Question no. 1

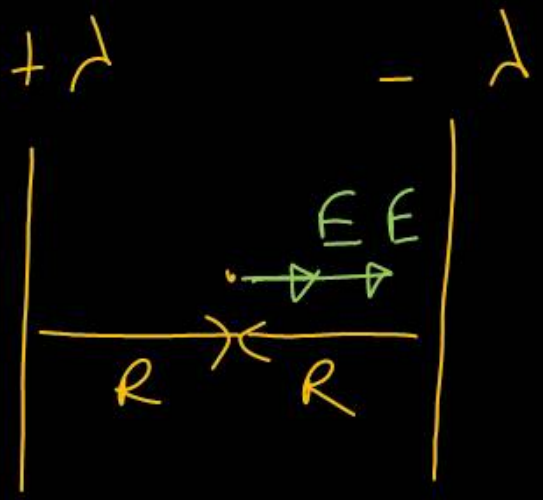
Two parallel infinite line charges with linear charge densities $+\lambda$ C/m and $-\lambda$ C/m are placed at a distance of 2R in free space. What is the electric field mid–way between the two line changes?

(1) $\frac{2\lambda}{\pi\varepsilon_0 R}$ N/C

(2) $\frac{\lambda}{\pi\varepsilon_0 R}$ N/C

(3) $\frac{\lambda}{2\pi\varepsilon_0 R}$ N/C

(4) Zero



$E_{net} = 2E$

$= 2 \times \frac{2K\lambda}{R}$

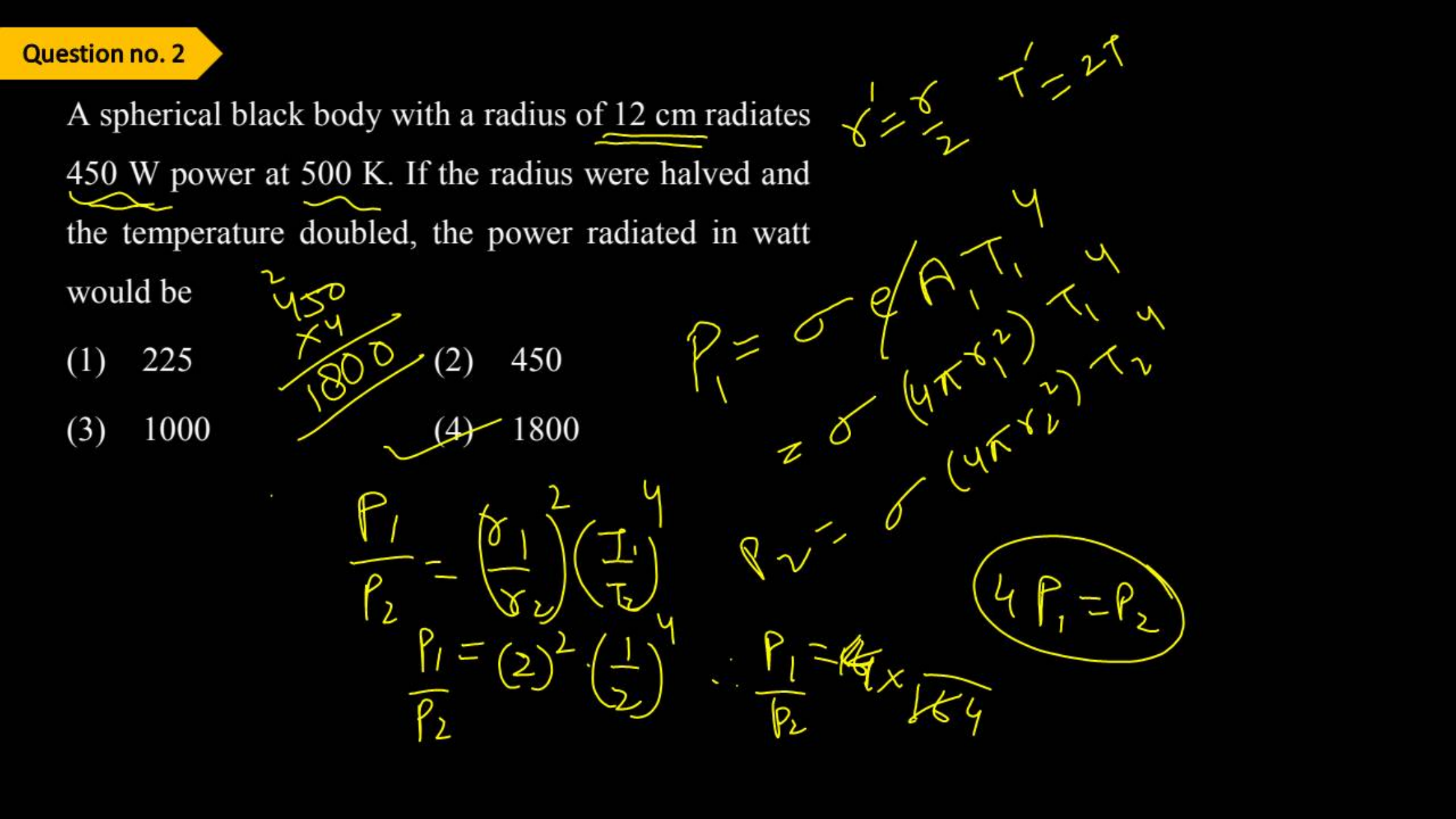
$= \frac{1}{4\pi\varepsilon_0} \frac{\lambda}{R} = \frac{\lambda}{\pi\varepsilon_0 R}$

Question no. 2

A spherical black body with a radius of 12 cm radiates 450 W power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be

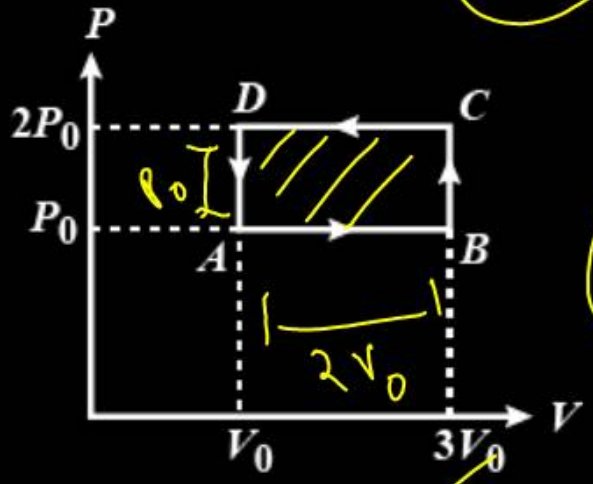
(1) 225 (2) 450

(3) 1000 (4) 1800



Question no. 3

An ideal gas undergoes cyclic process ABCDA as shown in given p-V diagram. The amount of work done by the gas is



(1) $6\ p_0V_0$

(2) $-2\ p_0V_0$

(3) $+2\ p_0V_0$

(4) $+4\ p_0V_0$

Question no. 4

Two charges of equal magnitude q are placed in air at a distance 2a apart and third charge – 2q is placed at mid–point. The potential energy of the system is

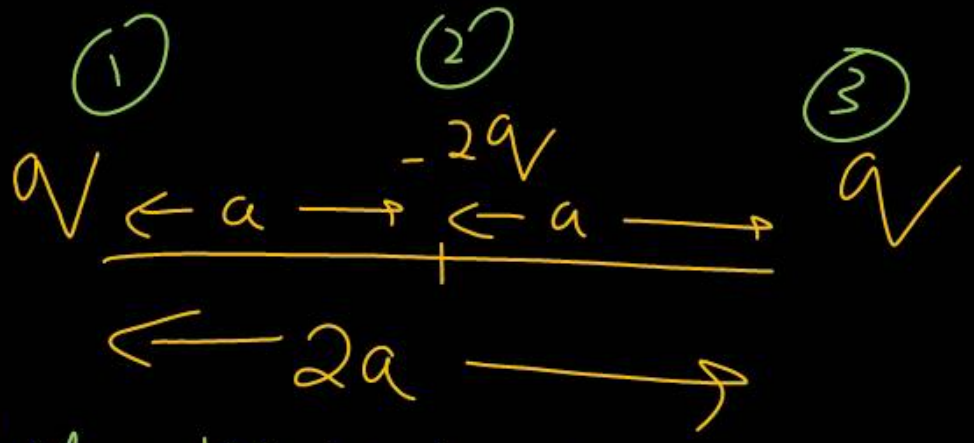
(ε_0 = permittivity of free space)

(1) $-\frac{q^2}{8\pi\varepsilon_0 a}$

(2) $-\frac{3q^2}{8\pi\varepsilon_0 a}$

(3) $-\frac{5q^2}{8\pi\varepsilon_0 a}$

(4) $-\frac{7q^2}{8\pi\varepsilon_0 a}$

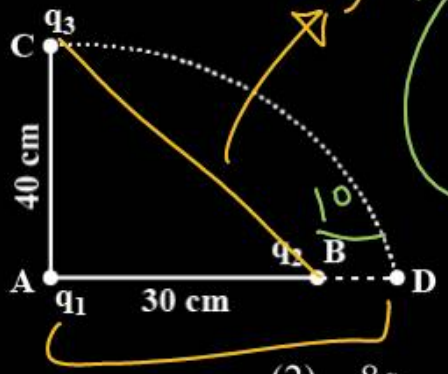


$$U_{net} = \frac{kq(-2q)}{a} + \frac{k(-2q)(q)}{a} + \frac{kqq}{2a}$$

4

Question no. 5

Two charges q_1 and q_2 are placed 30 cm apart, as shown in the figure. A third charge q_3 is moved along the arc of a circle of radius 40 cm from C to D. The change in the potential energy of the system is $\frac{q_3}{4\pi\varepsilon_0}K$, where K is



(1) $8q_2$ (2) $8q_1$

(3) $6q_2$ (4) $6q_1$

$\Delta U = U_f - U_i$

$\Delta U = q_3 V_D - q_3 V_C$

$\Delta U = q_3 (V_D - V_C)$

$\Delta U = q_3 \left(\frac{kq_1}{50\,cm} + \frac{kq_2}{10\,cm} - \left(\frac{kq_1}{40} + \frac{kq_2}{50} \right) \right)$

$\Delta U = q_3 \frac{k100}{10} \left(q_2 - \frac{q_2}{5} \right)$

$\Delta U = q_3 \frac{1}{4\pi\varepsilon_0} 16 \times \frac{4}{5} q_2 = \frac{q_3}{4\pi\varepsilon_0} K$

$K = 8q_2$

Question no. 6

A monochromatic light is incident at a certain angle on an equilateral triangular prism and suffers minimum deviation. If the refractive index of the material of the prism is $\sqrt{3}$, then the angle of incidence is

(1) 45°
(2) 90°
(3) 60°
(4) 3

$A = 60°$

$n = \dfrac{\sin\left(\dfrac{A+\delta_m}{2}\right)}{\sin(A/2)}$

$i = ?$

$n = \dfrac{\sin i}{\sin A/2}$

$\sqrt{3} \times \sin 30° = \sin i$

$\sin i = \sqrt{3}/2$

$i = 60°$

Question no. 7

If focal length of objective and eye lenses are 10 cm and 10 mm respectively, then angular magnification of telescope is normal adjustment is

(1) 10 (2) 5

(3) 100 (4) 50

1

$$m = \frac{f_o}{f_e} = \frac{10 \times 10^{-2}}{10 \times 10^{-3}}$$

$$m = 10$$

Question no. 8

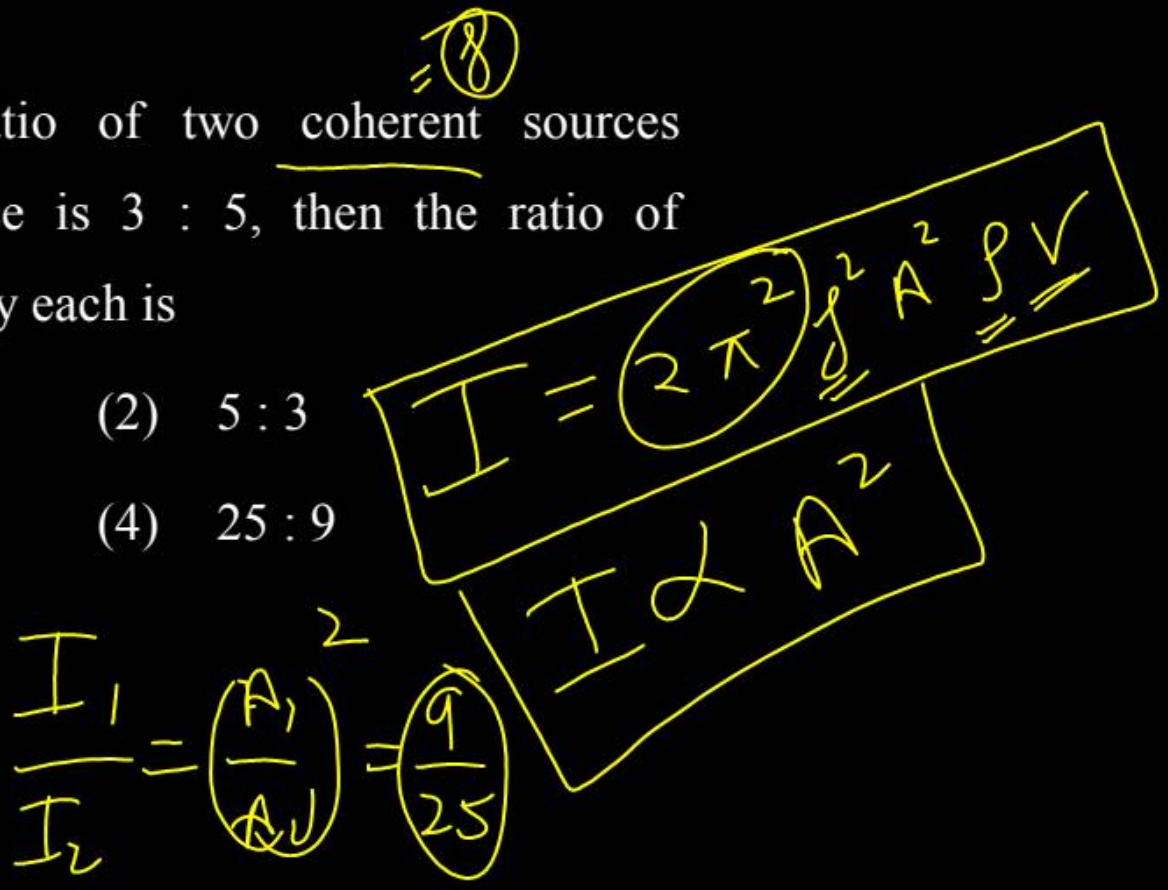
If the amplitude ratio of two coherent sources producing interference is 3 : 5, then the ratio of intensities produced by each is

(1) 3 : 5

(2) 5 : 3

(3) 9 : 25

(4) 25 : 9



Question no. 9

Two slits are separated by a distance of 0.5 mm and illuminated with light of $\lambda = 6000\,\text{Å}$. If the screen is placed 2.5 m from the slits, the distance of the third bright fringe from the centre will be

(1) 1.5 mm (2) 3 mm

(3) 6 mm (4) 9 mm

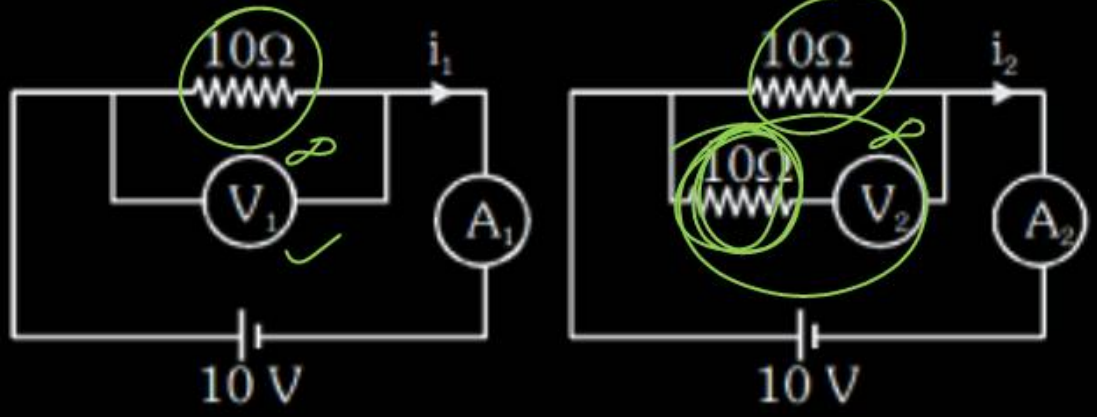
$= 0.5 \times 10^{-3}\,m$

$y = \frac{n\lambda D}{d} = 3 \times \frac{6000 \times 10^{-10} \times 2.5}{0.5 \times 10^{-3}} = \frac{45 \times 10^{-10} \times 10^{3}}{0.5 \times 10^{-3} \times 10^{3}}$

$= \frac{90 \times 10^{-4}}{9 \times 10^{-3}} = 9\,mm$

Question no. 10

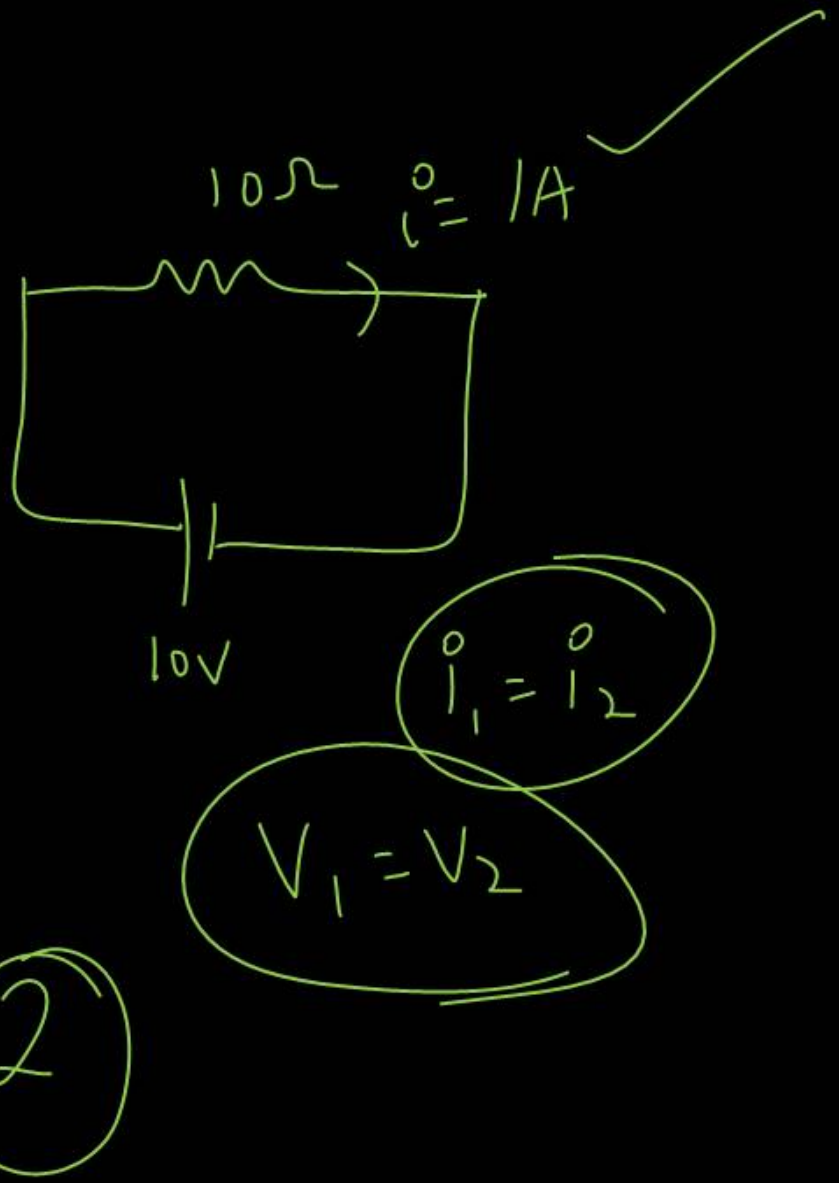
In the circuits shown below, the readings of voltmeters and the ammeters will be



Circuit 1 Circuit 2

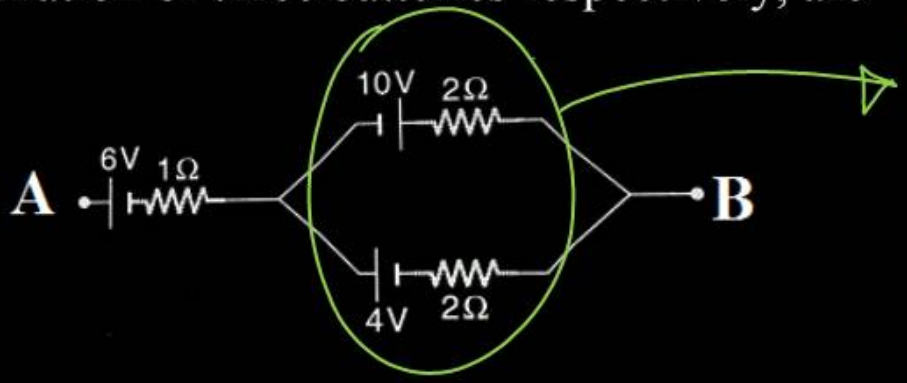
(1) $V_1 = V_2$ and $i_1 > i_2$ (2) $V_1 = V_2$ and $i_1 = i_2$

(3) $V_2 > V_1$ and $i_1 > i_2$ (4) $V_2 > V_1$ and $i_1 = i_2$



Question no. 11

In the given circuit diagram, the emf and internal resistance of a single battery which is equivalent to a combination of three batteries respectively, are

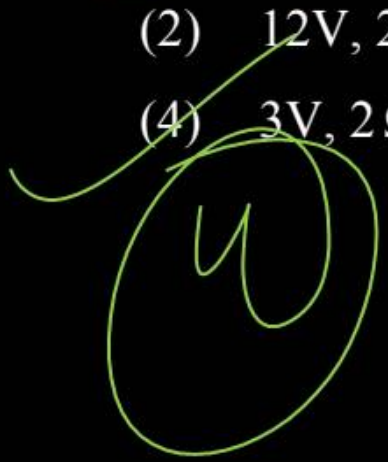


(1) 10V, 4Ω

(2) 12V, 2Ω

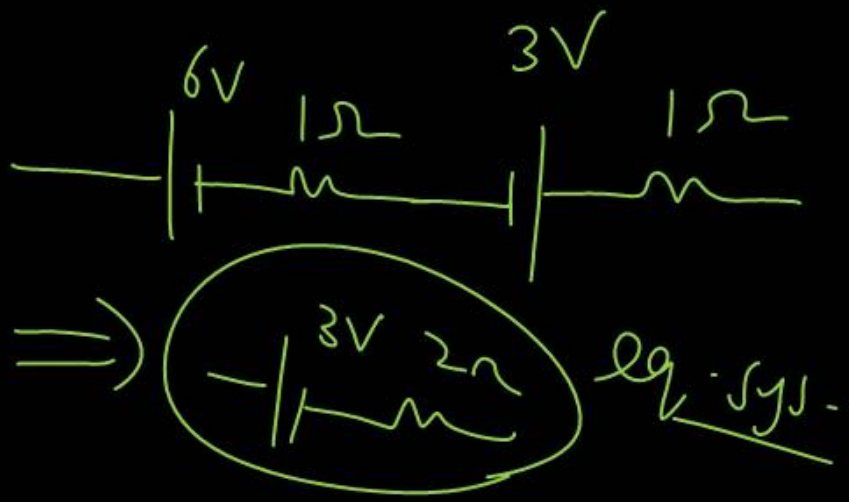
(3) 3V, 6Ω

(4) 3V, 2Ω



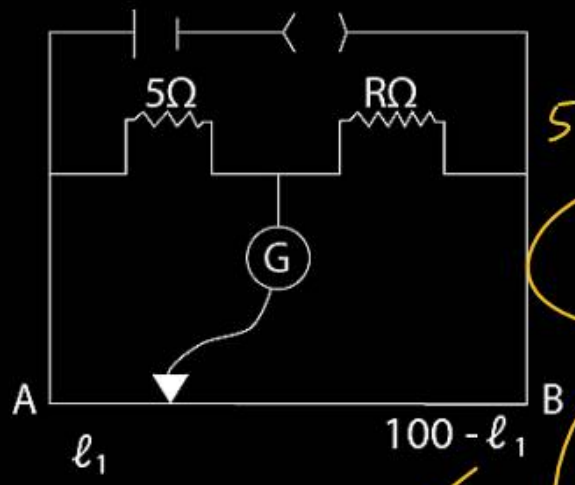
$\mathcal{E}_{eq} = \frac{-\frac{10}{2} + \frac{4}{2}}{\frac{1}{2} + \frac{1}{2}} = \frac{-5+2}{1} = -3V$

$r_{eq} = 1\Omega$



Question no. 12

The resistance in the two arms of the meter bridge are 5 Ω and R Ω, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at $1.6\ell_1$. The resistance R is



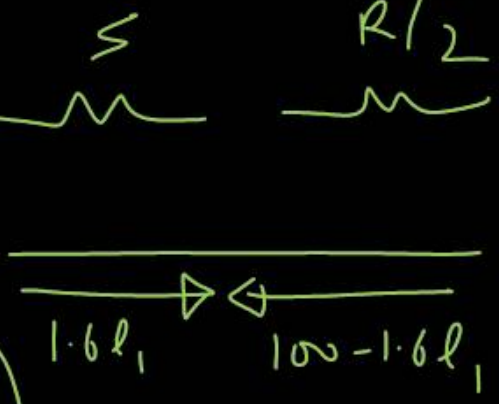
(1) 10 Ω (2) 15 Ω

(3) 20 Ω (4) 25 Ω

$5(100-\ell_1) = R\ell_1$

$5(75) = R(25)$

$R = 15\Omega$



$5(100-1.6\ell_1) = 1.6\ell_1 \frac{R}{2}$

$500 - 8\ell_1 = 1.6\ell_1\ 5(100-\ell_1)$

$100 - 16\ell_1 = 80 - 8\ell_1$

$20 = 8\ell_1$

$\ell_1 = \frac{20}{8} = \frac{10}{4} = 25\text{cm}$

2

Question no. 13

The ratio of spring constants of two spring is 2 : 3. What is the ratio of their potential energy, if they are stretched by the same force?

