Question no. 1

A body is displaced from $\vec{r}_A = (2\hat{i} + 4\hat{j} - 6\hat{k})$ to $\vec{r}_B = (6\hat{i} - 4\hat{j} + 2\hat{k})$ under a constant force $\vec{F} = (2\hat{i} + 3\hat{j} - \hat{k})$. Find the work done

(1) 40 units (2) 24 units

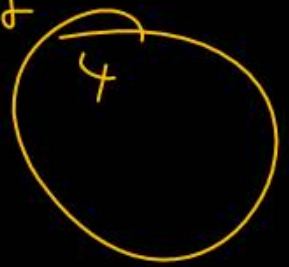
(3) 20 units (4) –24 units

$W = \vec{F} \cdot (\vec{r}_B - \vec{r}_A)$ (displ.)

$W = (2\hat{i} + 3\hat{j} - \hat{k})(4\hat{i} - 8\hat{j} + 8\hat{k})$

$W = 8 - 24 - 8$

$W = -24$ units



Question no. 2

An electric dipole of moment $\vec{p}$ is placed in a uniform electric field $\vec{E}$. Then

I. the torque on the dipole is $\vec{p} \times \vec{E}$

II. the potential energy of the system is $-(\vec{p} \bullet \vec{E})$

III. the resultant force on the dipole is zero.

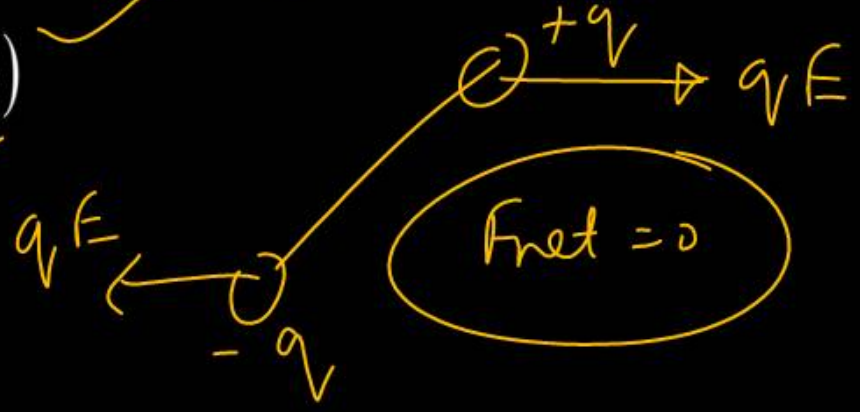
Which of the above statements is/are correct.

(1) I, II and III (2) I and III

(3) Only I (4) I and II

$\vec{\tau} = \vec{p} \times \vec{E}$

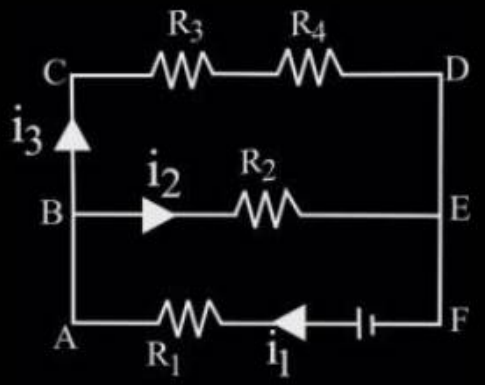
$U = -\vec{p} \cdot \vec{E}$



1

Question no. 3

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



$-i_3R_3 - i_3R_4 + i_2R_2 = 0$

2

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

Question no. 4

At which temperature velocity of sound (at 27°C) doubles?

(1) 327°C

(2) 927°C

(3) 54°C

(4) –123°C

2

$V \propto \sqrt{T}$

$\frac{V_1}{V_2} = \sqrt{\frac{T_1}{T_2}}$

$\frac{V_1}{V_2} = \sqrt{\frac{300}{T_2}} = \frac{V}{2V}$

$T_2 = 1200K$

$1200 - 273 = 927°C$

Question no. 5

A current of 2.5 A flows through a coil of inductance 5H. The magnetic flux linked with the coil is

(1) 2 Wb

(2) 0.5 Wb

(3) 12.5 Wb

(4) Zero

$\phi = Li$

$\phi = 5 \times 5/2 = 12.5\ Wb$

3

Question no. 6

A proton and an α-particle are accelerated from rest to the same energy. The de-Broglie wavelengths λ_p and λ_a are in the ratio.

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

(3) 1 : 1 (4) $\sqrt{2}$: 1

2

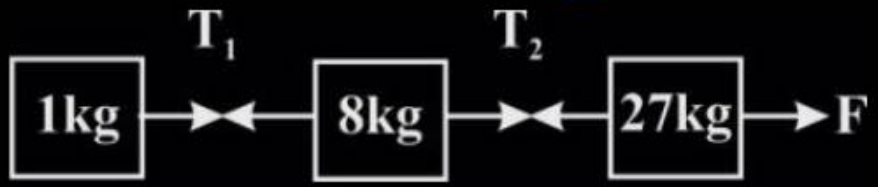
$$\lambda = \frac{h}{\sqrt{2mk}}$$

$$\lambda \propto \frac{1}{\sqrt{m}}$$

$$\frac{\lambda_p}{\lambda_\alpha} = \sqrt{\frac{m_\alpha}{m_p}} = \sqrt{\frac{4m_p}{m_p}} = 2$$

Question no. 7

Three blocks connected together by strings are pulled along a horizontal surface by applying a force F. If F = 36N, What is the tension T_2?



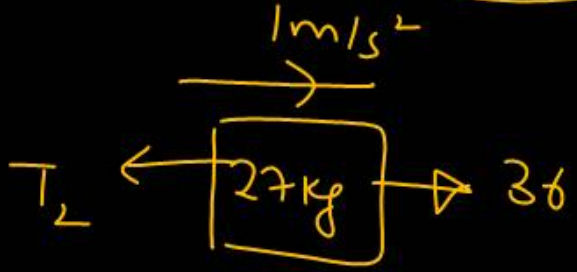
(1) 1 N (2) 5 N

(3) 10 N (4) 9 N

4

$a = \frac{F}{m_{net}} = \frac{36}{36}$

$a = 1 m/s^2$



$36 - T_2 = 27 \times 1$

$T_2 = 36 - 27 = 9N$

Question no. 8

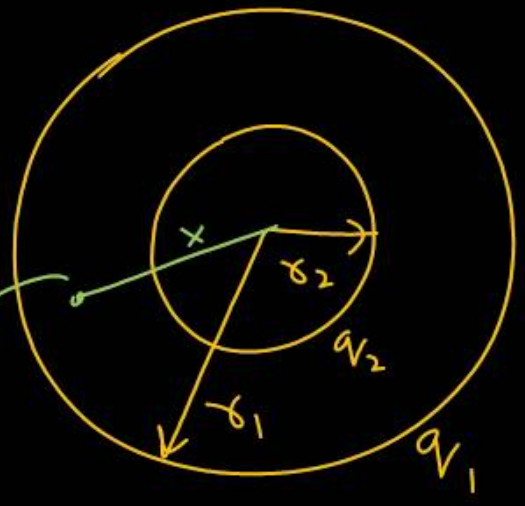
Two concentric hollow metallic spheres of radii r_1 and r_2 $(r_1 > r_2)$ contain charges q_1 and q_2 respectively. The potential at a distance x from the centre between r_1 and r_2 will be :

(1) $\dfrac{q_1 + q_2}{4\pi \in_0 R}$

(2) $\dfrac{q_1}{4\pi \in_0 r_1} + \dfrac{q_2}{4\pi \in_0 r_2}$

(3) $\dfrac{q_1}{4\pi \in_0 x} + \dfrac{q_2}{4\pi \in_0 r_2}$

(4) $\dfrac{q_1}{4\pi \in_0 r_1} + \dfrac{q_2}{4\pi \in_0 x}$



$$V = \frac{kq_2}{x} + \frac{kq_1}{r_1}$$

$$V = \frac{q_2}{4\pi\varepsilon_0 x} + \frac{q_1}{4\pi\varepsilon_0 r_1}$$

Question no. 9

An electron move in a circular orbit with a uniform speed v. It produces a magnetic field B at the centre of the circle. The radius of the circle is proportional to

(1) $\sqrt{\frac{B}{v}}$

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

(3) $\sqrt{\frac{v}{B}}$

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

3

$i = \frac{Q}{T} = \frac{e}{\frac{2\pi R}{v}} = \frac{ev}{2\pi R}$

$B = \frac{\mu_0 i}{2R}$

$B = \frac{\mu_0}{2} \frac{ev/2\pi R}{R}$

$\frac{B}{V} = \frac{\mu_0 e}{4\pi} \frac{1}{R^2}$

$R^2 \propto V/B$

$R \propto \sqrt{V/B}$

Question no. 10

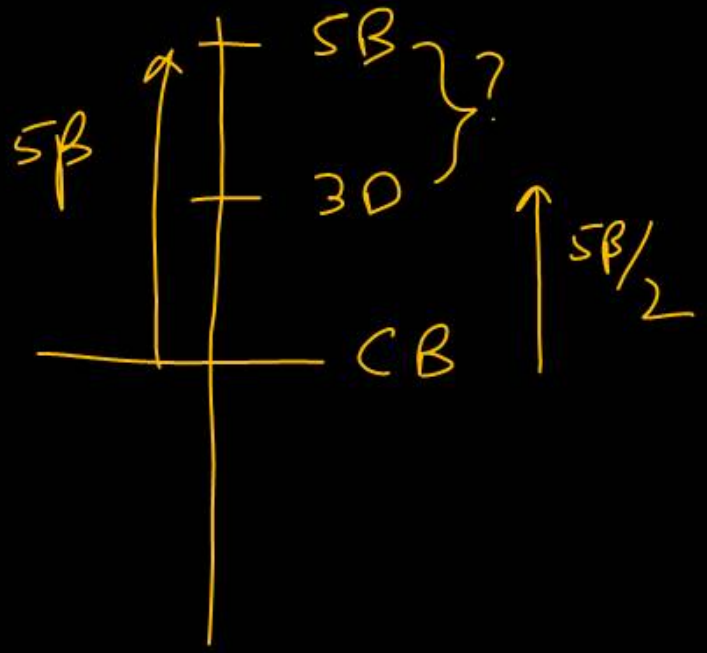
Light of wavelength 6.5×10^{-7} m is made incident on two slits 1 mm aparts. The distance between third dark fringe and fifth bright fringe on a screen distant 1 m from the slits will be

(1) 0.325 mm

(2) 0.65 mm

(3) 1.625 mm

(4) 3.25 mm



$5\beta - 5\beta/2 = \frac{5\beta}{2}$

$= \frac{5}{2} \times \frac{\lambda D}{d}$

$\frac{5}{2} \frac{6.5 \times 10^{-7}}{10^{-3}}$

$\frac{5 \times 65}{2} \times 10^{-5} = 1.625\,mm$

Question no. 11

Two nuclei have their mass numbers in the ratio of 1 : 3. The ratio of their nuclear densities would be

(1) 1 : 3

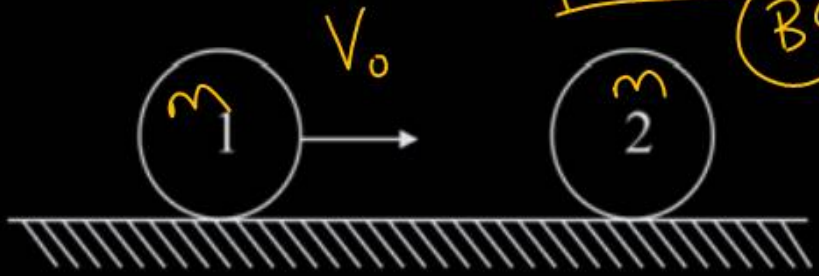
(2) 3 : 1

(3) $(3)^{1/3}$: 1

(4) 1 : 1

Question no. 12

Ball 1 collides with an another identical ball 2 at rest as shown in the figure. For what value of coefficient of restituion e, the velocity of second ball becomes two times that of first ball after collision?



(1) 1/2

(2) 0

(3) 3/1

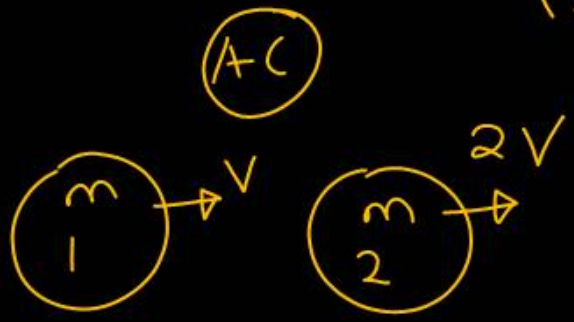
(4) 1/3

$e = \frac{2V - V}{V_0}$

$e = \frac{V}{V_0}$ — (1)

AC

BC



Mom. Cons: $mV_0 = mV + 2mV$

$mV_0 = 3mV$

$\frac{1}{3} = \frac{V}{V_0} = e$

4

Question no. 13

A planet in a distant solar system is 10 times of mass of the earth and its radius is 10 times smaller then the earth. Given that escape velocity from the earth is 11 km/s, the escape velocity from the surface of planet is

(1) 130 km/s (2) 160 km/s

(3) 110 km/s (4) 11 km/s

3

Planet → $10M_e$ $\frac{R_e}{10}$

$V_e \propto \sqrt{\frac{M_e}{R_e}}$

$V_p \propto \sqrt{\frac{M_p}{R_p}}$

$\frac{V_p}{V_e} = \sqrt{\frac{M_p}{R_p} \times \frac{R_e}{M_e}}$

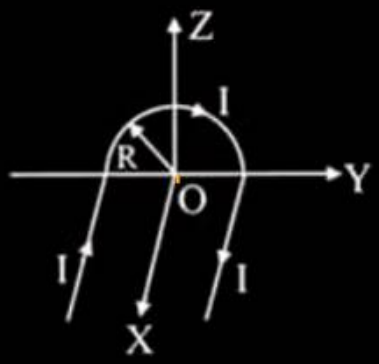
$\frac{V_p}{11} = \sqrt{\frac{10M_e \, R_e}{\frac{R_e}{10} \times M_e}}$

$\frac{V_p}{11} = \sqrt{100}$

$V_p = 110 \text{ Kps}$

Question no. 14

A wire carrying current I has the shape as shown in adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semicircular portion of radius R is lying in Y-Z plane. Magnetic field at point O is :



(1) $B=\frac{\mu_0}{4\pi}\frac{I}{R}\left(\hat{i}+2\hat{k}\right)$ (2) $B=\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i}+2\hat{k}\right)$

(3) $B=\frac{\mu_0}{4\pi}\frac{I}{R}\left(\pi\hat{i}-2\hat{k}\right)$ (4) $B=\frac{\mu_0}{4\pi}\frac{I}{R}\left(-\pi\hat{i}-2\hat{k}\right)$ 4

$$\vec{B_0}=\frac{\mu_0 I}{4\pi R}(-\hat{k})\times 2+\frac{\mu_0 I}{4R}(-\hat{i})$$

$$\vec{B_0}=\frac{\mu_0 I}{4R}\left(-\frac{2}{\pi}\hat{k}-\hat{i}\right)$$

$$\vec{B_0}=\frac{\mu_0 I}{4R}\frac{(-2\hat{k}-\pi\hat{i})}{\pi}$$

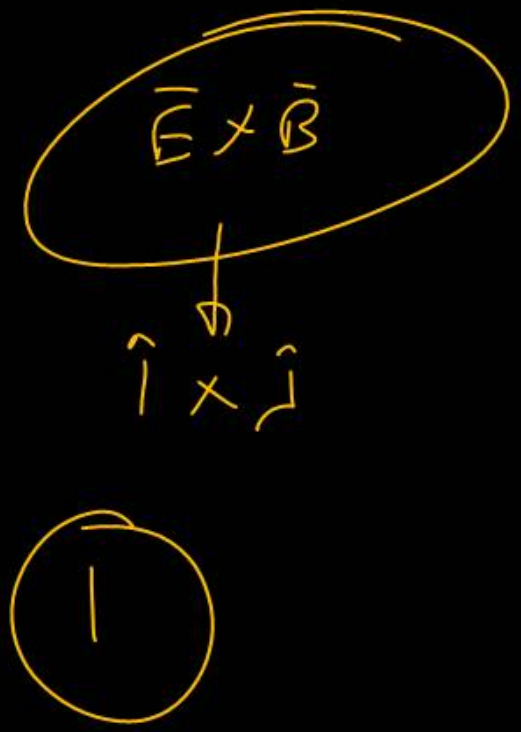
$$\vec{B_0}=\frac{\mu_0 I}{4\pi R}(-\pi\hat{i}-2\hat{k})$$

Question no. 15

The electric and the magnetic field, associated with an e.m. wave, propagating along the +z-axis, can be represented by :

(1) $\left[\vec{E} = E_0\hat{i}, \vec{B} = B_0\hat{j}\right]$ (2) $\left[\vec{E} = E_0\hat{k}, \vec{B} = B_0\hat{j}\right]$

(3) $\left[\vec{E} = E_0\hat{j}, \vec{B} = B_0\hat{i}\right]$ (4) $\left[\vec{E} = E_0\hat{j}, \vec{B} = B_0\hat{k}\right]$



Question no. 16

The magnetic field $(d\vec{B})$ due to a small element $(d\vec{\ell})$

at a distance $(\vec{r})$ and element carrying current is

(1) $d\vec{B} = \frac{\mu_0}{4\pi} i \left(\frac{d\vec{\ell} \times \vec{r}}{r} \right)$ (2) $d\vec{B} = \frac{\mu_0}{4\pi} i^2 \left(\frac{d\vec{\ell} \times \vec{r}}{r^2} \right)$

(3) $d\vec{B} = \frac{\mu_0}{4\pi} i^2 \left(\frac{d\vec{\ell} \times \vec{r}}{r} \right)$ (4) $d\vec{B} = \frac{\mu_0}{4\pi} i \left(\frac{d\vec{\ell} \times \vec{r}}{r^3} \right)$

$\vec{B} = \frac{\mu_0}{4\pi} \frac{I d\vec{\ell} \sin\theta}{r^2} \times \hat{r}$

$\vec{B} = \frac{\mu_0 I}{4\pi} \times \frac{d\vec{\ell} \times \hat{r}}{r^2}$

Question no. 17

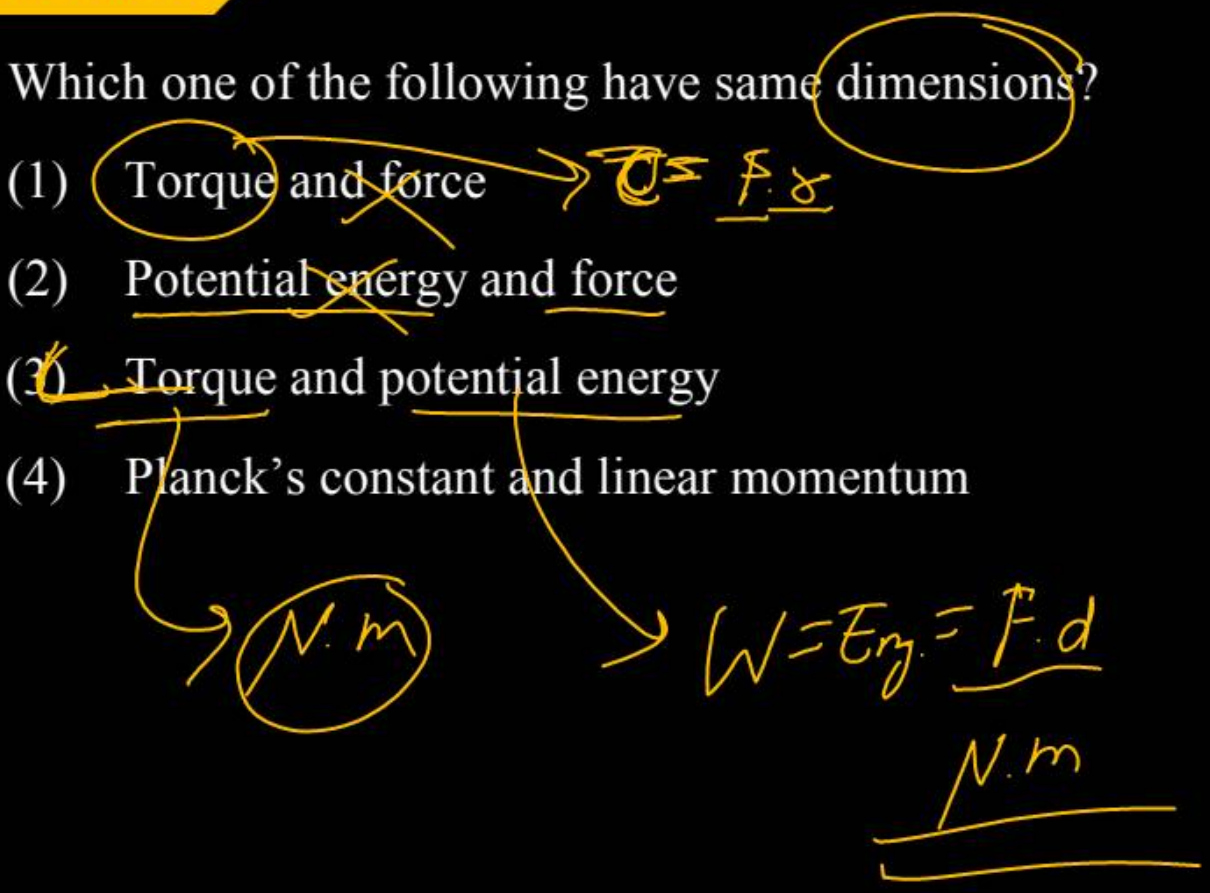
Which one of the following have same dimensions?

