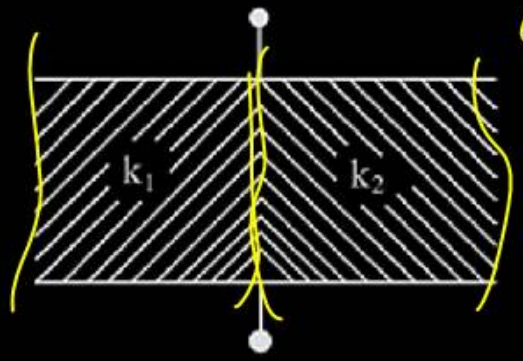
Question no. 1

Two material having the dielectric constants K_1 and K_2 are filled between two parallel plates of a capacitor.

Where area of each plate is A and the distance between the plates is d.



area = A/2

$C' = C_1 + C_2$

$= \frac{k_1 \varepsilon_0 (A/2)}{d} + \frac{k_2 \varepsilon_0 (A/2)}{d}$

$= \frac{C_0 A}{2d} (k_1 + k_2)$

The capacity of the capacitor is

(1) $\frac{A\varepsilon_0(K_1K_2)}{2d(K_1+K_2)}$

(2) $\frac{A\varepsilon_0(K_1-K_2)}{2d}$

(3) $\frac{2A\varepsilon_0(K_1K_2)}{d(K_1+K_2)}$

(4) $\frac{A\varepsilon_0(K_1+K_2)}{2d}$

Question no. 2

Two small conducting spheres of equal radius have charges +10 C and –20 C respectively and placed at a distance r from each other experience force F_1. if they are brought in contact and separated to the same distance, they experience force F_2. The ratio of F_1 to F_2 is

(1) 1 : 2 (2) –8 : 1

(3) 1 : 8 (4) –2 : 1

$f_1 = \frac{k(+10)(-20)}{R^2}$

touch, net $\frac{+10-20}{2} = \frac{-10}{2} = -5$

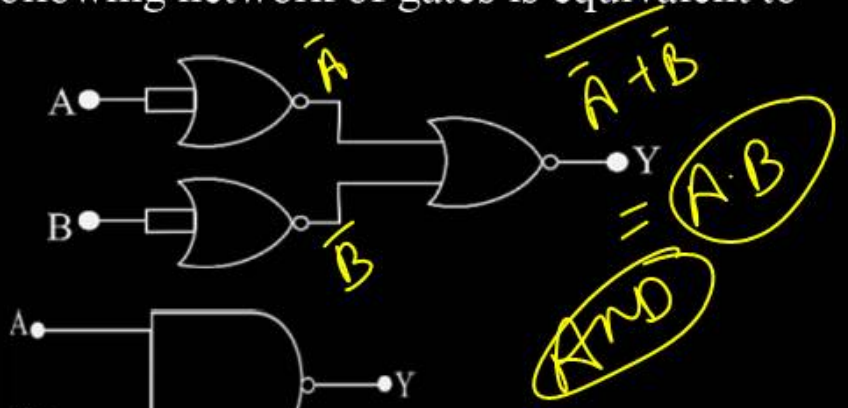
$f_2 = \frac{k(-5)(-5)}{R^2} =$

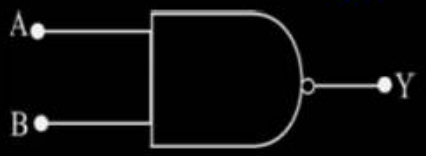
$\frac{f_1}{f_2} = \frac{k(10)^2(-20)^4}{R^2} \times \frac{R^2}{k(20)^5} = \frac{-8}{1}$

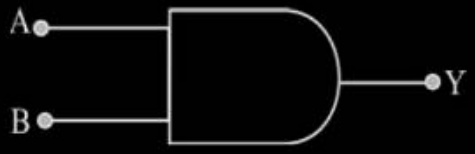
$-8:1$

Question no. 3

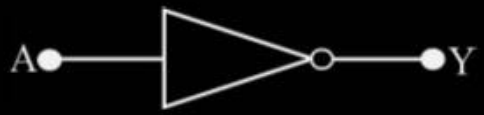
The following network of gates is equivalent to