(1) 2 : 3 (2) 3 : 2

(3) 4 : 9 (4) 9 : 4

$f = kx$

$f/k = x$

$f_1 = f_2 = f$

$U_1 = \frac{1}{2}kx^2$

$U_2 = \frac{1}{2}kx^2$

$\frac{U_1}{U_2} = \frac{\frac{1}{2}k_1\left(\frac{f_1}{k_1}\right)^2}{\frac{1}{2}k_2\left(\frac{f_2}{k_2}\right)^2} = \frac{k_2}{k_1}$

Question no. 14

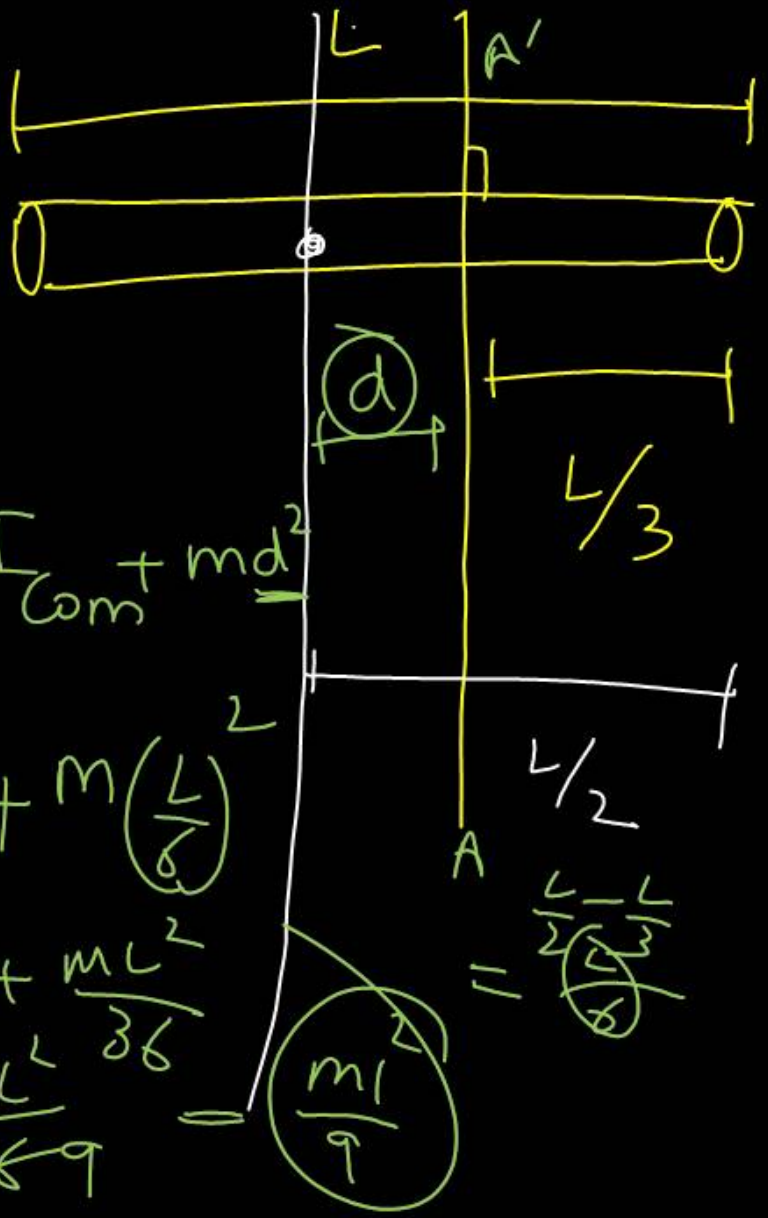
The moment of inertia of a thin uniform rod of length L and mass M about an axis passing through a point at a distance of 1/3 from one of its ends and perpendicular to the rod is

(1) $\frac{ML^2}{12}$

(2) $\frac{ML^2}{9}$

(3) $\frac{7ML^2}{48}$

(4) $\frac{ML^2}{48}$



$I_{AA'} = I_{Com} + md^2$

$I_{AA'} = \frac{ML^2}{12} + m\left(\frac{L}{6}\right)^2$

$= \frac{3 \times mL^2}{3 \times 12} + \frac{mL^2}{36}$

$= \frac{4mL^2}{36} = \frac{mL^2}{9}$

Question no. 15

Which of the following characteristics of electrons determines the current in a conductor?

(1) Drift velocity

(2) Thermal velocity

(3) Both drift velocity and thermal velocity

(4) Neither drift velocity nor thermal velocity

Question no. 16

A tightly wound coil of 100 turns and radius 10 cm is carrying–current of 1 A. What will be the magnitude of magnetic field at centre of coil?

(1) 6.28×10^{-6} T (2) 6.28×10^{-7} T

(3) 6.28×10^{-5} T (4) 6.28×10^{-4} T

(4)

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

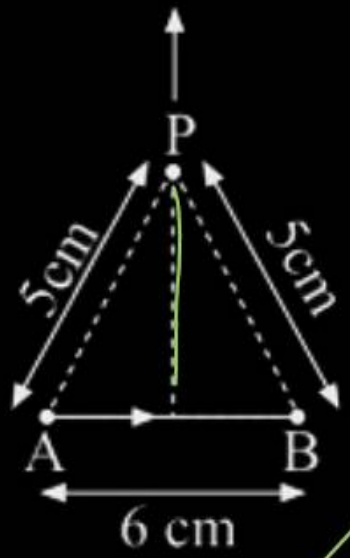
$$B = \frac{4\pi \times 10^{-7} \times 1}{2 \times \frac{1}{10}} \times 100$$

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

$$B = 6.28 \times 10^{-4}\ T$$

Question no. 17

Find the magnetic field at point P due to a straight line segment AB of length 6 cm carrying a current of 5A as shown.

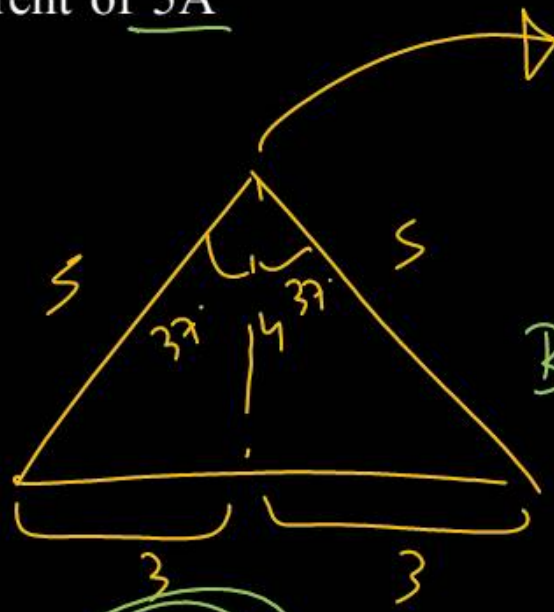


(1) 2.0×10^{-5} T

(2) 1.5×10^{-5} T

(3) 3.0×10^{-5} T

(4) 2.5×10^{-5} T



$B = \frac{\mu_0 i}{4\pi d}(\sin\alpha + \sin\beta)$

$B = 10^{-7} \times \frac{100}{4} \times \frac{3}{5} \times 2$

$B = 1.5 \times 10^{-5}$

2

Question no. 18

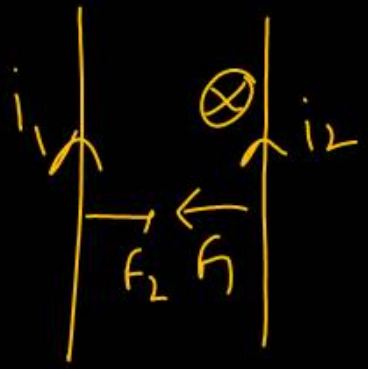
Two long and parallel straight wires A and B carrying currents of 8 A and 5 A in the same direction are separated by a distance of 4 cm. Estimate the force on a 10 cm section of wire A.

(1) 5×10^{-5} N, repulsive

(2) 5×10^{-5} N, attractive

(3) 2×10^{-5} N, repulsive

(4) 2×10^{-5} N, attractive



$|F_1| = |F_2|$

$$F = \left(\frac{\mu_0 i_1 i_2}{2\pi d}\right) \times 10\,cm$$

$$F = \frac{2}{4\pi} \times 10^{-7} \times \frac{10}{4\,cm} \times 10\,cm$$

$$F = 2 \times 10^{-7} \times 100$$

$$F = 2 \times 10^{-5}\,N$$

Question no. 19

The areas of cross–section of three magnets of same lengths are A, 2A and 6A, respectively. The ratio of their magnetic moments will be

(1) 6 : 2 : 1

(2) 1 : 2 : 6

(3) 2 : 6 : 1

(4) 1 : 1 : 1

m 2m 6m

l l l

$M_1 = ml$

$M_2 = 2ml$

$M_3 = 6ml$

1 : 2 : 6

Question no. 20

A square loop of wire of side length 10 cm is placed at an angle of 45° with a magnetic field that changes uniformly from 0.1 T to zero in 0.7 s. The induced current in the loop (its resistance is 1 Ω) is

(1) 1.0 mA (2) 2.5 mA

(3) 3.5 mA (4) 4.0 mA

$$i = \frac{\mathcal{E}}{R}$$

$$\mathcal{E} = \frac{\Delta\phi}{\Delta t} = \frac{N\Delta BA\cos 45^\circ}{t}$$

$$i = \frac{N\Delta BA\cos 45^\circ}{tR}$$

$$i = \frac{0.1 \times 100 \times 10^{-4}}{0.7 \times 1 \times \frac{1}{\sqrt{2}}}$$

$$i = 100 \times 10^{-5} = 10^{-3}\,A = 1\,mA$$

Question no. 21

A rectangular loop and a circular loop are moving out of a uniform magnetic field region in the given figure, to a field free region with a constant velocity v. In which loop do you expect the induced emf to be constant during the passage out of the field region?

(1) Rectangular loop (2) Circular loop

(3) Both (1) and (2) (4) Neither (1) nor (2)

Question no. 22

A long solenoid has 1000 turns. When a current of 4A flows through it, the magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self–inductance of the solenoid is

(1) 3H
(2) 2H
(3) 1H
(4) 4H

3

$\phi = Li$

$L = \frac{\phi}{i} = \frac{1000 \times 4 \times 10^{-3}}{4}$

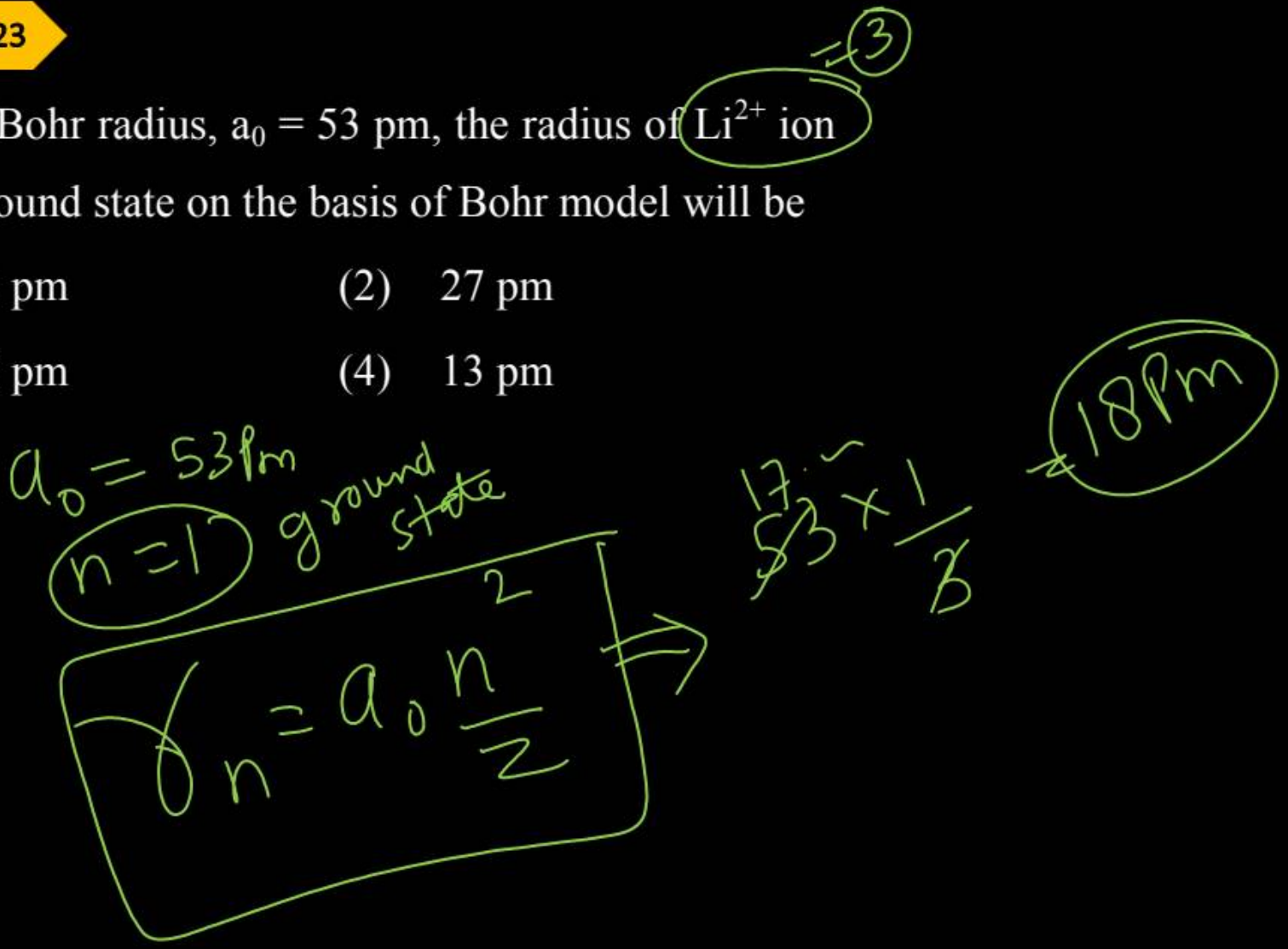
$= 1H$

Question no. 23

Taking Bohr radius, $a_0 = 53$ pm, the radius of Li^{2+} ion in its ground state on the basis of Bohr model will be

(1) 53 pm (2) 27 pm

(3) 18 pm (4) 13 pm



Question no. 24

amu

If the binding energy per nucleon of deuteron is 2.115 MeV, then its mass defect in atomic mass unit is

(1) 0.0024 u (2) 25.62 u

(3) 96.264 u (4) 0.0045 u

$E_b = \Delta m c^2$

no of nucleon = 2

$E_{bn} = \frac{E_b}{A}$

$2.115 \text{ MeV} = \frac{E_b}{2}$

$E_b = 2 \times 2.115$

$= 4.2 \text{ MeV}$

$\Delta m = \frac{4.2 \text{ MeV}}{931.5 \text{ MeV/amu}} =$

Question no. 25

How much mass has to be converted into energy to produce electric power of 200 MW for one hour?

(1) 2×10^{-6} kg (2) 8×10^{-6} kg

(3) 1×10^{-6} kg (4) 3×10^{-6} kg

$\text{Power} = \frac{\text{Energy}}{\text{time}} \Rightarrow E = P \times t$

$= 200 \times 10^6 \text{ W} \times 3600 \text{ s}$

$= 72 \times 10^{10}$

$E = mc^2$

$m = \frac{200 \times 10^6 \times 3600}{3 \times 10^8 \times 3 \times 10^8} = \frac{72 \times 10^{10}}{9 \times 10^{16}}$

$= 8 \times 10^{-6}$

Question no. 26

Which amongst the following statement(s) is/are correct?

(1) *n* –type germanium is negatively charged and *p*–type silicon is positively charged.

(2) Both *n*–type and *p*–type germanium are neutral.

(3) *n*–type germanium is positively charged and *p* –type germanium is negatively charged.

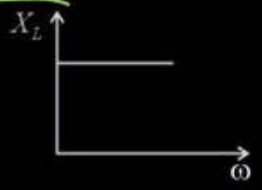
(4) Both *n*– type silicon and *p*–type germanium are negatively charged.

no of p^+ = no of e^-

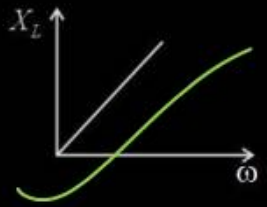
Question no. 27

Which of the following graphs represents the correct variation of inductive reactance X_L with angular frequency ω?

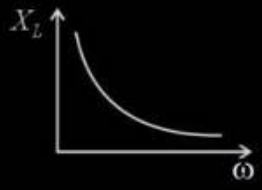
(1)



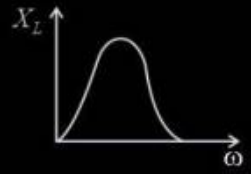
(2)



(3)



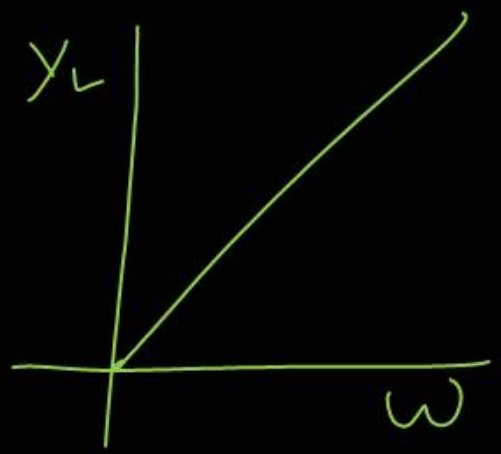
(4)



2

$X_L = \omega L$

$X_L \propto \omega$



Question no. 28

Arrange the following electromagnetic radiations in the order of increasing wavelength.

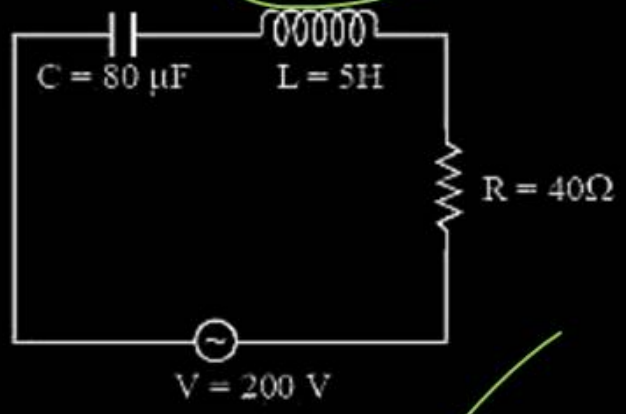
I. Blue light
II. Yellow light
III. X–ray
IV. Radio wave

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

3

Question no. 29

Figure shows a series L–C–R circuit, connected to a variable frequency source of 200 V with C = 80 μF, L = 5H and R = 40 Ω. The source frequency which drives the circuit at resonance is



(1) 25 Hz

(2) $\frac{25}{\pi}$ Hz

(3) 50 Hz

(4) $\frac{50}{\pi}$ Hz

$$f_R = \frac{1}{2\pi\sqrt{LC}}$$

$$f_R = \frac{1}{2\pi\sqrt{5 \times 80 \times 10^{-6}}}$$

$$f_R = \frac{100}{2\pi \times 20} = \frac{25}{\pi}\ \text{Hz}$$

Question no. 30

A convex lens of focal length 40 cm, a concave lens of focal length 40 cm and a concave lens of focal length 15 cm are placed in contact. The power of the combination in diopter is

(1) + 1.5 (2) – 1.5

(3) + 6.67 (4) – 6.67

$$\frac{1}{f_{eq}} = \frac{1}{40} + \frac{1}{-40} + \frac{1}{-15}$$

$$f_{eq} = -15\,cm$$

$$P_{eq} = \frac{100}{f_{eq}} = \frac{100}{-15}\,D$$

$$= -6.67\,D$$

Question no. 31

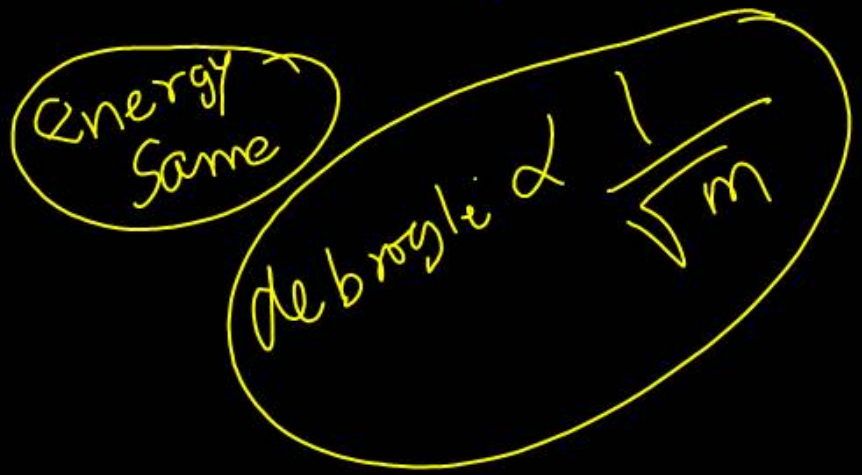
A proton, a neutron, an electron and an α– particle have same energy, then their de–Broglie wavelengths compare as

(1) $\lambda_p = \lambda_n > \lambda_e > \lambda_\alpha$

(2) $\lambda_\alpha < \lambda_p = \lambda_n < \lambda_e$

(3) $\lambda_e < \lambda_p = \lambda_n > \lambda_\alpha$

(4) $\lambda_e = \lambda_p = \lambda_n = \lambda_\alpha$



Question no. 32

The total energy of an electron in the first excited state of the hydrogen atom is about – 3.4 eV. What is the kinetic energy of the electron in this state?

(1) – 3.4 eV

(2) + 3.4 eV

(3) 6.8 eV

(4) – 6.8 V

KE = - (TE)

=

Question no. 33

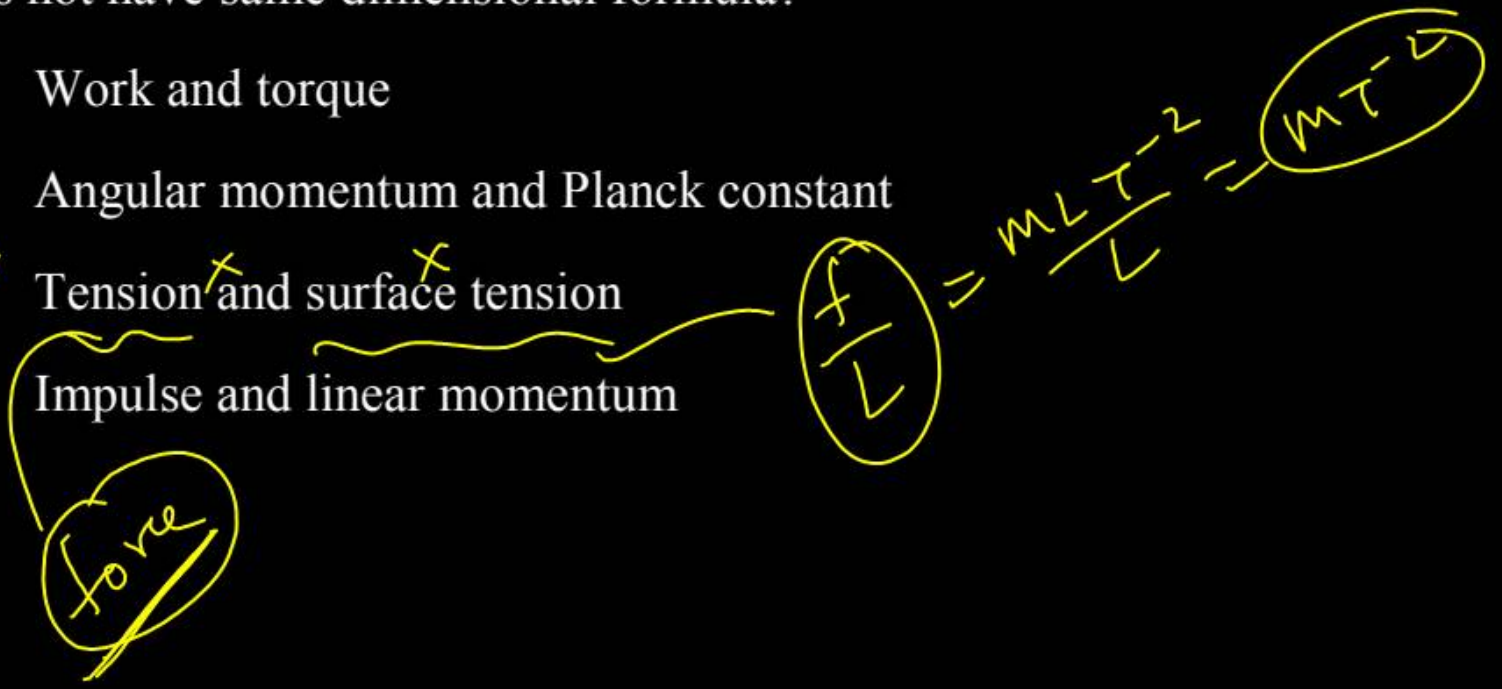
Which of the following pairs of physical quantities does not have same dimensional formula?

(1) Work and torque

(2) Angular momentum and Planck constant

(3) Tension and surface tension

(4) Impulse and linear momentum



Question no. 34

A body covers a distance of 6 m is 3rd second and 12 m in 6th second, if the motion is uniformly accelerated. How far will it travel in the next 3 s?