(1) Torque and force

(2) Potential energy and force

(3) Torque and potential energy

(4) Planck's constant and linear momentum



Question no. 18

A body starts from rest with an acceleration a_1. After two seconds another body B starts from rest with an acceleration a_2. If they travel equal distance in fifth second after the starts of A, the ratio $a_1 : a_2$ will be equal to :

(1) 9 : 5 (2) 5 : 7

(3) 5 : 9 (4) 7 : 9

A → 5 sec

B → 3 sec

$S_{A(5)} = S_{B(3)}$

$0 + \frac{a_1}{2}(9) = 0 + \frac{a_2}{2}(5)$

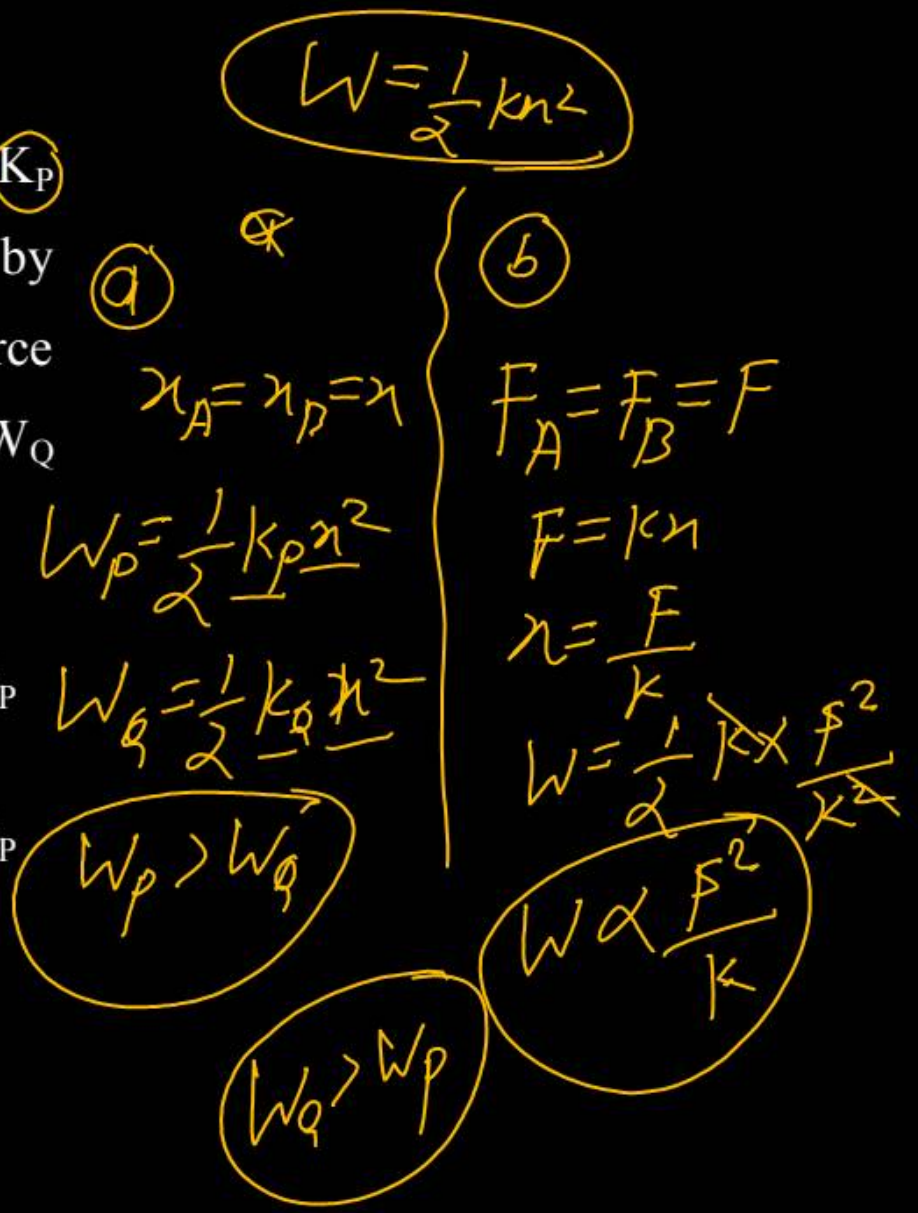
$\frac{a_1}{a_2} = \frac{5}{9}$

Question no. 19

Two similar springs P and Q have spring constants K_P and K_Q, such that $K_P > K_Q$. They are stretched first by the same amount (case a), then by the same force (case b). The work done by the springs W_P and W_Q are related as, in case (a) and case (b) respectively :

(1) $W_P > W_Q$; $W_Q > W_P$ (2) $W_P < W_Q$; $W_Q < W_P$

(3) $W_P = W_Q$; $W_Q > W_P$ (4) $W_P = W_Q$; $W_Q = W_P$



Question no. 20

$I = \frac{2}{5} MR^2$

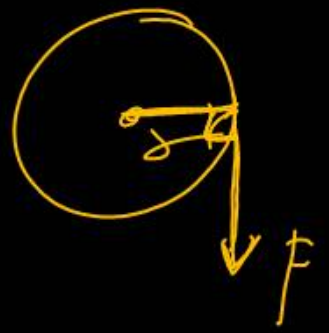
A hollow sphere of mass 1 kg and radius 10 cm is free to rotate about its diameter. If a force of 30N is applied tangentially to it, its acceleration is (in rad/s^2)

(1) 5000

(2) ~~450~~

(3) 50

(4) 5



$\tau = I\alpha = F \times r$

$\Rightarrow \frac{2}{3} \times 1 \times 10^{6} \times 10^{-4} \times \alpha = 30 \times 10 \times 10^{-2}$

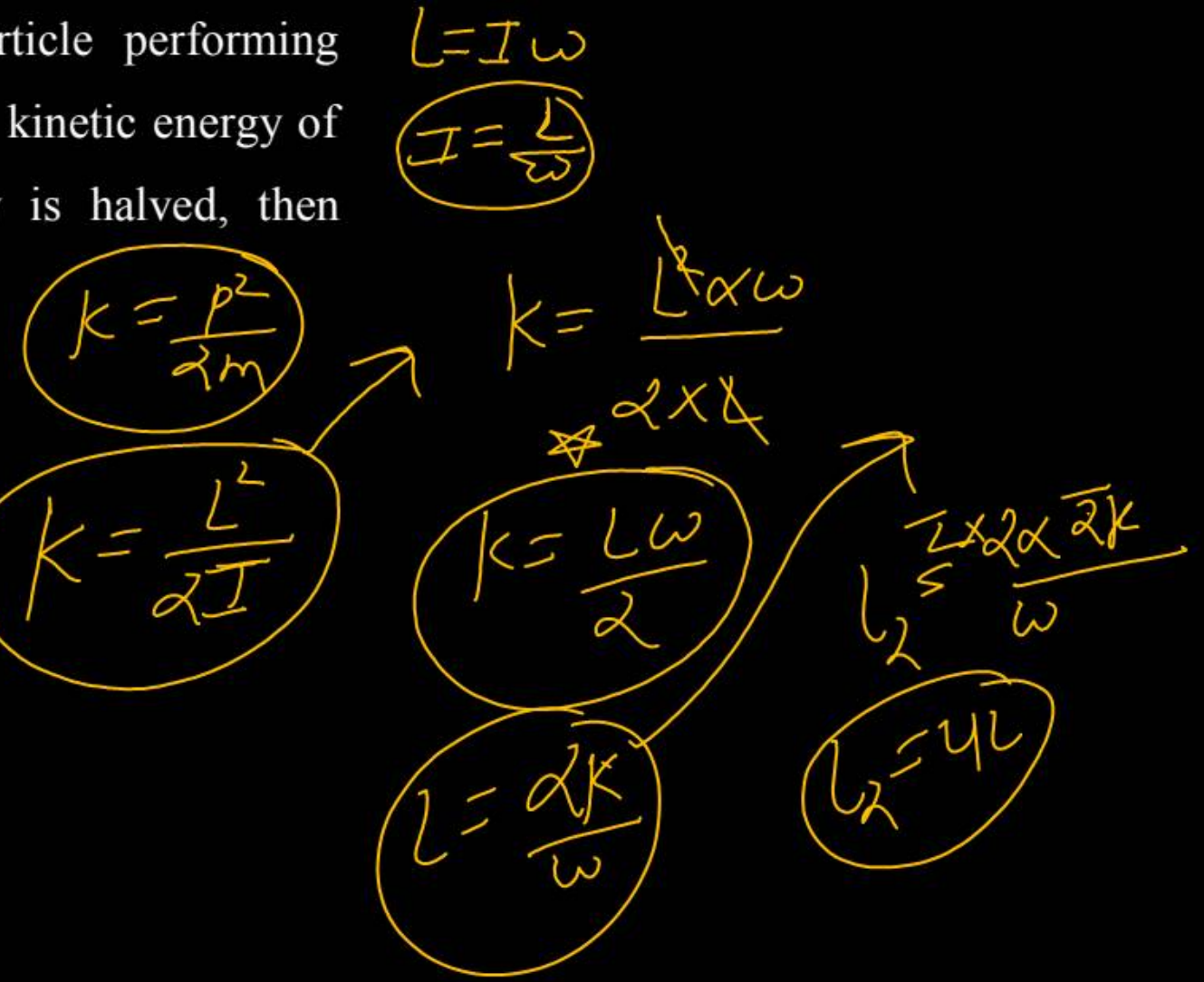
$\alpha = 450$

Question no. 21

The angular momentum of a particle performing uniform circular motion is L. If the kinetic energy of particle is doubled and frequency is halved, then angular momentum becomes.

(1) L/2 (2) 2L

(3) L/4 (4) 4L



Question no. 22

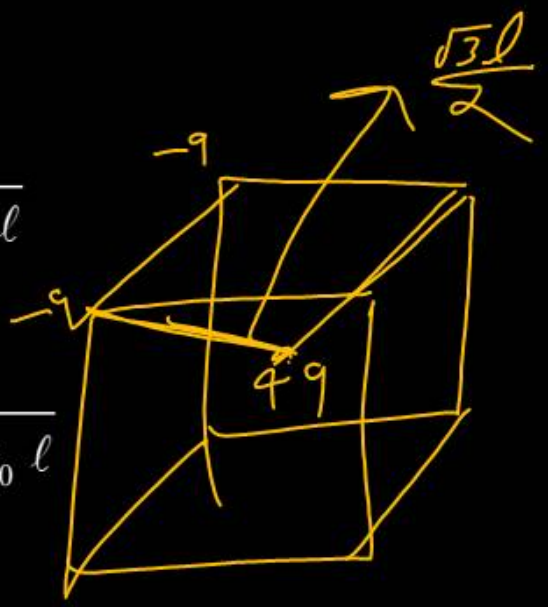
Each corner of a cube of side ℓ has a negative charge, –q. The electrostatic potential energy of a charge q at the centre of the cube is :

(1) $-\frac{4q^2}{\sqrt{2}\pi\epsilon_0\ell}$

(2) $\frac{\sqrt{3}q^2}{4\pi\epsilon_0\ell}$

(3) $\frac{4q^2}{\sqrt{2}\pi\epsilon_0\ell}$

(4) $\frac{4q^2}{\sqrt{3}\pi\epsilon_0\ell}$



$U_1 = 8 \times \frac{1}{4\pi\epsilon_0} \times \frac{kq^2 \times 2}{\sqrt{3}\ell}$

$= \frac{4}{\sqrt{3}} \frac{q^2}{\pi\epsilon_0 \ell}$

Question no. 23

n resistors, each of r ohm, when connected in parallel give an equivalent resistance of R ohm. If these resistances were connected in series, the combination would have a resistance in ohms, equal to

(1) nR

(2) n^2R

(3) R/n^2

(4) R/n

$R = \frac{r}{n} \rightarrow r = Rn$

$R_2 = nr$

$= Rn^2$

Question no. 24

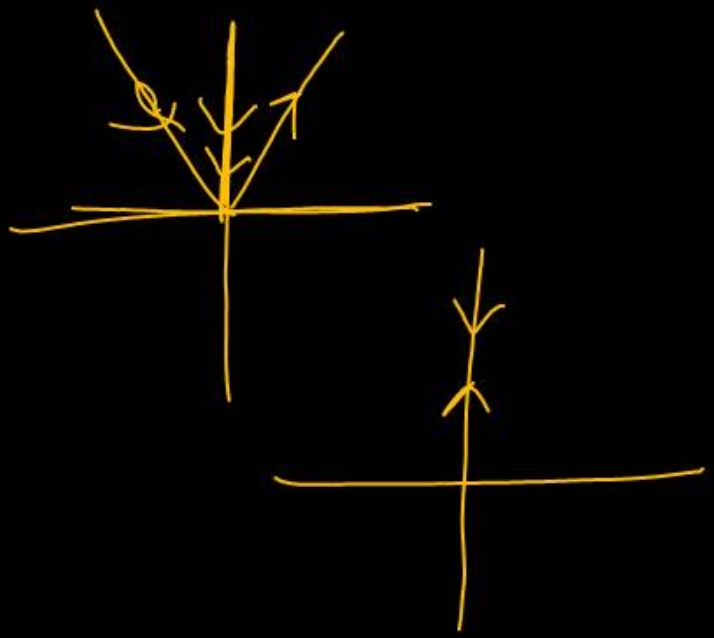
A radiation of energy 'E' falls normally on a perfectly reflecting surface. The momentum transferred to the surface is (C = Velocity of light)

(1) $\frac{2E}{C}$

(2) $\frac{2E}{C^2}$

(3) $\frac{E}{C^2}$

(4) $\frac{E}{C}$



Question no. 25

The instantaneous values of alternating current and voltages in a circuit are given as :

$i = \frac{1}{\sqrt{2}} \sin(100\pi t)$ ampere

$e = \frac{1}{\sqrt{2}} \sin(100\pi t + \pi/3)$ volt

The average power in watts consumed in the circuit is

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

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

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

(4) $\frac{1}{8}$

Question no. 26

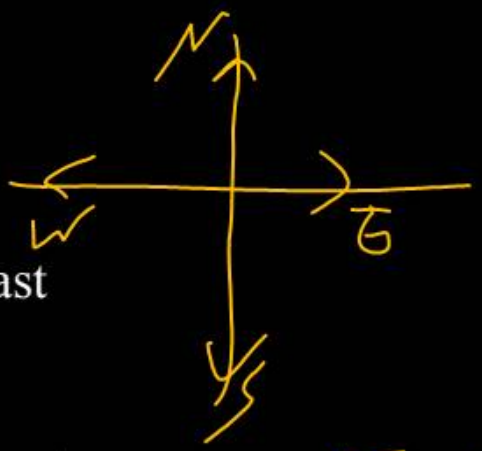
A particle is moving eastwards with a velocity of 5m s^{-1}. In 10 seconds the velocity changes to 5 m s^{-1} northwards. The average acceleration in this time is

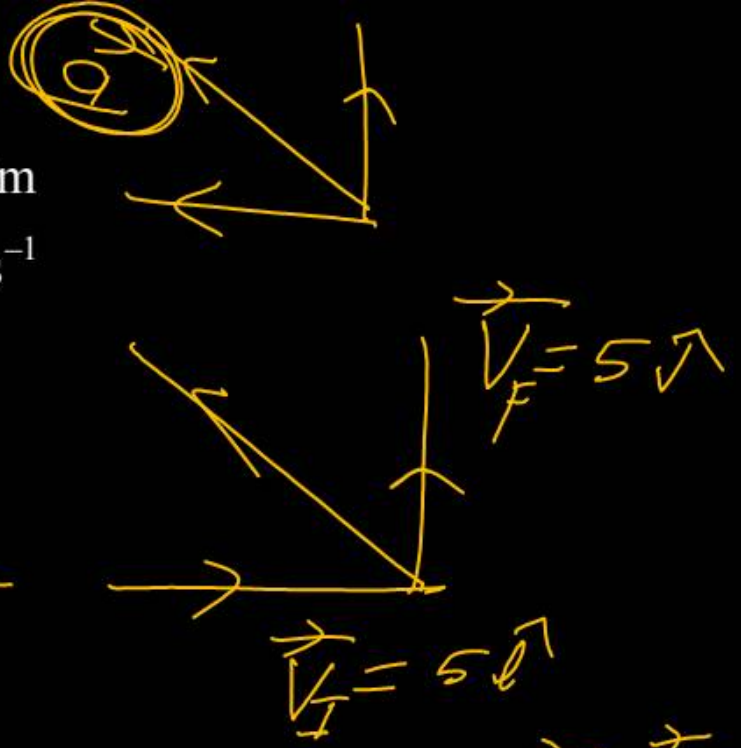
(1) $\frac{1}{2}ms^{-2}$ towards north

(2) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-east

(3) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-west

(4) zero





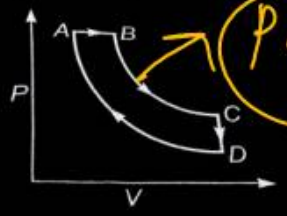
$\vec{a} = \frac{\Delta\vec{v}}{t}$ $\Delta\vec{v} = \vec{v}_f - \vec{v}_i$

$\vec{a} = \frac{1}{2}(5\hat{j} - 5\hat{i})$ $= 5\hat{j} - 5\hat{i}$

$|\vec{a}| = \frac{1}{\sqrt{2}}$

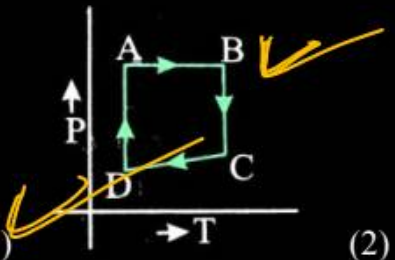
Question no. 27

An ideal gas is subjected to a cyclic process ABCD as depicted in the p-V diagram given below

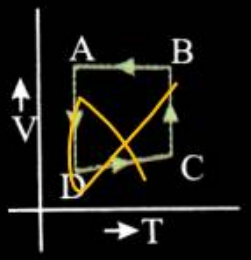


Which of the following curves represenets the equivalent cyclic process?

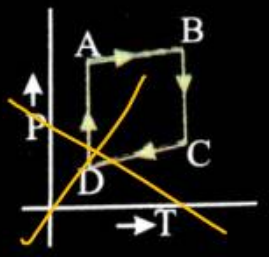
(1)



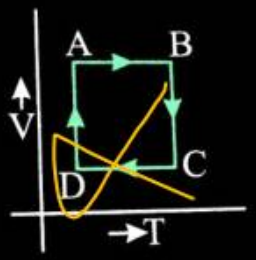
(2)

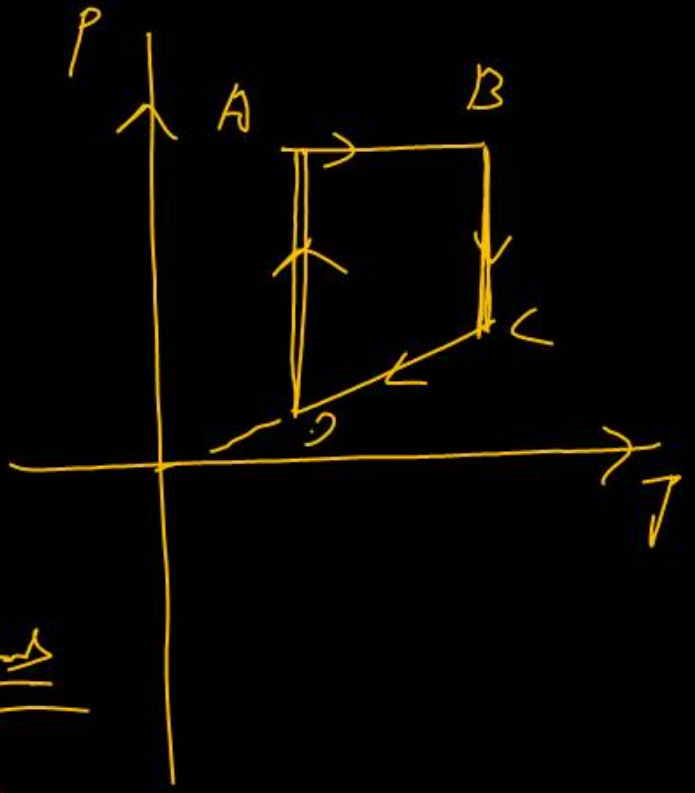


(3)



(4)





Question no. 28

The wave described by $y = 0.25 \sin(10\pi x - 2\pi t)$, where x and y are in meters and t in seconds, is a wave travelling along the :

(1) –ve x direction with frequency 1 Hz.