(1) 

(2) 

(3) 

(4) 

Question no. 4

A magnetic needle is placed in a uniform magnetic field and is aligned with field. The needle is now rotated by an angle of 60° and the work done is W. The torque on the magnetic needle at this position is

(1) $2\sqrt{3}$ W

(2) $\sqrt{3}$ W

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

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

0°

θ_2

$W = MB(\cos\theta_1 - \cos\theta_2)$

$W = MB\left(1 - \frac{1}{2}\right) = \frac{MB}{2}$

$\tau = \vec{M} \times \vec{B}$

$= |M||B| \sin\theta$

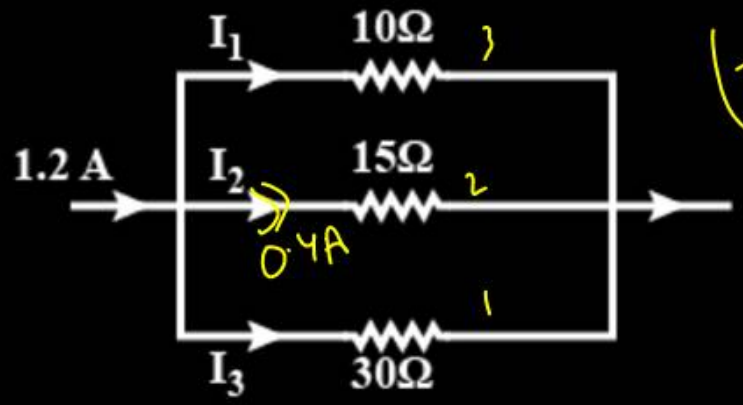
$\tau = M \cdot B \frac{\sqrt{3}}{2}$

$\frac{\tau}{W} = \frac{MB\sqrt{3}}{2} \Big/ \frac{MB}{2} = \sqrt{3}$

$\tau = \sqrt{3}W$

Question no. 5

In this circuit, the value of I_2 is



Current divider Rule

$\left(\frac{1}{10} : \frac{1}{15} : \frac{1}{30}\right) \times 30$

$= 3 : 2 : 1$

Current flow

$\frac{2}{6} \times 1.2 = 0.4\text{A}$

(1) 0.2 A

(2) 0.3 A

(3) 0.4 A

(4) 0.6 A

Question no. 6

The magnetic flux linked with a coil satisfies the relation $\phi = 4t^2 + 6t + 9$ Wb, where t is the time in second. The emf induced in the coil at t = 2 second is

(1) 22 V

(2) 18 V

(3) 16 V

(4) 40 V

$$\varepsilon = \frac{d\phi}{dt} = 8t + 6$$

$$= 22\text{V}$$

Question no. 7

$q_0 = 2q$, $m = 4m$

A proton and an alpha particle are accelerated under the same potential difference. The ratio of de-Broglie wavelengths of the proton and the alpha particle is

(1) $\sqrt{8}$

(2) $\frac{1}{\sqrt{8}}$

(3) 1

(4) 2

$P = mv$ $\quad P = h\nu$

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

$\lambda_1 = \frac{h}{\sqrt{2m_1 K}} = \frac{h}{\sqrt{2m_1 qV}}$

$\lambda_2 = \frac{h}{\sqrt{2m_2 q_0 V}} = \frac{h}{\sqrt{2 \times 4m \times 2qV}}$

$\frac{\lambda_1}{\lambda_2} = \frac{h}{\sqrt{2m_1 qV}} \times \frac{\sqrt{2 \times 8 m_1 qV}}{h}$

$= \sqrt{8}$

$= 2\sqrt{2}$

Question no. 8

The magnetic field at the centre of a current carrying circular coil of radius 10 cm is $5\sqrt{5}$ times the magnetic field at a point on its axis. The distance of the point from the centre of the coil in cm is