(1) 46 cm

(2) 48 cm

(3) 84 cm

(4) 132 cm

$S_{3^{rd}} = u + \frac{1}{2}a(2n-1)$

$6 = u + \frac{1}{2}a(5)$

$12 = u + \frac{1}{2}a(11)$

$12 = 2u + 5a$

$24 = 2u + 11a$

$-12 = -6a$

$a = 2$

$u = 1$

$S_9 - S_6$

$= [(1\times9) + \frac{1}{2}\times2\cdot9^2] - [1\times6 + \frac{1}{2}\times2\cdot6^2]$

$= 90 - 42$

$= 48$

Question no. 35

A wave equation is given by $y = 4\sin\left[\pi\left(\frac{x}{6} - \frac{t}{5} + \frac{1}{6}\right)\right]$

where, x is in cm and t is in second. The wave number of the wave is

(1) $\frac{\pi}{6}$ rad cm^{-1}

(2) $\frac{1}{6}$ rad cm^{-1}

(3) $\frac{\pi}{5}$ rad cm^{-1}

(4) $\frac{2\pi}{9}$ rad cm^{-1}

$y = a\sin(\omega t \pm kx + \phi)$

$\frac{\pi}{6}x - \frac{\pi t}{5} + \frac{\pi}{6}$

Question no. 36

The fundamental frequency in an open organ pipe is equal to the third harmonic of a closed organ pipe. If the length of the closed organ pipe is 20 cm, the length of the open organ pipe is

(1) 12.5 cm (2) 8 cm

(3) 13.3 cm (4) 16 cm

$$\nu_0 = \frac{v}{2\ell_0}$$

$$\nu_c = \frac{3v}{4\ell_c}$$

$$\frac{v}{2\ell_0} = \frac{3v}{4\ell_c}$$

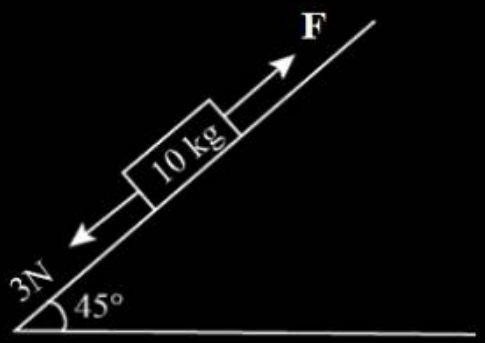
$$\frac{2 \times 20}{3} = \ell_0$$

$$\frac{40}{3} = 13.$$

Question no. 37

A block of mass 10 kg is kept on a rough inclined plane as shown in the figure. A force of 3 N is applied on the block. The coefficient of static friction between the plane and the block is 0.6. What should be the minimum value of force F, such that the block does not move downward?

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

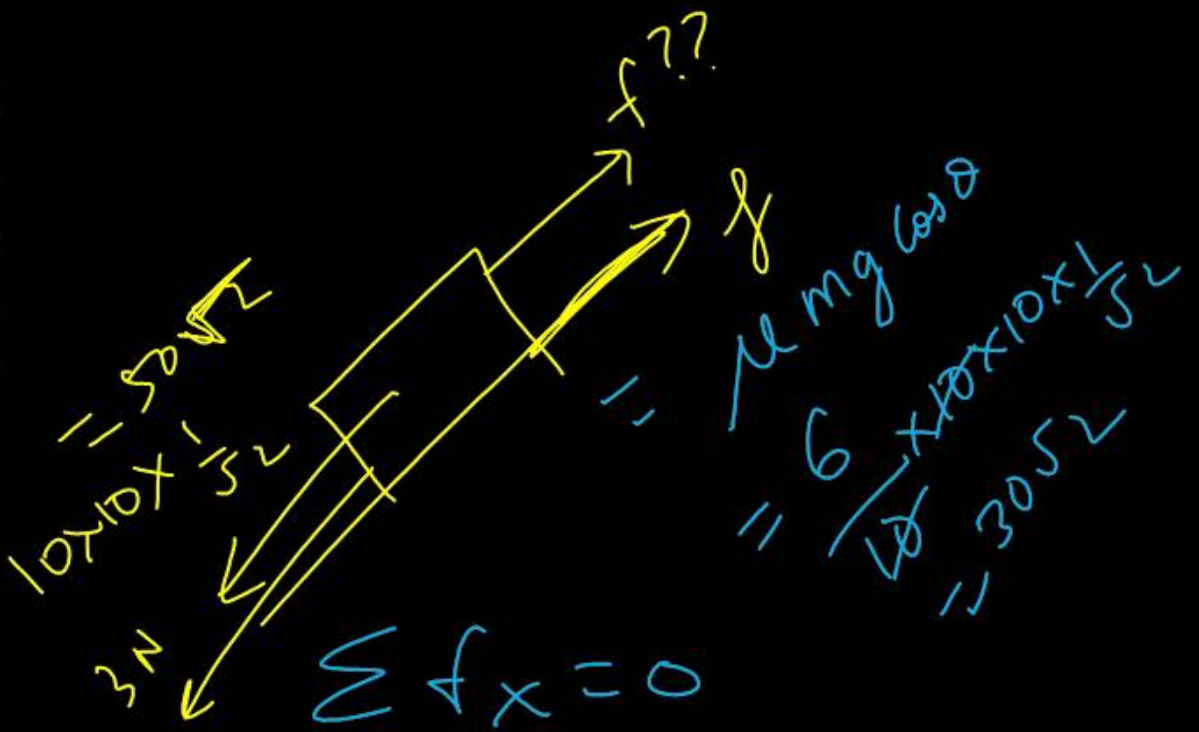


(1) 32 N

(2) 25 N

(3) 23 N

(4) 18 N



Question no. 38

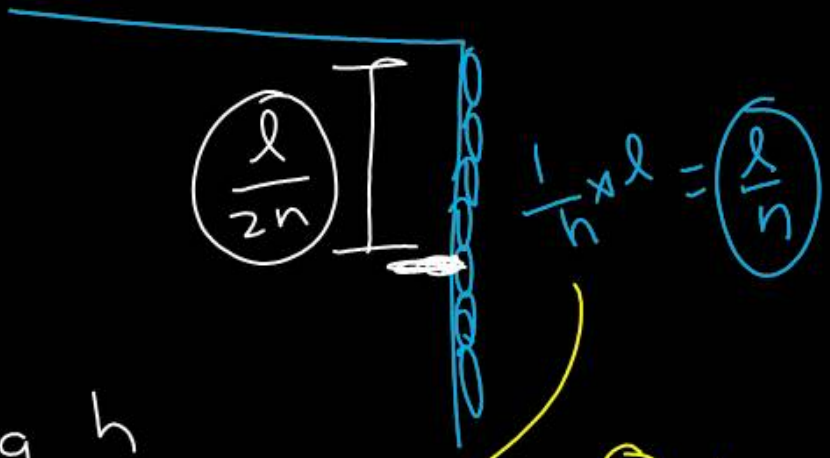
A uniform cable of mass M and length L is placed on a horizontal surface such that its $\left(\frac{1}{n}\right)$th part is hanging below the edge of the surface. To lift the hanging part of the cable up to the surface, the work done should be

(1) $\frac{2MgL}{n^2}$

(2) $nMgL$

(3) $\frac{MgL}{n^2}$

(4) $\frac{MgL}{2n^2}$



$W = mgh$

$= \frac{m}{n} \times g \times \frac{\ell}{2n}$

$= \frac{mg\ell}{2n^2}$

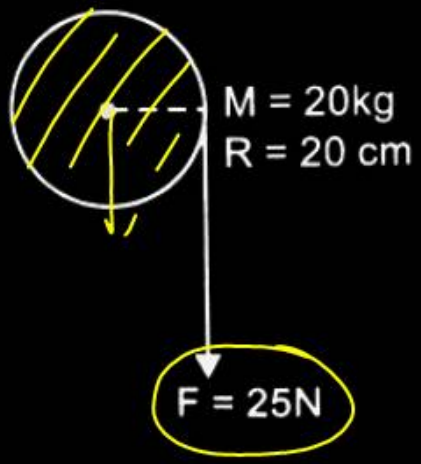
mass $= \lambda \cdot L$

$= \frac{m}{L} \times \frac{\ell}{n}$

$= \frac{m}{n}$

Question no. 39

A cord of negligible mass is wound round the rim of a flywheel (disc) of mass 20 kg and radius 20 cm. A steady pull of 25 N is applied on the cord as shown in figure. The flywheel is mounted on a horizontal axle with frictionless bearings.



$\tau = I\alpha$

$\alpha = \frac{\tau}{I} = \frac{f \cdot r}{I} = \frac{25 \times 0.2}{\frac{1}{2} \times 20 \times (0.2)^2}$

$= \frac{25 \times 10}{20 \times 2}$

$= 12.5$

Compute the angular acceleration of the flywheel.

(1) 12.50 rad s^{-2}

(2) 6 rad s^{-2}

(3) 10 rad s^{-2}

(4) 8 rad s^{-2}

Question no. 40

A planet of radius R has a time period of revolution T.

Find the time period of a planet of radius 9R.

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

(2) 9 T

(3) 27 T

(4) $9\sqrt{3}$ T

$T^2 \propto R^3$

$$\left(\frac{T_1}{T_2}\right)^2 = \left(\frac{R_1}{R_2}\right)^3$$

$$\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{3/2} = \left(\frac{R}{9R}\right)^{3/2} = \left(\frac{1}{3}\right)^{2 \times \frac{3}{2}} = \frac{1}{27}$$

Question no. 41

A planet has twice the density of earth but the acceleration due to gravity on its surface is exactly the same as on the surface of earth. Its radius in terms of radius of earth R will be

(1) R/4 (2) R/2

(3) R/3 (4) R/8

$$g = g'$$

$$\frac{GM}{R^2} = \frac{GM'}{R'^2}$$

$$\frac{\frac{4}{3}\pi R^3 \times \rho}{R^2} = \frac{\frac{4}{3}\pi R'^3 \times \rho}{R'^2}$$

$$R = 2R'$$

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

Question no. 42

Two wires are made of the same material and have the same volume. The first wire has cross-sectional area A and the second wire has cross-sectional area 3A. If the length of the first wire is increased by Δl on applying a force F, how much force is needed to stretch the second wire by the same amount?

(1) 4F (2) 6F

(3) 9F (4) F

$V = A_1 l_1$ $V = A_2 l_2$

$l_1 = \frac{V}{A}$ $l_2 = \frac{V}{3A}$

$Y = \frac{f \cdot l}{A \cdot \Delta l} = \frac{f V}{A \cdot A \Delta l} = \frac{f V}{A^2 \Delta l}$

$Y_2 = \frac{f' V}{3A \cdot 3A \Delta l} = \frac{f' V}{9 A^2 \Delta l}$

$\frac{f V}{A^2 \Delta l} = \frac{f' V}{9 A^2 \Delta l}$

$f' = 9f$

Question no. 43

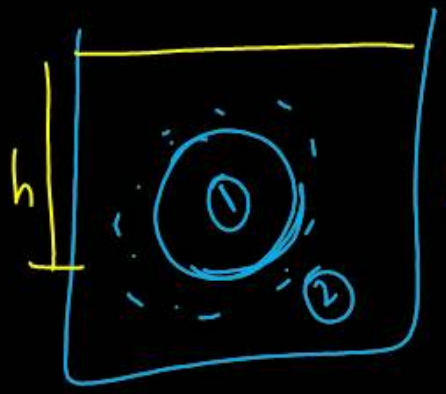
If the air bubble of radius r is formed at a depth h inside the container of soap solution of density ρ, the total pressure inside the bubble is (here, P_o denotes the atmospheric pressure and σ denotes surface tension)

(1) $\frac{2\sigma}{r} + h\rho g$

(2) $\frac{2\sigma}{r} - h\rho g$

(3) $\frac{2\sigma}{r} + P_o + h\rho g$

(4) $\frac{4\sigma}{r} + P_o + h\rho g$



$\Delta P = \frac{2T}{R}$

$P_1 - P_2 = \frac{2T}{R}$

$P_2 = P_{atm} + \rho g h$

$P_2 = P_o + \rho g h$

$P_1 = P_2 + \frac{2T}{R}$

$P_1 = P_o + \rho g h + \frac{2T}{R}$

Question no. 44

The value of $\gamma\left(=\frac{C_p}{C_v}\right)$, for hydrogen, helium and another ideal diatomic gas X (whose molecules are not rigid but have an additional vibrational mode), are respectively equal to

(1) $\frac{7}{5}, \frac{5}{3}, \frac{9}{7}$

(2) $\frac{5}{3}, \frac{7}{5}, \frac{9}{7}$

(3) $\frac{5}{3}, \frac{7}{5}, \frac{7}{5}$

(4) $\frac{7}{5}, \frac{5}{3}, \frac{7}{5}$

diatomic

mono

$f = 3$

$\gamma_{He} = 1 + \frac{2}{3} = \frac{5}{3}$

$f_X = (3t + 2r + 2v)$

$= 7$

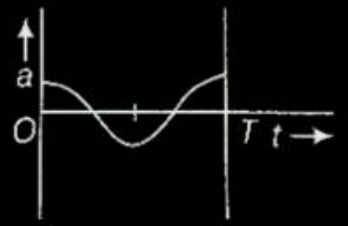
$\gamma = 1 + \frac{2}{7} = \frac{9}{7}$

Question no. 45

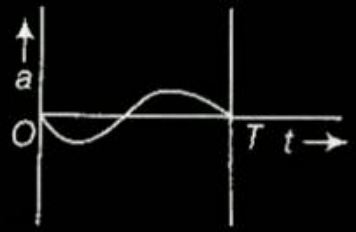
The oscillation of a body on a smooth horizontal surface is represented by the equation $x = A \cos \omega t$, where x=displacement at time t and ω= frequency of oscillation.

Which one of the following graphs shows correctly the variation of a with t.

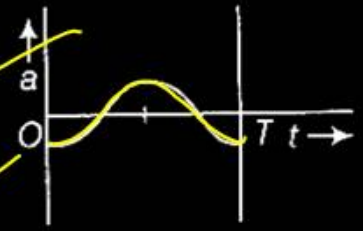
(1)



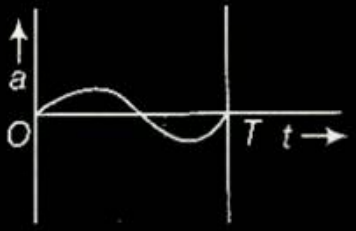
(2)



(3)



(4)



$x = A \cos \omega t$

$v = -A\omega \sin \omega t$

$a = -A\omega^2 \cos \omega t$

$a \propto -\omega^2 x$

$= -\omega^2 A \cos \omega t$

Question no. 46

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

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

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

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

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

$n = 2$ H $Z = 1$

$Z = 3$

$n = 2$

$r = \frac{0.53\, n^2}{Z}$

$\frac{0.53 \times 4}{3}$

$\frac{a_0\, 4}{3}$

Question no. 47

The number of subshells associated with n = 4 and m = –2 quantum number is:

(1) 8

(2) 2

(3) 16

(4) 4

$l = 0, 1, 2, 3$

$m = -2$

d, f

Question no. 48

The solubility of PbI_2 at 25°C is 0.7 gL^{-1}. The solubility product of PbI_2 at this temperature is (molar mass of PbI_2=460 g mol^{-1})

(1) 1.40×10^{-9} (2) 0.14×10^{-9}

(3) 140×10^{-9} (4) 14.0×10^{-9}

$PbI_2 \longrightarrow Pb^{+2} + 2I^-$

$s \quad 2s$

$K_{sp} = [Pb^{+2}][I^-]^2$

$= [s][2s]^2 =$

$\boxed{K_{sp} = 4s^3}$

$K_{sp} = 4 \times (1.53 \times 10^{-3})^3$

$= 1.53 \times 1.53 \times 1.58 \times 4 \times 10^{-9}$

$\simeq 14 \times 10^{-9}$

solubility = 0.7 g/lit

↳ Strength

Solubility Molarity $= \frac{s}{M_B} = \frac{0.7}{460}$

$= \frac{0.00153}{} = 1.53 \times 10^{-3}$

Question no. 49

The molarity of a solution obtained by mixing750 mL of 0.5 (M) HCl with 250 mL of 2(M) HCl will be:

(1) 0.875 M
(2) 1.00 M
(3) 1.75 M
(4) 0.975 M

$V_1 = 750$ $V_2 = 250$

$M_1 = 0.5$ $M_2 = 2M$

$M_1V_1 + M_2V_2 = M_3V_3$

$$M_3 = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$$

$$= \frac{0.5 \times 750 + 2 \times 250}{750 + 250}$$

$$= \frac{375 + 500}{1000} = \frac{875}{1000}$$

$M_R = 0.875\,M$

Question no. 50

Freezing point of an aqueous solution is (–0.186)°C then what will be the elevation of boiling point for the same solution- (K_b = 0.512°C, K_r=1.86°C)

(1) 0.186 °C (2) 0.0512 °C

(3) 0.092 °C (4) 0.2372 °C

$\Delta T_f = K_f \times m$

f.p. = −0.186

$\Delta T_f = 0.186$

$\Delta T_f = K_f \times m \times i$

$0.186 = 1.86 \times m \times i$

$m = \frac{0.186}{1.86 \times i}$

$\Delta T_b = K_b \times m \times i$ 0.1

$\Delta T_b = 0.512 \times \frac{0.186}{1.86 \times i} \times i$

$\Delta T_b = 0.0512$

Question no. 51

Consider the following E° values

$E°_{Fe^{3+}/Fe^{2+}} = +0.77V$; $E°_{sn^{2+}/sn} = -0.14V$

Under standard conditions the potential for the reaction

$Sn(s)+2Fe^{3+}(aq) \rightarrow 2Fe^{2+}(aq)+Sn^{2+}(aq)$ is

(1) 0.91 V (2) 1.40 V

(3) 1.68 V (4) 0.63 V

$E°_{cell} = E°_{cathode} - E°_{anode}$

$= (0.77) - (-0.14)$

$= 0.77 + 0.14$

Question no. 52

The half-life period of a first order reaction is 15 minutes. The amount of substance left after one hour will be:

(1) $\frac{1}{4}$ of the original amount

(2) $\frac{1}{8}$ of the original amount

(3) $\frac{1}{16}$ of the original amount

(4) $\frac{1}{32}$ of the original amount

$t_{1/2}$ = 1/2 = 15 min

1/4 = 30

1/8 = 45

1/16 = 60

Question no. 53

The reaction $X \rightarrow Y$ is an exothermic reaction. Activation energy of the reaction for X into Y is 150 kJ mol^{-1}. Enthalpy of reaction is 135 kJ mol^{-1} . The activation energy for the reverse reaction, $Y \rightarrow X$ will be:

(1) 280 kJ mol^{-1}

(2) 285 kJ mol^{-1}

(3) 270 kJ mol^{-1}

(4) 15 kJ mol^{-1}

$\Delta H = -ve$

$E_{a_f} = 150$

$\Delta H = -135$

E_{a_b}

$\Delta H = E_{a_f} - E_{a_b}$

$-135 = 150 - E_{a_b}$

$E_{a_b} = 150 + 135$

285

Question no. 54

Match List-I with List-II.

	List – I		List – II
A.	16 g of $CH_{4(g)}$	I.	Weighs 28 g
B.	1 g of $H_{2(g)}$	II.	60.2×10^{23} electrons
C.	1 mole of $N_{2(g)}$	III.	Weighs 32 g
D.	0.5 mol of $SO_{2(g)}$	IV.	Occupies 11.2 L volume at STP

Choose the correct answer from the options given below :

(1) A – II, B – III, C – IV, D – I

(2) A – I, B – III, C – II, D – IV

(3) A – II, B – IV, C – III, D – I

(4) A – II, B – IV, C – I, D – III

$mol = \frac{16}{16} = 1 mol$

$molecule = mol \times N_A = 1 \times 6.023 \times 10^{23}$

$= 6.023 \times 10^{23}$

No. of e^- in 1 molecule of $CH_4 = 10 e^-$

$= 6.023 \times 10^{23} \times 10 e^- = 60.23 \times 10^{23}$

A – IV B – IV C – I , D – III

Question no. 55

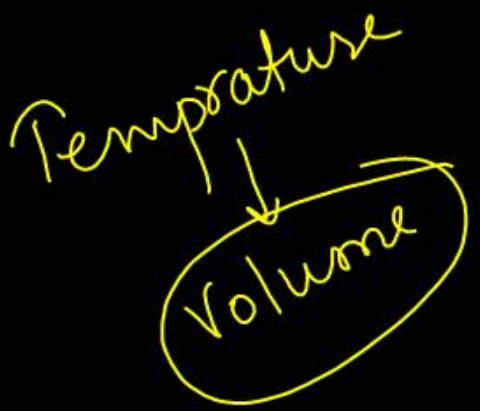
With increase of temperature, which of these changes?

(1) Molality

(2) Weight fraction of solute

(3) molarity

(4) Mole fraction



Question no. 56

The enthalpy changes for the following processes are listed below :

$Cl_{2(g)} \rightarrow 2Cl_{(g)}$, 242.3 kJ mol^{-1}

$I_{2(g)} \rightarrow 2I_{(g)}$, 151.0 kJ mol^{-1}

$ICl_{(g)} \rightarrow I_{(g)} + Cl_{(g)}$, 211.3 kJ mol^{-1}

$I_{2(s)} \rightarrow I_{2(g)}$, 62.76 kJ mol^{-1}

$\frac{1}{2} I_{2(s)} + \frac{1}{2} Cl_{2(g)} \rightarrow ICl_{(g)}$

$\Delta H = \left[\frac{62.76}{2} + \frac{151}{2} + \frac{242.3}{2}\right] - [211.3]$

Given that the standard states for iodine and chlorine are $I_{2(s)}$ and $Cl_{2(g)}$, the standard enthalpy of formation for $ICl_{(g)}$ is

(1) –14.6 kJ mol^{-1} (2) –16.8 kJ mol^{-1}

(3) +16.8 kJ mol^{-1} (4) +244.8 kJ mol^{-1}

Question no. 57

For the given hypothetical reactions, the equilibrium constants are as follows :

$X \rightleftharpoons Y;\ K_1 = 3.0$

$X \rightleftharpoons Z;\ K_2 = 2.0$

$Z \rightleftharpoons W;\ K_3 = 4.0$

$K_2 \times K_3 = K_{eq}$

$2 \times 4 = K_{eq}$

$K_{eq} = 8$

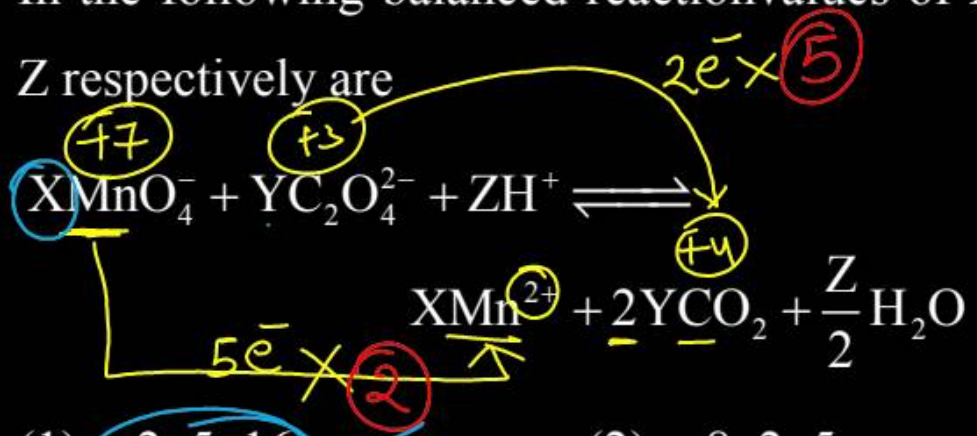
The equilibrium contants for the reaction, $X \rightleftharpoons W$ is

(1) 12.0 (2) 6.0

(3) 8.0 (4) 7.0

Question no. 58

In the following balanced reactionvalues of X, Y and Z respectively are



(1) 2, 5, 16

(2) 8, 2, 5

(3) 5, 2, 16

(4) 5, 8, 4

$2MnO_4^- + 5C_2O_4^{-2} + 16H^+ \longrightarrow 2Mn^{+2} + 10CO_2 + 8H_2O$

X = 2 Y = 5

Question no. 59

In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to change from 0.1 M to 0.025 M is

(1) 30 minutes (2) 15 minutes

(3) 7.5 minutes (4) 60 minutes

$t_{1/2} = 15$ min

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

$2(t_{1/2}) = \frac{1}{4}$

30 min

Question no. 60

Resistance of 0.2 M solution of an electrolyte is 50 Ω. The specific conductance of the solution is 1.4 S m^{-1}. The resistance of 0.5 M solution the same electrolyte is 280 Ω. The molar conductivity of 0.5 M solution fo the electrolyte in S m^2 mol^{-1} is

(1) 5×10^{2}

(2) 5×10^{-4}

(3) 5×10^{-3}

(4) 5×10^{3}

Same cell

$$k_1 R_1 = k_2 R_2$$

$$1.4 \times 50\,\Omega = k_2 \times 280$$

$$\frac{1.4 \times 50}{2800} = \frac{1}{200} = \frac{1}{4}$$

$$k_2 = \frac{1}{4}$$

$$\Lambda_m = \frac{k}{M \times 1000}$$

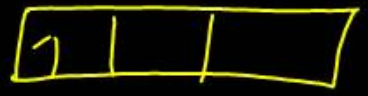
$$\Lambda_m = \frac{1}{4} \times \frac{1}{0.5 \times 1000} = 5 \times 10^{-4}$$

Question no. 61

Outermost electronic configurations of four elements

A, B, C, D are given below:

A. $3s^2$ 

B. $3s^2\ 3p^1$ 

C. $3s^2\ 3p^3$ 

D. $3s^2\ 3p^4$ 

The correct order of first ionization enthalpy for them is :

C > D > A > B

(1) A < B < C < D

(2) B < A < D < C

(3) B < D < A < C

(4) B < A < C < D

Question no. 62

The formation of the oxide ion O^{2-} (g) requires first an exothermic and then an endothermic step as shown below

$O(g) + e^- \rightarrow O^- \Delta H^0(g) = -142 \text{ kJ mol}^{-1}$

$O(g) + e^- \rightarrow O^{2-} \Delta H^0(g) = 844 \text{ kJ mol}^{-1}$

The is because

(1) O^- ion will tend to resist the addition of another electron

(2) Oxygen has high electron affinity

(3) Oxygen is more electronegative

(4) O^- ion has comparatively larger size than oxygen atom

Question no. 63

The number of species below that have two lone pairs of electrons in their central atom is

SF_4, BF_4^-, ClF_3, AsF_3, PCl_5, BrF_5, XeF_4, SF_6

(1) 2

(2) 3

(3) 5

(4) 6

XeF_4 — 2

SF_6 — 0

SF_4 — 1

BF_4^- — 0

ClF_3 — 2

AsF_3 — 1

PCl_5 — 0

BrF_5 — 1

Question no. 64

Match List-I with List – II.