(2) +ve x direction with frequency π Hz and wavelength $\lambda = 0.2$ m.

(3) +ve x direction with frequency 1 Hz and wavelength $\lambda = 0.2$ m.

(4) –ve x direction with amplitude 0.25 m and wavelength $\lambda = 0.2$ m.

Question no. 29

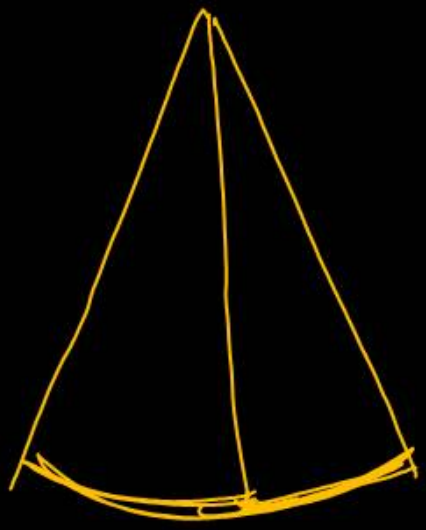
The average speed of the bob of a simple pendulum oscillating with a small amplitude A and time period T is

(1) $\frac{4A}{T}$

(2) $\frac{2\pi A}{T}$

(3) $\frac{4\pi A}{T}$

(4) 0



$\langle \text{speed} \rangle = \frac{\text{dist}}{T} = \frac{4A}{T}$

Question no. 30

A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position are V_1 and V_2, respectively. Its time period is

(1) $2\pi\sqrt{\dfrac{V_1^2+V_2^2}{x_1^2+x_2^2}}$

(2) $2\pi\sqrt{\dfrac{V_1^2-V_2^2}{x_1^2-x_2^2}}$

(3) $2\pi\sqrt{\dfrac{x_1^2+x_2^2}{V_1^2+V_2^2}}$

(4) $2\pi\sqrt{\dfrac{x_2^2-x_1^2}{V_1^2-V_2^2}}$

$\frac{1}{\omega^2}(V_1^2-V_2^2)=x_2^2-x_1^2$

$\frac{V_1^2}{\omega^2}=A^2-x_1^2$

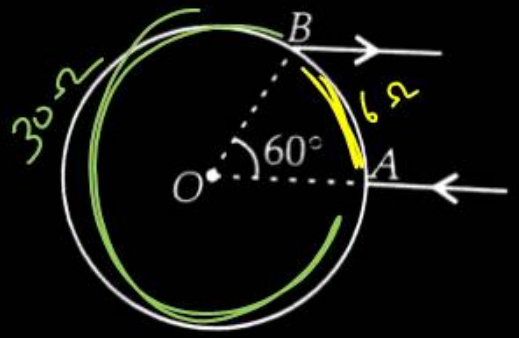
$\frac{V_2^2}{\omega^2}=A^2-x_2^2$

$V=\omega\sqrt{A^2-x^2}$

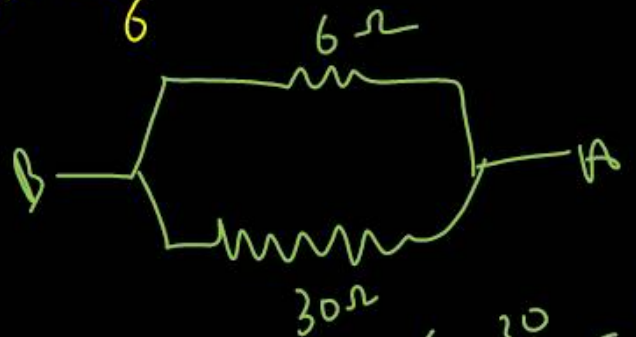
$\frac{V^2}{\omega^2}=A^2-x^2$

Question no. 31

A uniform wire of resistance 36 Ω is bent in the form of a circle. The effective resistance across the points A and B is



$\frac{1}{6}$ of total $= \frac{1}{6} \times 36 = 6\Omega$



$\frac{6 \times 30}{6+30} = \frac{6 \times 30}{36} = 5\Omega$

(1) 5Ω

(2) 15Ω

(3) 7.2Ω

(4) 30Ω

Question no. 32

The acceleration due to gravity at a height 1 km above the earth is the same as at a depth d below the surface of earth, then :

(1) $d = 1\text{km}$

(2) $d = \frac{3}{2}\text{km}$

(3) $d = 2\text{km}$

(4) $d = \frac{1}{2}\text{km}$

$g' = g\left(1 - \frac{2h}{R_e}\right)$

$g' = g\left(1 - \frac{d}{R_e}\right)$

$d = 2h$

$d = 2\text{km}$

Question no. 33

Two 220 volt, 100 watt bulbs are connected first in series and then in parallel. Each time the combination is connected to a 220 volt a.c. supply line. The power drawn by the combination in each case respectively will be :

(1) ✓ 50 watt, 200 watt (2) 50 watt, 100 watt

(3) 100 watt, 50 watt (4) 200 watt, 150 watt

$P = \frac{V^2}{R} \therefore R = \frac{220^2}{100} = 484\,\Omega$

$R_s = 484 + 484 = 968\,\Omega$

$\text{Power drawn} = \frac{V^2}{R_{eq}} = \frac{220 \times 220}{968} = 50\,W$

$P = \frac{V^2}{242} = \frac{220 \times 220}{242} = 200\,W$

Question no. 34

When a hydrogen atom is raised from the ground state to an excited state.

(1) P.E. decreases and K.E. increases

(2) P.E. increases and K.E. decreases

(3) both K.E. and P.E. decresae

(4) both K.E. and P.E. increases

$KE = \frac{kZe^2}{2r}$ $KE \propto \frac{1}{r}$

$TE = KE + PE \uparrow$

$\downarrow$

$PE = -\frac{kZe^2}{r}$

Question no. 35

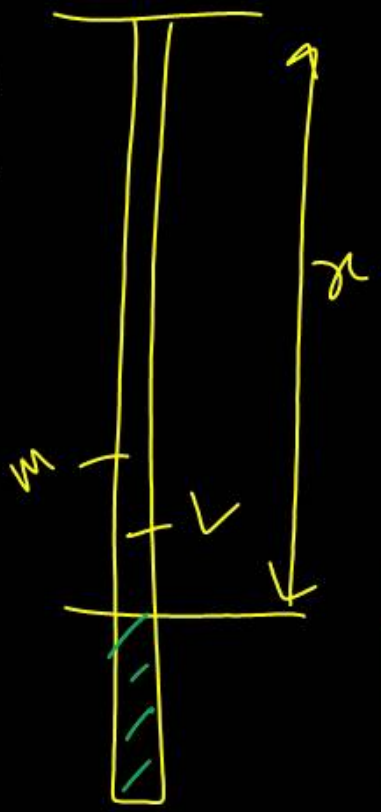
A rope of length L and mass M is hanging from a rigid support. The tension in the rope at a distance x from the rigid support is

(1) Mg

(2) $\left(\frac{L-x}{L}\right)Mg$

(3) $\left(\frac{L}{L-x}\right)Mg$

(4) $\frac{x}{L}Mg$



$\Sigma f_y = 0$

$T = m_{an} g$

$= \frac{M(L-x)}{L} \cdot g$

$m_{an} = \lambda \cdot \text{Length}$

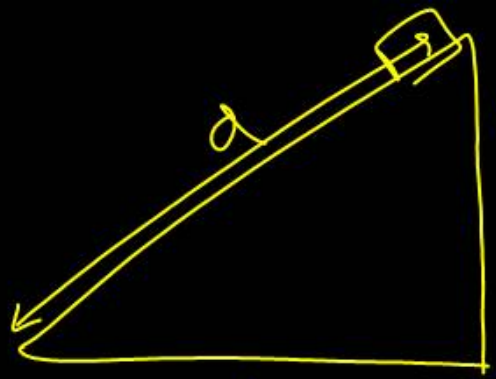
$= \frac{M}{L} \cdot (L-x)$

Question no. 36

A smooth block is released at rest on a 45° inclined and then slides a distances 'd'. The time taken to slide is 'n' times as much to slide on rough incline than on a smooth incline. The coefficient of friction is

(1) $\mu_k = \sqrt{1-\frac{1}{n^2}}$ (2) $\mu_k = 1-\frac{1}{n^2}$

(3) $\mu_s = \sqrt{1-\frac{1}{n^2}}$ (4) $\mu_s = 1-\frac{1}{n^2}$



$a_s = g\sin\theta$

$a_r = g\sin\theta - \mu g\cos\theta$

$S_1 = \frac{1}{2}a_1 t_1^2$

$S_2 = \frac{1}{2}a_2 t_2^2$

$a_1 \cdot t_1 = a_2 \cdot (n t_1)$

$a_1 = a_2 \cdot n^2$

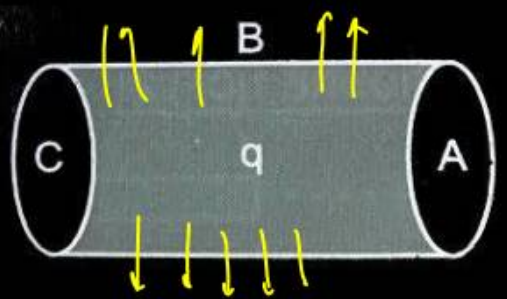
$\frac{a_2}{a_1} = \frac{1}{n^2} = \frac{g\sin\theta - \mu g\cos\theta}{g\sin\theta}$

$\frac{1}{n^2} = 1 - \mu \cot 45^\circ$

$\mu = 1 - \frac{1}{n^2}$

Question no. 37

A hollow cylinder has charge q with it. If ϕ is the electric flux in unit of Vm associated with the curved surface B, the flux linked with the plane surface A in unit of Vm will be :



(1) $\frac{q}{2\epsilon_0}$

(2) $\frac{q}{\epsilon_0}$

(3) $\frac{q}{\epsilon_0} - \phi$

(4) $\frac{1}{2}\left(\frac{q}{\epsilon_0} - \phi\right)$

$\phi_t = q/\epsilon_0$

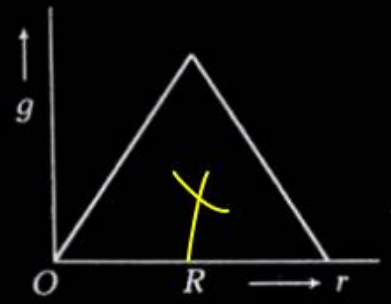
$\phi_A + \phi_B + \phi_L = q/\epsilon_0$

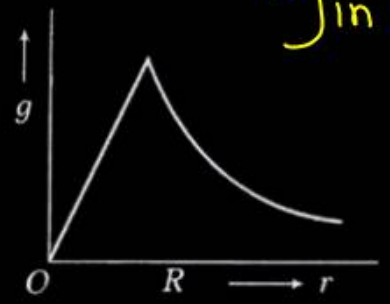
$2\phi_A = \frac{q}{\epsilon_0} - \phi_B$

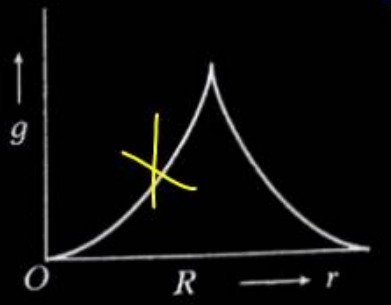
$\phi_A = \frac{\left(\frac{q}{\epsilon_0} - \phi\right)}{2}$

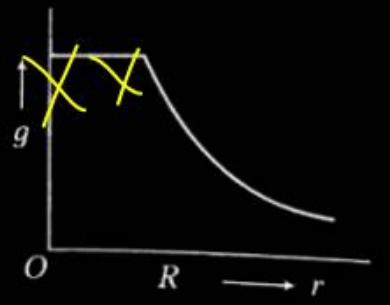
Question no. 38

Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by

(1) 

(2) 

(3) 

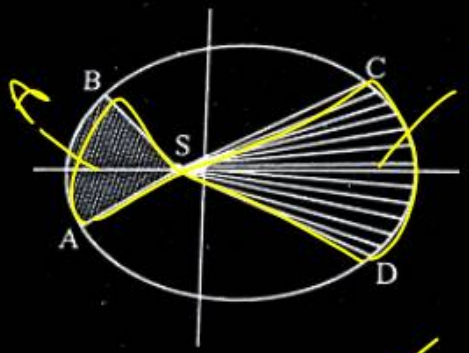
(4) 

$g_{in} = \frac{GM}{R_e^3} \cdot r$ $\quad g_{in} \propto r$

$g_{out} = \frac{GM}{r^2}$ $\quad g_{out} \propto \frac{1}{r^2}$

Question no. 39

The figure shows elliptical orbit of a planet m about the sun S. The shaded area SCD is twice the shaded area SAB. If t_1 is the time for the planet to move from C to D and t_2 is the time to move from A to B then –



$2A$

$\frac{dA}{dt} = \text{Const}$

$\frac{2A}{t_1} = \frac{A}{t_2}$

$t_1 = 2t_2$

(1) $t_1 = 4t_2$

(2) $t_1 = 2t_2$

(3) $t_1 = t_2$

(4) $t_1 > t_2$

Question no. 40

The co-ordinates 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) $\sqrt{\alpha^2+\beta^2}$

$x = \alpha t^3$

$y = \beta t^3$

$v_x = 3\alpha t^2$

$v_y = 3\beta t^2$

$v_{net} = \sqrt{v_x^2 + v_y^2}$

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

Question no. 41

Match the C_P / C_V ratio for ideal gases with different type of molecules :

	Column-I (Molecule type)		Column-II (C_P / C_V)
A.	Monoatomic	i.	7 / 5
B.	Diatomic rigid molecules	ii.	9 / 7
C.	Diatomic non-rigid molecules	iii.	4 / 3
D.	Triatomic rigid molecules	iv.	5 / 3

(1) A – IV, B – II, C – I, D – III

(2) A – III, B – IV, C – II, D – I

(3) A – IV, B – I, C – II, D – III

(4) A – II, B – III, C – I, D – IV

$\gamma = \frac{C_P}{C_V} = 1 + \frac{2}{f}$

mono = 3

$1 + \frac{2}{3} = 5/3$

diatom rigid = 5

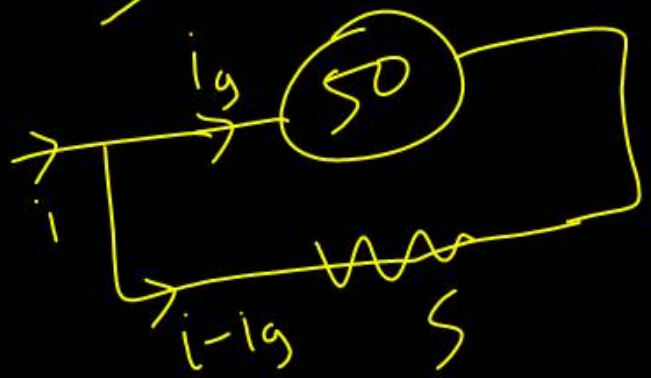
$1 + \frac{2}{5} = 7/5$

Question no. 42

The resistance of a galvanometer is 50 Ω and the maximum current which can be passed through it is 0.002 A. What resistance must be connected to it order to convert it into an ammeter of range 0-0.5 A?

(1) 0.5 Ω (2) 0.002 Ω

(3) 0.02 Ω (4) 0.2 Ω



$i_g \times 50 = (i - i_g) \cdot S$

$S = \frac{0.002 \times 50}{0.5 - 0.002} = \frac{2}{10} = 0.2$

Question no. 43

Lorentz force can be calculated by using the formula

(1) $\vec{F} = q\left(\vec{E} + \vec{V} \times \vec{B}\right)$

(2) $\vec{F} = q\left(\vec{E} - \vec{V} \times \vec{B}\right)$

(3) $\vec{F} = q\left(\vec{E} + \vec{V} \bullet \vec{B}\right)$

(4) $\vec{F} = q\left(\vec{E} \times \vec{V} + \vec{B}\right)$

Question no. 44

The equation of motion of a particle is $\frac{d^2y}{dt^2} + Ky = 0$,

where K is positive constant. The time period of the motion is given by

(1) $2\pi K$

(2) $2\pi K$

(3) $\frac{2\pi}{\sqrt{K}}$

(4) $2\pi\sqrt{K}$

$\frac{d^2y}{dt^2} + \omega^2 y = 0$

$\omega^2 = k$

$\omega = \sqrt{k}$

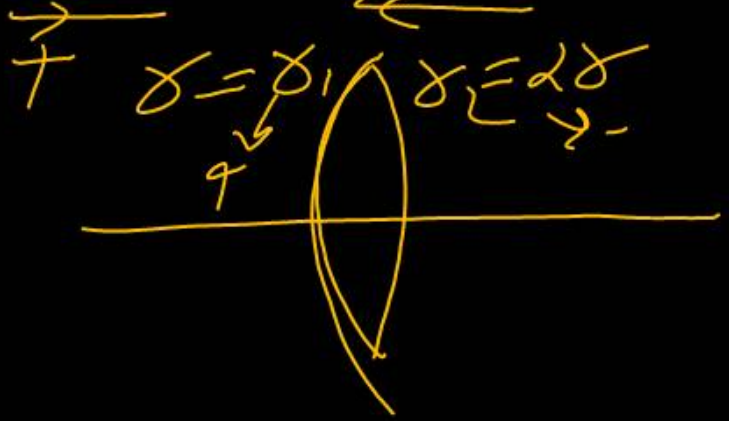
$T = \frac{2\pi}{\omega} = \frac{2\pi}{\sqrt{k}}$

Question no. 45

The focal length of a biconvex lens of refractive index 1.5 is 0.06 m. Radii of curvature are in the ratio 1 : 2. Then radii of curvature of two lens surfaces are

(1) 0.045 m, 0.09 m (2) 0.09m, 0.18 m

(3) 0.04 m, 0.08 m (4) 0.06 m, 0.12 m



$$\frac{1}{0.06} = (1.5-1)\left(\frac{1}{R} + \frac{1}{2R}\right)$$

$$\frac{1}{0.06} = \frac{1}{2} \times \frac{3}{2R}$$

$R \rightarrow ?$

Question no. 46

Solution A, B,C and D are respectively 0.1 M glucose, 0.05 M $NaCl$, 0.05 M $BaCl_2$ and 0.1 M $AlCl_3$. Which one of the following pairs is isotonic?

(1) A and B

(2) B and C

(3) A and D

(4) A and C

$C_{eff} = c \times i$

$A = 0.1 \times 1 = 0.1$

$B = 0.05 \times 2 = 0.1$

$C = 0.05 \times 3 = 0.15$

$D = 0.1 \times 4 = 0.4$

Question no. 47

The temperature at which 10% aqueous solution (*w*/V) of glucose exhibits the osmotic pressure of 16.4 atm is (R=0.082 dm^3 atm K^{-1} mol^{-1}).

(1) 200 K (2) 180 K

(3) 90 K (4) 360 K

$C = M = \frac{10 \times \%w/v}{M_B}$

$\pi = CRT$

$16.4 = \frac{10 \times 10}{180} \times 0.082 \times T$

$2 \quad 16.4 = \frac{8.2 \times T}{180}$

$T = 180 \times 2$

$T = 360\ K$

Question no. 48

If the E°_{Cell} for a given reaction has a negative value, then which of the following gives the correct relationship for the values of ΔG° and K_{eq}?

(1) $\Delta G^{\circ} > 0; K_{eq} < 1$ (2) $\Delta G^{\circ} > 0; K_{eq} > 1$

(3) $\Delta G^{\circ} < 0; K_{eq} > 1$ (4) $\Delta G^{\circ} < 0; K_{eq} < 1$

E°_{cell} = -ve

$$E^{\circ}_{cell} = \frac{2.303RT}{nF} \log K_{eq}$$

-ve

$K_{eq} < 1$

$$\Delta G^{\circ} = -nFE^{\circ}_{cell} = +ve$$

-ve

$\Delta G^{\circ} > 0$

Question no. 49

Ag = 108

What will be the weight of silver deposited, if 96.5 A of current is passed into aqueous solution of $AgNO_3$ for 100 s ?

(1) 1.08 g

(2) 10.8 g

(3) 108 g

(4) 1080 g

$I = 96.5\ A$

Ag^+

$t = 100\ sec$

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

10.8 g

$$= \frac{108 \times 96.5 \times 100}{1 \times 965000}$$

(10)

Question no. 50

$\Lambda_m^\circ(NH_4OH)$ is equal to ……..

(1) $\Lambda_m^\circ(NH_4OH)+\Lambda_m^\circ(NH_4Cl)-\Lambda_m^\circ(HCl)$

(2) $\Lambda_m^\circ(NH_4Cl)+\Lambda_m^\circ(NaOH)-\Lambda_m^\circ(NaCl)$

(3) $\Lambda_m^\circ(NH_4Cl)+\Lambda_m^\circ(NaCl)-\Lambda_m^\circ(NaOH)$

(4) $\Lambda_m^\circ(NaOH)+\Lambda_m^\circ(NaCl)-\Lambda_m^\circ(NH_4Cl)$

$NH_4OH + NaCl \longrightarrow NH_4Cl + NaOH$

$\lambda_m^\circ\, NH_4OH + \lambda_m^\circ\, NaOH - \lambda_m^\circ\, NaCl$

Question no. 51

What is the activation energy (kJ/mol) for a reaction if its rate constant doubles when the temperature is raised from 300 K to 400 K?