(1) 5

(2) 10

(3) 20

(4) 25

$B_C = \frac{\mu_0 i}{2R}$ $B_{axis} = \frac{\mu_0 i R^2}{2(R^2+x^2)^{3/2}}$

$B_C = 5\sqrt{5}\, B_{axis}$

$\frac{\mu_0 i}{2R} = 5\sqrt{5}\, \frac{\mu_0 i R^2}{2(R^2+x^2)^{3/2}}$

$\frac{1}{R^3} = \frac{5\sqrt{5}}{(R^2+x^2)^{3/2}}$

$\frac{1}{R^6} = \frac{125}{(R^2+x^2)^3}$

$\left(\frac{R^2+x^2}{R^2}\right)^3 = 5^3$

$1+\frac{x^2}{R^2} = 5$

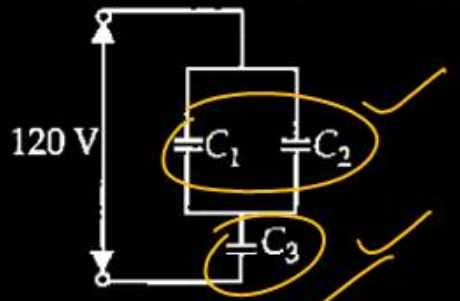
$\frac{x^2}{R^2} = 4$

$\therefore x = 2R$

Question no. 9

In figure $C_1 = 10\ \mu F$, $C_2 = 20\ \mu F$ and $C_3 = 15\ \mu F$

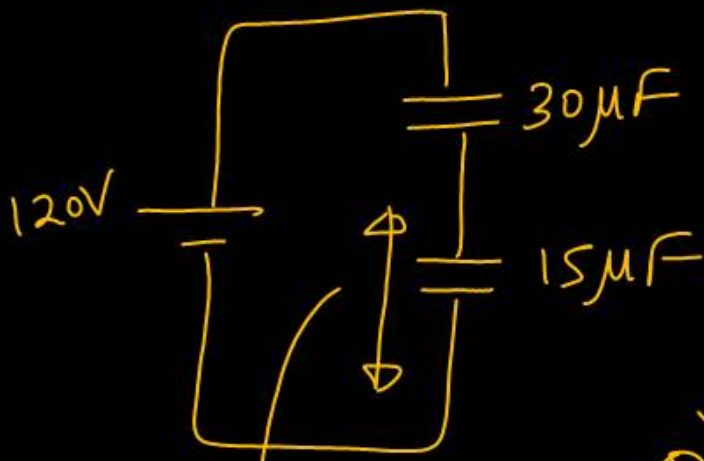
The potential difference across C_3 is



(1) 25 V (2) 80 V

(3) 35 V (4) 40 V

2



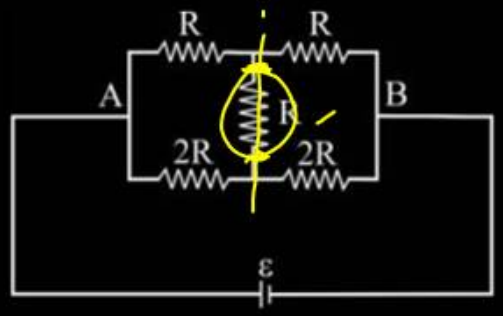
$Q = CV$

$\{V \propto \frac{1}{C}\}$

$\frac{30}{45} \times 120 = 80$ volt

Question no. 10

Consider the following statements regarding the network shown in the figure.



$\frac{2R \times 4R}{2R+4R} = \frac{8R^2}{6R} = \frac{4R}{3}$

(i) The equivalent resistance of the network between A and B is independent of the value of R'.

(ii) The equivalent resistance of the network between points A and B is 4R/3.

(iii) The current flowing through R' is zero.

