ovum stage

Question no. 148

Trace the correct path of movement of the sperms up to urethra.

(1) Seminiferous tubules → Vasa efferentia → Rete testis → Epididymis → Vas deferens → Ejaculatory duct → Urethra

(2) Seminiferous tubules → Rete testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Urethra

(3) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra

(4) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Ejaculatory duct → Vas deferens → Urethra

Question no. 149

Which of the following option correctly depicts correct picture of hormone levels of blood just prior to ovulation in a female -

(1) low FSH., high LH and high estrogen

(2) low FSH, high LH and low estrogen

(3) high FSH, low LH and high estrogen

(4) high FSH, high LH and high estrogen

4

Question no. 150

Receptors for sperm binding in mammals are present on

(1) Corona radiata
(2) Vitelline membrane
(3) Perivitelline space
(4) Zona pellucida

ZP3

4

Question no. 151

RCH stands for

(1) routine check-up of health

(2) reproduction cum hygiene

(3) reversible contraceptive hazards

(4) reproduction and child health care

Question no. 152

Which of the following statements about ZIFT is incorrect?

(1) It is zygote intra fallopian transfer

(2) Zygote is transferred into the fallopian tube after IVF.

(3) Early embryos up to 8 blastomeres can also transferred into the fallopian tubes.

(4) Embryos with more than 8 blastomeres are also transferred into the fallopian tubes.

Zygote intra fallopian Transfer

morula

4 Four

Question no. 153

MTP is considered safe up to how many weeks of pregnancy

(1) Six
(2) Eight
(3) Twelve
(4) Eighteen

3

Medical Termination of Pregnancy
= First Trimester
= 3 month
= 12 weeks

Question no. 154

Secondary messengers are required for which of the following activity of

(1) Testosterone

(2) Prolactin

(3) Estrogen

(4) Progesterone

IP3, Ca++ Protein hormone

2

Question no. 155

Which of the following is incorrect with respect to cortisol?

(1) Secreted by adrenal cortex

(2) Suppresses RBC production

(3) Suppresses immune response

(4) Maintains the cardio-vascular and kidney functions

Question no. 156

Deficiency of thyroxine in children causes dwarfism, low IQ, deaf-mutism and mental retardation. The condition is called

(1) Myxedema
(2) Cretinism
(3) Grave's disease
(4) Cushing's disease

2

Question no. 157

Grafted kidney may be rejected in a patient due to which of the following

(1) passive immune response

(2) innate immune response

(3) humoral immune response

(4) cell-mediated immune response

Question no. 158

If a diploid cell has 16 tetrad, then what will be the number of chromosome in a cell of anaphase I and anaphase II respectively?

(1) 16, 32

(2) 16, 16

(3) 32, 32

(4) 32, 16

3

Question no. 159

Read the assertion and reason carefully to mark the correct option given in question.

Assertion : Virus infected cells secrete proteins known as interferons.

Reason : Interferons protect the non-infected cells from bacterial infection.

(1) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(2) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(3) If assertion is true but reason is false

(4) if both assertion and reason are false

Question no. 160

Which one of the following pairs of disease can spread through blood transfusion?

(1) Cholera and hepatitis

(2) Hepatitis and AIDS

(3) Diabetes mellitus and malaria

(4) Hay fever and AIDS

2

Question no. 161

Which of the following characteristics are found in a healthy cell?

A. Metastasis

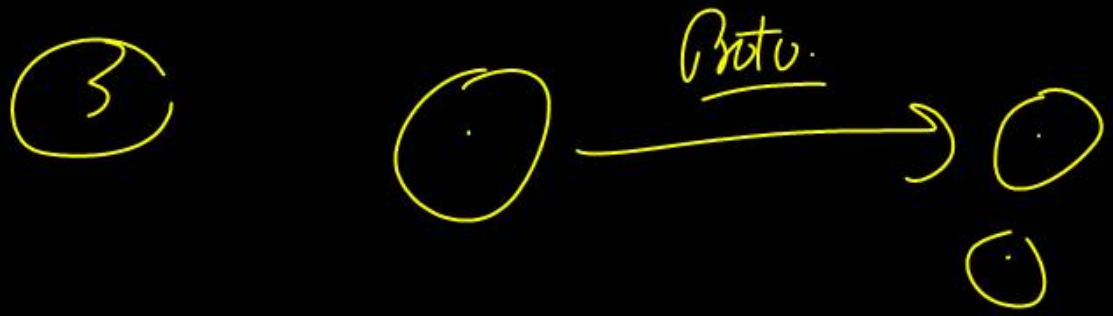
B. Presence of contact inhibition

C. Presence of proto-oncogenes

D. Uncontrolled cell division

(1) D & C (2) A & C

(3) B & C (4) B & D



Question no. 162

Which of the following antibody is mediator in allergic response?