($R=8.314\ Jmol^{-1}\ K^{-1}$)

(1) 69.1

(2) 6.91

(3) 34.4

(4) 3.44

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

$$\log\frac{2}{1}=\frac{E_a}{2.303\times 8.314}\left[\frac{400-300}{400\times 300}\right]$$

$$0.3010=\frac{E_a}{2.303\times 8.314}\left[\frac{100}{120000}\right]$$

$$E_a=\frac{0.3010\times 2.303\times 8.314\times 120000}{100}$$

$$E_a=0.3010\times 2.303\times 8.314\times 1.2$$

$$\boxed{E_a=6.91}$$

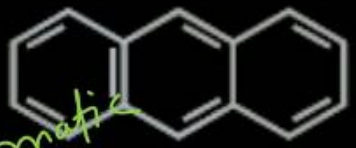
Question no. 52

Which one of the following compound is non-aromatic?

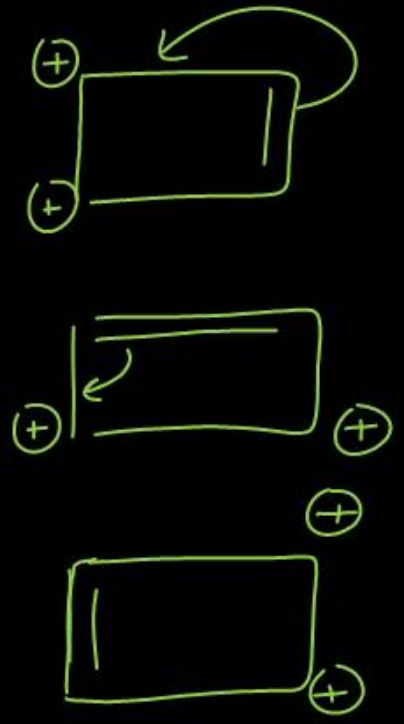
(1) 

(2) 

(3) 

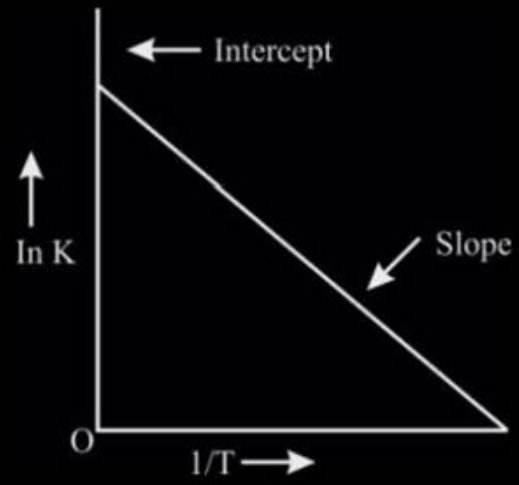
(4) 

2



Question no. 53

Consider the following plot between In k and 1/T,



In this plot, the intercept and slope respectively are

(1) $-\frac{E_a}{R}$; In A

(2) In A; $-\frac{E_a}{R}$;

(3) $\frac{E_a}{R}$; –In A

(4) $\frac{E_a}{R}$; ; A

$\ln k = \ln A + \left(-\frac{E_a}{RT}\right)$

$k = A e^{-E_a/RT}$

$\ln k = \ln A - \frac{E_a}{R} \times \frac{1}{T}$

$y = c - m x$

Question no. 54

Which is the correct thermal stability order for H_2E

(E = O, S, Se, Te and Po)?

(1) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$

(2) $H_2Po < H_2Te < H_2Se < H_2S < H_2O$

(3) $H_2Se < H_2Te < H_2Po < H_2O < H_2S$

(4) $H_2S < H_2O < H_2Se < H_2Te < H_2Po$

T.S. $\propto$ BE.

$BE \propto \frac{1}{size}$

size ↓ BE ↑ TS ↑

2

Question no. 55

$KMnO_4$ acts as an oxidizing agent in alkaline medium. When alk. $KMnO_4$ is treated with KI, iodide ion is oxidized to.

(1) I_2

(2) IO^-

(3) IO_3^-

(4) IO_4^-

$KMnO_4 + I^- \longrightarrow IO_3^- + MnO_2$

iodate

Question no. 56

The set of meta directing functional groups forms the following sets is

(1) – CN, –NH$_2$, –NHR, –OCH$_3$

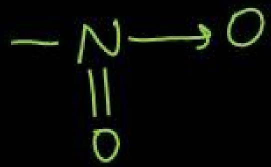
(2) –CN, –CHO, –NHCOCH$_3$, –COOR

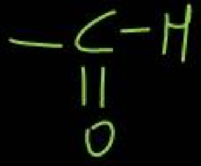
(3) –NO$_2$, –NH$_2$, –COOH, –COOR

(4) – NO$_2$, –CHO, –SO$_3$H, –COR

4

–M/–R





+M/+R ⇒ lp ⇒ o/p

–M/–R ⇒ EN atom ⇒ meta
= & ≡

Question no. 57

The complex that can show fac- and mer-isomers is:

(1) $[Pt(NH_3)_2Cl_2]$

(2) $[Co(NH_3)_3(NO_2)_3]$

(3) $[Co(NH_3)_4Cl_2]^+$

(4) $[CoCl_2(en)_2]$

Question no. 58

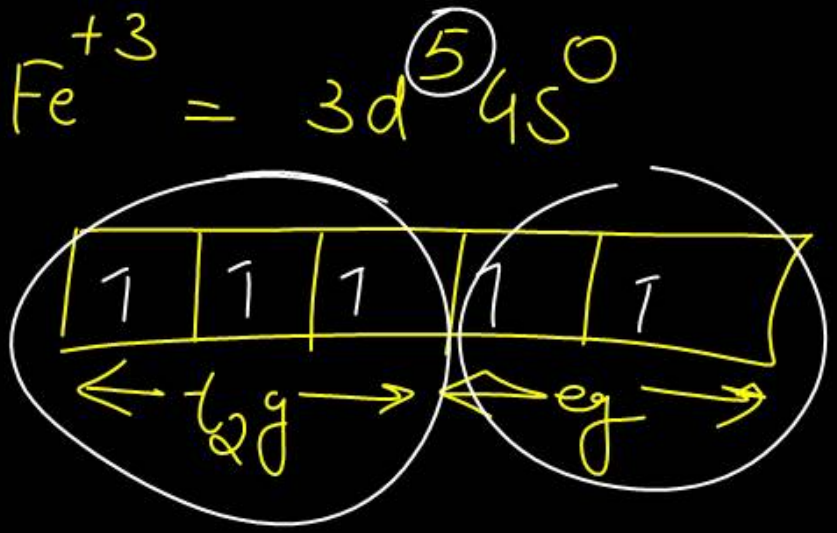
Which of the following complex ions has electrons that are symmetrically filled in both t_{2g} and e_g orbitals?

(1) $[FeF_6]^{3-}$

(2) $[Mn(CN)_6]^{4-}$

(3) $[CoF_6]^{3-}$

(4) $[Co(NH_3)_6]^{2+}$



Question no. 59

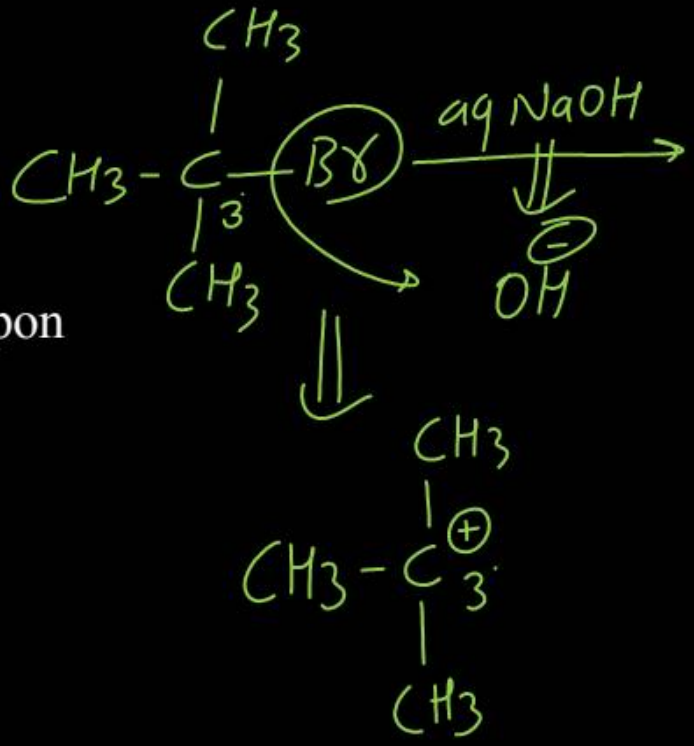
Reaction of tert-butyl bromide with aqueous sodium hydroxide follows

(1) S_N1 mechanism

(2) S_N2 mechanism

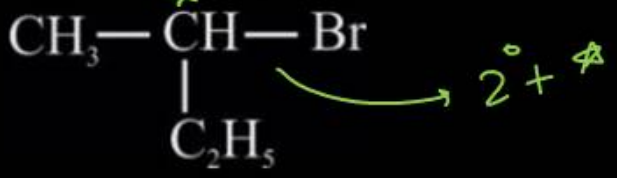
(3) Any of the above two depending upon temperature of reaction

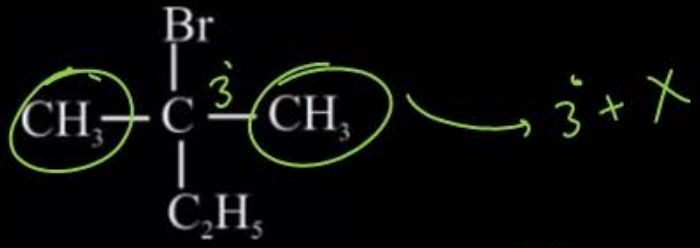
(4) E_1 mechanism



Question no. 60

Which of the following compounds will give racemic mixture on nucleophilic substitution by OH^- ion?

I. 

II. 

III. 

(1) Only I

(2) I, II and III

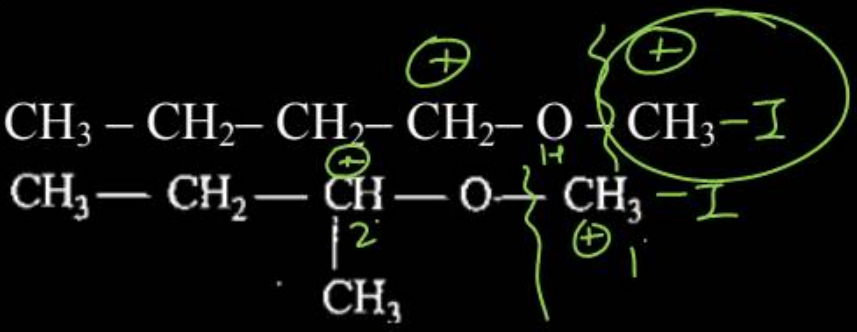
(3) II and III

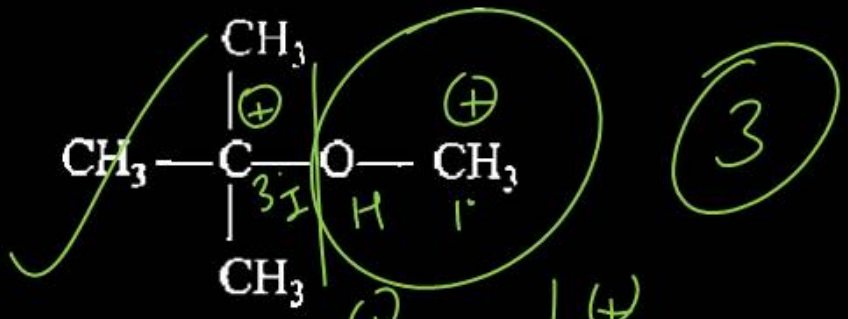
(4) I and III

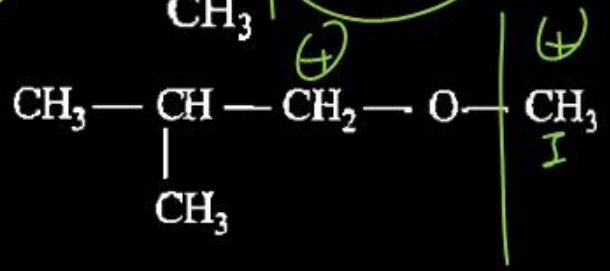
Question no. 61

Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HI?

(1) $CH_3 - CH_2 - CH_2 - CH_2 - O - CH_3$

(2) 

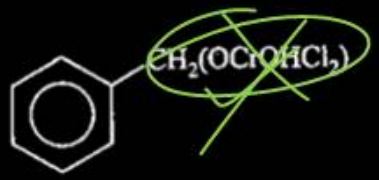
(3) 

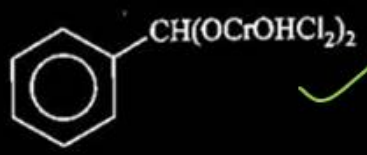
(4) 

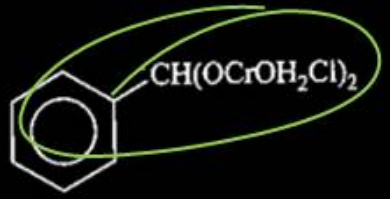
Question no. 62

Select the structure of chromium complex formed when toluene reacts with chromyl chloride to give benzaldehyde on hydrolysis.

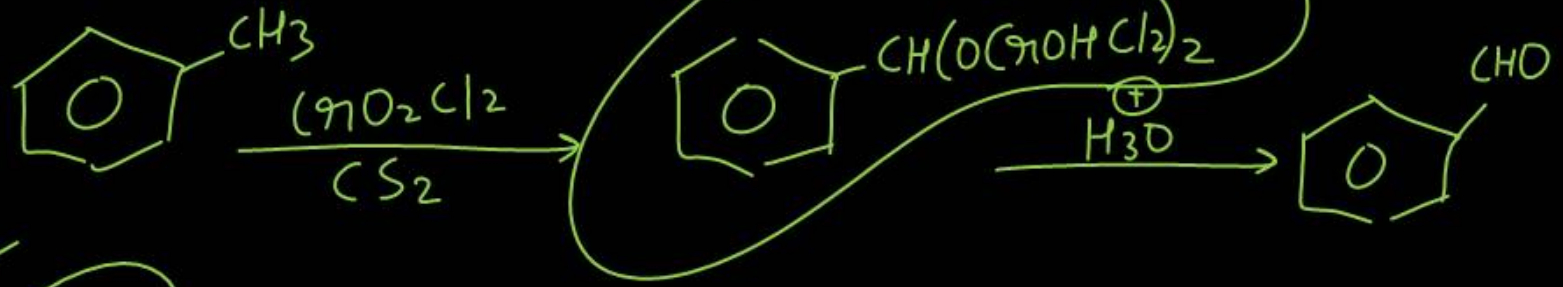
(1) 

(2) 

(3) 

(4) 

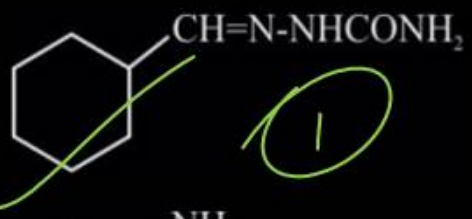
Etard Rxn.

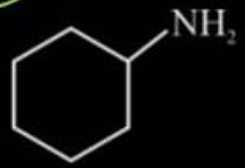


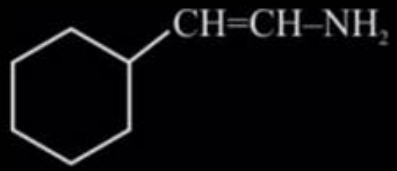
3

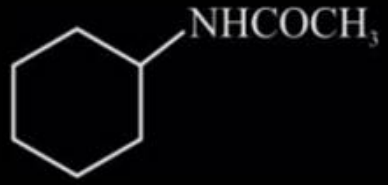
Question no. 63

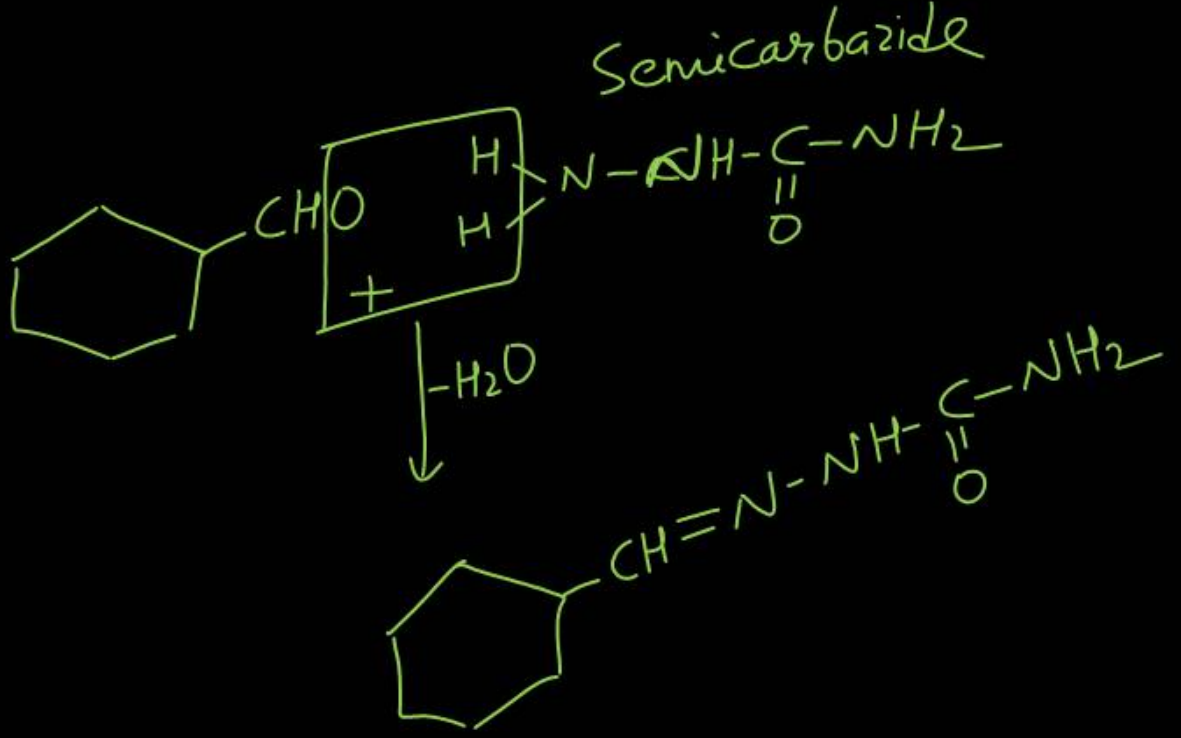
Predict the products formed when cyclhexane carbalodehyde reacts with semicarbazide and weak acid.

(1) 

(2) 

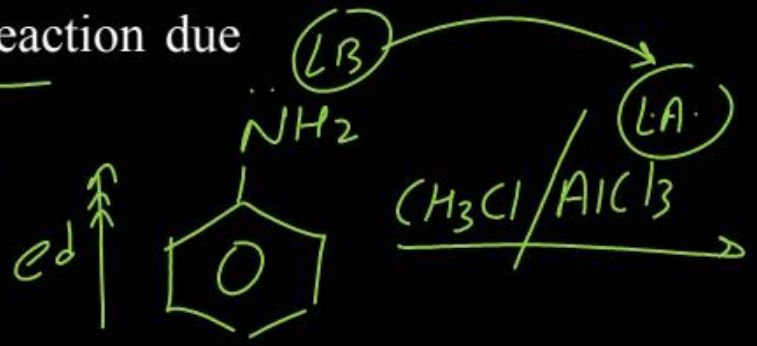
(3) 

(4) 



Question no. 64

Aniline does not undergo Friedel-Crafts reaction due to



(1) less reactivity of aniline

(2) salt formation with $AlCl_3$

(3) electron accepting effect of $-NH_2$ group present in aniline

(4) None of the above

Question no. 65

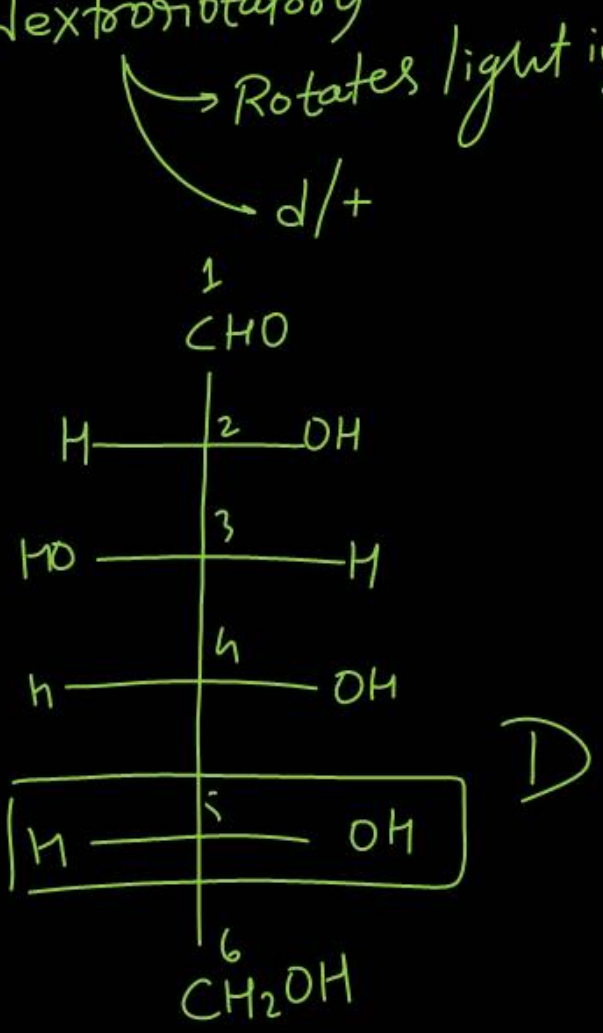
What does 'D' and (+) signifies in D-(+)- glucose?