	List I		List II
A.	$[PtCl_4]^{2-}$	i.	Sp^3d
B.	BrF_6^-	ii.	d^2sp^3
C.	PCl_5	iii.	dsp^2
D.	$[Co(NH_3)_6]^{3+}$	iv.	sp^3d^3

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

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

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

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

Question no. 65

The correct order of magnetic moments (spin only values in B.M.) among the following is

(1) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$

(2) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$

(3) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$

(4) $[Fe(CN)_6]^{4-} [CoCl_4]^{2-} > [MnCl_4]^{2-}$

0

$Mn^{+2} = 3d^5$

Question no. 66

The 'f' orbitals are half and completely filled, respectively in lanthanide ions

(Given : Atomic no. Eu, 63; Sm, 62; Tm, 69; Tb, 65; Yb, 70 ; Dy, 66)

(1) Eu^{2+} and Tm^{2+}

(2) Sm^{2+} and Tm^{3+}

(3) Tb^{4+} and Yb^{2+}

(4) Dy^{3+} and Yb^{3+}

$Eu = 6s^2 5d^0 4f^7$

$Yb^{+2} = 6s^2 5d^0 4f^{14}$

$Tb = 6s^2 5d^1 4f^8$

$Tb^{+4} = 6s^0 5d^0 4f^7$

Question no. 67

The orange colour of $K_2Cr_2O_7$ and purple colour of $KMnO_4$ is due to

(1) Charge transfer transition in both.

(2) $d \rightarrow d$ transitions in $KMnO_4$ and charge transfer transitions in $K_2Cr_2O_7$.

(3) $d \rightarrow d$ transitions in $K_2Cr_2O_7$ and charge transfer transitions in $KMnO_4$.

(4) $d \rightarrow d$ transitions in both.

Question no. 68

Match the metals (column I) with the coordination compound(s)/enzyme(s) (column II) :

	Column – I		Column – II
A.	Co	i.	Wilkinson catalyst
B.	Zn	ii.	Chlorophyll
C.	Rh	iii.	Vitamin B_{12}
D.	Mg	iv.	Carbonic anhydrase

(1) A – iii, B – iv, C – i, D – ii

(2) A – i, B – ii, C – iii, D – iv

(3) A – ii, B – i, C – iv, D – iii

(4) A – iv, B – iii, C – i, D – ii

Question no. 69

Match the List-I with List-II.

	List – I Coordination entity		List – II Wavelength of light absorbed in nm
A.	$[CoCl(NH_3)_5]^{2+}$	i.	310
B.	$[Co(NH_3)_6]^{3+}$	ii.	475
C.	$[Co(CN)^6]^{3-}$	iii.	535
D.	$[Cu(H_2O)_4]^{2+}$	iv.	600

Choose the correct answer from the options given below :

(1) A – iv, B – i, C – iii, D – ii

(2) A – iii, B – ii, C – i, D – iv

(3) A – iii, B – i, C – ii, D – iv

(4) A – ii, B – iii, C – iv, D – i

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

CN^- $(NH_3)_6$ $(NH_3)_5$ H_2O

C D

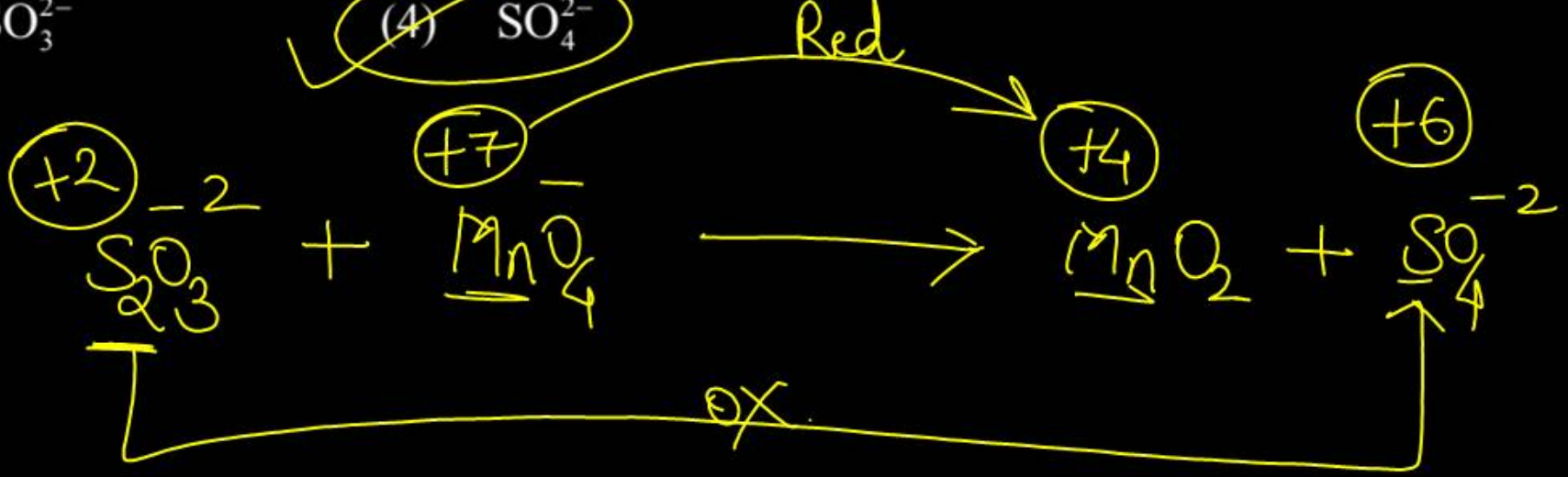
310 600

Question no. 70

In neutral or alkaline soution, MnO_4^- oxidises thiosulphate to :

(1) $S_2O_7^{2-}$ (2) $S_2O_8^{2-}$

(3) SO_3^{2-} (4) SO_4^{2-}



Question no. 71

In the Kjeldahl's method of estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralised 10 mL of 1 M H_2SO_4. The percentage of nitrogen in the soil is

(1) 37.33

(2) 45.33

(3) 35.33

(4) 45.33

$$= \frac{1.4 \times 2N \times 10}{0.75}$$

$$\% N = \frac{1.4 \times \text{Normality} \times \text{Volume}}{W}$$

Question no. 72

Match the List-I with List-II.

	List – I (Metal Ion)		List – II (Group in Qualitative analysis)
A.	Mn^{2+}	i.	Group-III
B.	As^{3+}	ii.	Group-IIA
C.	Cu^{2+}	iii.	Group-IV
D.	Al^{3+}	iv.	Group-IIB

(1) A – i, B – ii, C – iii, D – iv

(2) A – iii, B – iv, C – ii, D – i

(3) A – i, B – iv, C – ii, D – iii

(4) A – iv, B – ii, C – iii, D – i

Basic

I	Ag^{+}, Hg^{+2}, Pb^{+2}
II_A	Cu^{+2}, Hg^{+2}, Pb^{+2}, Bi^{+3}
II_B	As^{+3}, Sn^{+2}, Sn^{+4}, Cd^{+3}
III	Al^{+3}, Cr^{+3}, Fe^{+3}
IV	Mn^{+2}, Zn^{+2}, Co^{+2}
V	Ca^{+2}, Ba^{+2}, Sr^{+2}
VII	Mg^{+2}

Question no. 73

KJeldahl's method cannot be used for the estimation of nitrogen in

(1) pyridine

(2) nitro compounds

(3) azo compounds

(4) All of these

Question no. 74

What is the number of σ and π bonds in napthalene?

(1) 18, 5

(2) 19, 5

(3) 20, 5

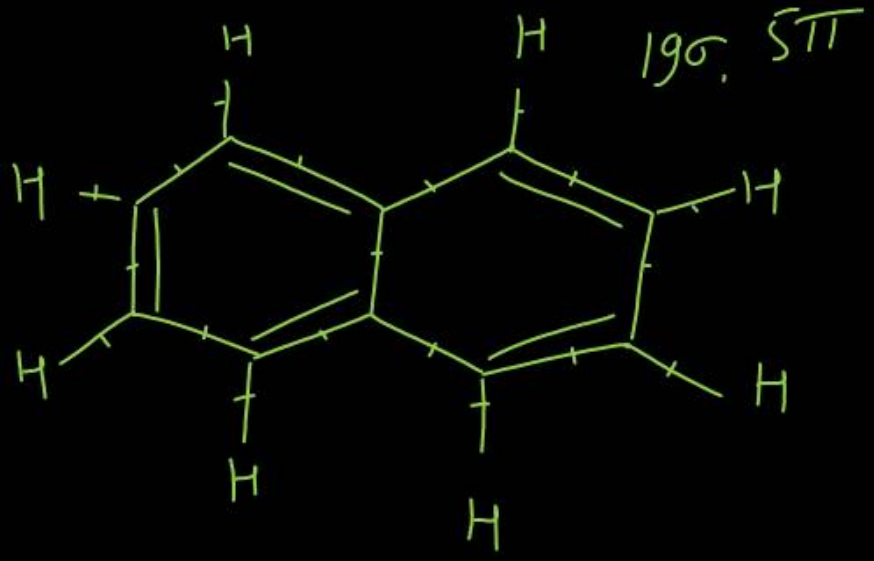
(4) 26, 7

A–B ⇒ 1σ

A = B ⇒ 1σ 1π

A ≡ B ⇒ 1σ 2π

(2)

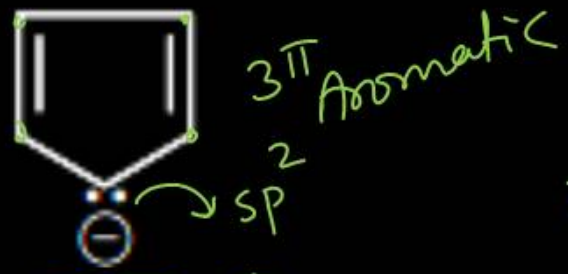


Question no. 75

Which one of the following compounds is not aromatic?

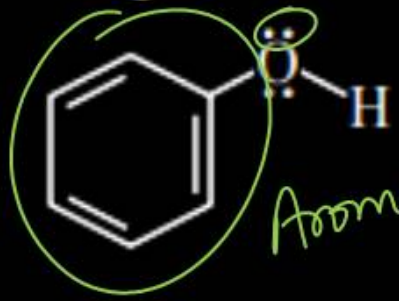
(1)

(2)



(3)

(4)



Question no. 76

An unknown alcohol is treated with the "Lucas reagent" to determine whether the alcohol is primary, secondary, or tertiary. Which alcohol reacts fastest and by what mechanism:

(1) secondary alcohol by SN1

(2) tertiary alcohol by SN1

(3) secondary alcohol by SN2

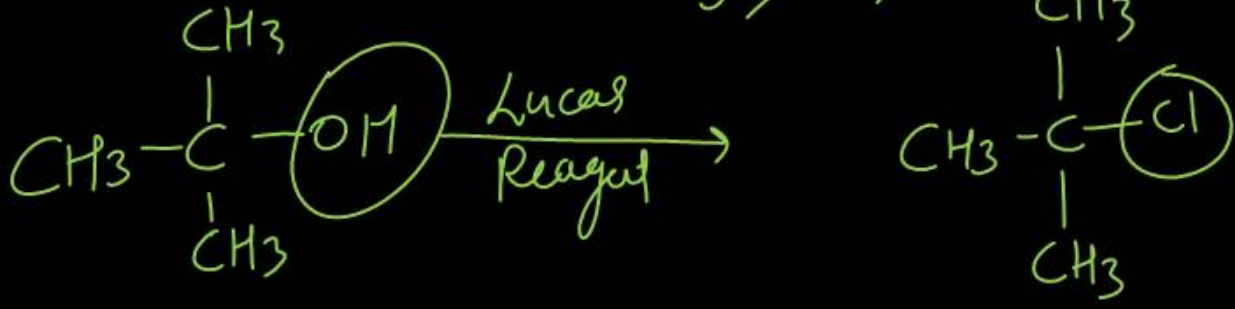
(4) tertiary alcohol by SN2

Lucas Reagent
Conc. HCl + anhydrous $ZnCl_2$

$\oplus$ C ✓ SN1

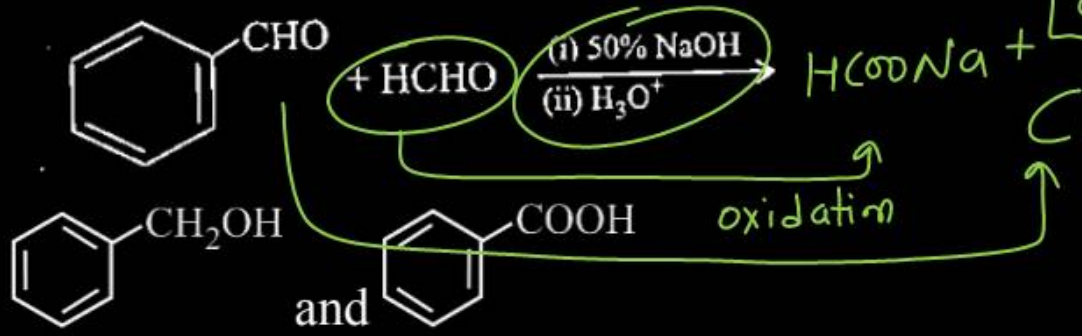
alcohol
$3^\circ > 2^\circ > 1^\circ$

2

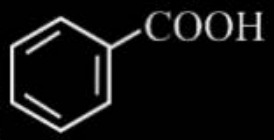


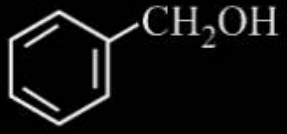
Question no. 77

Major product of the following reaction are:

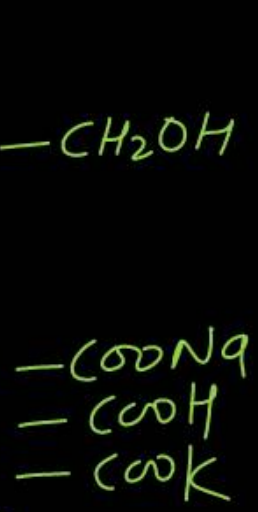


(1) and

(2) CH_3OH and 

(3) HCOOH and 

(4) ~~CH_3OH and HCO_2H~~



3

more Reactive Ald. ⇒ oxidation

Reactivity of Aldehyde $\propto \frac{1}{\text{steric Hindrance}}$

less Reactive Aldehyde ⇒ Reduction

Question no. 78

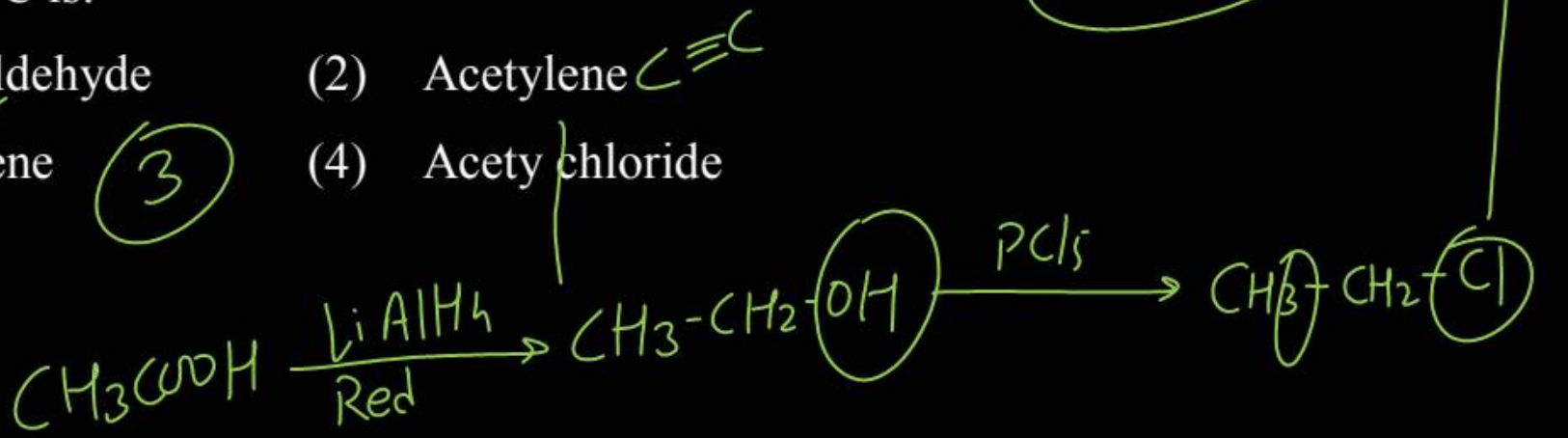
In the reaction,

$$CH_3COOH \xrightarrow{LiAlH_4} A \xrightarrow{PCl_5} B \xrightarrow{Alc.KOH} C,$$

the product C is:

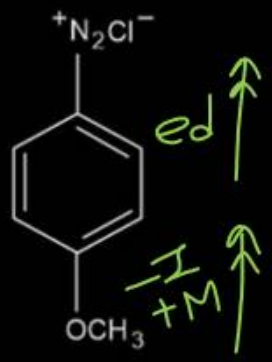
(1) Acetaldehyde (2) Acetylene

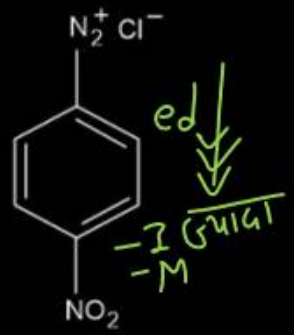
(3) Ethylene (4) Acety chloride

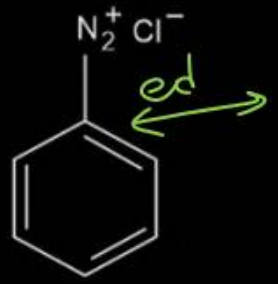


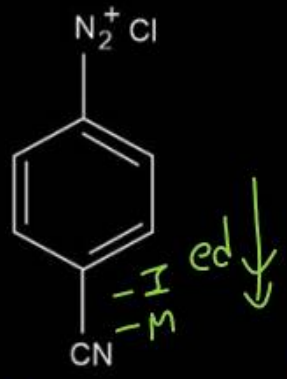
Question no. 79

The correct stability order of the following diazonium salt is

(A) 

(B) 

(C) 

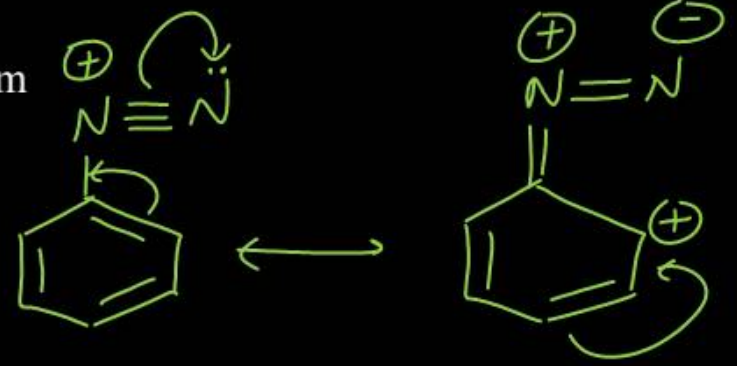
(D) 

(1) A > B > C > D

(2) A > C > D > B

(2) C > A > D > B

(4) C > D > B > A



Stability of Diaz. Salt ∝ ed on Ring

$-NO_2$ (−I) > $-CN$ (−I)

2

Question no. 80

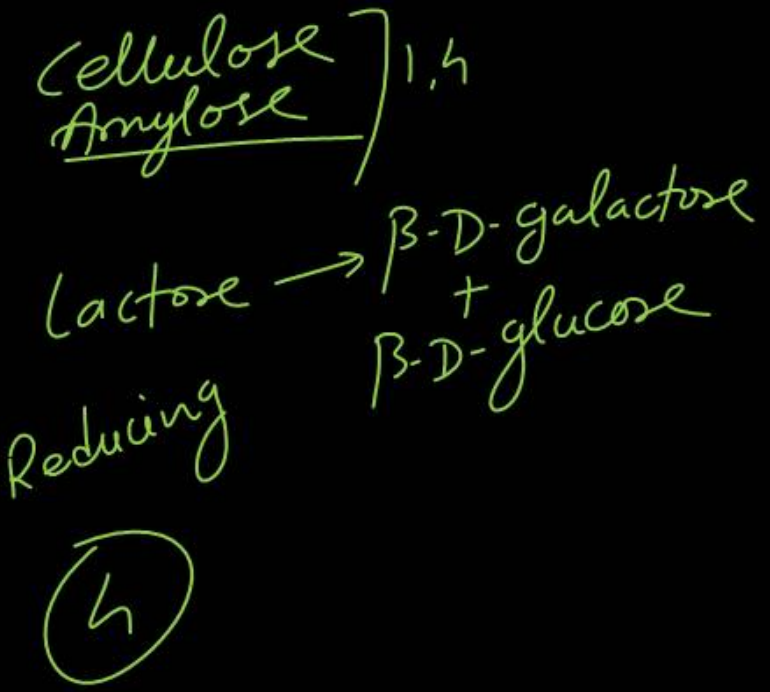
Among the following the incorrect statement is :

(1) Cellulose and amylose have 1, 4 – glycosidic linkage

(2) Lactose contains β -D-galactose and β -D-glucose

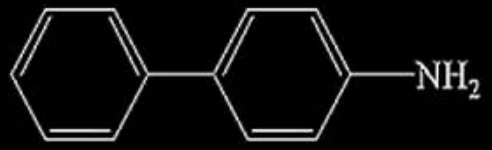
(3) Maltose and lactose have 1, 4-glycosidic linkage

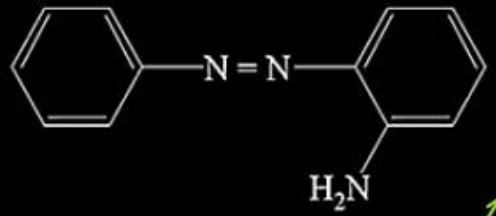
(4) Sucrose and amylose have 1, 2-glycosidic linkage

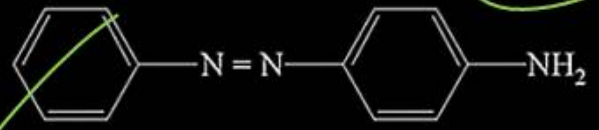


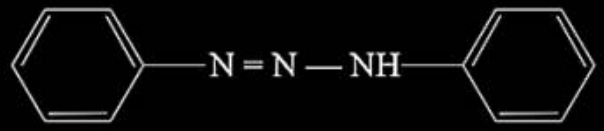
Question no. 81

Benzene diazonum chloride on reaction with aniline in the presence of dilute hydrochloric acid gives:

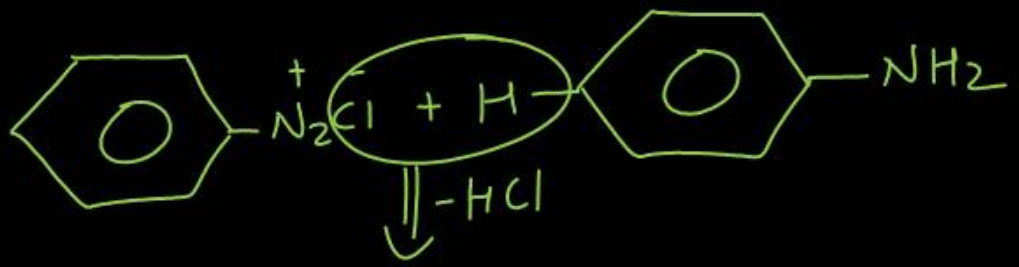
(1) 

(2) 

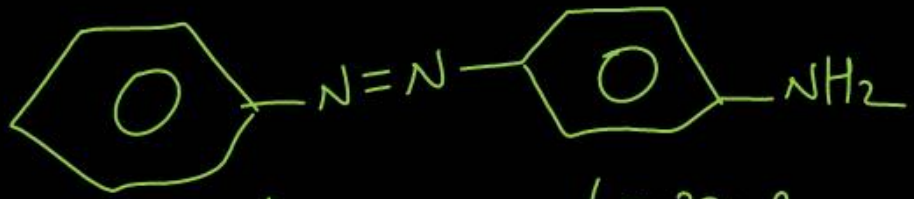
(3) 

(4) 

→ Coupling Rxn (ESR)



3

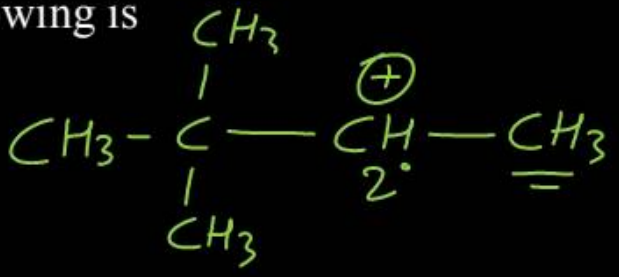


p-amino azo benzene

Question no. 82

The most stable carbocation, among the following is

(1) $(CH_3)_3C-\overset{\oplus}{C}H-CH_3$



(2) $CH_3-CH_2-\overset{\oplus}{C}H-CH_2-CH_3$

2°

(3) $CH_3-\overset{\oplus}{C}H-CH_2-CH_2-CH_3$

2° + 4∝H

(4) $CH_3-CH_2-\overset{\oplus}{C}H_2$

2° + 5∝H

3

1° + 2∝H

Question no. 83

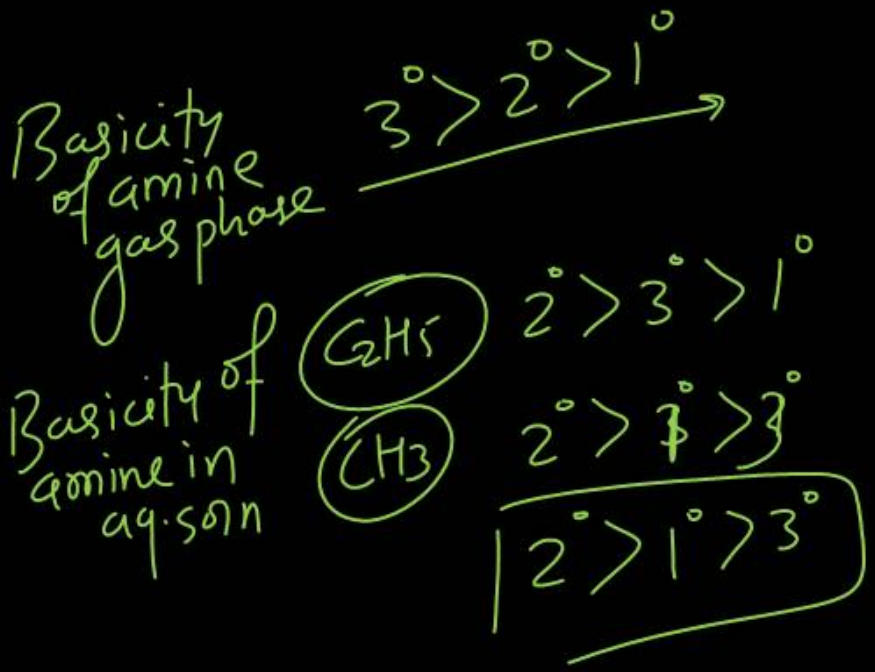
The correct order in aqueous medium of basic strength in case of methyl substitued amines is :