(1) IgA

(2) IgD

(3) IgE

(4) IgG

3

Question no. 163

How many of the following are diseases that can be caused by bacteria?

Typhoid, Pneumonia, Malaria, Amoebiasis, Ascariasis, Filariasis, Common cold viral

(1) 6 (2) 5

(3) 3 (4) 2

4

Question no. 164

a Allele = q

In a population of 800 inidividuals of an insect-species, there are only two alleles for the gene locus that determines eye color. One allele is dominant to the other. There are 250 homozygous dominant, 400 heterozygous, and 150 homozygous recessive individuals. What is the approximate frequency of the recessive allele in the gene pool of this population?

AA = 250
Aa = 400
aa = 150

Homozygous recessive indi. = 150/800

q^2

(1) ~~31%~~

(2) ~~38%~~

(3) 44%

(4) ~~56%~~

$q^2 = \frac{150}{800}$

$q = \sqrt{\frac{150}{800}} = \sqrt{0.18} \approx \sqrt{0.16}$

$0 = 0.4$

40%

0.18
80 | 150
80
700

3

Question no. 165

Which of the following human was the first to start cave paintings and domestication of animals?

(1) Homo erectus
(2) Australopithecus
(3) Cro-Magnon man
(4) Heidelberg man

3

Question no. 166

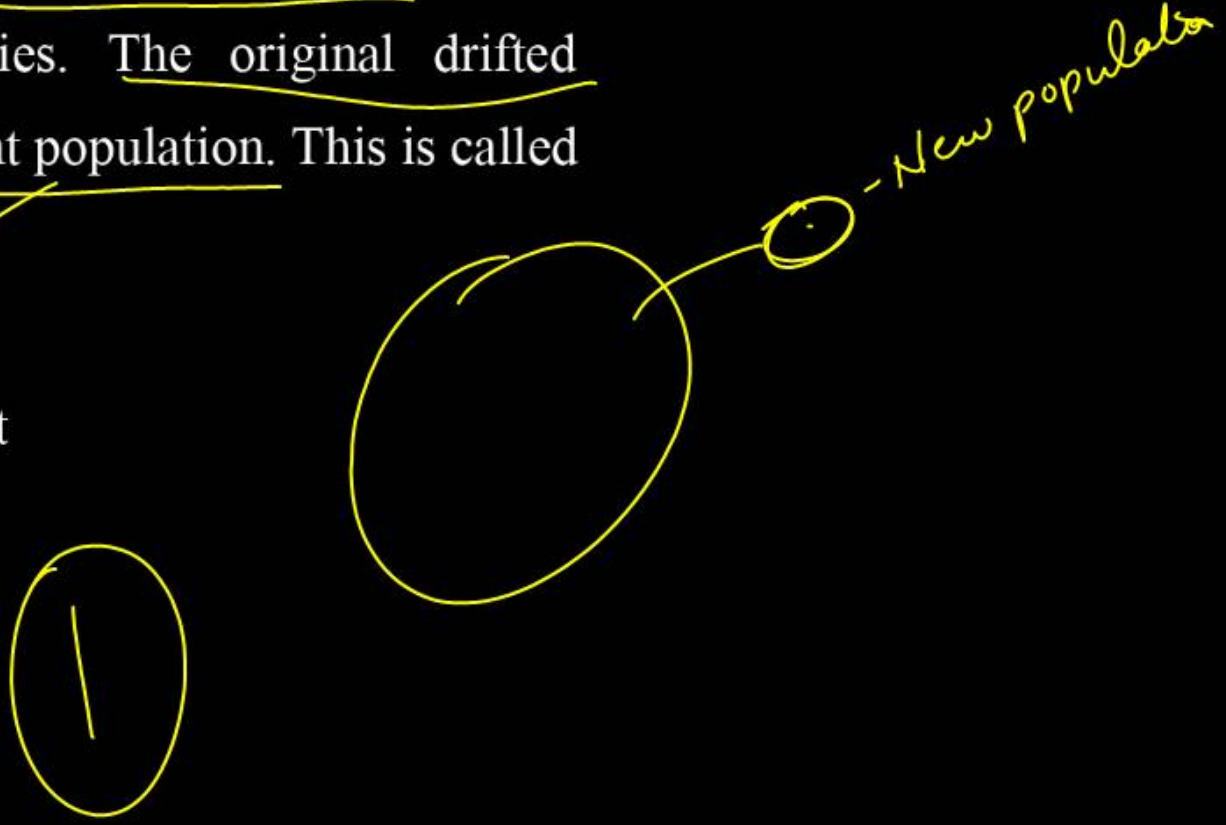
Sometimes the change in allelic frequency is so different in the new sample of the population that they become a different species. The original drifted population create a different population. This is called

(1) Founder effect

(2) Bottleneck effect

(3) Metapopulation effect

(4) Gene migration



Question no. 167

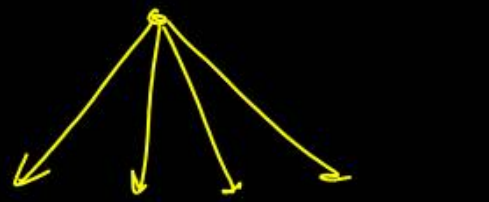
Among the following sets of examples for divergent evolution, select the incorrect option.