(1) D represents conformation and (+) represents the laevorotatory nature of molecule

(2) D represents configuration and (+) represents the dextrorotatory nature of molecule.

(3) D represents conformation and (+) represents the dextrorotatory nature of molecule.

(4) D represents configuration and (+) represents the laevorotatory nature of molecule.



Question no. 66

Gadolinium has a low value of third ionization enthalpy because of

(1) high exchange enthalpy

(2) high electronegativity

(3) high basic character

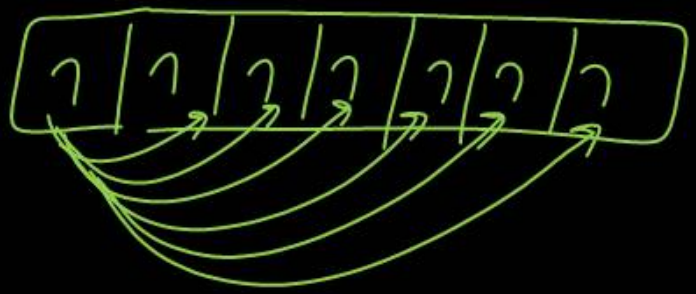
(4) small size

(1)

$Gd = [Xe]_{54} 6s^2 4f^7 5d^1$

$Z = 64$

$= [Xe]_{54} 6s^2 5d^1 4f^7$ (Half filled config.)



Question no. 67

What is the IUPAC name of the organic compound formed in the following chemical reaction?

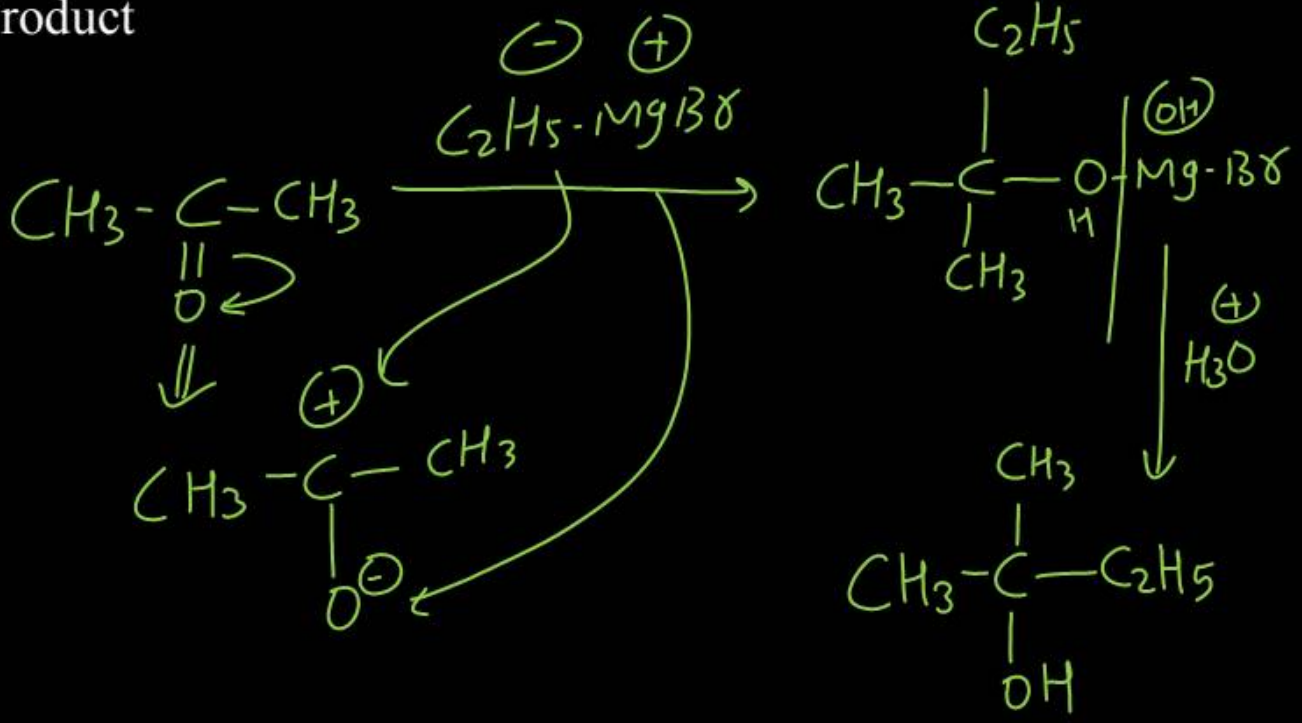
$$\text{Acetone} \xrightarrow[(ii)\,H_2O,\,H^+]{(i)\,C_2H_5MgBr,\ \text{Dry ether}} \text{Product}$$

(1) 2-methyl propan 2-ol

(2) pentan-2-ol

(3) pentan-3-ol

(4) 2-methyl butan-2-ol



Question no. 68

A solution is prepared by adding 2 g of "X" to 1 mole of water. Mass percent of "X" in the solution is

(1) 5%

(2) 10%

(3) 20%

(4) 2%

$W_x = 2\ gm$

$W_{H_2O} = 18\ gm$

$W_{soln} = 2 + 18 = 20\ gm$

$$\% X = \frac{W_{solute(x)}}{W_{soln}} \times 100$$

$$= \frac{2}{20} \times 100 = 10\%$$

Question no. 69

The shortest wavelength of H-atom in the Lyman series is λ_1. The longest wavelength in the Balmer series of He^+ is

(1) $\frac{9\lambda_1}{5}$

(2) $\frac{5\lambda_1}{9}$

(3) $\frac{27\lambda_1}{5}$

(4) $\frac{36\lambda_1}{5}$

$n_1 = 1 \quad n_2 = \infty$

$n_1 = 2 \quad n_2 = 3$

$$\frac{\frac{1}{\lambda_1}}{\frac{1}{\lambda_2}} = \frac{R \times 1^2\left(\frac{1}{1^2} - \frac{1}{\infty}\right)}{R \times 2^2\left(\frac{1}{2^2} - \frac{1}{3^2}\right)}$$

$$\frac{\lambda_2}{\lambda_1} = \frac{1}{4} \times \frac{1}{\frac{9-4}{4 \times 9}}$$

$$\frac{\lambda_2}{\lambda_1} = \frac{9}{5}$$

Question no. 70

Uncertainty in the position of an electron (mass $=9.1\times10^{-31}$ kg) moving with a velocity 300 ms^{-1} accurate upto 0.001% will be ($h=6.6\times10^{-34}$ J s)

(1) 19.2×10^{-2} m

(2) 5.76×10^{-2} m

(3) 1.92×10^{-2} m

(4) 3.84×10^{-2} m

Δx

v

$\Delta v = 300 \times \frac{10^{-3}}{100}$

$= 3 \times 10^{-3}$

$\Delta x \cdot \Delta v \geq 5.8 \times 10^{-5}$

$\geq \frac{5.8 \times 10^{-5}}{3 \times 10^{-3}}$

1.92×10^{-2}

Question no. 71

According to molecular orbital theory, the species among the following that does not exist is

(1) Be_2

(2) He_2^+

(3) O_2^{2-}

(4) He_2^-

Question no. 72

Which of the following hydrogen bonds is the strongest?

(1) O – H ----F

(2) O – H ----H

(3) F – H ----F

(4) O – H ----O

Question no. 73

If at 298 K the bond energies of C– H, C– C, C= C and H – H bonds are respectively 414, 347, 615 and 435 kJ mol^{-1}, the value of enthalpy change for the reaction,

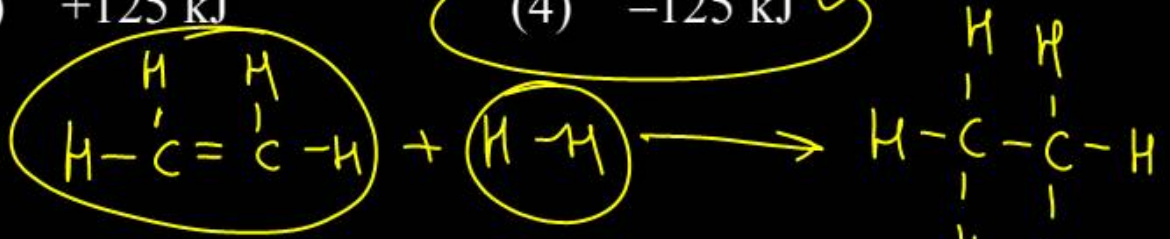
$H_2C = CH_{2(g)} + H_{2(g)} \rightarrow H_3C - CH_{3(g)}$ at 298 K will be

(1) +250 kJ (2) –250 kJ

(3) +125 kJ (4) –125 kJ

$\Delta H = [(414 \times 4) + 615 + 435] - [(414 \times 6) + 347]$

$\Delta H = -125$



$\Delta H = [(C-H) \times 4 + (C=C) + (H-H)] - [(C-H) \times 6 + (C-C)]$

Question no. 74

The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of 10 dm^3 to a volume of 100 dm^3 at 27°C

(1) 38.3 $J\ mol^{-1}\ K^{-1}$

(2) 35.8 $J\ mol^{-1}\ K^{-1}$

(3) 32.3 $J\ mol^{-1}\ K^{-1}$

(4) 42.3 $J\ mol^{-1}\ K^{-1}$

$n = 2$

$V_1 = 10L$

$V_2 = 100L$

$T = 300K$

$\Delta S^0 = 2.303\ n R \log \frac{V_2}{V_1}$

$= 2.3 \times 2 \times \frac{25}{3} \times \log \frac{100}{10}$

$= \frac{2.3 \times 50}{30} = \frac{115}{3}$

38

Question no. 75

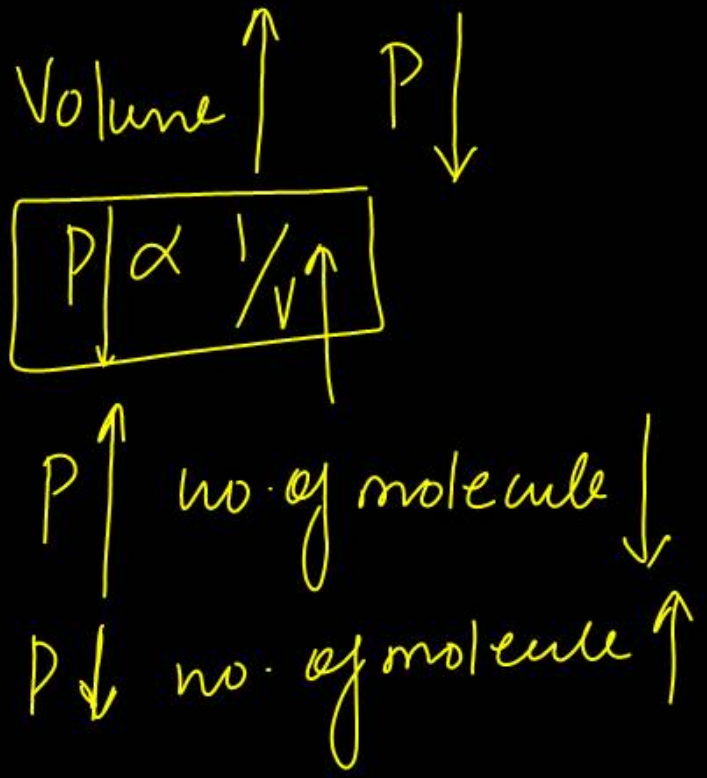
In which of the following reactions, an increase in the volume of the container will favour the formation of products?

(1) $2NO_{2(g)} \rightleftharpoons 2NO_{(g)} + O_{2(g)}$

(2) $3O_{2(g)} \rightleftharpoons 2O_{3(g)}$

(3) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

(4) $4NH_{3(g)} + 5O_{2(g)} \rightleftharpoons 4NO_{(g)} + 6H_2O(l)$



Question no. 76

8 mol of $AB_{3(g)}$ are introduced into a 1.0 dm^3 vessel. If it dissociates as $2AB_{3(g)} \rightleftharpoons A_{2(g)} + 3B_{2(g)}$. At equilibrium, 2 mol of A_2 are found to be present. The equilibrium constant of this reaction is

(1) 2

(2) 3

(3) 27

(4) 36

1 lit

$2AB_{3(g)} \rightleftharpoons A_{2(g)} + 3B_{2(g)}$

8 | 0 | 0

$8-2x$ | x | $3x$

$= 8-2\times2$ | $=2$ | $=3\times2$

$= 4$ | | 6

Conc $= 4/1 = 4$ | $= \frac{2}{1} = 2$ | $= \frac{6}{1} =$

$K_{eq} = \frac{[A_2][B_2]^3}{[AB_3]^2}$

$= \frac{2 \times 6^3}{4^2} = \frac{2\times6\times6\times6}{4\times4}$

$K_{eq} = 3\times3\times3 = 27$

Question no. 77

Hydrogen ion concentration in mol/L in a solution of pH = 5.4 will be

(1) 3.98×10^{8} (2) 3.88×10^{6}

(3) 3.68×10^{-6} (4) 3.98×10^{-6}

$pH = -\log[H^+]$

$pH = 5.4$

$[H^+] = 4 \times 10^{-6}$

$5+1 = 6$

$1-0.4 = 0.6$

Question no. 78

Which out of the following is a correct equation to show change in molar conductivity with respect to concentration for a weak electrolyte, if the symbols carry their usual meaning?

(1) $\wedge_m^2 C - K_a \wedge_m^{o2} + K_a \wedge_m \wedge_m^o = 0$

(2) $\wedge_m - \wedge_m^o - AC^{1/2} = 0$

(3) $\wedge_m - \wedge_m^o + AC^{1/2} = 0$

(4) $\wedge_m^2 C + K_a \wedge_m^{o2} - K_a \wedge_m \wedge_m^o = 0$

$$\Lambda_m = \Lambda_m^\circ - A\sqrt{C}$$

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

$$K_a = \frac{C(\Lambda_m)^2}{\Lambda_m^\circ(\Lambda_m^\circ - \Lambda_m)}$$

$$K_a(\Lambda_m^{\circ 2} - \Lambda_m\Lambda_m^\circ) = C\Lambda_m^2$$

$$C\Lambda_m^2 - K_a(\Lambda_m^\circ)^2 + K_a\Lambda_m\Lambda_m^\circ = 0$$

Question no. 79

The difference between electron gain enthalpies will be maximum between

(1) Na and Cl

(2) Ne and F

(3) Ar and Cl

(4) Ar and F

3

Na	−53 kJ/mol ΔH_{eg}
Cl	−350 kJ/mol
F	−330 kJ/mol
Ne	+116
Ar	+96

Cl = most −ve

Ne = more +ve

Na − Cl

−350 − (−53) = −350 + 53

= −300

Ne − F

−328 − (+116) = −444

Ar − Cl

−350 − (96) = −446

−330 + 96 = −426

−328 − 116 = −444

−349 − 96 = −445

Question no. 80

The IUPAC nomenclature of and element with electronic configuration $[Rn]5f^{14}\ 6d^{1}\ 7s^{2}$ is

(1) Unnilbium (2) Unnilunium

(3) Unnilquadium (4) Unniltrium

86
14
3
103

unniltrium

Question no. 81

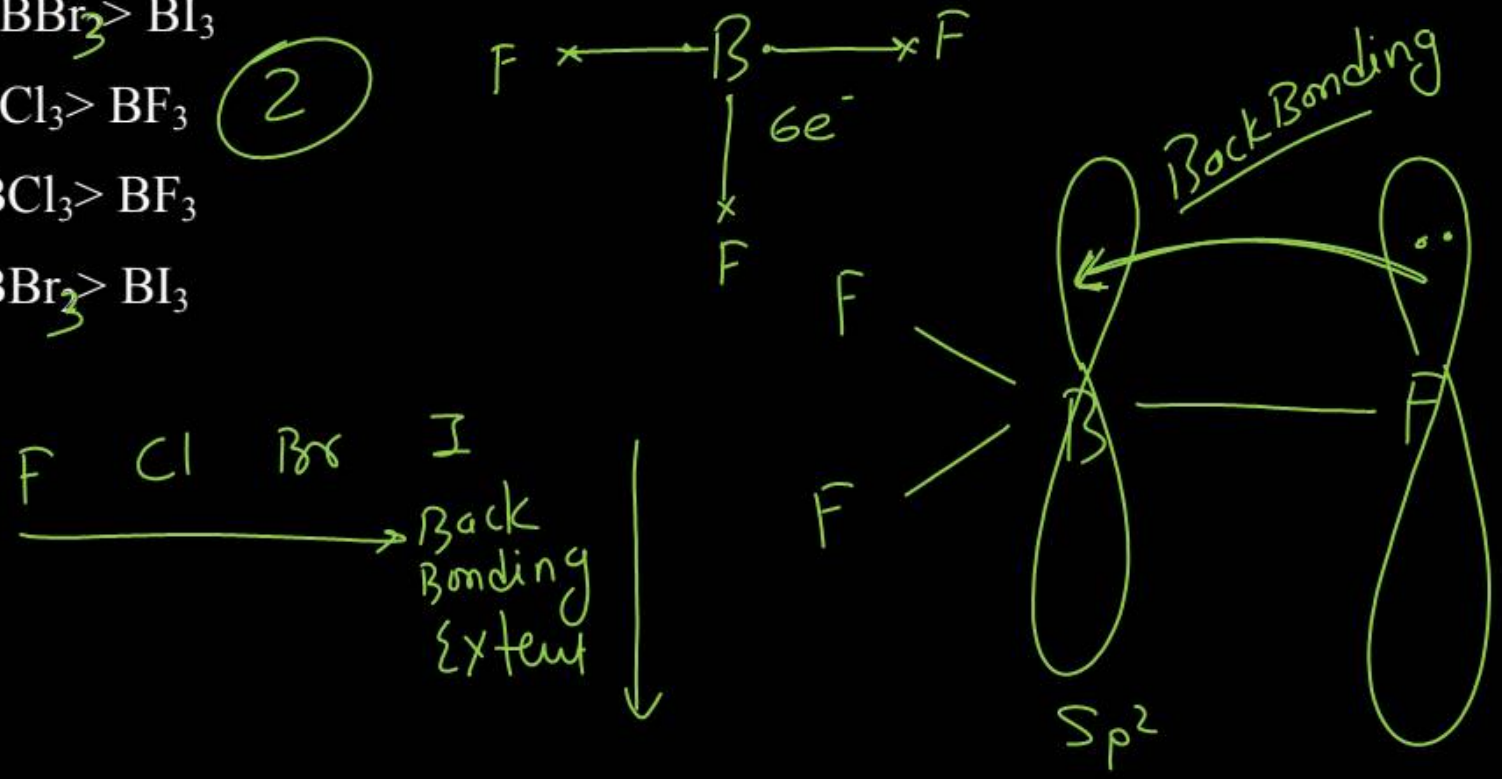
The Lewis acid character of boron tri halides follows the order

(1) $BCl_3 > BF_3 > BBr_3 > BI_3$

(2) $BI_3 > BBr_3 > BCl_3 > BF_3$

(3) $BBr_3 > BI_3 > BCl_3 > BF_3$

(4) $BF_3 > BCl_3 > BBr_3 > BI_3$



Question no. 82

Match List –I with List – II.