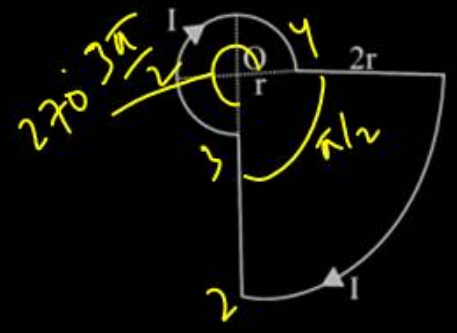
Which of the above statement is/are correct?

(1) (i) alone (2) (ii) alone

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

Question no. 11

A current I flowing through the loop as shown in figure. The magnetic field at the centre O is



(1) $\frac{7\mu_0 I}{12r}$ acting downwards

(2) $\frac{5\mu_0 I}{12r}$ acting downwards

(3) $\frac{7\mu_0 I}{12r}$ acting upwards

(4) $\frac{5\mu_0 I}{12r}$ acting upwards

$B = B_{12} + B_{34}$

$= \frac{\mu_0}{4\pi}\frac{i}{3r}\left(\frac{\pi}{2}\right) + \frac{\mu_0}{4\pi}\frac{i}{r}\left(\frac{3\pi}{2}\right)$

$= \frac{\mu_0 i \pi}{\pi 8 r}\left(\frac{1}{3}+3\right)$

$= \frac{\mu_0 i}{8R}\left(\frac{10}{3}\right) = 5\frac{\mu_0 i}{12R}$

Question no. 12

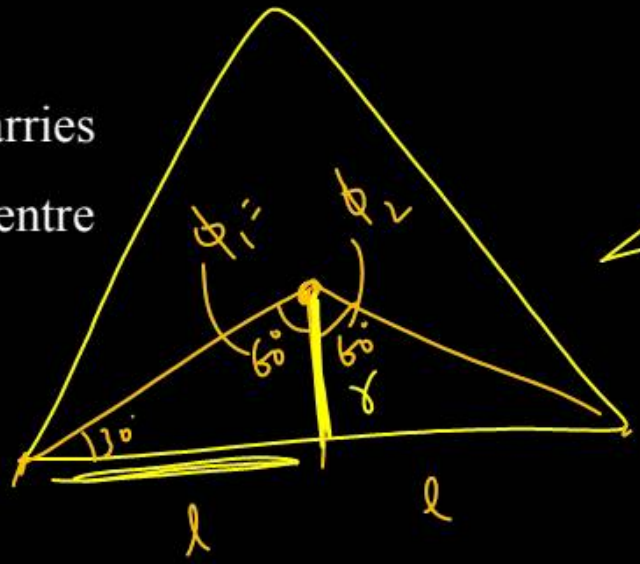
An equilateral triangular loop of wire of side $2l$ carries a current I. The magnetic field produced at the centre of the loop is

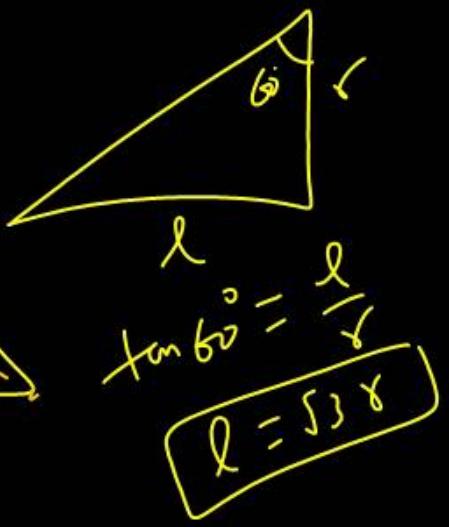
(1) $\frac{\mu_0}{4\pi}\frac{3\sqrt{3}I}{l}$

(2) $\frac{\mu_0}{4\pi}\frac{18I}{l}$

(3) $\frac{\mu_0}{4\pi}\frac{6I}{l}$

(4) $\frac{\mu_0}{4\pi}\frac{9I}{l}$





$$B = \frac{\mu_0 I}{4\pi\gamma}(\sin\phi_1 + \sin\phi_2)$$

$$= \frac{\mu_0 I}{4\pi l}\sqrt{3}\left(\frac{\sqrt{3}}{2}+\frac{\sqrt{3}}{2}\right) = \frac{\mu_0 I 3}{4\pi l} \times 3$$