(1) Forelimbs of man, bat and cheetah ✗

(2) Heart of bat, man and cheetah ✗

(3) Brain of bat, man and cheetah ✗

(4) Eye of octopus, bat and man



Homologous

4

Question no. 168

Which of the following is initiation codon?

(1) UAG

(2) GUA

(3) AUG

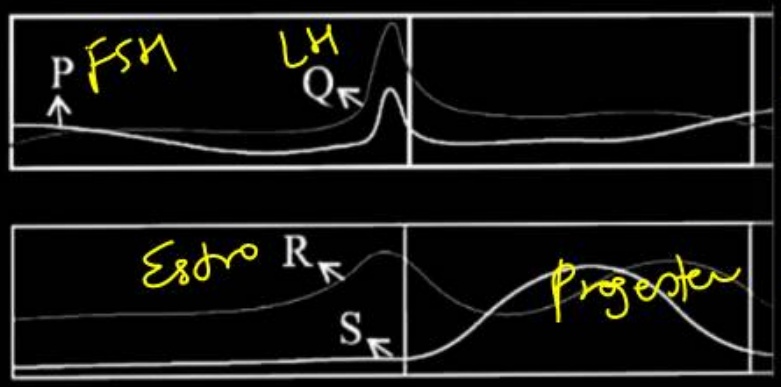
(4) CCU

AUG / GUG

3

Question no. 169

P, Q, R and S are representing the hormonal titers in the menstrual cycle starting from day one



Which hormone is responsible for ovulation?

(1) P

(2) Q LH

(3) R

(4) S

2

Question no. 170

Some important events in the human female reproductive cycle are given below. Arrange the events in a proper sequence.

A. Secretion of FSH

B. Growth of corpus luteum

C. Growth of the follicle and oogenesis

D. Ovulation

E. Sudden increase in the levels of LH

(1) C → A → D → B → E

(2) A → C → E → D → B

(3) A → D → C → E → B

(4) B → A → C → D → E

A → C → E → D → B

2

Question no. 171

What will be ratio of ova and sperms produced when germ cells in female gonad and male gonad undergo meiosis simultaneously?

(1) 1 : 4

(2) 1 : 1

(3) 1 : 2

(4) 2 : 1

Question no. 172

Given below are two statements :

Statement I :- The release of sperms into the seminiferous tubules is called spermiation.

Statement II :- Spermiogenesis is the process of formation of sperms from spermatogonia.

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

(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. 173

Contraceptive pills used by females are very effective with lesser side effects. They work by

(1) Inhibiting ovulation

(2) Inhibiting implantation

(3) They alter the quality of cervical mucus to prevent /retard the entry of sperms

(4) All of these

4

Question no. 174

A healthy male has got normal sperm count. However, he is unable to inseminate. Which of the following assisted reproductive technology can be best suggested in this case?

A.R.T.

(1) GIFT

(2) ZIFT

(3) IVF

(4) AI

Artificial insemination.

4

Question no. 175

Which of the following is a hormone releasing Intra Uterine Device (IUD)?

(1) Vault ✗

(2) Multiload 375 — Copper Releasing.

(3) LNG – 20 ✓ Levonogestrol.

(4) Cervical cap ✗

3

Question no. 176

Dwarfism can occur due to

(1) Under secretion of growth hormone

(2) Under secretion of somatostatin

(3) Over secretion of somatostatin

(4) Both (1) and (3)

4

Question no. 177

How many of the following statements is/are correct?

A. Glucocorticodis stimulate gluconeogenesis, lipolysis and protcolysis.

B. Cortisol promotes cellular uptake and utilization of amino acids.

C. Insulin is involved in maintaining the cardiovascular system as well as the kidney functions

D. Catecholamines increase concentration of glucose in blood

(1) One (2) Two

(3) Three (4) Four

Question no. 178

Gonadotropin releasing hormone (GnRH) from hypothalamus stimulates release of

(1) Cortisol from adrenal cortex

(2) Vasopressin from neurohypophysis

(3) Estradiol from granulosa cells

(4) FSH and LH from anterior pituitary

4

Question no. 179

Anticodon occurs in

(1) tRNA

(2) mRNA

(3) rRNA

(4) DNA

Question no. 180

Which one of the following is commonly used in transfer of foreign DNA into crop plants?

(1) Meloidogyne incognita

(2) Agrobacterium tumefaciens

(3) Penicillium expansum

(4) Trichoderma harzianum

2