	List -I		List –II
A.	Cl, S	I.	Elements with highest electronegativity
B.	Ge, As	II.	Elements with largest atomic size
C.	Fr, Ra	III.	Elements which show properties of both metals and non-metals
D.	F, O	IV.	Elements with highest negative electron gain enthalpy

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

(2) A-III, B-II, C-I, D-IV

(3) A-II, B-I, C-IV, D-III

(4) A-II, B-III, C-IV, D-I

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

Si
Ge
Sb
As
Te
Po
At

Question no. 83

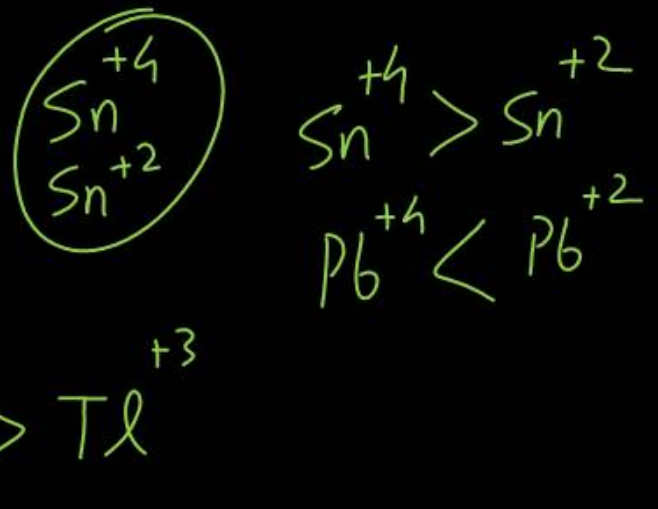
The number of ions from the following that are expected to behave as oxidizing agent is : Sn^{4+}, Sn^{2+}, Pb^{2+}, Tl^{3+}, Pb^{4+}, Tl^{+}

(1) 4

(2) 2

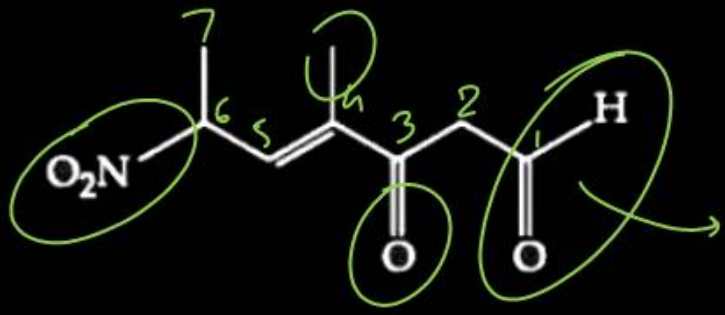
(3) 1

(4) 3



Question no. 84

The correct IUPAC name of the following compound is



(1) 4-methyl-2-nitro-5-oxohept-3-enal

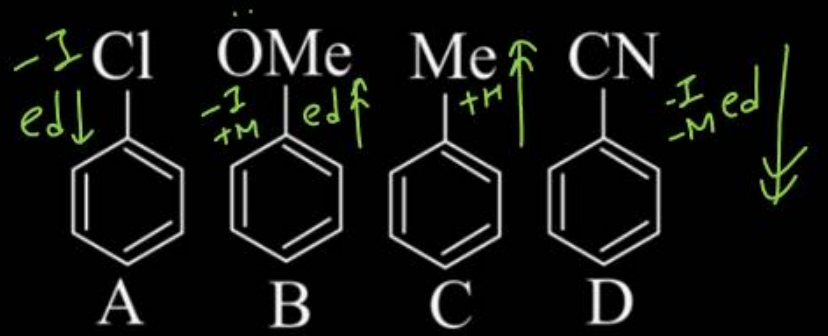
(2) 4-methyl-5-oxo-2-nitrohept-3-enal

(3) 4-methyl-6-nitro-3-oxohept-4-enal

(4) 6-formyl-4-methyl-2-nitrohex-3-enal

Question no. 85

The increasing order of reactivity of the following compounds towards aromatic electrophilic substitution reaction is



(1) D < B < A < C

(2) B < C < A < D

(3) A < B < C < D

(4) D < A < C < B

Question no. 86

Match List –I with List – II.

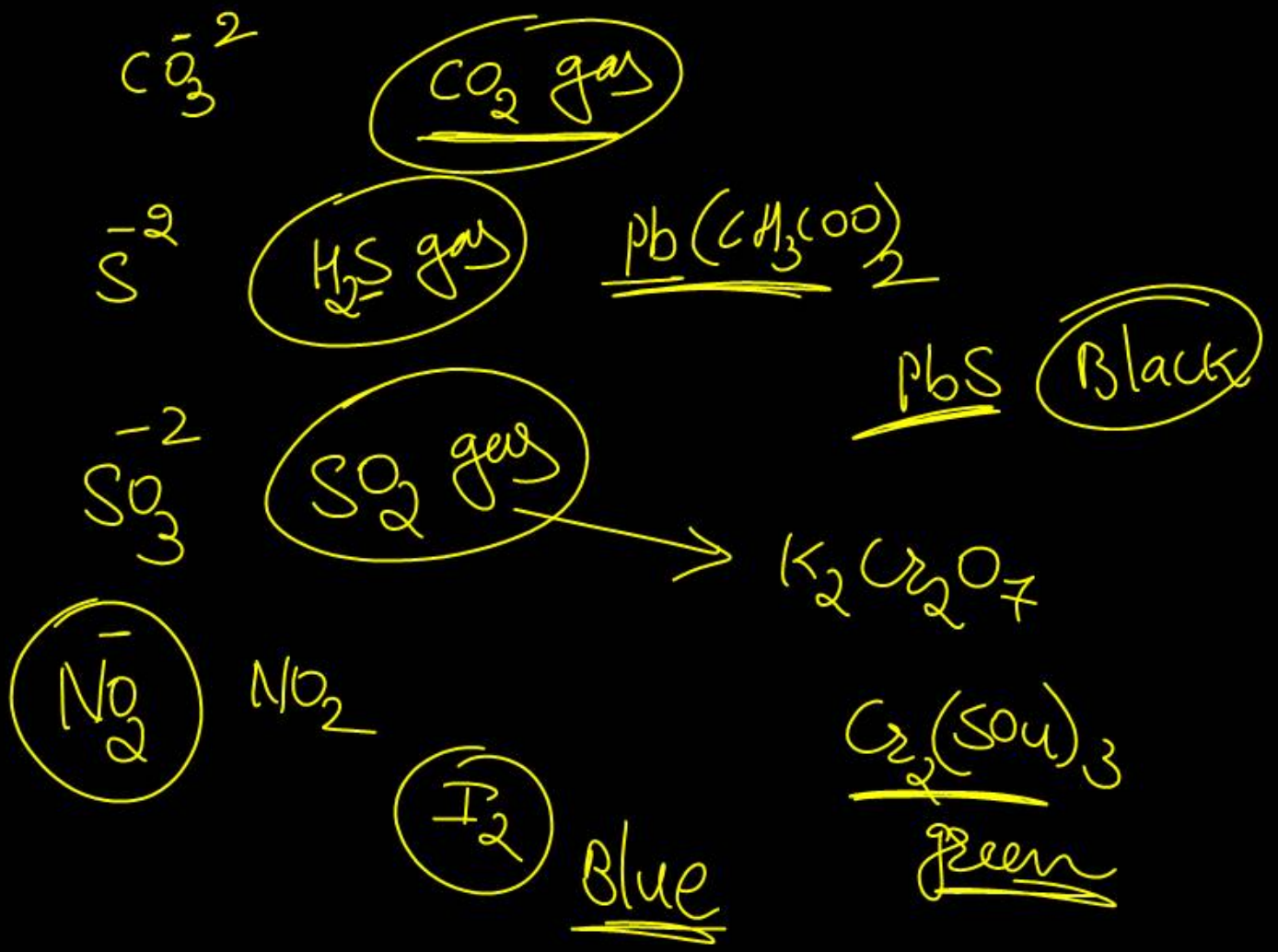
	List -I		List –II
A.	CO_3^{2-}	I.	Colourless gas which turns lead acetate paper black.
B.	S^{2-}	II.	Colourless gas which turns acidified potassium dichromate solution green.
C.	SO_3^{2-}	III.	Brown fumes which turns acidified KI solution containing starch blue.
D.	NO_2^-	IV.	Colourless gas evolved with brisk effervescence, which turns lime water milky.

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

(2) A-II, B-I, C-IV, D-III

(3) A-IV, B-I, C-III, D-II

(4) A-IV, B-I, C-II, D-III



Question no. 87

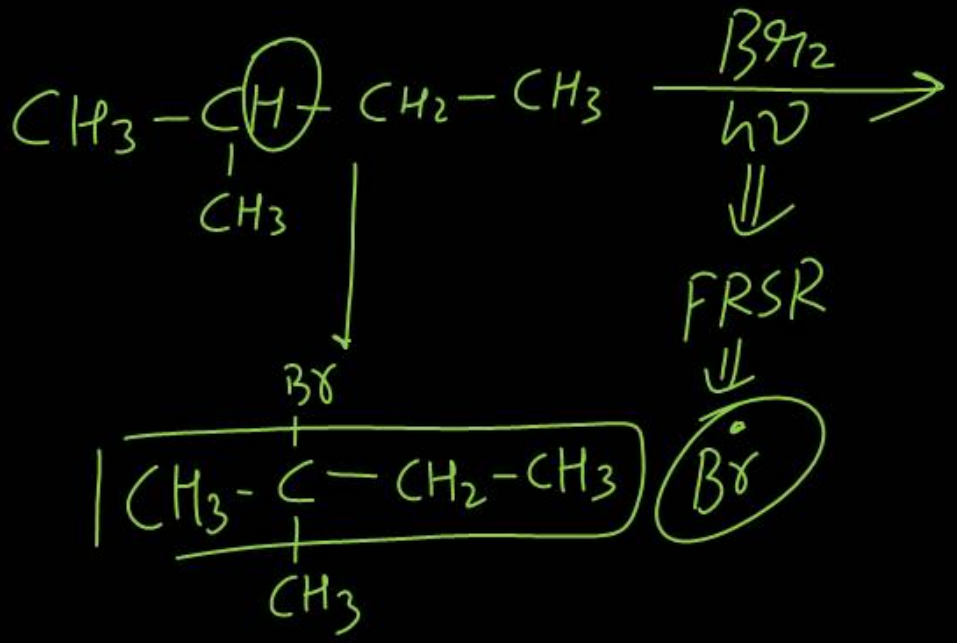
2-Methyl butane on reaction with bromine in the presence of sunlight given mainly

(1) 1-bromo-2-methylbutane

(2) 2-bromo-2-methylbutane

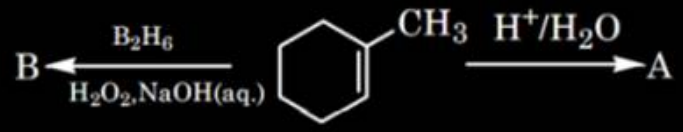
(3) 2-bromo-3-methylbutane

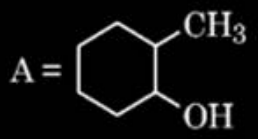
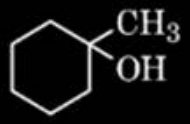
(4) 1-bromo-3-methylbutane

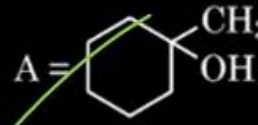
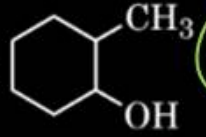


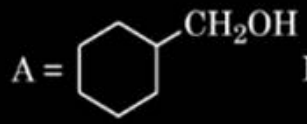
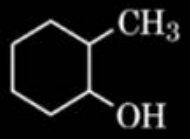
Question no. 88

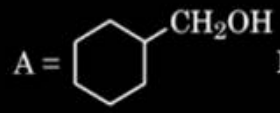
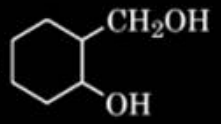
Products A and B formed in the following set of reactions are

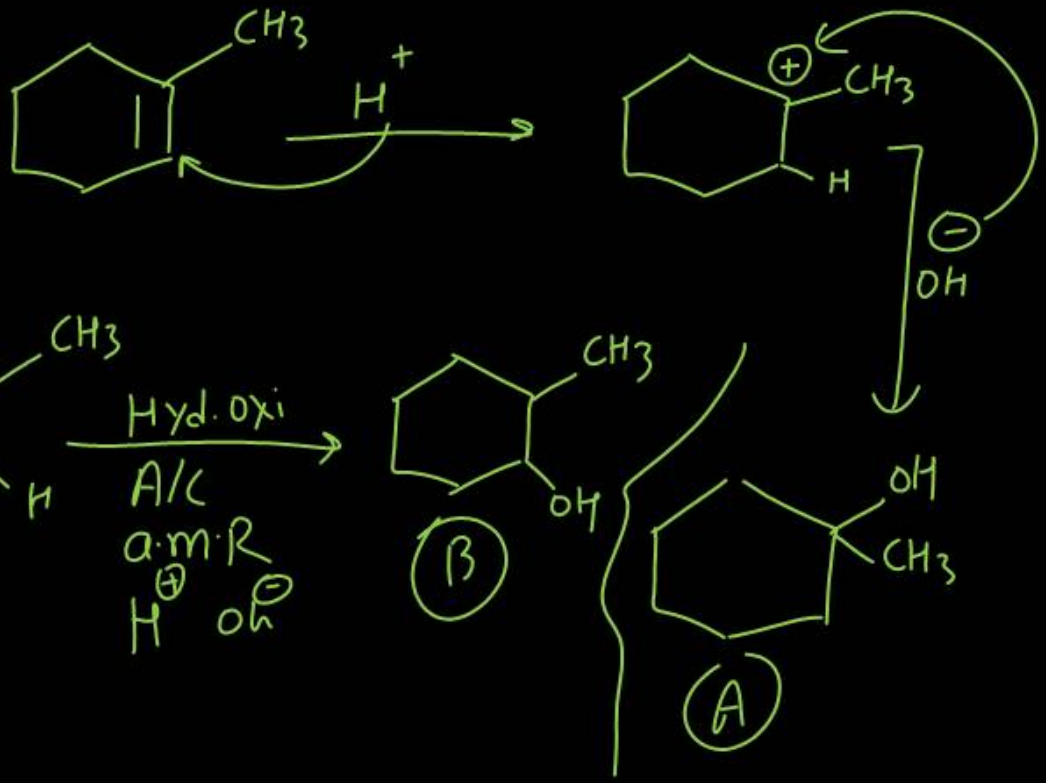


(1) A =  B = 

(2) A =  B = 

(3) A =  B = 

(4) A =  B = 



Question no. 89

Which one of the lanthanoids given below is the most stable in divalent form?

(1) Ce (Atomic No. 58)

(2) Sm (Atomic No. 62)

(3) Eu (Atomic No. 63)

(4) Yb (Atomic No. 70)

+2

$Ce^{+2} = 6s^2\ 5d^1\ 4f^1$

$Sm^{+2} = 6s^2\ 4f^6$

$Eu^{+2} = 6s^2\ 4f^7$ — half filled

$Yb^{+2} = 6s^2\ 4f^{14}$ — fully filled

Question no. 90

In collision theory of chemical reaction, Z_{AB} represent

(1) the fraction of molecules with energies equal to E_a.

(2) the fraction of molecules with energies greater than E_a.

(3) the collision frequency of reactants, A and B

(4) steric factor

Question no. 91

Endosperm is completely consumed by the developing embryo in

(1) pea and groundnut

(2) maize and castor

(3) castor and groundnut

(4) maize and pea

Question no. 92

Polyembryony commonly occurs in

(1) banana

(2) tomato

(3) potato

(4) citrus

4

Question no. 93

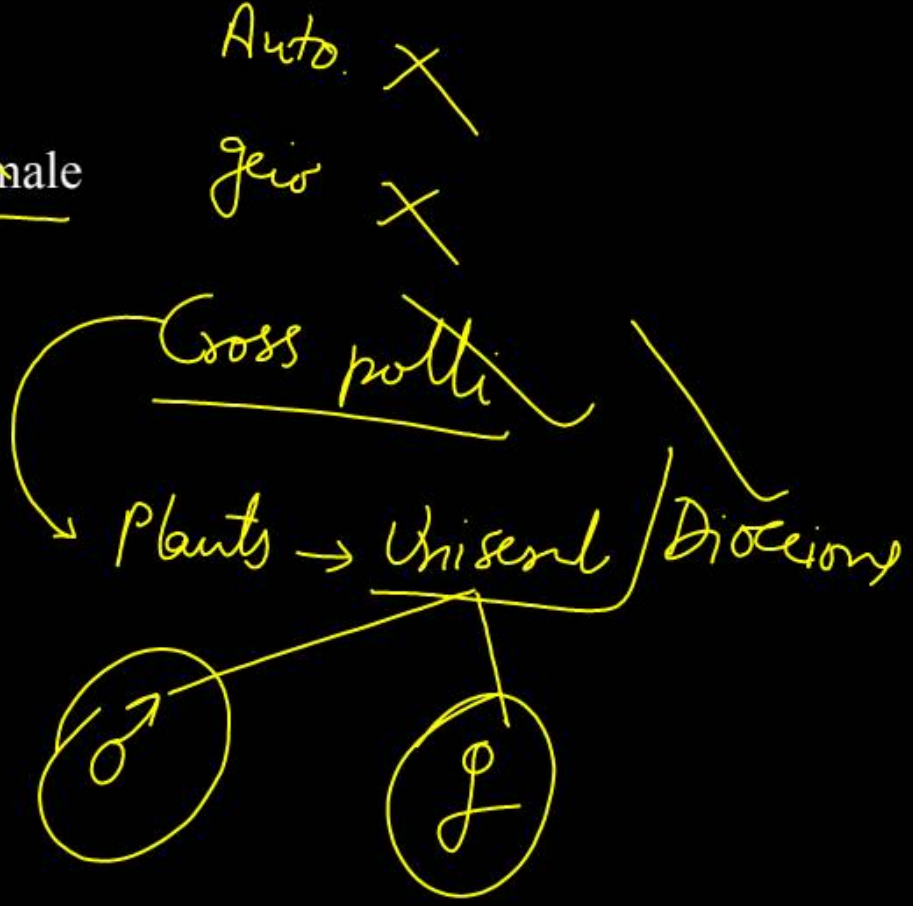
From among the situations given below, choose the one that prevent both autogamy and geitonogamy.

(1) Monoecious plant bearing unisexual flowers.

(2) Dioecious plant bearing only male or female flowers.

(3) Monoecious plant with bisexual flowers.

(4) Dioecious plant with bisexual flowers.



Question no. 94

Immediately after ovulation, the mammalian egg is covered by a membrane known as

(1) chorion

(2) zona pellucida

(3) corona radiata

(4) vitelline membrane

Primary-Follicle.

After ovulation

3

Question no. 95

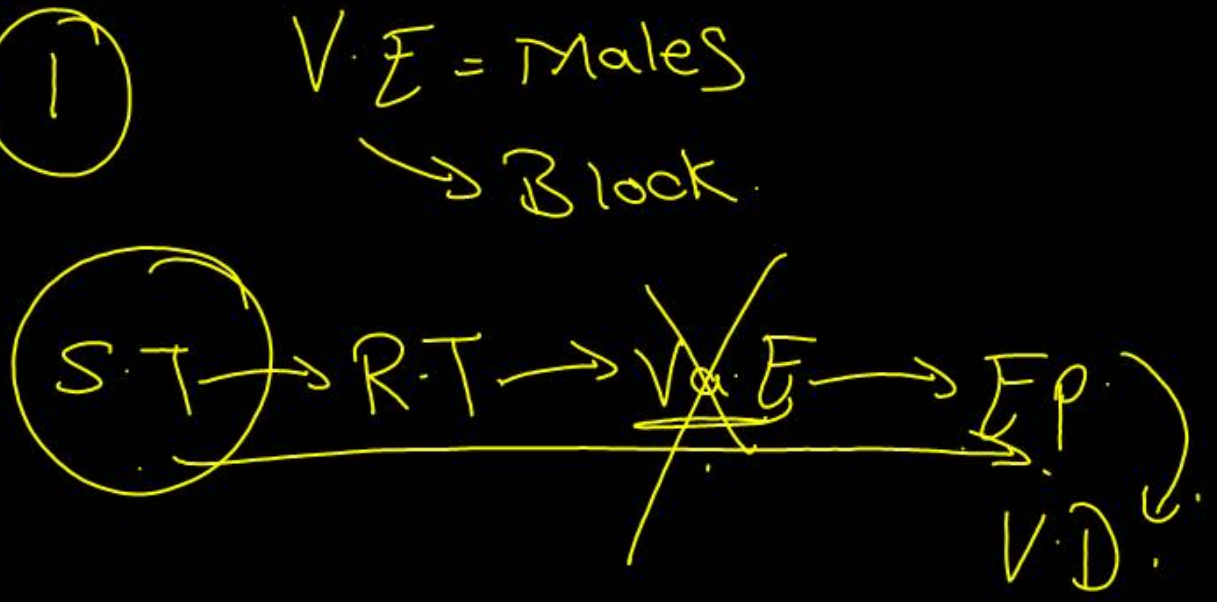
If for some reason, the vasa efferentia in the human reproductive system get blocked, the gametes will not be transported from

(1) testes to epididymis

(2) epididymis to vas deferens

(3) ovary to uterus

(4) vagina to uterus



Question no. 96

Some important events that take place during fertilisation are given below. Arrange the events in a proper sequence and select the correct option.

(i) Cortical reaction (ii) Sperm entry

(iii) Karyogamy (iv) Acrosomal reaction

(1) (iv) → (i) → (ii) → (iii)

(2) (i) → (ii) → (iii) → (iv)

(3) (iv) → (ii) → (i) → (iii)

(4) (ii) → (i) → (iii) → (iv)

Question no. 97

Which of the following pairs contributes to an increase in population?