(1) $Me_2NH > MeNH_2 > Me_3N > NH_3$

(2) $Me_2NH > Me_3N > MeNH_2 > NH_3$

(3) $NH_3 > Me_3N > MeNH_2 > Me_2NH$

(4) $Me_3N > Me_2NH > MeNH_2 > NH_3$



Question no. 84

The increasing order of the reactivity of the following compounds in nucleophilic addition reaction is :

Propanal, Benzaldehyde, Propanone, Butanone

(1) Benzaldehyde < Butanone < Propanone < Propanal

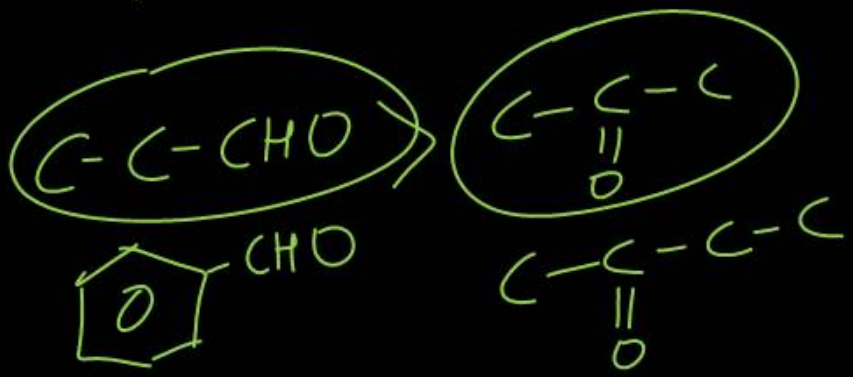
(2) Butanone < Propanone < Benzaldehyde < Propanal

(3) Propanal < Propanone < Butanone < Benzaldehyde

(4) Benzaldehyde < Propanal< Propanone < Butanone

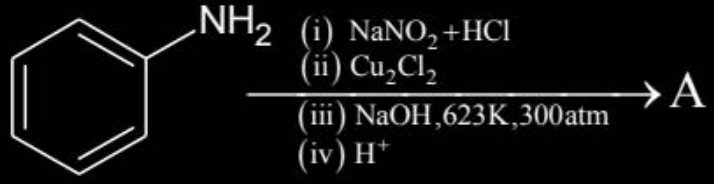
NAR (ald. & ketone) Reactivity $\propto \frac{+\text{ve charge on } sp^2\text{-C}}{\text{Steric Hindrance}}$

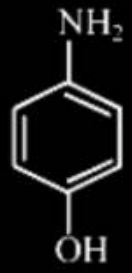
Ald > Ketone

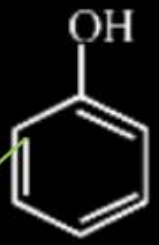


Question no. 85

Identify the product A in the following reaction.

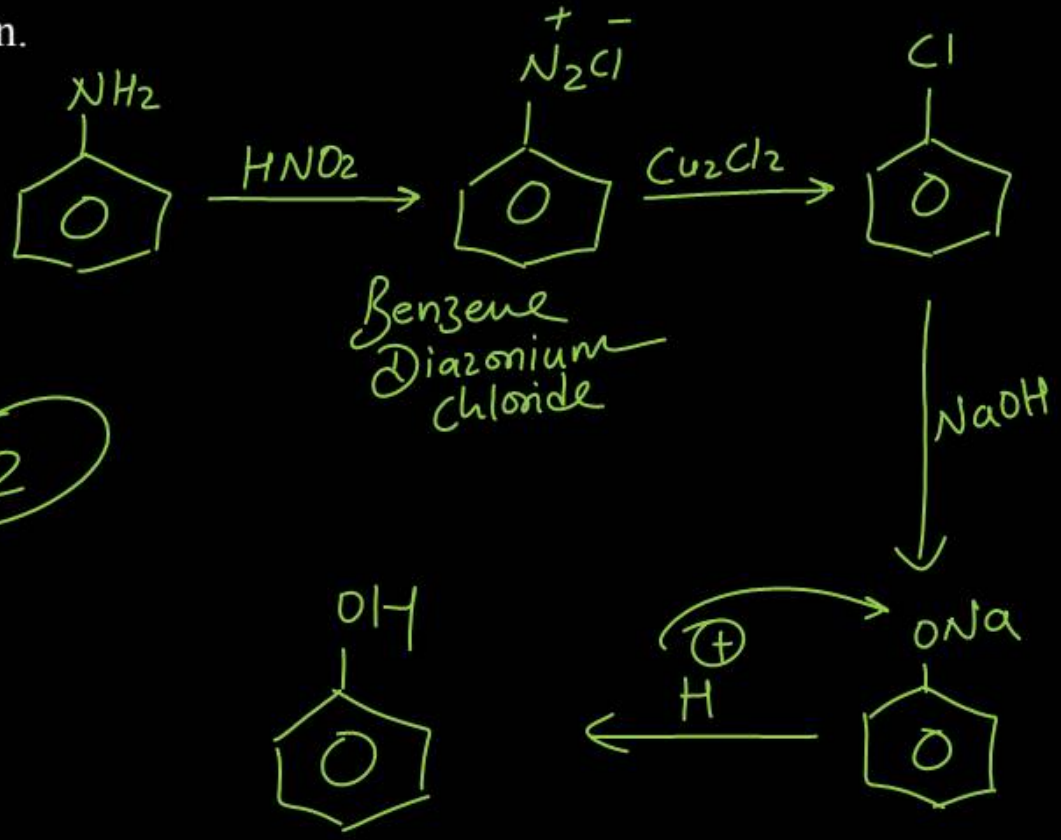


(1) 

(2) 

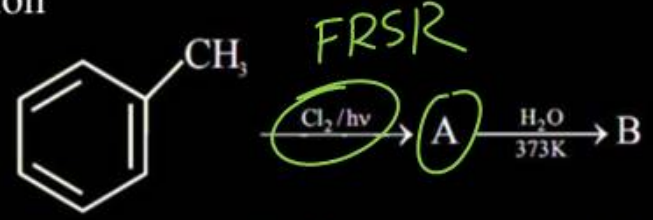
(3) 

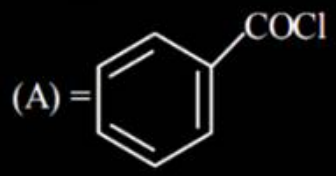
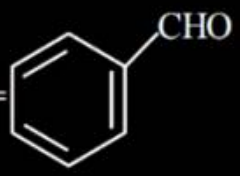
(4) 

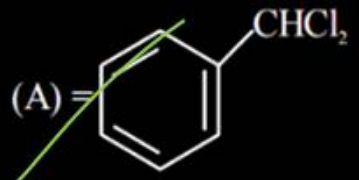
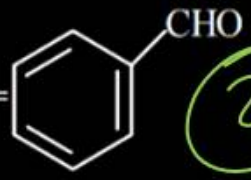


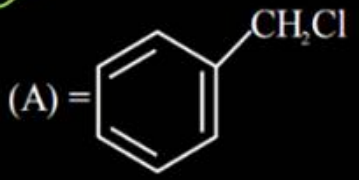
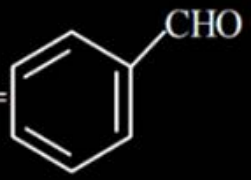
Question no. 86

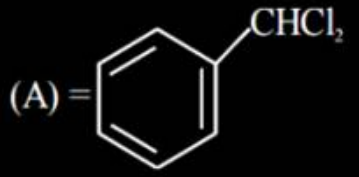
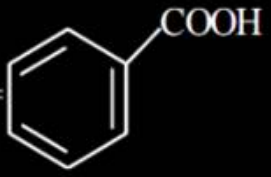
Identify A and B in the following sequence of reaction

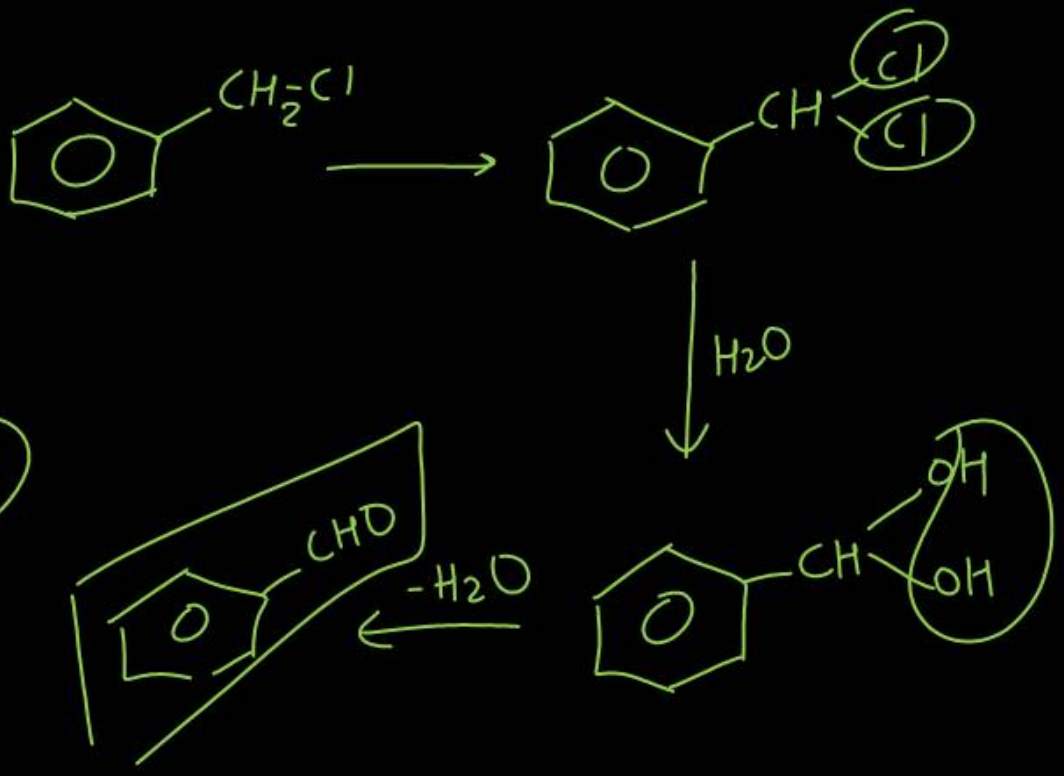


(1) (A) =  (B) = 

(2) (A) =  (B) = 

(3) (A) =  (B) = 

(4) (A) =  (B) = 



Question no. 87

The final product 'A' in the following reaction sequence.

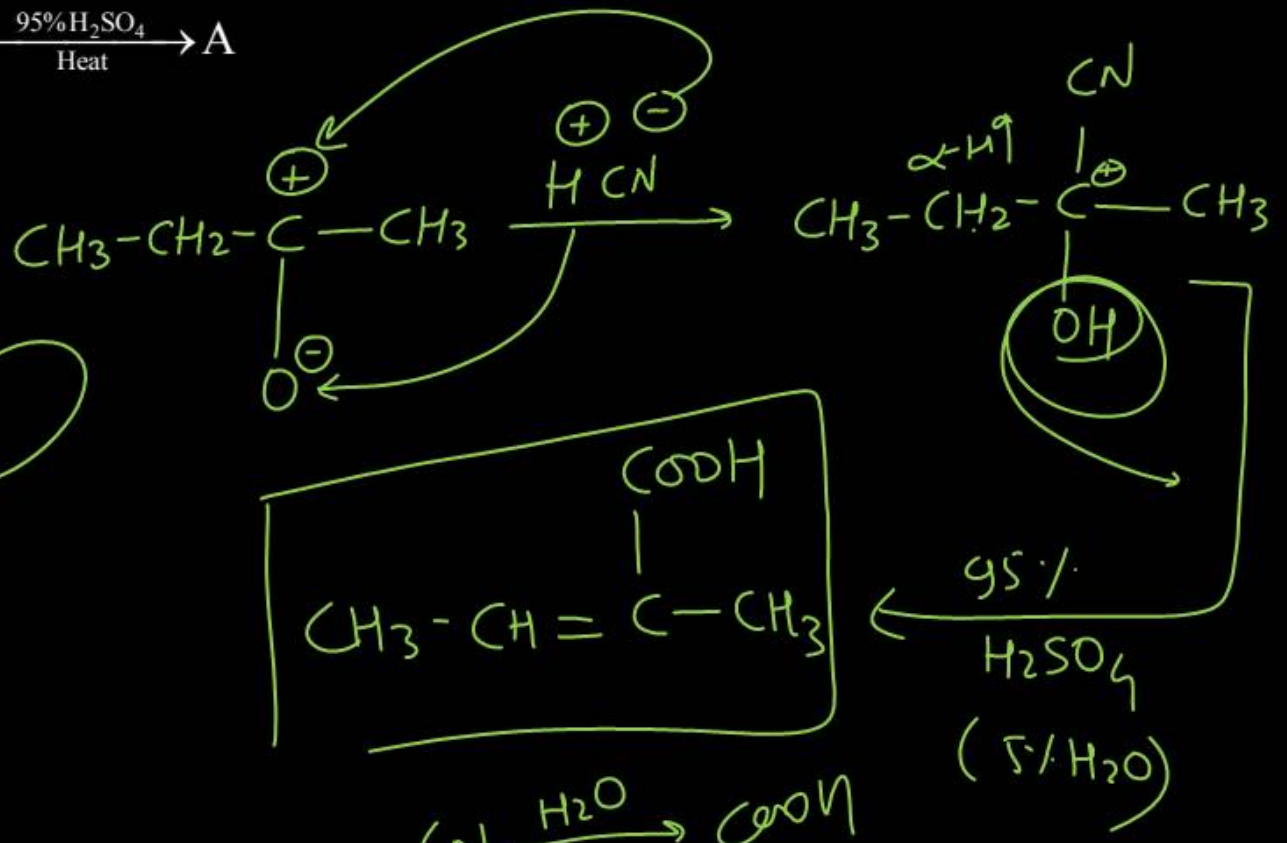
$$CH_3CH_2-\underset{\underset{O}{\|}}{C}-CH_3 \xrightarrow{HCN} ? \xrightarrow[\text{Heat}]{95\%\,H_2SO_4} A$$

(1) $CH_3-CH=\underset{\underset{CH_3}{|}}{C}-COOH$

(2) $CH_3-CH=\underset{\underset{CH_3}{|}}{C}-CN$

(3) $CH_3-CH-\underset{\underset{CH_3}{|}}{C}-COOH$ (OH)

(4) $CH_3-CH=\underset{\underset{CH_3}{|}}{C}-CONH_2$



Question no. 88

Match the List-I with List-II.

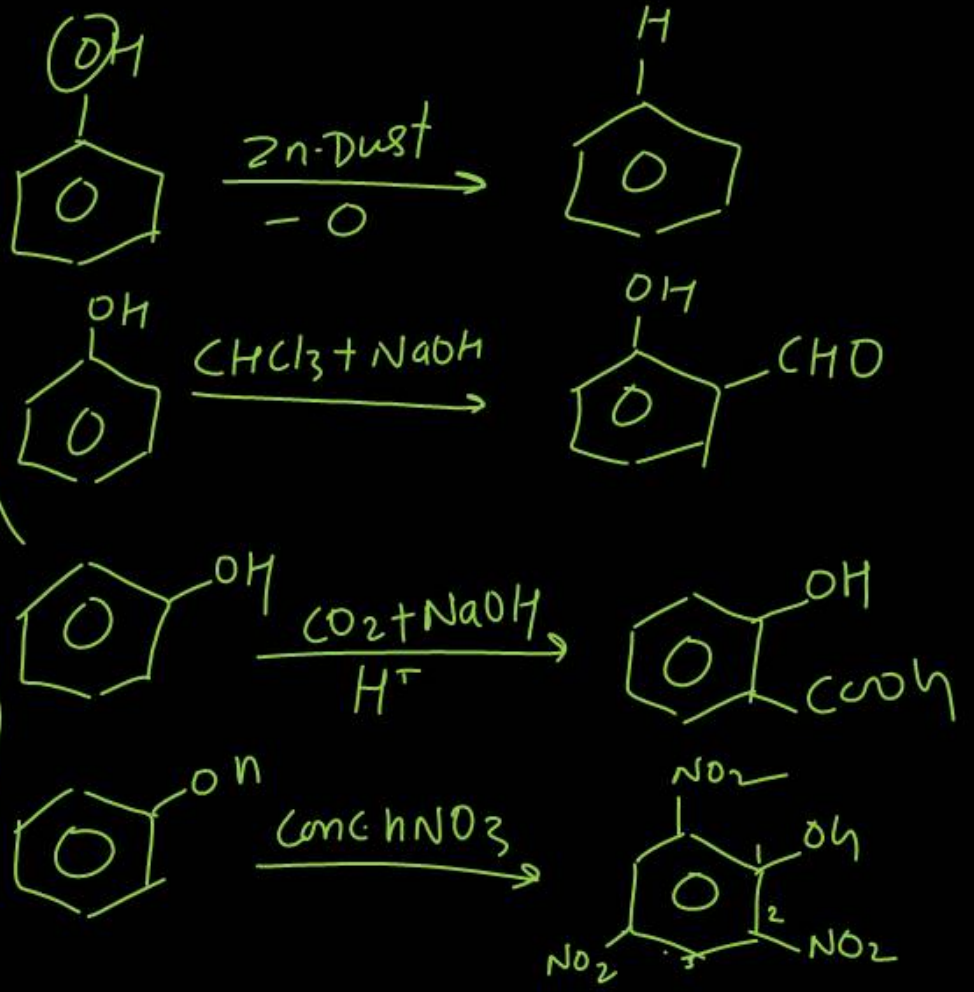
	List – I (Reactions)		List – II (Products)
A.	Phenol, Zn/Δ	i.	Salicylaldehyde
B.	Phenol, $CHCl_3$, NaOH, HCl	ii.	Salicylic acid
C.	Phenol, CO_2, NaOH, HCl	iii.	Benzene
D.	Phenol, Conc.HNO_3	iv.	Benzene

(1) A – iv, B – i, C – ii, D – iii

(2) A – iii, B – i, C – ii, D – iv

(3) A – iv, B – ii, C – i, D – iii

(4) A – iii, B – iv, C – i, D – ii

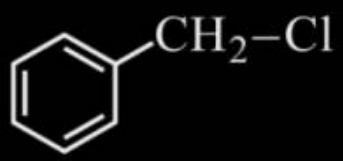


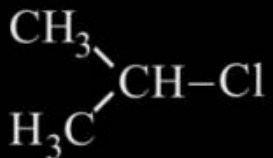
Question no. 89

Which among the folloiwng halide/s will not show S_N1 reaction :

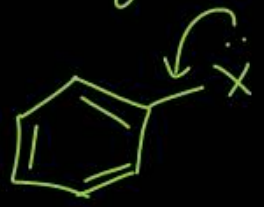
(1) $H_2C = CH - CH_2Cl$

(2) $CH_3 - CH = CH - Cl$ (2)

(3) 

(4) 

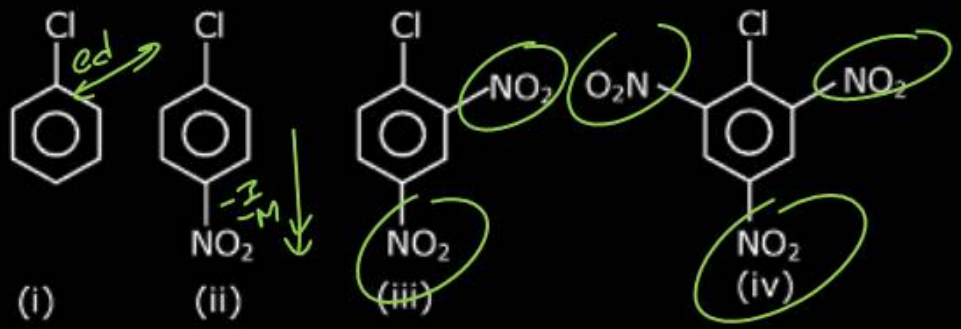
Vinyl Halide / Phenyl Halide

$CH_2 = CH - Cl$ | 

least Reactive
Don't give S_N1 & S_N2

Question no. 90

The correct order of the following compunds showing increasing tendency towards nucleophilic substitution reaction is :



(1) (iv) < (iii) < (ii) < (i)

(2) (iv) < (i) < (ii) < (iii)

(3) (iv) < (i) < (iii) < (ii)

(4) (i) < (ii) < (iii) < (iv)

S_N Reactivity of aromatic halides $\propto \frac{1}{\text{edon } \bigcirc \text{ Ring}}$

iv > iii > ii > i

4

Question no. 91

Can you identify the correct sequence of taxonomical categories?

(1) Species → Order → Phylum → Kingdom

(2) Genus → Species → Order → Kingdom

(3) Species → Genus → Order → Phylum

(4) Genus → Order → Family → Kingdom

Question no. 92

Who proposed two kingdom system of classification and named kingdoms as Plantae and Animalia?

(1) Carolus Linnaeus

(2) RH Whittaker

(3) Carl Woese

(4) Herbert Copeland

Question no. 93

Which one of the following is wrong for fungi?

(1) They are eukaryotic

(2) All fungi possess a purely cellulosic cell wall

(3) They are heterotrophic

(4) They are both unicellular and multicellular

chitin

2

Question no. 94

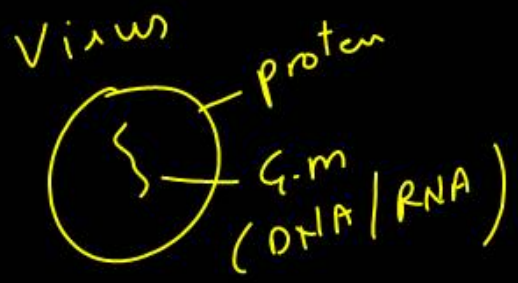
Viroids have

(1) dsDNA enclosed by protein coat

(2) ss DNA enclosed by protein coat

(3) ssRNA not enclosed by protein coat

(4) dsRNA enclosed by protein coat



Question no. 95

Which one of the following statements is wrong?

(1) Algin and carrageenan are products of algae

(2) Agar–agar is obtained from Gelidium and Gracilaria

(3) Chlorella and Spirullina are used as space food

(4) Mannitol is stored food in Rhodophyceae

4

Red Algae

Rheophyceae

Question no. 96

Consider the following statements regarding gymnosperms and choose the correct option.

I. In gymnosperms, the male and female gametophytes have an independent existence.

II. The multicellular female gametophyte is retained within the megasporangium.

III. The gymnosperms are heterosporous.

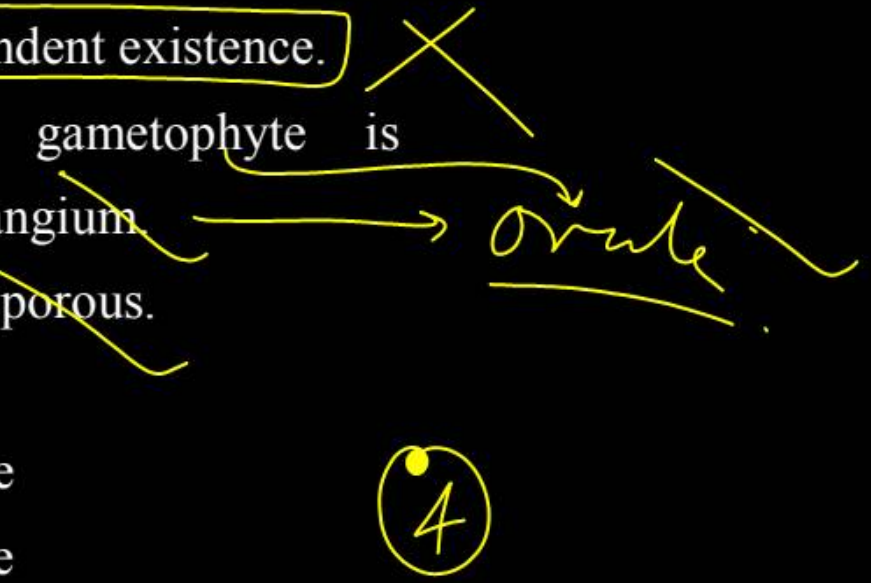
Of these statements

(1) I and II are true, but III is false

(2) I and III are true, but II is false

(3) II and III are false, but I is true

(4) II and III are true, but I is false



Question no. 97

Plant shows thallus level of organization. It shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile.

Identify the group to which it belongs

(1) pteridophytes (2) gymnosperms

(3) monocots (4) bryophytes

4

Question no. 98

Holdfast, stipe and frond constitute the plant body in case of

(1) rhodophyceae (2) chlorophyceae

(3) phaeophyceae (4) All of these

Question no. 99

Which statement is incorrect for animals belonging to class of Chondrichthyes? (Cartilagenous Fish)

(1) The presence of placoid scales

(2) The absence of air bladder

(3) The presence of cartilaginous endoskeleton

(4) Notochord is persistent only at larval stage, after that it disappears

X Vertebrate → Vertebral Column

4

Question no. 100

Which of the following statements are true?