Question no. 13

Three identical bulbs connected in series across an accumulator consumes 20 W power. If the bulbs are connected in parallel to the same source, the power consumed is

(1) 60 W (2) 90 W

(3) 120 W (4) 180 W

$P_{total} = P/N$

$20 = P/3$

$P_{ind} = 60\,W$

$P = P_1 + P_2 + P_3$

$= 180\,W$

Question no. 14

A transformer is used to light a 100 W and 110 V lamp using a 220 V mains supply. If the supply current to 0.5 A, then the efficiency of the transformer is

(1) 100 %

(2) 90.9 %

(3) 99 %

(4) 87.7 %

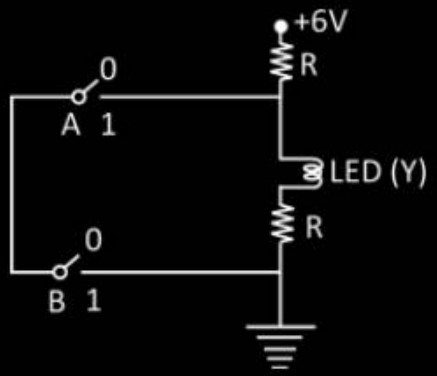
Output = 100W

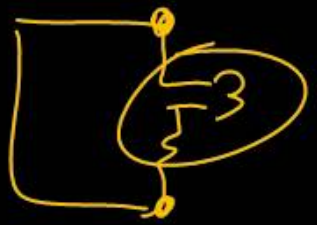
$\eta = \frac{\text{Output}}{\text{Input}} = \frac{100 \times 2}{220 \times 1} = \frac{200}{220} = \frac{10}{11} \times 100 =$

Input = 220 × 0.5A

Question no. 15

The correct Boolean operation represented by the circuit diagram drawn is





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

NAND

(1) NOR (2) AND

(3) OR (4) NAND

4

Question no. 16

If λ_1 and λ_2 are the wavelengths of the first members of the Lyman and Paschen series respectively, then $\lambda_1 : \lambda_2$ is

(1) 1 : 3

(2) 1 : 30

(3) 7 : 50

(4) 7 : 108

$n_1 = 1 \quad n_2 = 2$

$\frac{1}{\lambda_1} = R\left(1 - \frac{1}{4}\right) = \frac{3R}{4}$

$n_1 = 3 \quad n_2 = 4$

$\frac{1}{\lambda_2} = R\left(\frac{1}{9} - \frac{1}{16}\right)$

$= R\left(\frac{16-9}{16\,9}\right)$

$= \frac{7R}{144}$

$\frac{4}{3R} \Big/ \frac{144}{7R} = \frac{4}{3R} \times \frac{7R}{144}$

$= \frac{7}{108}$

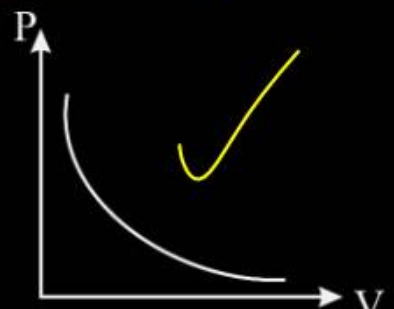
Question no. 17

Which of the following graph best represents the variation of pressure (P) with volume (V) of a gas at a fixed temperature?