(1) Natality and immigration

(2) Mortality and emigration

(3) Natality and emigration

(4) Mortality and immigration

Question no. 98

. Which of the following contraceptive methods correctly matches with its mode of action?

	Contraceptive method	Mode of action
(1)	Tubectomy	Makes the uterus unsuitable for implantation
(2)	Oral pills	Inhibit ovulation and implantation
(3)	Diaphragms	Spermicidal and increase phagocytosis of sperms within the uterus
(4)	IUDs	Block gamete transport

Gamete Transport

2

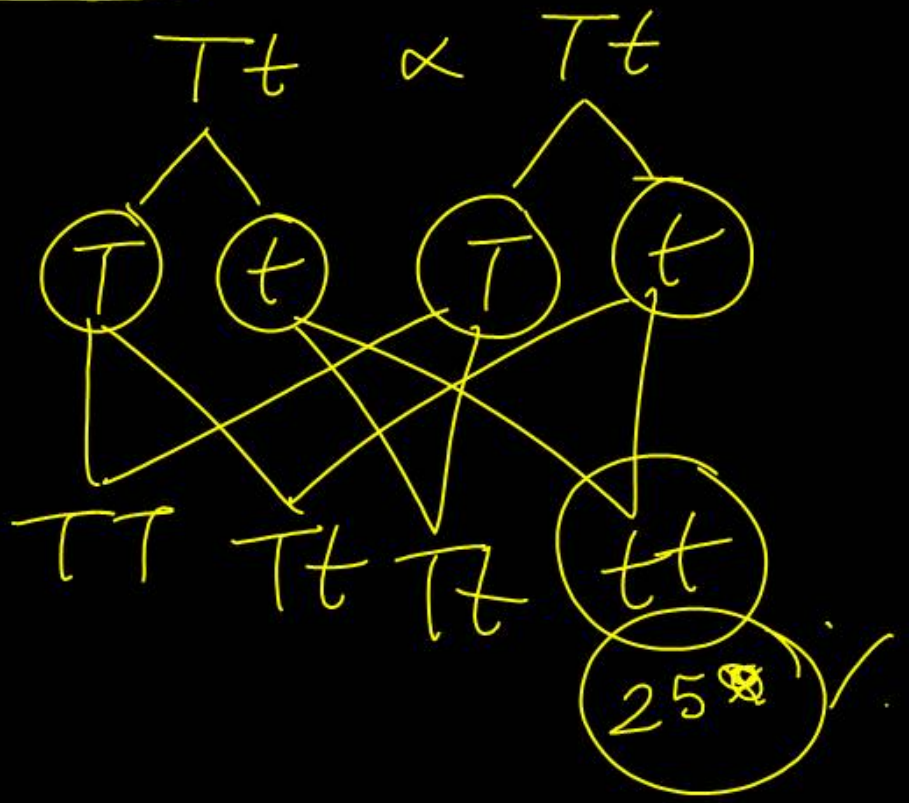
Prevents Sperm entry.

Question no. 99

What is the probability of production of dwarf tt offspring in a cross between two heterozygous tall pea plants?

(1) Zero
(2) 50%
(3) 25%
(4) 100%

3



Question no. 100

If linkage was known at the time of Mendel then which of the following laws, he would not have been able to explains?

(1) Law of dominance

(2) Law of independent assortment

(3) Law of segregation

(4) Law of purity of gametes

Question no. 101

A pleiotropic gene

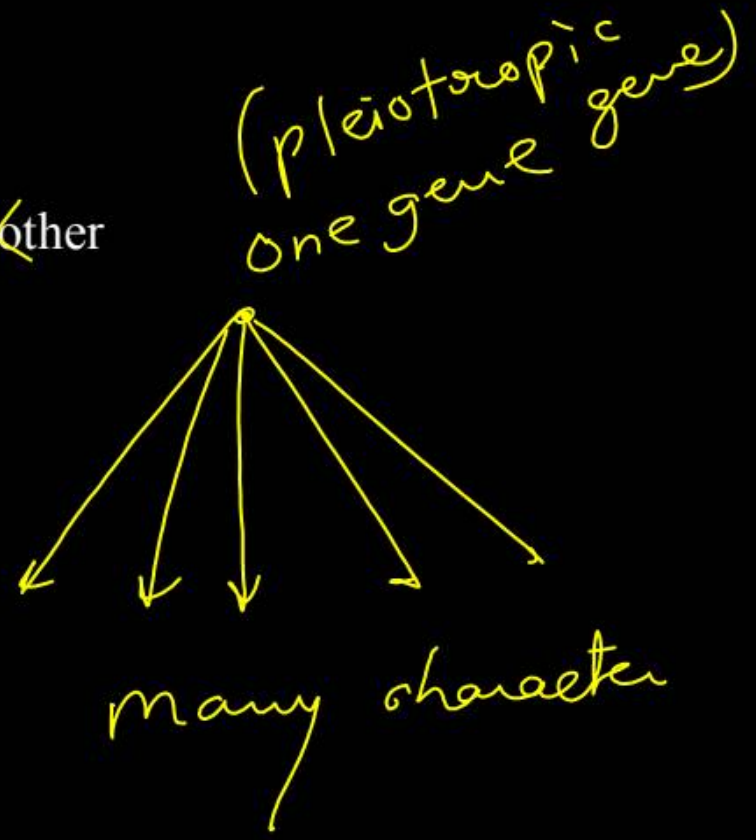
(1) controls a trait only in combination with another gene

(2) controls multiple traits in an individual

(3) is expressed only in primitive plants

(4) is a gene evolved during Pliocene.

2



Question no. 102

Insertion or deletion of a single base cause

(1) inversion mutation

(2) transition mutation

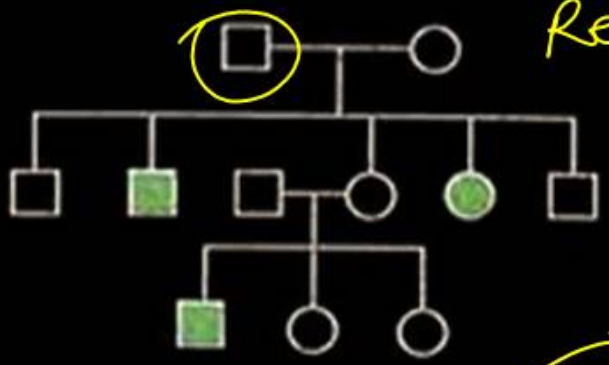
(3) frame-shift mutation

(4) transversion mutation

3

Question no. 103

The trait traced in the below pedigree chart is



(1) dominant X–linked

(2) recessive X–linked

(3) autosomal dominant

(4) autosomal recessive

Question no. 104

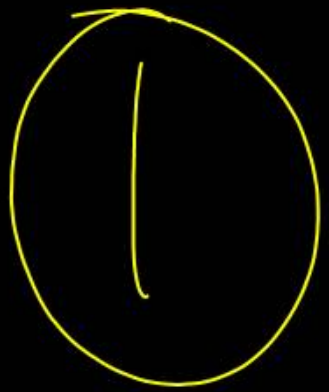
Conditions of a karyotype 2n ± 1 and 2n ± 2 are called

(1) aneuploidy

(2) polyploidy

(3) allopolyploidy

(4) monosomy (2n-1)



Question no. 105

Histone proteins are

(1) basic, negatively charged

(2) basic, positively charged

(3) acidic, positively charged

(4) acidic, negatively charged

Question no. 106

Select the correct statements out of the following.

(i) Both DNA and RNA are able to mutate.

(ii) RNA being unstable, mutates at a faster rate.

(iii) RNA shows catalytic properties.

(iv) Presence of uracil (U) at place of thymine (T) confers additional stability to RNA.

(1) (i) and (ii)

(2) (ii) and (iii)

(3) (1) and (iv)

(4) (ii) and (iii)

Ribozyme 23S r-RNA

a(i)

4

Question no. 107

The three codons which result in the termination of polypeptide chain synthesis are

(1) UAA, UAG, GUA (2) UAA, UAG, UGA

(3) UAA, UGA, UUA (4) UGU, UAG, UGA

UAA
UAG
UGA

2

Question no. 108

With regard to mature mRNA in eukaryotes

(1) exons and introns do not appear in the mature RNA

(2) exons appear but introns do not appear in the mature RNA

(3) introns appear but exons do not appear in the mature RNA

(4) both exons and introns appear in the mature RNA.

Question no. 109

Abiogenesis theory of origin supports

(1) spontaneous generation

(2) origin of life from blue–green algae

(3) origin of life is due to pre–existing organisms

(4) organic evolution is due to chemical reactions

Question no. 110

First life form on earth was a

(1) cyanobacterium

(2) chemoheterotroph

(3) autotroph

(4) photoautotroph

Question no. 111

Which of the following statements is true?

(1) Wings of birds and insects are homologous organs.

(2) Human hands and bird's wings are analogous organs.

(3) Human hands and bat's wings are analogous organs.

(4) Flipper of penguin and dolphin are analogous organs.

Question no. 112

An isolated population of humans with approximately equal numbers of blue–eyed and brown–eyed individuals was decimated by an earthquake. Only a few brown–eyed people remained to form the next generation. This kind of change in the gene pool is called

(1) Hardy–Weinberg equilibrium

(2) blocked gene flow

(3) bottle–neck effect

(4) gene migration

3

Question no. 113

Which of the following disease is transmitted by the bite of the female mosquito vector?

(1) Filariasis

(2) Amoebiasis

(3) Typhoid

(4) Pneumonia

Question no. 114

The primary lymphoid organs are

(1) spleen and thymus

(2) bone marrow and thymus

(3) bone marrow and lymph node

(4) thymus and MALT

2

Question no. 115

Cocaine is obtained from

(1) Erythroxylon coca

(2) Papaver somniferuma

(3) Atropa belladonna

(4) Datura stramonium

Question no. 116

Which one of the following microorganisms forms symbiotic association with plants and helps them in their nutrition?

(1) Glomus

(2) Azotobacter

(3) Klebsiella

(4) Azospirillum

Fungus

Free living

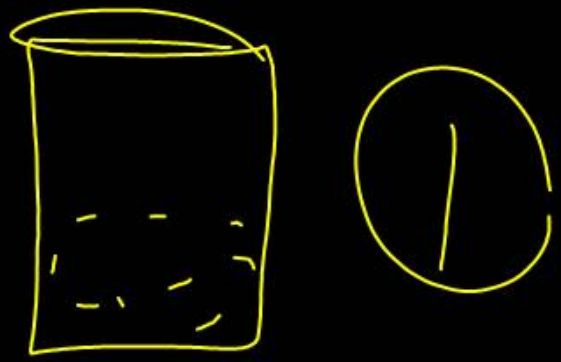
Mycorhiza (1)

Question no. 117

Read the following statements and select the correct option.

Statement 1 : BOD represents the amount of dissolved oxygen that would be consumed if all the organic matter in one litre of water were oxidised by microorganisms.

Statement 2 : High value of BOD indicates that water is highly polluted by organic matter.



(1) Both Statements 1 and 2 are correct.

(2) Statement 1 is correct but statement 2 is incorrect.

(3) Statement 1 is incorrect but statement 2 is correct.

(4) Both statements 1 and 2 are incorrect.

Question no. 118

Which of the following bacteria is used as a vector for plant genetic engineering?

(1) Agrobacterium tumefaciens

(2) Bacteriophages

(3) Thermus aquaticus

(4) Pyrococcus furiosus

Question no. 119

Which of the following is the nematode that attacks the roots of tobacco plants?

(1) Agrobacterium tumefaciens

(2) Rhizobium leguminosarum

(3) Meloidogyne incognita

(4) Taenia solium

Question no. 120

The Bt toxin is not toxic to human beings because

(1) the pro Bt toxin activation requires temperature above human body temperature

(2) the Bt toxin recognizes only insect–specific targets

(3) the pro Bt toxin activation requires pH lower than that present in human stomach

(4) conversion of pro Bt toxin to Bt toxin takes place in highly alkaline conditions.

Question no. 121

Match column I containing transgenic organisms with their specific characteristics in column II and select the correct option from the given codes.

	Column I		Column II
A.	Golden rice	(i)	Protein – enriched milk
B.	Bt cotton	(ii)	Increased shelf life
C.	Flavr Savr	(iii)	Enriched with vitamin A
D.	Rosie cow	(iv)	High yield and pest resistant

A – iii
B – iv
C – ii
D – i

(1) A–(iii), B–(iv), C–(ii), D–(i)

(2) A–(iii), B–(ii), C–(iv), D–(i)

(3) A–(ii), B–(iv), C–(iii), D–(i)

(4) A–(i), B–(iv), C–(ii), D–(iii)

1

Question no. 122

The interdependent evolution of flowering plants and pollinating insect together is known as

(1) mutualism

(2) co–evolution

(3) commensalism

(4) co–operation

2

Question no. 123

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

	Column I		Column II
A.	Ladybird beetles feeding on insects	(i)	Mutualism
B.	Barnacles growing on the back or a whale	(ii)	Predation
C.	Wasp pollinating the fig inflorescence	(iii)	Competition
D.	Lice living on skin of humans	(iv)	Commensalism
		(v)	Parasitism

(1) A–(ii), B–(iv), C–(i), D–(v)

(2) A–(iv), B–(ii), C–(v), D–(i)

(3) A–(ii), B–(i), C–(v), D–(iv)

(4) A–(iii), B–(ii), C–(i), D–(iv)

Question no. 124

There are four major causes of accelerated rates of species extinction, which are collectively called as 'the evil quartet'. Which one of the following is not included in 'the evil quartet'?

(1) over exploitation

(2) Pollution

(3) Co–extinctions

(4) Alien species invasions

2

Question no. 125

Bali, Javan and Caspian are

(1) species to tiger

(2) species of Cheetah

(3) subspecies of cheetah

(4) subspecies of tiger

4

Question no. 126

Which of the following is/are not the characteristics of the Class Osteichthyes?

(i) Body is streamline and mouth is terminal.

(ii) Gills are covered by operculum.

(iii) Skin covered with cycloid and placoid scales.

(iv) Many of them are viviparous.

(1) (iv) only (2) (iii) and (iv)

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

Question no. 127

Which one of the following is a matching set of a phylum and its three examples?

(1) Porifera – Spongilla, Euplectella, Pennatula

(2) Cnidaria, Dentalium, Physalia, Aurelia

(3) Platyhelminthes – Planaria, Schistosoma, Enterobius

(4) Mollusca – Loligo, Teredo, Octopus

Ship worm

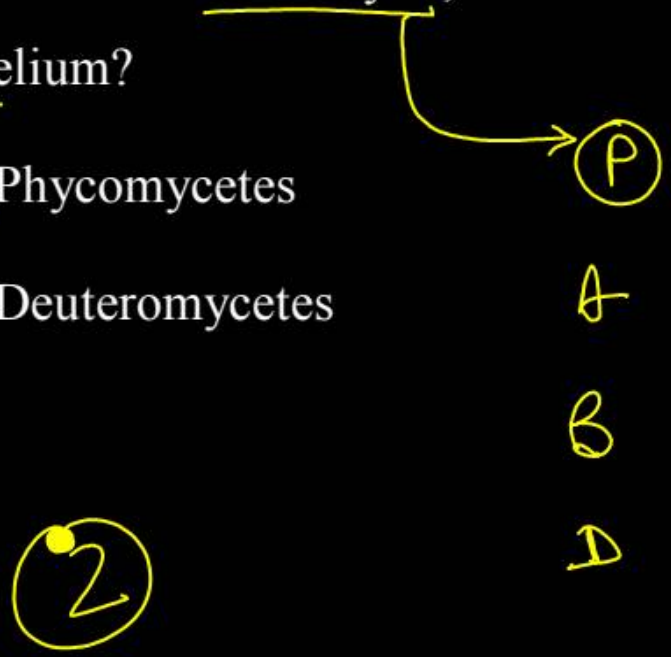
4

Question no. 128

Which of the following classes of Kingdom Fungi are characterised by the presence of coenocytic, multinucleate and branched mycelium?

(1) Basidiomycetes (2) Phycomycetes

(3) Ascomycetes (4) Deuteromycetes



Question no. 129

Which one is an incorrectly matched pair?

(1) Phycomycetes – Mucor, Albugo

(2) Ascomycetes – Penicillium, Aspergillus

(3) Basidiomycetes – Puccinia, Agaricus

(4) Deuteromycetes – Ustilago, Colletotrichum

4

Question no. 130

With respect to the fungal sexual cycle, choose the correct sequence of events.

(1) Karyogamy, plasmgamy and meiosis

(2) Meiosis, plasmogamy and karyogamy

(3) Plasmogamy, karyogamy and meiosis

(4) Meiosis, karyogamy and plasmogamy

Plasmo.

Karyo.

Red./Meiosis

3

Question no. 131

Gymnosperms are referred to as "naked seeded plants", because

(1) they lack ovule

(2) they lack ovaries

(3) they have no seed coat

(4) the embryo is unprotected

Question no. 132

Read the given statements and select the incorrect ones.

(i) Sporophyte in mosses in more elaborate than that in liverworts.

(ii) Salvinia is homosporous.

(iii) Life–cycle in all spermatophytes is diplontic.

(iv) In Cycas, male cones and megasporophylls are borne on the same trees.

(1) (i) and (ii)

(2) (i) and (iii)

(3) (ii) and (iv)

(4) (iii) and (iv)

g/A

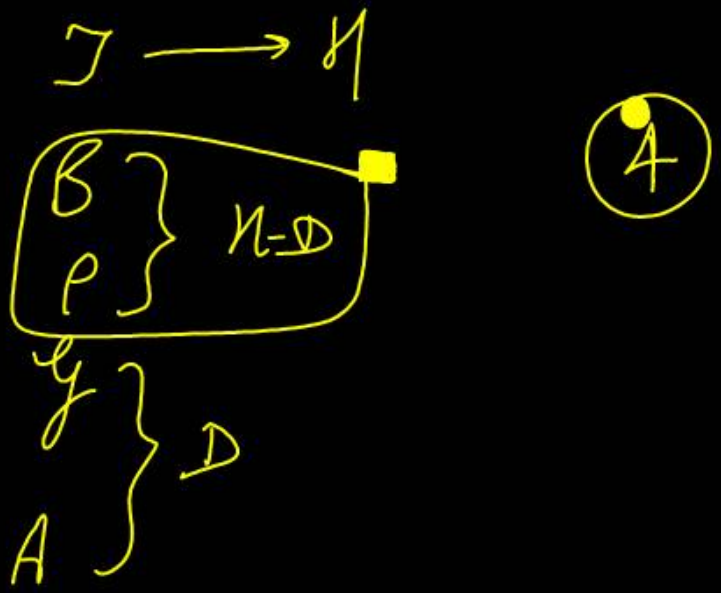
3

Question no. 133

Haplo–diplontic life cycle is found in

(1) bryophytes (2) pteridophytes

(3) fungi (4) both (1) and (2)



Question no. 134

The placenta is attached to the developing seed near the

(1) testa
(2) hilum
(3) micropyle
(4) chalaza

Question no. 135

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

	Column I		Column II
A.	Marginal	(i)	Sunflower, marigold
B.	Parietal	(ii)	Pea
C.	Axile	(iii)	Mustard, Argemone
D.	Free central	(iv)	Hibiscus, tomato, lemon
E.	Basal	(v)	Dianthus, Primrose

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

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

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

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

Question no. 136

A typical monocotyledonous root is characterised by

(1) usually more than six xylem bundles

(2) large and well developed pith

(3) no secondary growth

(4) all of these

4

Question no. 137

Who proposed a modification in the cell theory?

(1) Schleiden and Schwann

(2) Rudolf Virchow

(3) Robert Hooke

(4) Marcello Malpighi

Question no. 138

Select the incorrect statement regarding the plasma membrane.

(1) Ratio of proteins and lipids varies considerably in different cell types.

(2) 52% proteins and 40% lipids constitute the membrane of human RBC.

(3) Arrangement of proteins (P) and Lipids (L) is L–P–P–L.

(4) Head of lipid is hydrophilic

Question no. 139

Continuity of cytoplasm from cell to cell is maintained through cytoplasmic connections in plants called

(1) ER

(2) tight junction

(3) gap junction

(4) plasmodesmata

4

Question no. 140

Arrangement of microtubules in a flagellum and a centriole is respectively

(1) 9 + 2 and 9 + 1

(2) 9 + 1 and 9 + 0

(3) 9 + 0 and 9 + 2

(4) 9 + 2 and 9 + 0

4

Question no. 141

Read the given statements.

(i) Fructose in the sweetest sugar.

(ii) Glycine is the simplest amino acid.

(iii) Lactose is a disaccharide composed of one molecule each of glucose and galactose.

(iv) Cellulose is an unbranched chain of glucose molecules liked by β–1, 4–glycosidic bond.

Which of the given statements are correct?

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

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

4

All are Correct

Question no. 142

Enzymes that catalyse removal of group from substrates by mechanisms other than hydrolysis, and addition of group to double bonds, are called

Hydrolase.

(1) ligases

(2) lyases

without water.