I. Molluscs possess cellular level of organisation.

II. Arthropods are true coelomates.

III. Platyhelminths are pseudocoelomates.

IV. Ctenophores have bilateral symmetry.

Choose the correct option.

(1) I and II

(2) Only II

(3) I and IV

(4) II, III and IV

Radial.

2

Question no. 101

Which of the following is an incorrect pair?

(1) Superior ovary – Mustard, China rose

(2) Half–inferior ovary – Plum, Rose

(3) Inferior ovary – Guava, Cucumer

(4) None of the above

4

Question no. 102

Free–central placentation is found in

(1) Dianthus

(2) Argemone

(3) Brassica

(4) Citrus

Question no. 103

Companion cells are closely associated with

(1) sieve elements
(2) vessel elements
(3) trichomes
(4) guard cells

Question no. 104

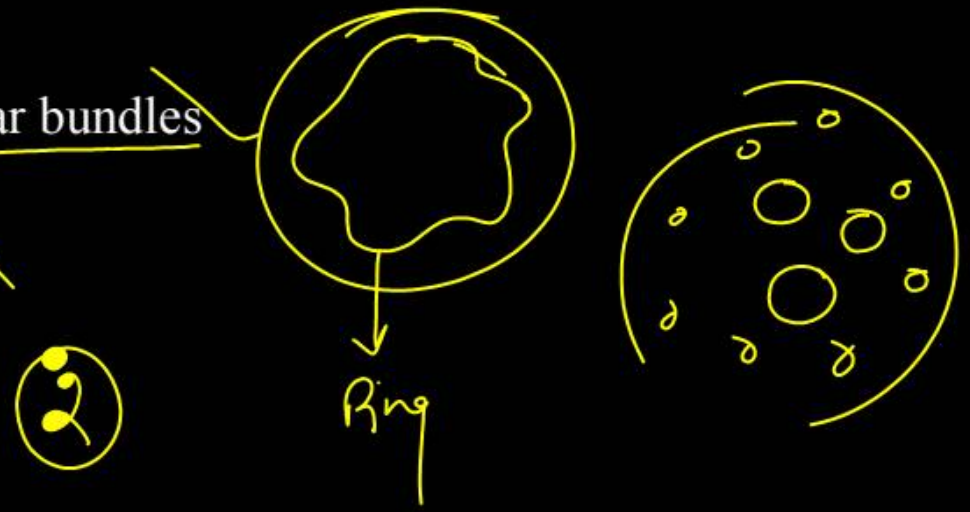
Cut a transverse section of young stem of a plant from your school garden and observe it under the microscope. How would you ascertain whether it is a monocot stem or a dicot stem?

(1) By observing colour of stem

(2) By observing arrangement of vascular bundles

(3) By observing apical meristems

(4) All of the above

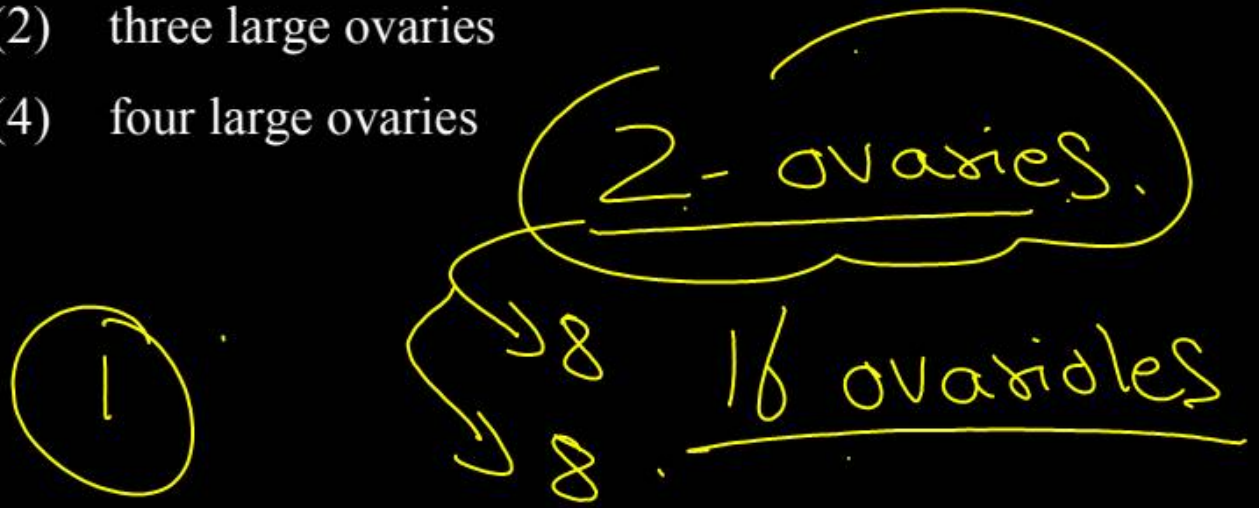


Question no. 105

The female reproductive system of the cockroach consists of

(1) two large ovaries (2) three large ovaries

(3) one large ovary (4) four large ovaries



Question no. 106

Plastid differs from mitochondria on the basis of one of the following features. Mark the right answer.

(1) The presence of two layers of membrane

(2) The presence of ribosomes

(3) The presence of thylakoids

(4) The presence of DNA

Question no. 107

Different cells have different size. Arrange the following cell in an ascending order of their size.

Choose the correct option among the followings.

I. Mycoplasma

II. Ostrich eggs

III. Human RBC

IV. Bacteria

(1) I, IV, III, II

(2) I, II, III, IV

(3) II, I, III, IV

(4) III, II, I, IV

I → IV – III – II

Question no. 108

Name of term given to the left and right ends of a polysaccharide.

(1) left end – N – terminal end, Right end – C– terminal end

(2) left end – reducing end, Right end – non – reducing end

(3) Left end – non – reducing end, Right end – reducing end

(4) Left end – C – terminal end, Right end – N – terminal end

Polysaccharide

∴ Right end = Reducing end.

∴ Left end = Non-Reducing end.

(3)

Question no. 109

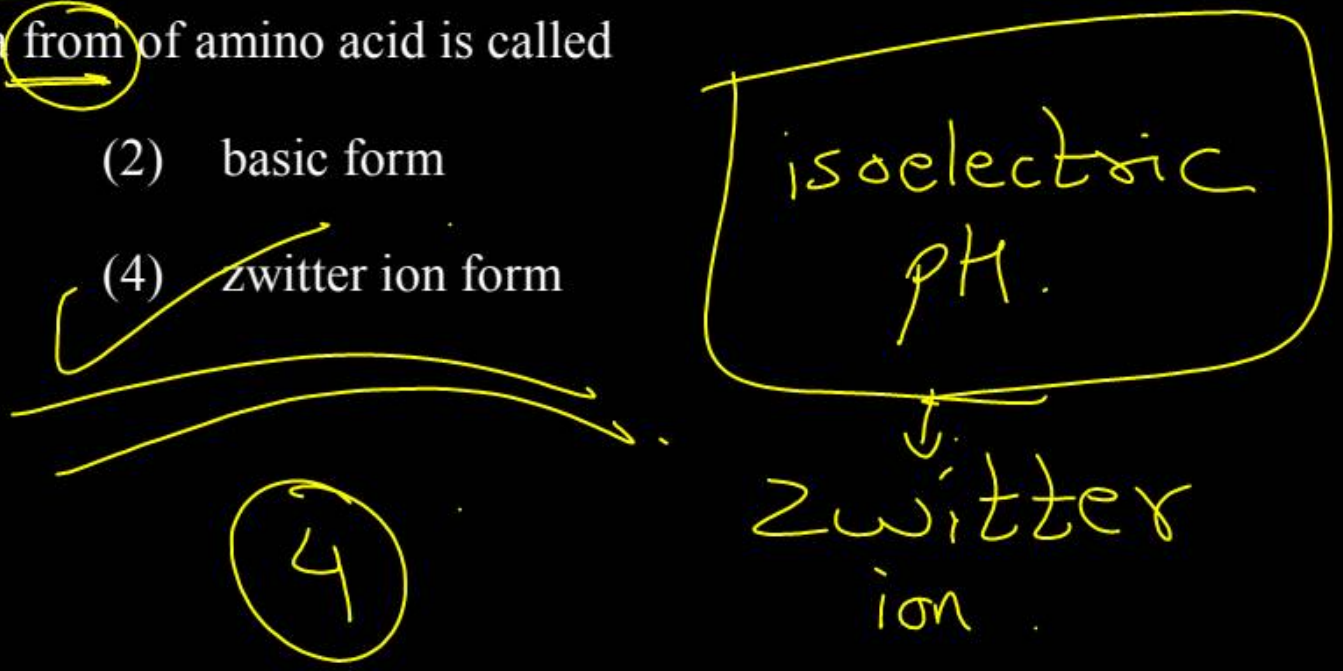
An amino acid under certain conditions have both positive and negative charges simultaneously in the same molecule, such a from of amino acid is called

(1) acidic form

(2) basic form

(3) aromatic form

(4) zwitter ion form



Question no. 110

Diakinesis is marked by

(1) terminalisation of chiasmata

(2) degeneration of nucleolus

(3) fully condensed chromosomes

(4) All of the above

M-I → P.I → L.P Dikn. → last step

4

Question no. 111

Under normal condition, which one of the following is a major limiting factor?

(1) Light

(2) CO_2

(3) Temperature

(4) Chlorophyll

2

Question no. 112

Which of these steps in Krebs' cycle indicates substrate level phosphorylation?

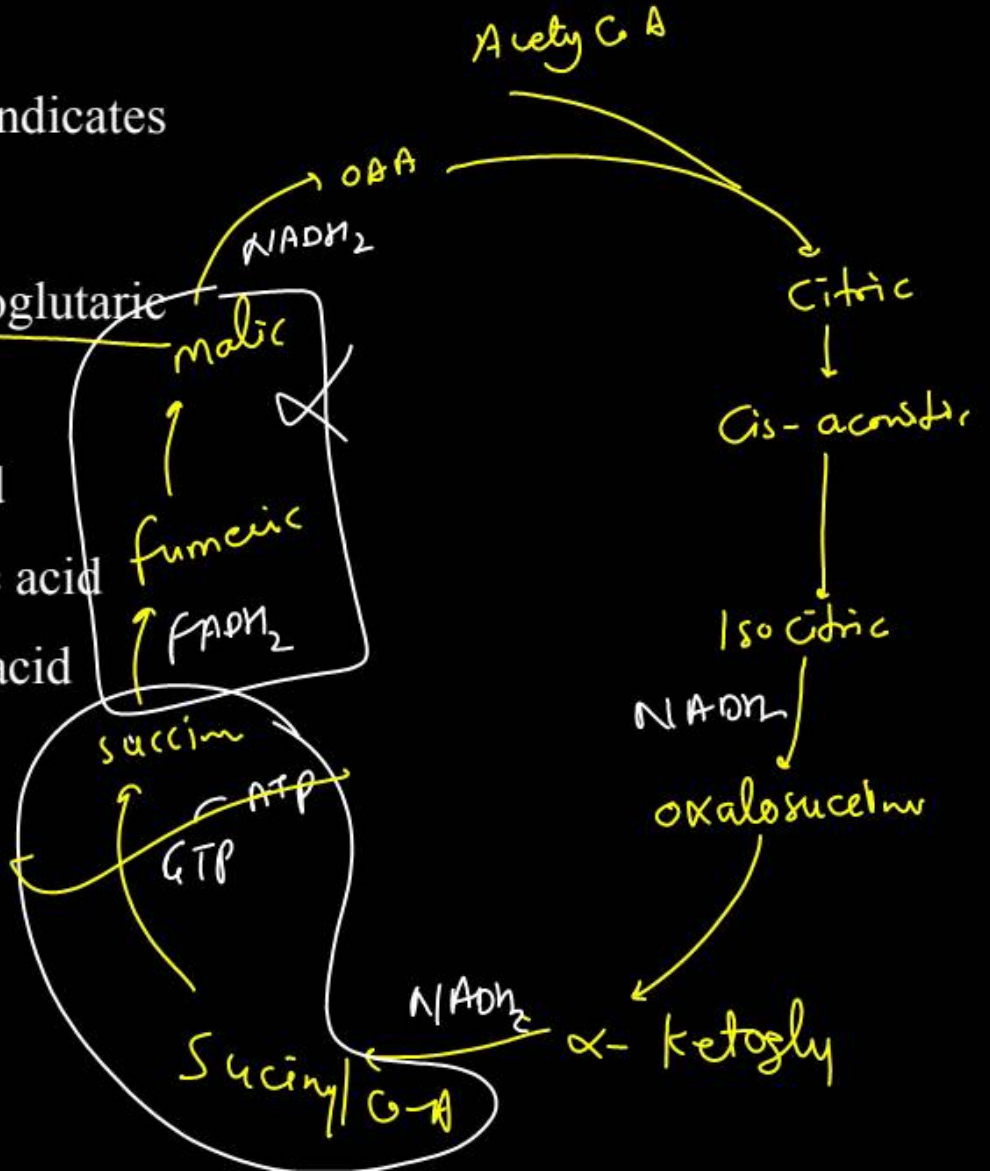
(1) Conversion of succinyl acid to α–ketoglutaric acid

(2) Conversion of succinic acid to malic acid

(3) Conversion of succinly Co–A to succinic acid

(4) Conversion of malic acid to oxaloacetic acid

3



Question no. 113

What would be the cardiac output of a person having 72 heart beats per minute and a stroke volume of 50 mL?

HR

SV

(1) 360 mL

(2) 3600 mL

(3) 7200 mL

(4) 5000 mL

2

C.O = HR × S.V

= 72 × 50

= 3600 ml

Question no. 114

The counter–current mechanism operates in nephron

(1) in ascending and descending limb of vasa recta

(2) in ascending limb of Henle's loop

(3) in descending limb of Henle's loop

(4) between the loop of Henle's loop

Question no. 115

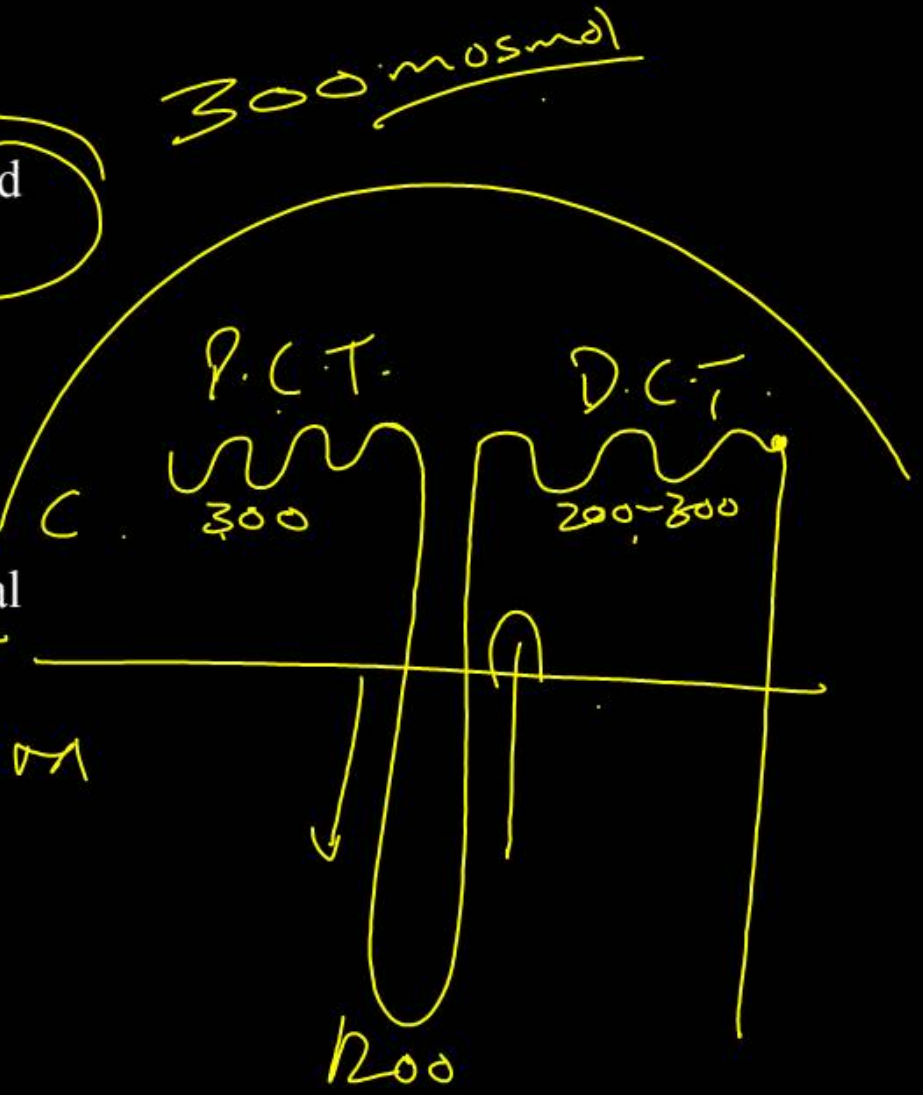
The renal fluid isotonic to the cortical fluid and blood is found in

(1) collecting duct and ascending duct

(2) distal convoluted tubule and ascending limb

(3) the proximal convoluted tubule and distal convoluted tubule

(4) the ascending limbs and descending limb



Question no. 116

I. Reabsorption of water occurs passively in the initial segment of nephron.

II. Nitrogenous waste are absorbed by active transport.

III. Conditional reabsorption of Na^+ and water takes place in DCT.

IV. DCt reabsorbs glucose.

V. DCT is capable of selective secretion of H^+, K^+ and NH_3 to maindmaintain pH and Na^+ $-k^+$ balance in blood.

VI. Substances like glucose, amino acids, Na^+, etc., in the filtrate are reabsorbed actively.

Choose the option with incorrect statements.

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

(3) V and Vi (4) II and IV

Question no. 117

Glenoid cavity articulates

(1) clavicle with acromion

(2) scapula with acromion

(3) clavicle with scapula

(4) humerus with scapula

4

Question no. 118

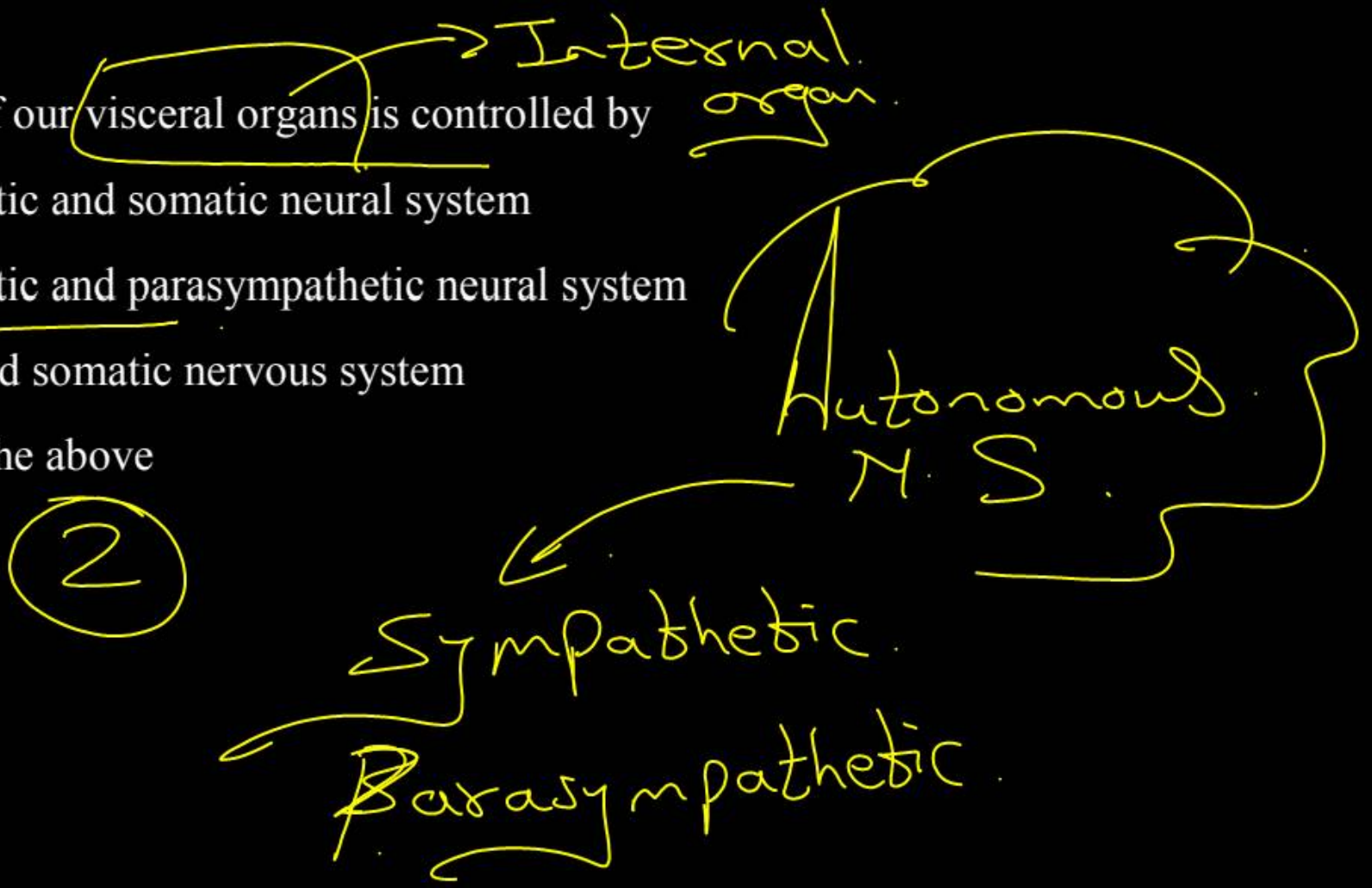
The function of our visceral organs is controlled by

(1) sympathetic and somatic neural system

(2) sympathetic and parasympathetic neural system

(3) central and somatic nervous system

(4) None of the above



Question no. 119

A child with a weak immune system could have problem in which of the following gland?

(1) Thyroid gland

(2) Parathyroid gland

(3) Thymus

(4) Pituitary gland

Question no. 120

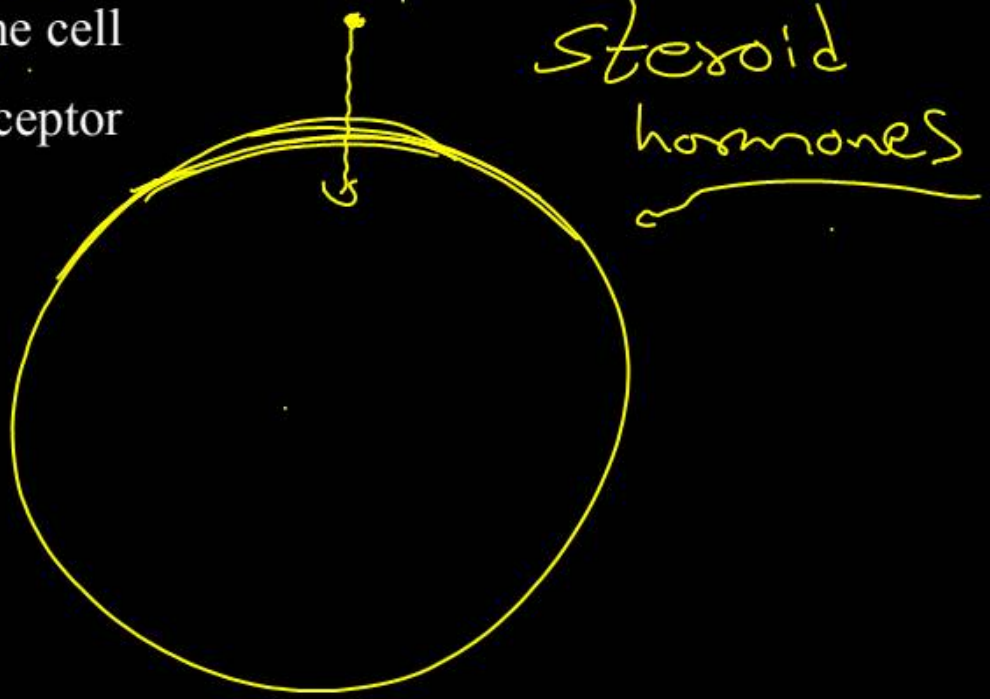
Which one of the following pairs of hormones are the examples of those that can easily pass through the cell membrane of the target cell ad bind to a receptor inside it (mostly in the nucleus)?

(1) Insulin and glucagon

(2) Thyroxin and insulin

(3) Somatostatin and oxytocin

(4) Cortisol and testosterone



Question no. 121

I. Insulin
II. Epinephrine
III. Testosterone
IV. Norepinephrine
V. Testosterone
VI. Glucagon

Which of the above hormones are amino acid derivatives?

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

Question no. 122

Which of following hormones is not secreted by anterior pituitary?

(1) Growth hormone

(2) Follicle stimulating hormones

(3) Oxytocin (post. pit.)