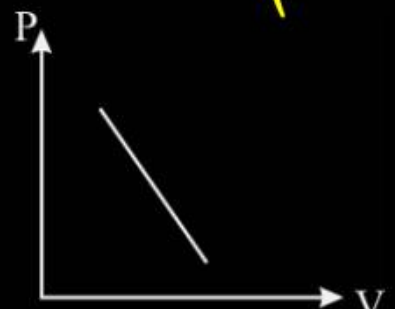
$P \cdot V = \text{Const}$

$P \propto \frac{1}{V}$

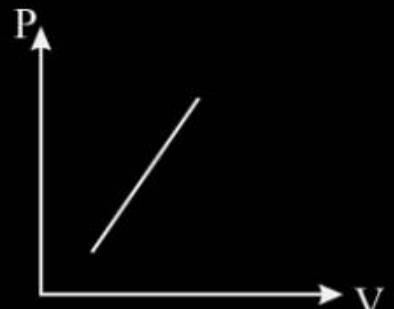
(1)



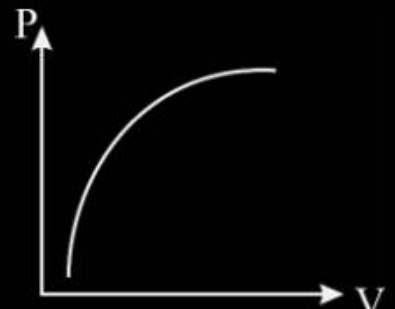
(2)



(3)



(4)



Question no. 18

Two spherical conductors of radii 4 cm and 5 cm are charged to the same potential. If σ_1 and σ_2 be the respective values of the surface density of charge on both the conductors, then the ration σ_1 / σ_2 is

(1) $\frac{25}{16}$

(2) $\frac{5}{4}$

(3) $\frac{16}{25}$

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

$\sigma = \frac{Q}{4\pi R^2}$

$Q = \sigma 4\pi R^2$

$\frac{Q}{R} = \sigma 4\pi R$

$V = \frac{kQ}{R}$

$V = \frac{1}{4\pi\varepsilon_0}(\sigma 4\pi R)$

$\sigma R = \text{constant}$

$\sigma_1 R_1 = \sigma_2 R_2$

$\frac{\sigma_1}{\sigma_2} = \frac{R_2}{R_1} = \frac{5}{4}$

Question no. 19

In a Young's double slit experiment, the intensity at a point where the path difference is $\frac{\lambda}{6}$ (λ being the wavelength of light used) is I. If I_0 denotes the maximum intensity $\frac{I}{I_0}$ is equal to

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

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

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

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

$\phi = k\Delta x = \frac{2\pi}{\lambda} \cdot \frac{\lambda}{6} = \pi/3$

$I = I_0 \cos^2\left(\frac{\Delta\phi}{2}\right)$

max

$I = I_0 \cos^2(\pi/6)$

$I = I_0 \left(\frac{\sqrt{3}}{2}\right)^2 \Rightarrow \frac{I}{I_0} = 3/4$

Question no. 20

When a metallic surface is illuminated by a light of wavelength λ, the stopping potential for the photoelectric current is 3V. When the same surface is illuminated by light of wavelength 2λ, the stopping potential is 1 V. The threshold wavelength of this surface is

(1) 4λ (2) 3.5λ

(3) 3λ (4) 2.7λ

$$\frac{hc}{\lambda} - \frac{hc}{\lambda_0} = eV_s$$

$$E = W + hv$$

$$\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + hv$$

$$\frac{\frac{hc}{\lambda} - \frac{hc}{\lambda_0} = e \cdot 3V_0}{\frac{hc}{2\lambda} - \frac{hc}{\lambda_0} = e \cdot V_0}$$

$$\frac{1}{\lambda} - \frac{1}{\lambda_0} = 3\left(\frac{1}{2\lambda} - \frac{1}{\lambda_0}\right)$$

$$\frac{1}{2\lambda} - \frac{3}{2\lambda} = \frac{1}{\lambda_0} - \frac{3}{\lambda_0}$$

$$-\frac{1}{2\lambda} = -\frac{2}{\lambda_0}$$

$$\lambda_0 = 4\lambda$$

Question no. 21

A current of 1 A through a coil of inductance of 200 mH is increasing at a rate of 0.5 A s^{-1}. The energy stored in the inductor per second is