(3) hydrolases

(4) dehydrogenase

Question no. 143

Michaelis Menten Constant (K_m) is equal to

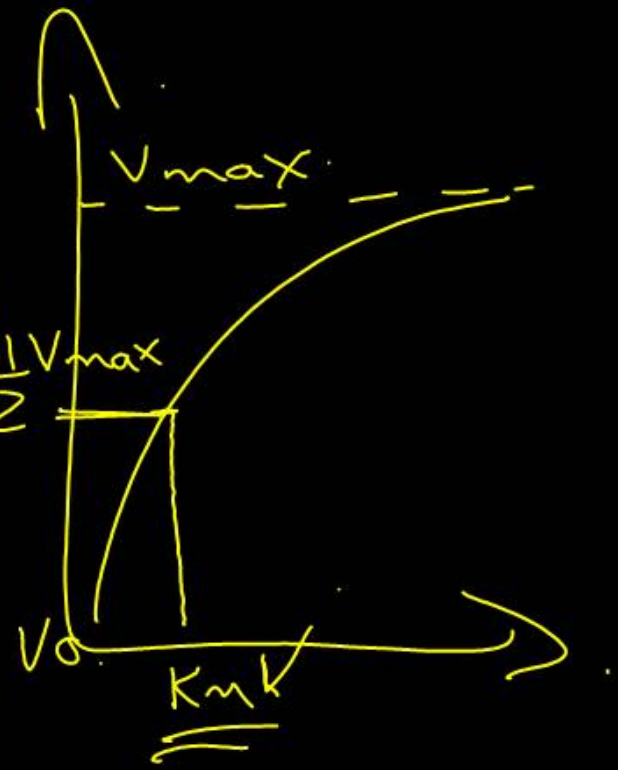
(1) the rate of reaction

(2) the rate of enzymatic activity

(3) substrate concentration at which the reaction attains half of its maximum velocity

(4) substrate concentration at which the rate of reaction is maximum.

3



Question no. 144

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

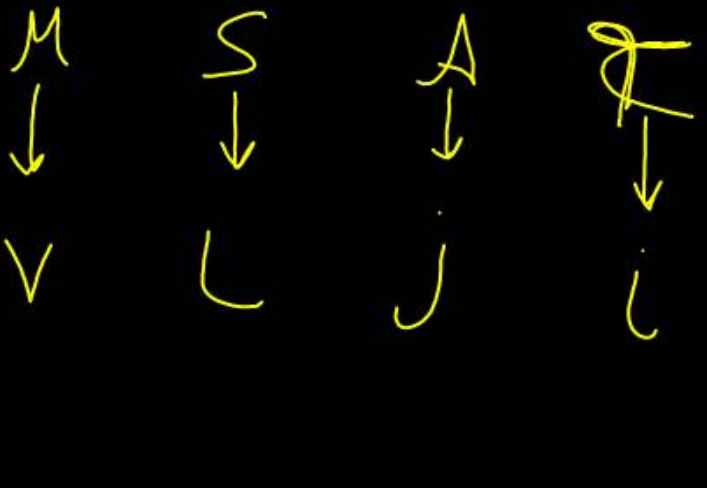
	Column I		Column II
A.	V–shaped at anaphase	(i)	Acrocentric chromosome
B.	L–shaped at anaphase	(ii)	Metacentric chromosome
C.	J–shaped at anaphase	(iii)	Telocentric chromosome
D.	I–shaped at anaphase	(iv)	Sub–metacentric chromosome

(1) A–(iv), B–(ii), C–(i), D–(iii)

(2) A–(ii), B–(iv), C–(i), D–(iii)

(3) A–(ii), B–(iv), C–(iii), D–(i)

(4) A–(iv), B–(iii), C–(ii), D–(i)



Question no. 145

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

	Column I		Column II
A.	Synaptonemal complex	(i)	Pachytene
B.	Recombination nodule	(ii)	Zygotene
C.	Terminalisation of chiasmata	(iii)	Telophase I
D.	Formation of dyad cell	(iv)	Diakinesis

(1) A–(ii), B–(i), C–(iv), D–(iii)

(2) A–(i), B–(ii), C–(iv), D–(iii)

(3) A–(iii), B–(i), C–(iv), D–(ii)

(4) A–(ii), B–(i), C–(iii), D–(iv)

Question no. 146

Consider following statements with respect to the C_4 pathway and select the correct ones.

(i) Mesophyll cells possess both RuBisCO and PEP case enzymes.

(ii) Initial CO_2 fixation occurs in mesophyll cells.

(iii) Final CO_2 fixation occurs in bundle sheath cell.

(1) (i) and (ii)

(2) (ii) and (iii)

(3) (i) and (iii)

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

Question no. 147

How many ATP and $NADPH_2$ are respectively produced in the process of photorespiration?

waste

(1) 2 and 4

(2) 1 and 2

(3) 4 and 6

(4) 0 and 0

4

Question no. 148

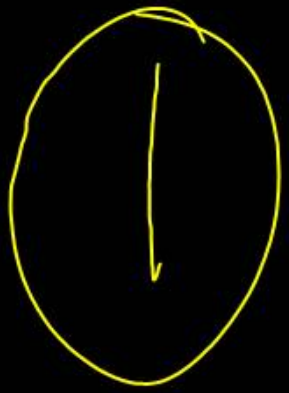
The enzyme RuBisCO has

(1) more affinity for CO_2, than for O_2

(2) more affinity for O_2, than for CO_2

(3) equal affinity for both

(4) more affinity for sugars, than for CO_2



Question no. 149

As per chemiosmotic coupling hypothesis, in mitochondria, protons accumulate in the

(1) outer membrane

(2) inner membrane

(3) intermembrane space

(4) matrix

Question no. 150

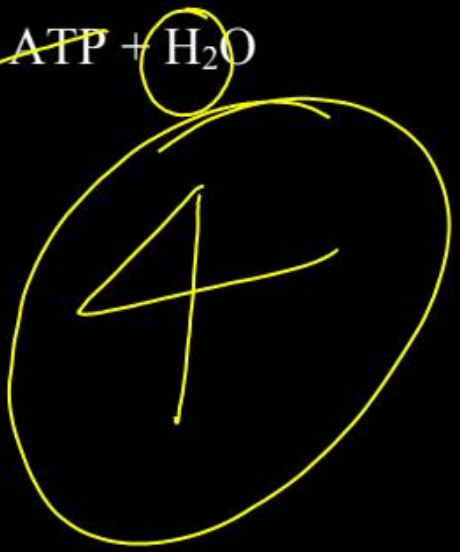
The end product of oxidative phosphorylation is

(1) NADH

(2) Oxygen

(3) ADP

(4) ATP + H_2O



Question no. 151

To increase sugar production in sugarcanes, they are sprayed with

(1) IAA
(2) cytokinin
(3) gibberellin
(4) ethylene

Question no. 152

Growth can be measured in various ways. Which of these can be used as parameters to measure growth?

(1) Increase in cell number

(2) Increase in cell size

(3) Increase in length and weight

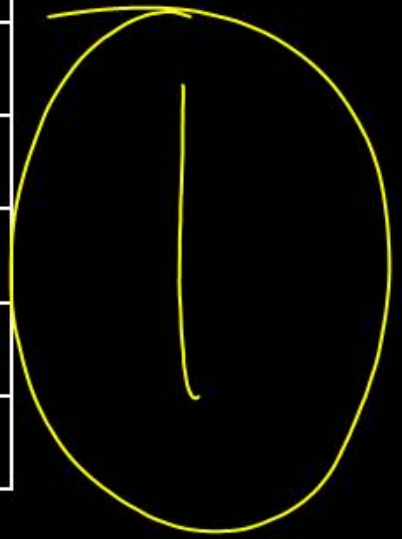
(4) All the above

4

Question no. 153

Match the following.

	Column I		Column II
A.	IAA	(i)	Herring sperm DNA
B.	ABA	(ii)	Bolting
C.	Ethylene	(iii)	Stomatal closure
D.	GA	(iv)	Weed–free lawns
E.	Cytokinins	(v)	Ripening of fruits



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

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

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

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

Question no. 154

It is known that exposure to carbon monoxide is harmful to animals because

(1) it reduces CO_2 transport

(2) it reduces O_2 transport

(3) it increases CO_2 transport

(4) in increases O_2 transport

2

Question no. 155

Incidence of Emphysema – a respiratory disorder is high in cigarette smokers. In such cases

(1) the bronchioles are found damaged

(2) the alveolar walls are found damaged

(3) the plasma membrane is found damaged

(4) the respiratory muscles are found damaged

Question no. 156

From the following relationships between respiratory volumes and capacities, mark the correct option.

(i) Inspiratory Capacity (IC) = Tidal Volume + Residual Volume

(ii) Vital Capacity (VC) = Tidal Volume (TV) + Inspiratory Reserve Volume (IRV) + Expiratory Reserve Volume (ERV)

(iii) Residual Volume (RV) = Vital Capacity (VC) – Inspiratory Reserve Volume (IRV)

(iv) Tidal Volume (TV) = Inspiratory Capacity (IC) – Inspiratory Reserve Volume (IRV)

(1) (i) Incorrect, (ii) Incorrect, (iii) Incorrect, (iv) Correct

(2) (i) Incorrect, (ii) Correct, (iii) Incorrect, (iv) Correct

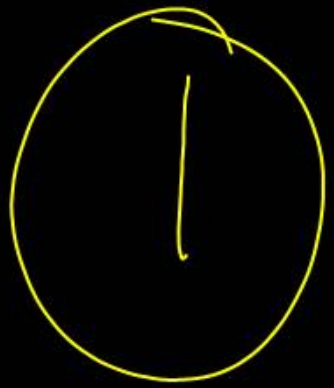
(3) (i) Correct, (ii) Correct, (iii) Incorrect, (iv) Correct

(4) (i) Correct, (ii) Incorrect, (iii) Correct, (iv) Incorrect

Question no. 157

Which of the following blood groups is a universal recipient in blood transfusion?

(1) Group AB
(2) Group B
(3) Group A
(4) Group O



Question no. 158

Which one of the following blood cells is involved in antibody production?

(1) B–Lymphocytes
(2) T–Lymphocytes
(3) RBC
(4) Neutrophils

Question no. 159

The net pressure gradient that causes the fluid to filter out of the glomeruli into the capsule is

(1) 50 mm Hg
(2) 75 mm Hg
(3) 10 mm Hg
(4) 30 mm Hg

E.F.P. 10-20 mmHg

N.F.P.

3

Question no. 160

Which of the following options has the correct pair of nephron parts that maintain pH and ionic balance of blood?

(1) Proximal convoluted tubule and Henle's loop

(2) Distal convoluted tubule and collecting duct

(3) Proximal convoluted tubule and glomerulus

(4) Collecting duct and Henle's loop

Selective/Tubular Secretion.

2

M.A.K

Question no. 161

Which true about the difference between cortical and juxtamedullary nephrons?

(1) Most nephrons are juxtamedullary.

(2) The efferent arterioles of cortical nephrons give rise to most of the vasa recta.

(3) The afferent arterioles of the juxtamedullary nephrons give rise to most of the vasa recta.

(4) Juxtamedullary nephrons generate a hyperosmotic medullary interstitum.

Question no. 162

Read the following statements carefully and select the correct ones.

(i) Cardiac fibres are branched with one or more nuclei.

(ii) Smooth muscles dare unbranched and cylindrical.

(iii) Skeletal muscles can be branched or unbranched.

(iv) Smooth muscles are non–striated.

(1) only (iv)
(2) (ii) and (iii)
(3) (iii) and (iv)
(4) only (iii)

Question no. 163

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

	Column I (Skeletal part)		Column II (Number of bones)
A.	Cranium	(i)	29
B.	Skull (Cranial and facial bones)	(ii)	8
C.	Face	(iii)	14
D.	Hindlimb	(iv)	24
E.	Ribs	(v)	30

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

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

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

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

Question no. 164

Which of the following is the correct pairing regarding a specific disorder of muscular or skeletal system?

(1)	Muscular Dystrophy	Age related shortening of muscles
(2)	Osteoporosis	Decrease in bone mass and higher chances of fractures with advancing age
(3)	Myasthenia Gravis	Autoimmune disorder which inhibits sliding of myosin filaments
(4)	Gout	Inflammation of joints due to extra deposition of calcium

2

Question no. 165

Chemicals which are released at the synaptic junction are called

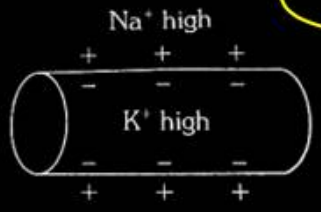
(1) hormones (2) neurotransmitters

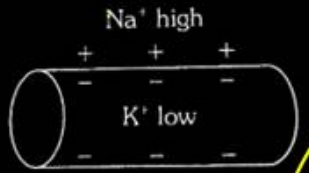
(3) cerebrospinal fluid (4) lymph

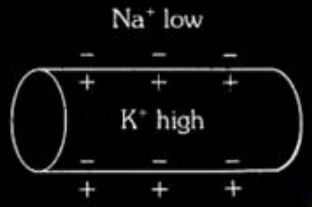
2

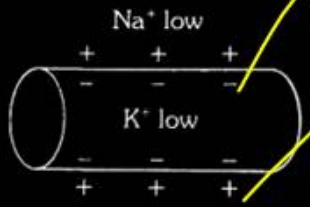
Question no. 166

Which of the following options illustrates the distribution of Na^+ and K^+ ions in a section of non–myelinated axon which is at resting potential?

(1) 

(2) 

(3) 

(4) 

:- No stimuli.

:- Outside = Na^+ high.

Inside = K^+ high.

Question no. 167

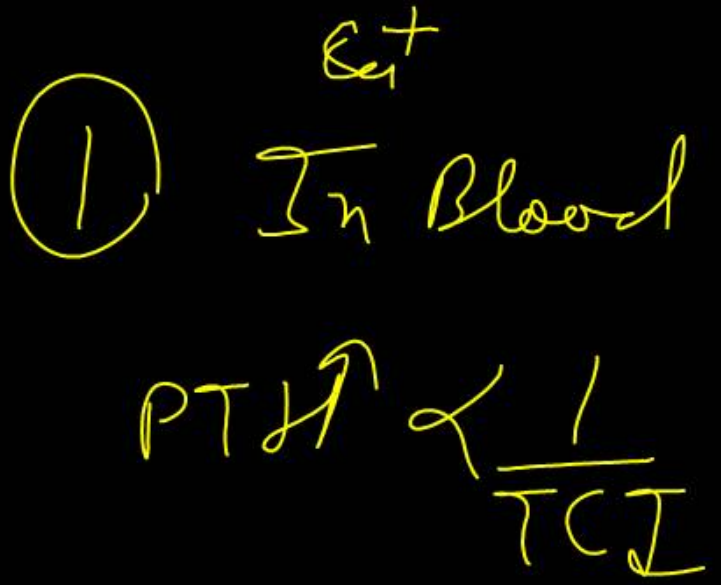
Which of the following statements is correct for 'parathormone'?

(1) It increases blood calcium level and decreases calcium store of the bone.

(2) It decreases blood calcium level and increase calcium store of the bone.

(3) It increase blood glucose level and decreases calcium store of the bone.

(4) It decreases blood glucose level and increases calcium store of the bone.



Question no. 168

Which of the following hormones does not have a particular target organ in the body?

(1) Growth hormone (2) TSH

(3) Oxytocin (4) FSH

Question no. 169

Which of the following conditions is not linked to deficiency to thyroid hormone?

(1) Cretinism
(2) Goitre
(3) Myxoedema
(4) Exopthalmia

4

Question no. 170

Which one of the following statements is wrong?

(1) Algae increase the level of dissolved oxygen in the immediate environment

(2) Algin is obtained from red algae and carrageenan from brown algae

(3) Agar-agar is obtained from Gelidium and Gracilaria

(4) Laminaria and Sargassum are used as food

Question no. 171

The term ‘polyadelphous’ is related to:

(1) gynoecium

(2) androecium

(3) corolla

(4) calyx

Question no. 172

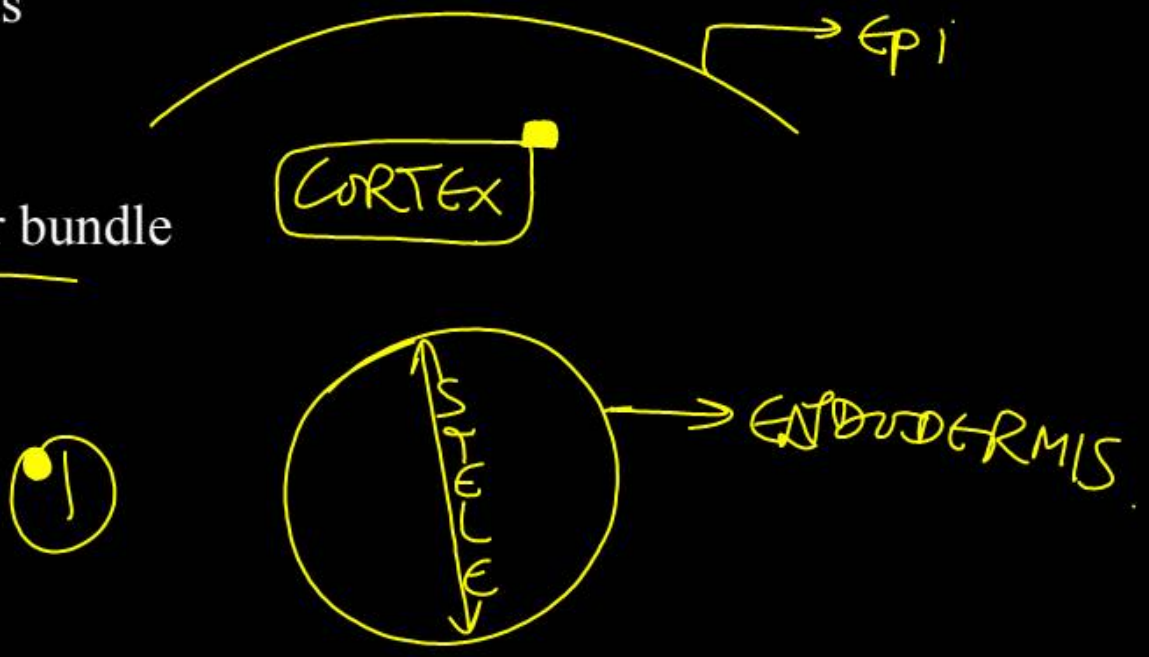
Cortex is the region found between:

(1) epidermis and stele

(2) pericycle and endodermis

(3) endodermis and pith

(4) endodermis and vascular bundle



Question no. 173

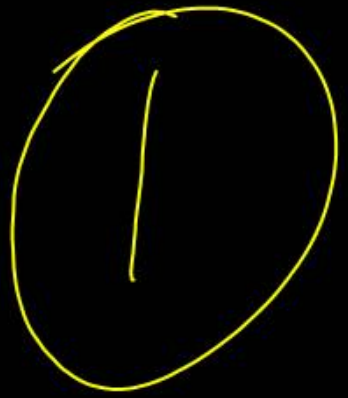
The ovule of an angiosperm is technically equivalent to:

(1) megasporangium ovule

(2) megasporophyll Carpel

(3) megaspore mother cell

(4) megaspore



Question no. 174

Taylor conducted the experiments to prove semi-conservative mode of chromosome replication on:

(1) Vinca rosea

(2) Vicia faba

(3) Drosophila melanogaster

(4) E.coli

2

Question no. 175

The equivalent of a structural gene is:

(1) muton

(2) cistron

(3) operon

(4) recon

Question no. 176

Which of the following rRNAs act as structural RNA as well as ribozyme in bacteria?

(1) 5S rRNA

(2) 18S rRNA

(3) 23S rRNA

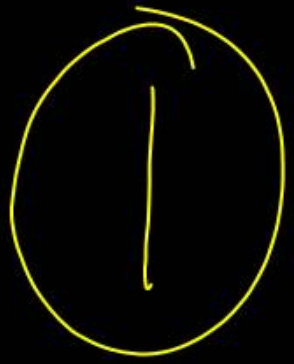
(4) 58S rRNA

3

Question no. 177

Which kind of therapy was given in 1990 to a four-year-old girl with Adenosine Deaminase (ADA) deficiency?

(1) Gene therapy
(2) Chemotherapy
(3) Immunotherapy
(4) Radiation therapy



Question no. 178

Which of the following is correct for r-selected species?

(1) Large number of progeny with small size

(2) Large number of progeny with large size

(3) Small number of progeny with small Size

(4) Small number of progeny with large size

Question no. 179

Match column I with column II for housefly classification and select the correct option using the codes given below:

	Column I		Column II
A.	Family	i.	Diptera
B.	Order	ii.	Arthropoda
C.	Class	iii	Muscidae
D.	Phylum	iv.	Insecta

Select the correct option.

	A	B	C	D
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iv)	(ii)	(i)	(iii)

Question no. 180

Which of the following depicts the correct pathway of transport of sperms?

(1) Rete testis → Efferent ductules → Epididymis → Vas deferens

(2) Rete testis → Epididymis → Efferent ductuled → Vas deferens

(3) Rete testis → Vas deferens → Efferent ductules → Epididymis

(4) Efferent ductules → Rete testis → Vas deferens → Epididymis

Vas efferens.