(4) Adrenocorticotropic hormone ACTH

3

Question no. 123

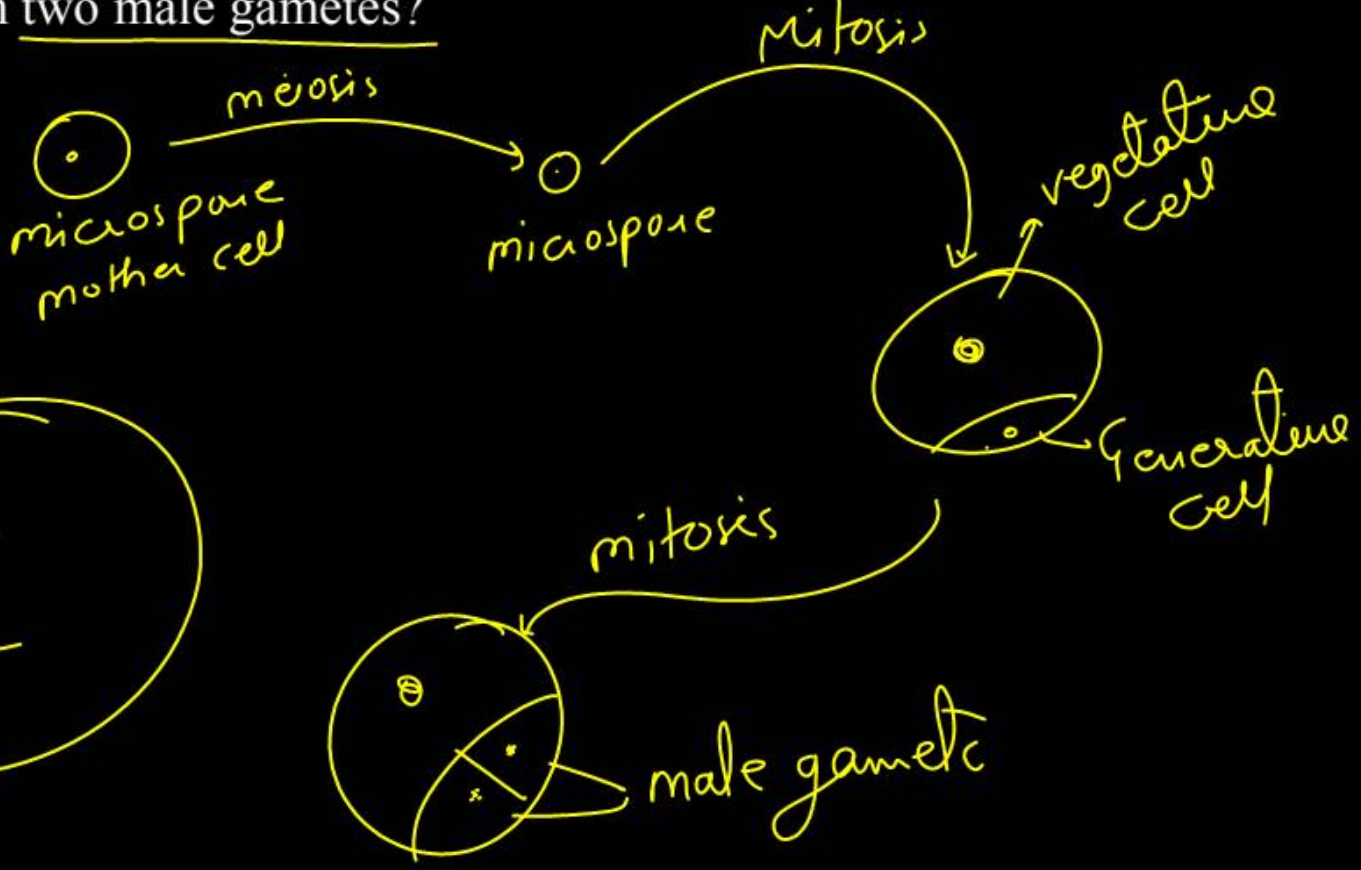
To achieve 3 – celled stage in angiosperms, which cell of the pollen grain divides to form two male gametes?

(1) Vegetative cell

(2) Generative cell

(3) Microspore mother cell

(4) None of the above



Question no. 124

What type of pollination takes place in Vallisneria?

(1) Pollination occurs in submerged condition by water

(2) Flowers emerge above surface of water and pollination occurs by insects

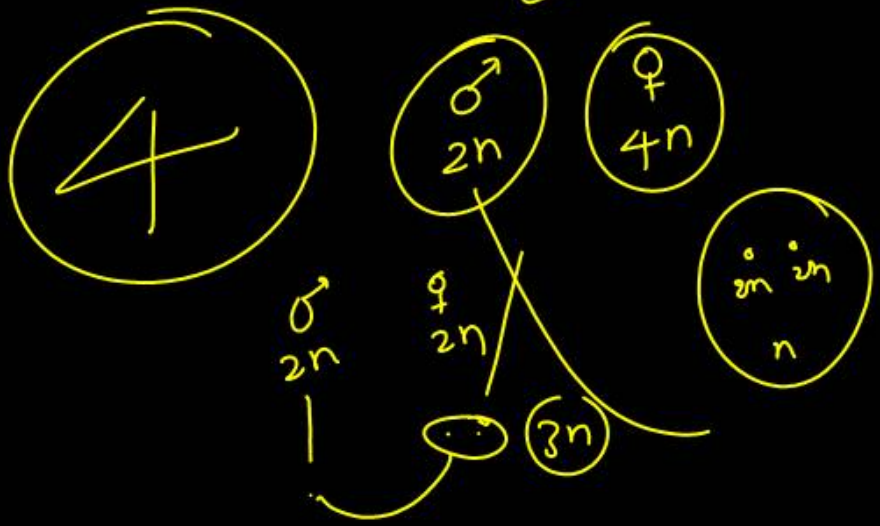
(3) Flowers emerge above water surface and pollen is carried by wind

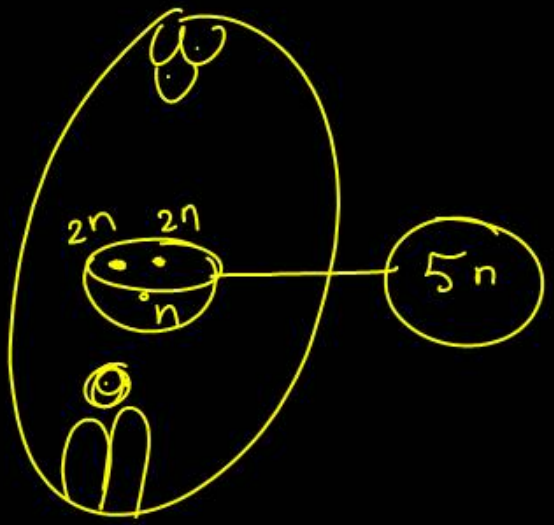
(4) Male flowers are carried by water currents to female flowers at the surface of water

Question no. 125

In an angiosperm, male plant is diploid and female plant in tetraploid then endosperm will be

(1) haploid
(2) triploid
(3) tetraploid
(4) pentaploid





Question no. 126

Level of LH is maximum

(1) just before ovulation

(2) just after ovulation

(3) at the time of ovulation

(4) during mestrual bleeding phase

3

Question no. 127

Identify the correct statement on 'inhibin'.

(1) It is produced by granulosa cells in ovary and inhibits the secretion of FSH

(2) It is produced by granulosa cells in ovary and inhibits the secretion of LH

(3) It is produced by nurse cells in testes and inhibits the secretion of LH

(4) It inhibits the secretion of LH, FSH and prolactin

Question no. 128

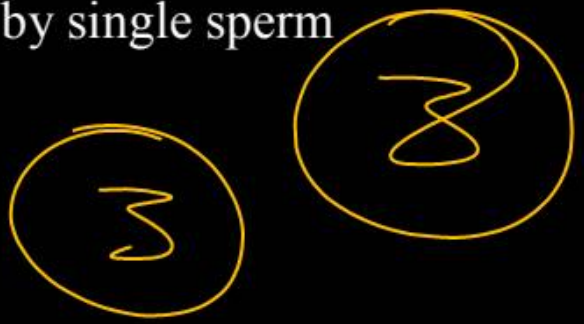
How many eggs do you think would have been released by human ovary if the mother gave birth to identical twins?

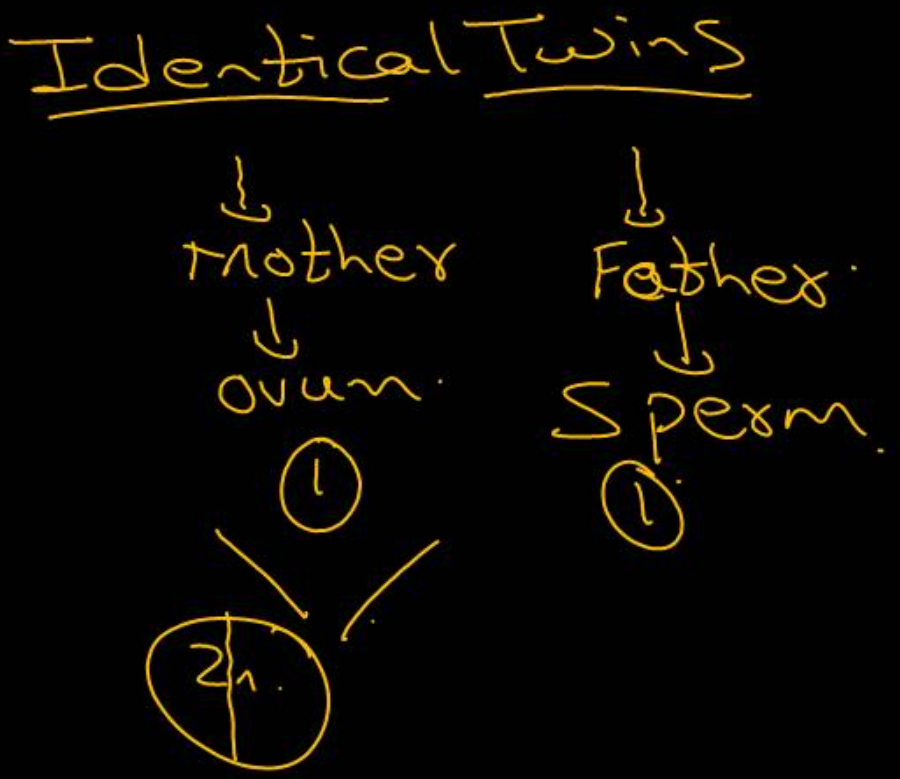
(1) One, fertilised by two sperms

(2) Two, fertilised by different sperms

(3) One, fertilised by single sperm

(4) Two, fertilised by single sperm





Question no. 129

In case of a couple, where the male is having a very low sperm count, which technique will be suitable for fertilisation?

(1) Intra Uterine Transfer

(2) Gamete Intracytoplasmic Fallopian Transfer

(3) Artificial Insemination

(4) Intracytoplasmic Sperm Injection

Ncert

3

Question no. 130

Which of the following statements are correct?

I. MTPs are generally advised during first trimester.

II. MTP (Amendment) Act, 2017 was enacted by the government of India to reduce illegal abortions.

III. Government of India legalised MTP in 1971.

IV. MTP during the second trimester can be done in case where the child after birth would suffer from some physical or mental abnormalities.

(1) I, II, III

(2) II, III and IV

(3) I, III and IV

(4) All of these

Question no. 131

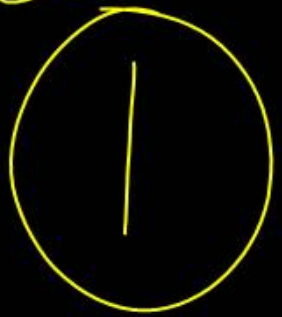
Which of the following option (s) is/are correct for starch synthesis in pea seeds controlled by single gene which has two allelic forms B and b?

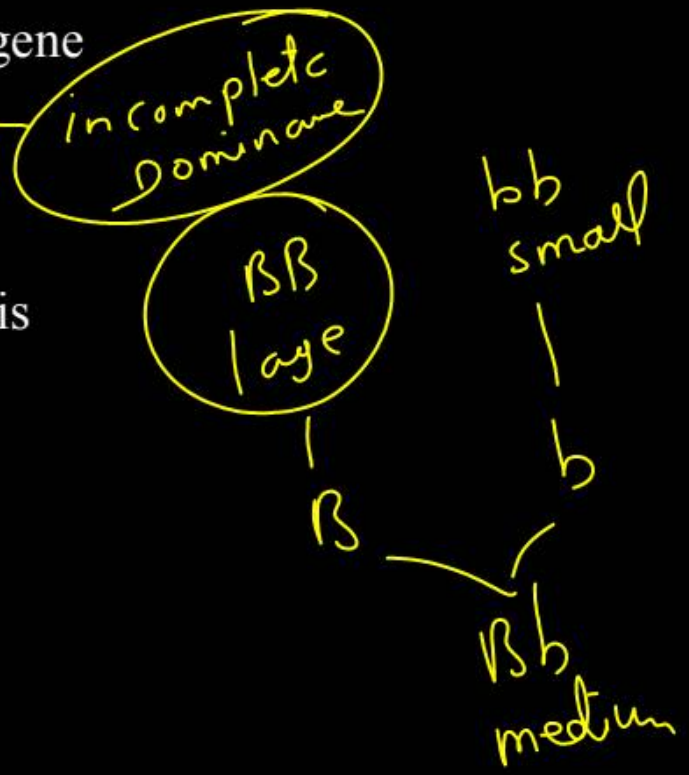
(1) BB is round seed with large starch synthesis

(2) bb is wrinkled seed with large starch synthesis

(3) Bb is round seed with less starch synthesis

(4) All of the above





Question no. 132

The diagram given below show the inheritance of haemophilia in a family. What will be the genotype of the individual marked M?

(1) M – XY

(2) M – XX

(3) M – $X^h X^h$

(4) M – $X^h X$

Sex linked (X) Gene related recessive disorder

♂ $X^h Y$ = Haemophilia ♂

♀ $X^h X$ = Carrier (♀) Normal

$X^h X^h$ = Haemophili ♀

3

Question no. 133

In a certain taxon of insects some have 17 chromosomes and the othes have 18 chromosomes.

The 17 and 18 chromosome – bearing orgnaisms are

(1) males and females, respectively

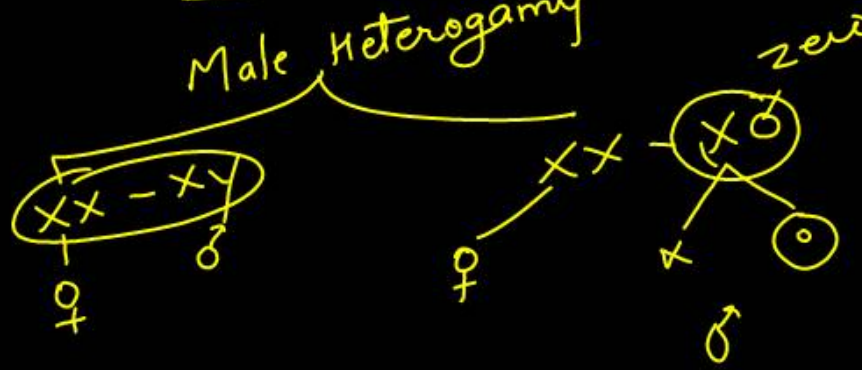
(2) females and male, respectively

(3) all males

(4) all females

Chromosomal theory of sex determination

Male Heterogamy



Female Heterogamy

Question no. 134

Lightly stained part of chromatin which remains loosely packed and is transcriptionally active named as

Euchromatin

(1) euchromatin
(2) heterochromatin
(3) chromatosome
(4) chromonemata

Question no. 135

In Griffith experiment, what would be the effect of following conditions on mice?

	Form of Pneumococcusn Injected	Effect on Mice
I.	Live R–strain (non-virulent)	A Survived
II.	Live S– strain (virulent)	B Died
III.	Heat–killed S–strain	C Survived
IV.	Heat–killed S–strain + live R–strain	D Died

Choose the correct option for effect on mice.

(1) A–Survived, B–Died, C–Died, D–Survived

(2) A–Survived, B–Died, C–Survived, D–Died

(3) A–Died, B–Survived, C–Survived, D–Died

(4) A–Died, B–Survived, C–Died, D–Died

2

Question no. 136

If the coding strand has the sequence

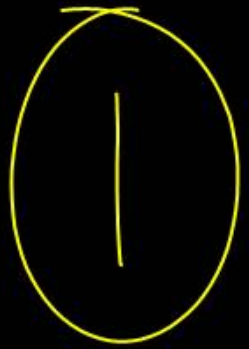
5' – ATCGATCG–3' then find out the sequence of non–coding strand.

(1) 3' – TAGCTAGC – 5'

(2) 5' – TACGTACG – 3'

(3) 5' – UAGGUACG – 3'

(4) 5' – UACFUACG – 3'



Question no. 137

What happens in the tailing process of transcription?

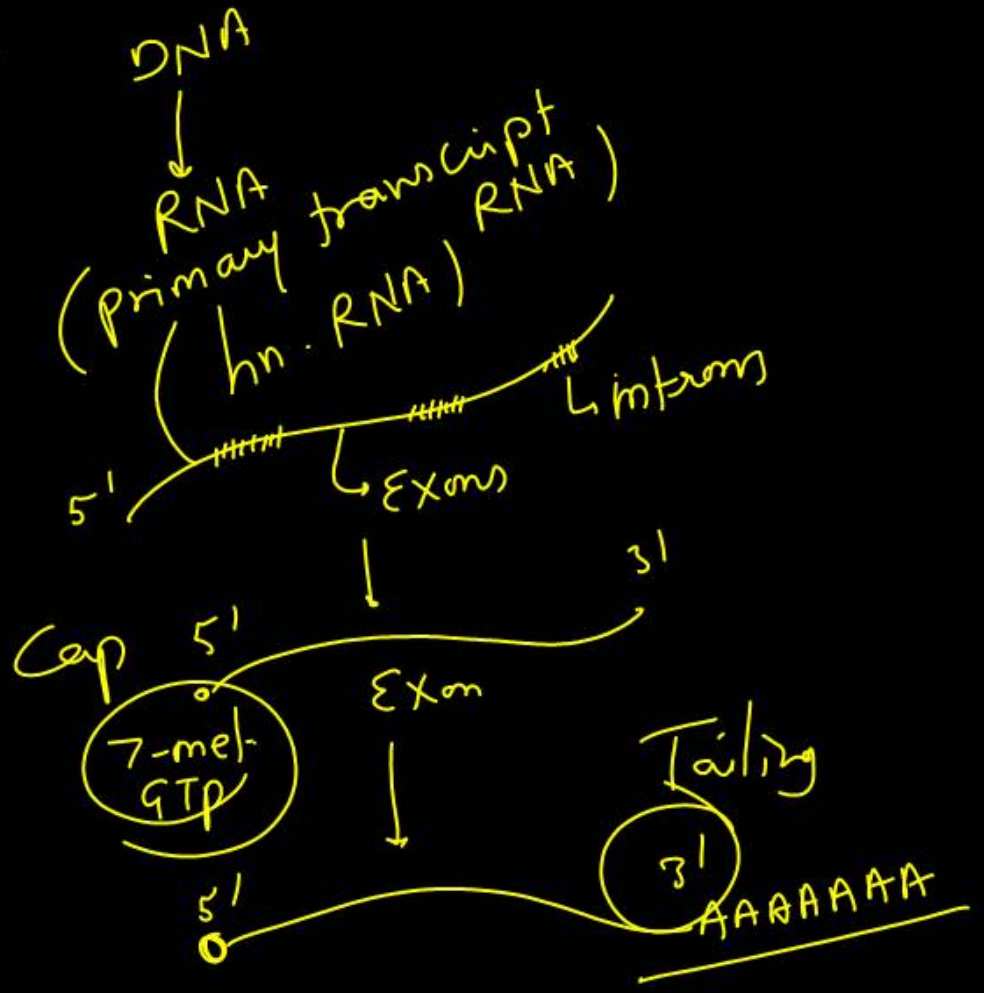
(1) Adenylate residues added at 5' end of RNA

(2) Adenylate residues added at 3' end of RNA

(3) Guanylate residues added at 5' end of RNA

(4) Guanylate residues added at 3' end of RNA

2



Question no. 138

Example of convergent evolution is

(1) Darwin finches and marsupial mouse

(2) Placental wolf and Tasmanian wolf

(3) Placental wolf and Darwin finches

(4) Tasmanian wolf and marsupial mole

2

Question no. 139

Match the Column I with Column II. Select the correct option from the codes given below.

	Priamtes		**Cranial Capacities** (in cubic centimetres)
A.	Chimpanzee and gorilla	1.	325 – 510 cc
B.	Australopithecus	2.	500 cc
C.	Homo habilis	3.	700 cc
D.	Java ape man	4.	800 – 1000 cc

Codes

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

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

Question no. 140

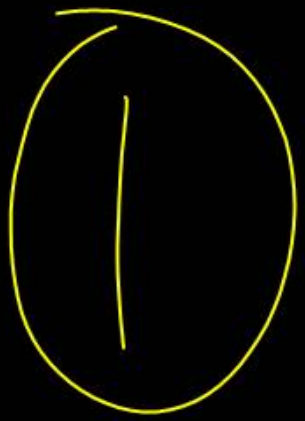
Match the following columns.

	Column I (Terms)		Column II (Explanations)
A.	Genetic drift	1.	Change in the population's allele frequency due to change alone
B.	Natural selection	2.	Difference in survivial individuals
C.	Gene flow	3.	Immigration or emigration changes the allele frequency
D.	Mutation	4.	Source of the new alleles

Codes

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

A - 1
B - 2
C - 3
D - 4



Question no. 141

In malignant tumours, the cells proliferate, grow rapidly and move to other parts of the body to form new tumours. This stage to disease is called

(1) metagenesis (2) metastasis

(3) teratogenesis (4) mitosis

2

Question no. 142

The disease chikungunya is transmitted by

(1) house flies

(2) Aedes mosquitoes

(3) cockroach

(4) female Anopheles

Vector

Female Aedes

2

Question no. 143

The most common fungal partne of mycorrhiza belongs to genus

(1) Azotobacter

(2) Glomus

(3) Azolla

(4) Frankia

Best Mycorhiza

2

Question no. 144

The different steps involved in the process of recombinant DNA technology are given below randomly? Arrange these in correct order.

III → II – IV → V → I

I. Extraction of the desired product.

II. Amplification of the gene of interest.

III. Isolation of a desired DNA fragment.

IV. Ligation of the DNA fragmentt into a vector. (plasmid)

V. Insertion of recombinant DNA into the host.

Correct order is

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

(3) II, IV, V, III and I (4) I, IV, V, III and II

2

Question no. 145

Which of the following statements does not hold true for restriction enzyme?

(1) It recognises a palindromic nucleotide sequence

(2) It is an endonuclease

(3) It is isolated from ~~viruses~~ Bacteria

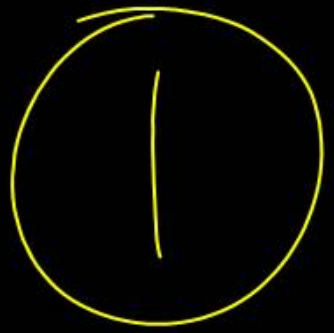
(4) It can produce the same kind of sticky ends in different DNA molecules

3

Question no. 146

The most important feature in a plasmid to serve as a vector in gene cloning experiment is

(1) origin of replication (ori)



(2) presence of a selectable marker

(3) presenece of sites for restriction endonuclease

(4) its size

Question no. 147

What triggers activation of protoxin to active Bt toxin of Bacillus thuringiensis in bollworm?

(1) Moist surface of midgut

(2) Alkaline pH of gut

(3) Acidic pH of stomach

(4) Body temperature

2

Bt cotton

Bacillus thuringiensis Bacteria

cry gene

cry protein (inactive toxin) protoxin

Ingested by insects

In mid gut At Alkali pH

Activated (Bt toxin)

Question no. 148

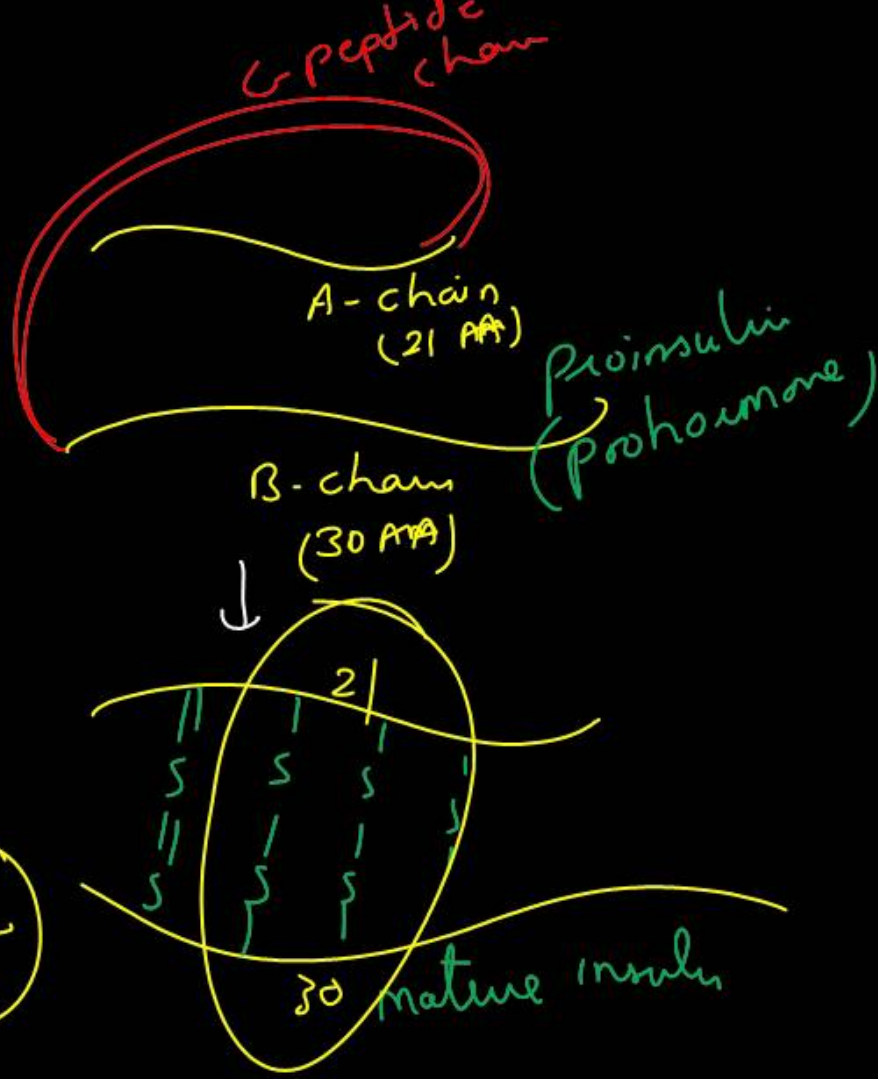
Consider the following statements about insulin and select the incorrect.

(1) Human insulin is made up of 51 amino acids arranged in two polypeptide chains

(2) The two polypeptide chains are interconnected by disulphide bridges

(3) In mammals including humans, insulin is synthesised as a prohormone, which contains and extra stretch called the C–peptide

(4) C–peptide is present in the mature insulin



Question no. 149

The age structure of a population represents

(1) relative number of individuals at each age

(2) number of newborns each year

(3) number of individuals reaching puberty each year

(4) relative number of deaths at each age

Question no. 150

Interspecific interactions arise from the interaction of

(1) population of two different species

(2) population of same species

(3) two individuals of same species

(4) two individuals of differents area

Question no. 151

Amensalism is an association between two species where

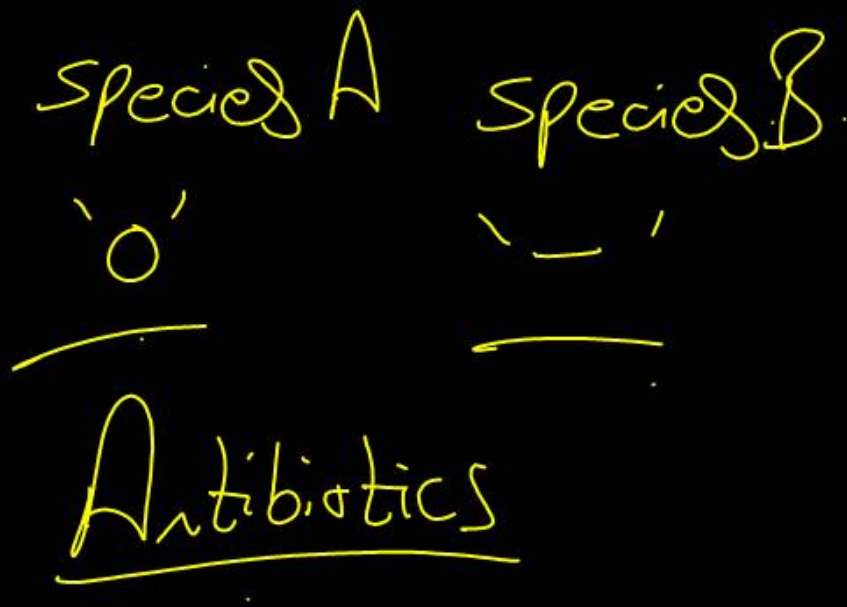
(1) one species is harmed and other is benefitted

(2) one species is harmed and other is unaffected

(3) one species is benefitted and other is unaffected

(4) Both the species are harmed

2



Question no. 152

Frog that feeds on insects, is a

(1) primary consumer

(2) secondary consumer

(3) tertiary consumer

(4) decomposer

2

Plants → Producer

↓

Insect → 1° C.

↓

Frog → 2° Consu.

Question no. 153

Regarding detritus food chain.

I. It begins with dead organic matter and decomposers called saprophytes as first trophic level.

II. A much large fraction of energy flows through this type of food chain in terrestrial ecosystem.

III. Energy for detritus food chain comes from sun.

Which of the statements given above are correct?

(1) I and II

(2) I and III

(3) II and III

(4) I, II and III

Question no. 154

The second trophic level in a lake is

(1) phytoplankton (2) zooplankton

(3) benthos (4) fishes

Phytoplanktons

2

Question no. 155

The Western Ghats have a greater amphibians diversity than the Eastern Ghats. It is an example of

(1) species diversity (2) genetic diversity

(3) ecological diversity (4) None of the above

1

Question no. 156

Organism living in salty areas are called as

(1) methanogens (2) halophiles

(3) heliophytes (4) thermodacidophiles

2

Question no. 157

Fusion of two motile gametes which are dissimilar in size is termed as

(1) oogamy

(2) isogamy

(3) anisogamy

(4) zoogamy

Question no. 158

Which one of the following sets of animals share a four chambered heart?

(1) Amphibian, Reptiles, Birds

(2) Crocodiles, Birds, Mammals

(3) Crocodiles, Lizards, Turtles

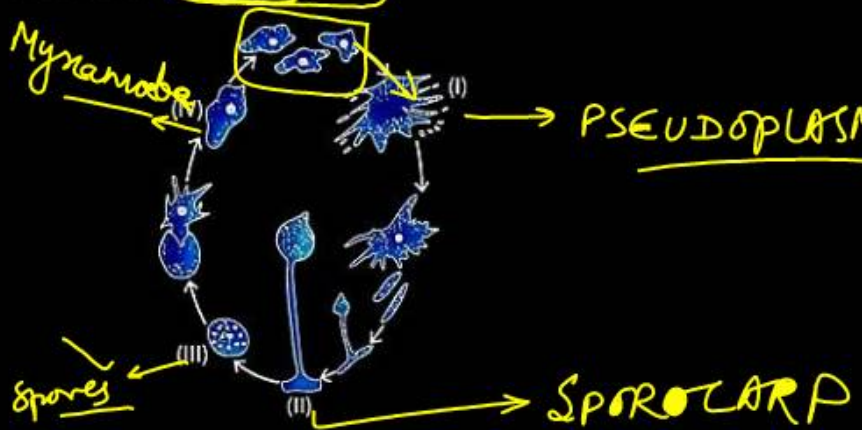
(4) Lizards, Mammals, Birds

Crocodiles
Birds
Mammals

(2)

Question no. 159

Study the given life cycle of cellular slime moulds and select the incorrect option



P. Structure (i) is formed in response to drought conditions and exhaustion of food supply.

Q. Structure (ii) represents myxamoeba, which rounds off and is converted to a spore.

R. (iii) are uninucleate, haploid structures without any cell wall.

S. (iv) are uninucleate, haploid structures possessing a conspicuous cell wall.

(1) P and Q (2) R and S

(3) P, Q and S (4) Q, R and S

Question no. 160

Ovary is one-chambered but it becomes two-chambered due to the formation of false septum in

(1) Brassica (Mustard)
(2) Pisum
(3) Hibiscus
(4) Dianthus

Parietal

1

Question no. 161

Read the following statements and select the correct ones.

(i) Phloem parenchyma is absent in most monocots.

(ii) Gymnosperms lack tracheids and vessels.

(iii) Gymnosperms lack companion cells.

(1) (i) and (ii)

(2) (ii) and (iii)

(3) (i) and (iii)

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

3

Question no. 162

Read th given statements and select the correct option.

Statement I: Low temperature destroys enzymes by causing their denaturation.

Statement II : High temperature preserves the enzymes in their denaturation.

(1) Both statements I and II are correct

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

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

(4) Both statements I and II are incorrect.

Question no. 163

Identify the correct sequence of stages of Calvin cycle.

C_3 cycle

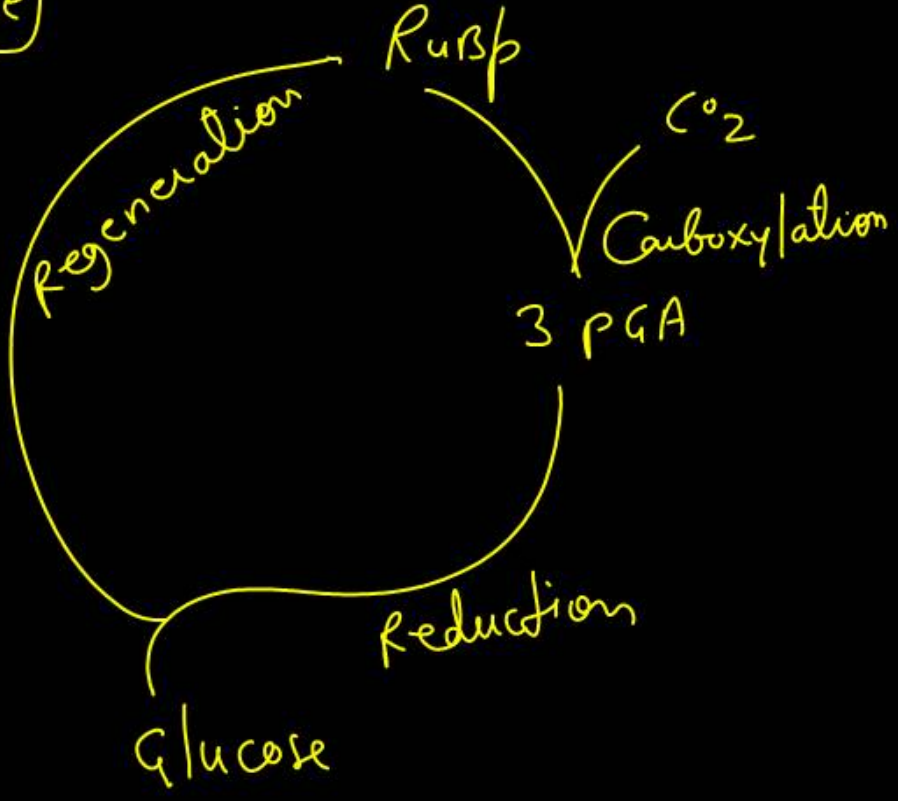
(1) Reduction → Carboxylation → Regeneration

(2) Carboxylation → Regeneration → Reduction

(3) Carboxylation → Reduction → Regeneration

(4) Reduction → Regeneration → Carboxylation

3



Question no. 164

Mammalian lungs have an enormous number of minute alveoli (air sacs). This is to allow

(1) more surface area for diffusion of gases.

(2) more space for increasing the volume of inspired air.

(3) more nerve supply to keep the lungs working.

(4) more spongy texture for keeping lung in proper shape.

Question no. 165

Anti-A and Anti-B antibodies are not found in which of the following blood group?

(1) AB

(2) A

(3) O

(4) B

Bld Gp	Antigen	Antibody
A	A	Anti B
B	B	Anti - A
AB	A & B	X
O	X	Anti A Anti - B

Question no. 166

Which of the following statements is true for lymph?

(1) WBCs + serum

(2) Blood – RBCs and some proteins

(3) RBCs +WBCs + plasma

(4) RBCs + proteins +platelets

2

Blood = plasma + Bld cells
= plasma + RBC + WBC + Plt

lymph = plasma + WBC
= Blood – (RBC + Plt)

Serum = Blood – (RBC + Plt) + WBC

- Blood Clotting

Question no. 167

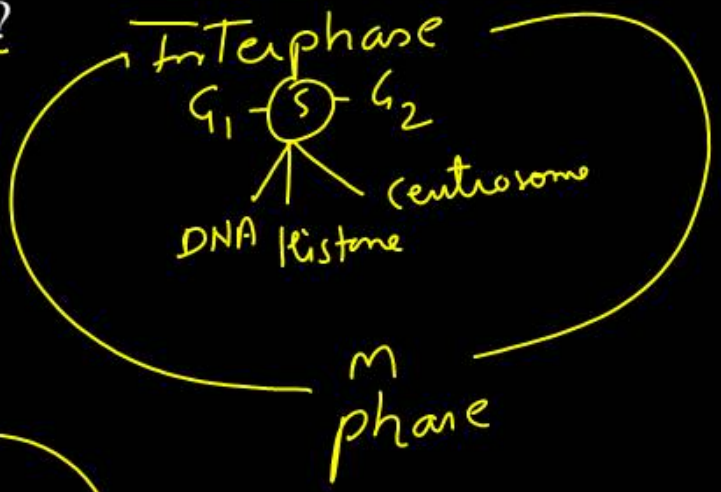
In which stage of the cell cycle are histone proteins synthesized in a eukaryotic cell?

(1) G_2- stage of prophase

(2) S-phase

(3) Entire prophase

(4) Telophase



2

Question no. 168

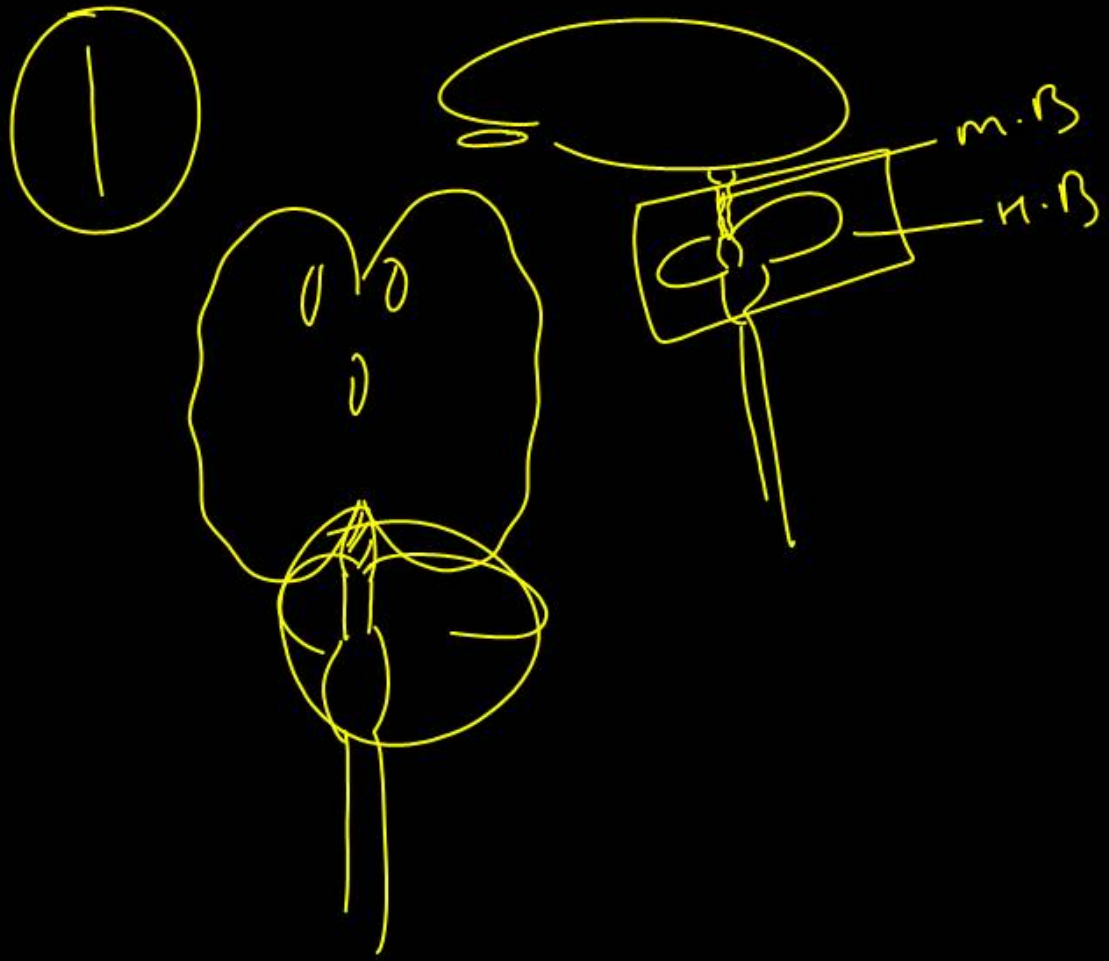
Which of the following parts of brain constitute the brain stem?

(1) Midbrain and hindbrain

(2) Hindbrain and forebrain

(3) Forbrain and midbrain

(4) Forebrain only



Question no. 169

The active component of photosystem – I is composed of

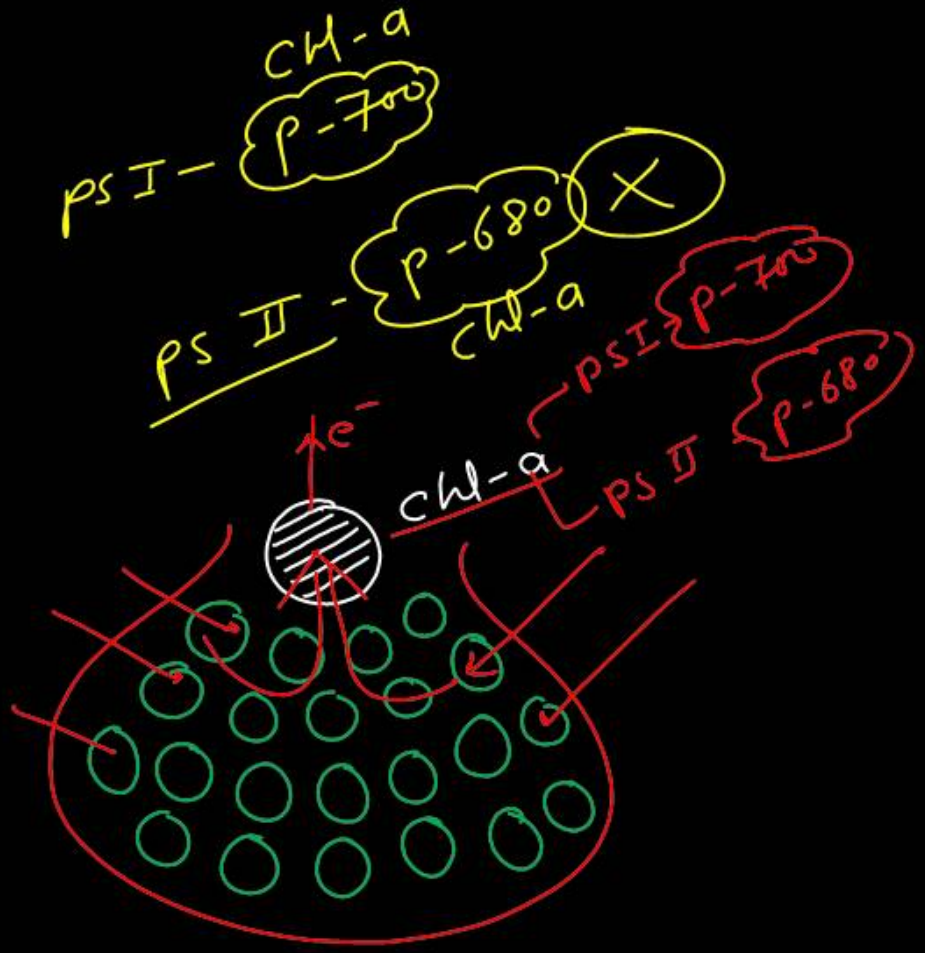
(1) chlorophyll-a with absorption peak at 680 nm

(2) chlorophyll-a with absorption peak at 700 nm

(3) chlorophyll-b with absorption peak at 680 nm

(4) chlorophyll-a and chlorophyll-b with absorption peak at 700 nm

4



Question no. 170

Consider the following statements.

(A) Plant cells have centrioles which are absent in almost all animal cells.

(B) Ribosomes are the site of protein synthesis.

(C) The middle lamella is a layer made of calcium carbonate which holds the different neighboring cells together.

(D) In animal cell, steroidal hormones are synthesized by smooth endoplasmic reticulum.

(1) A and B only are correct

(2) C and D only are correct

(3) B and D only are correct

(4) A and D only are correct

Question no. 171

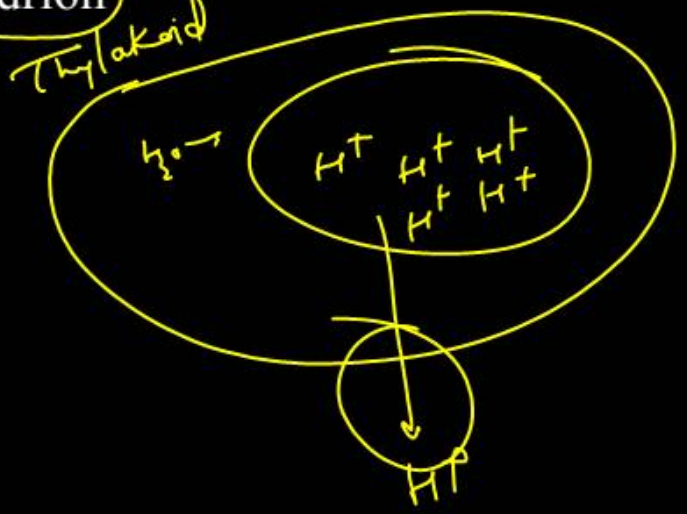
Energy released during movement of electrons through the photosystems in photosynthesis is used to drive gradient. As a result the protons accumulate is

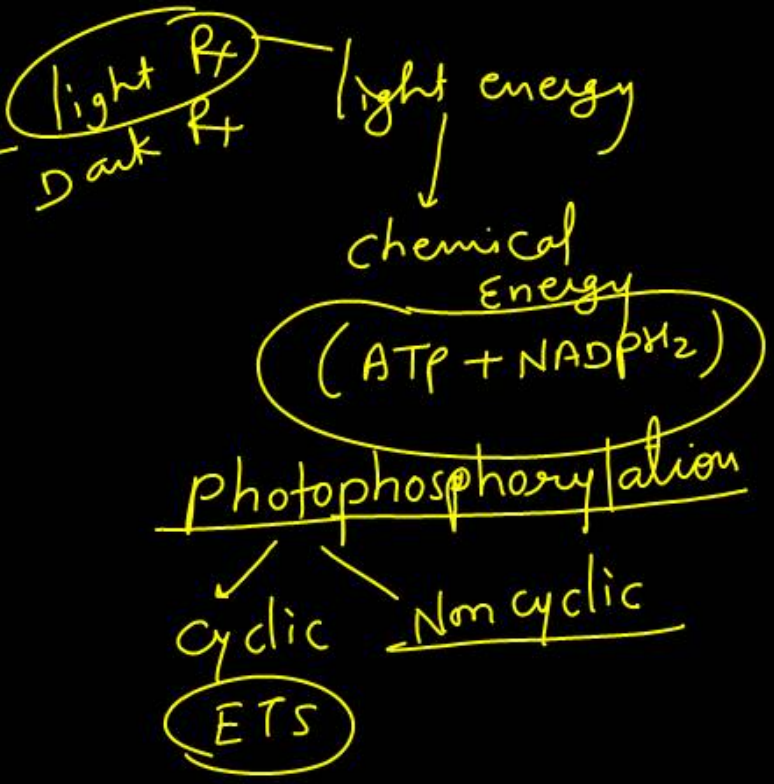
(1) thylakoid lumen

(2) stroma of chloroplast

(3) matrix of mitochondrion

(4) none of these





Question no. 172

Match the following and select the correct combination from the given options.

	Column I (Population interaction)		**Column II** (Examples)
A.	Mutualism	i.	Ticks on dogs
B.	Commensalism	ii.	Balanus and Chathamalus
C.	Parasitism	iii.	Sparrow and any seed
D	Competition	iv.	Epiphyte on a mango
E.	Predation	v.	Mycorrhiza

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

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

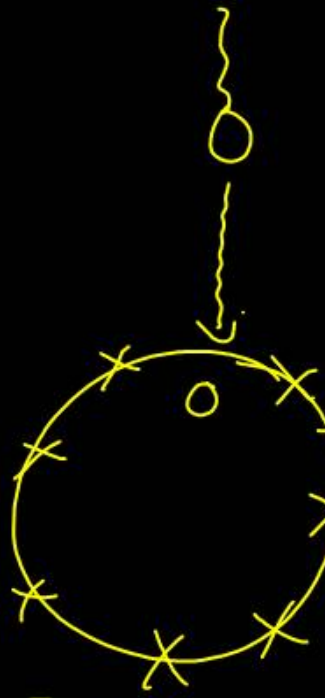
(3) A-iii, B-ii, C-i, D-v, E-iv

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

Question no. 173

Which of the following layers of the voum undergoes changes to prevent polyspermy when sperm contacts with it?

(1) Corona radiata
(2) Plasma membrane
(3) Zona pellucida
(4) Tunica albuginea



3

Impermeable for sperms

Block

Receptors

Question no. 174

Select the correct statement.

(1) hPL plays a major role in parturition

(2) Feturs shows movements first time in the 7^{th} month

(3) Signal for parturition comes from fully developed. foetus

(4) Embryo's heart is formed by the 2^{nd} month of pregnancy

3 Bonus

Question no. 175

Cu ions released from copper-releasing intra uterine devices (IUDs)

(1) make uterus unsuitable for implantation

(2) increases phagocytosis

(3) suppress sperm motility

(4) prevent ovulation

PYQ

3

Question no. 176

In microbial genetics with one is referred to as "~~Giffith effect~~"? "Griffith effect" 1928 → Transformation

(1) Conjugation
(2) Transduction
(3) Transformation
(4) Sex-duction

3

Question no. 177

Biotechnology

DNA fragments → Agarose gel → separation

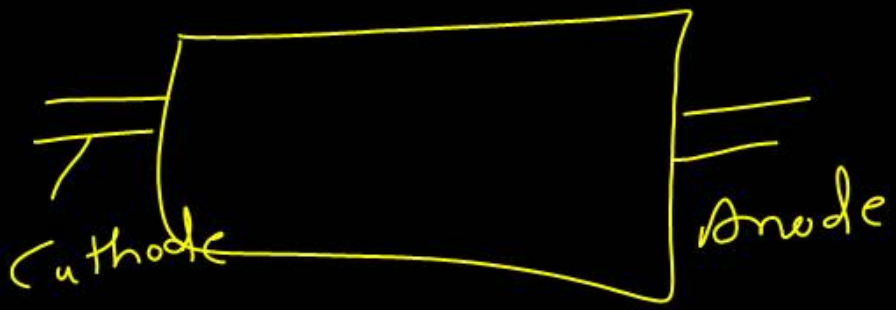
Gel electrophoresis is a

(1) technique of separation of charged molecules under the influence of magnetic field

(2) technique of incorporation of DNA molecuels into the cell through transient pore made due to electrical impulsed

(3) technique of separation and isolation of DNA fragments through the pores of agarose

(4) technique of separation and purification of gene products.



3

Question no. 178

The egg apparatus of angiosperms comprises

(1) an egg cell and two antipodals

(2) an egg cell and two synergids

(3) an egg cell and two polar nuclei

(4) an egg cell and the central cell.

2

Question no. 179

Bacteria Flagella, Pilli

If your remove the fimbriae from the bacterial cell which of the following would you expect to happen?

(1) The bacteria could no longer swim.

(2) The bacteria would not adhere to the host tissue.

(3) Transpotation of molecules across the membrane would stop

(4) The shape of bacteria would change.

2

Question no. 180

The best material for the study of structure of cell membrane is (plasma membrane)

(1) RBC of human

(2) liver cell

(3) Kidney cell

(4) muscle cell