(1) 0.5 J s^{-1} (2) 5.0 J s^{-1}

(3) 0.1 J s^{-1} (4) 2.0 J s^{-1}

$U = \frac{1}{2} L I^2 = 200 \times 10^{-3} \times 1 \times 0.5 = \frac{1}{10}$

$\frac{dU}{dt} = \frac{1}{2} L \times I \frac{dI}{dt}$

Question no. 22

A photoelectric cell is illuminated by a point source of light 1 m away. When the source is shifted to 2 m then

(1) each emitted electron carries one quarter of the initial energy

(2) number of electrons emitted is half the initial number

(3) each emitted electron carries half the initial energy

(4) number of electrons emitted is a quarter of the initial number

$I \propto \frac{1}{r^2}$

$1m \rightarrow 2m$

$I \rightarrow I/4$

4

Question no. 23

The electric resistance of a certain wire of iron is R. If its length and radius are both doubled then

(1) the resistance will be doubled and the specific resistance will be halved

(2) the resistance will be halved and the specific resistance will remain unchanged

(3) the resistance will be halved and the specific resistance will be doubled

(4) the resistance and the specific resistance, will both remain unchanged.

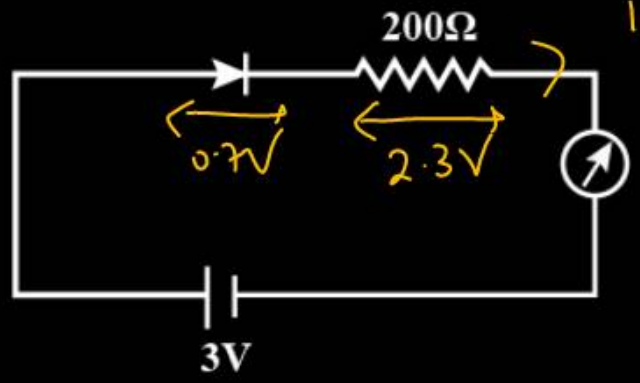
$$R = \frac{\rho l}{A}$$

$$R \propto \frac{l}{A} \propto \frac{l}{r^2}$$

$$R' = \frac{2l}{(2r)^2} = \frac{2l}{4r^2} = \frac{R}{2}$$

Question no. 24

The reading of the ammeter for a silicon diode in the given circuit is:



$i = \frac{2.3}{200} \approx 11.5\,mA$

3

(1) 0

(2) 15 mA

(3) 11.5 mA

(4) 13.5 mA

Question no. 25

The unit of permittivity of free space, ε_0 is

(1) coulomb/newton-metre

(2) newton-metre^2/coulomb^2

(3) coulomb^2/newton-metre^2

(4) coulomb^2/(newton-metre)^2

$$F = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r^2}$$

$$\epsilon_0 = \frac{q_1 q_2}{4\pi F r^2} = \frac{C^2}{N\,m^2}$$

Question no. 26

A galvanometer of 50 ohm resistance has 25 division. A current of 4×10^{-4} ampere gives a deflection of one division. To convert this galvanometer into a voltmeter having a range of 25 volts, it should be connected with a resistance of

(1) 2000 Ω as a shunt

(2) 2250 Ω as a shunt

(3) 1950 Ω as a series

(4) 2450 Ω as a series

$V = I_g (R + G)$

$25 = 25 \times 4 \times 10^{-4} (R + 50)$

$\frac{25000}{4} = R + 50$

$2500 - 50 = R$

$2450 = R$

Question no. 27

In a circuit L, C and R are connected in series with an alternating voltage source of frequency f. The current leads the voltage by 45°. The value of C is

(1) $\frac{1}{\pi f(2\pi f L - R)}$

(2) $\frac{1}{2\pi f(2\pi f L - R)}$

(3) $\frac{1}{\pi f(2\pi f L + R)}$

(4) $\frac{1}{2\pi f(2\pi f L + R)}$

$X_L - X_C$ $V > I$

$X_C - X_L$ $I > V$

RL

$\tan\phi = \frac{X_L}{R}$

$R_{eff} = \frac{X_C}{R}$

LCR

$\tan 45 = \frac{X_C - X_L}{R}$

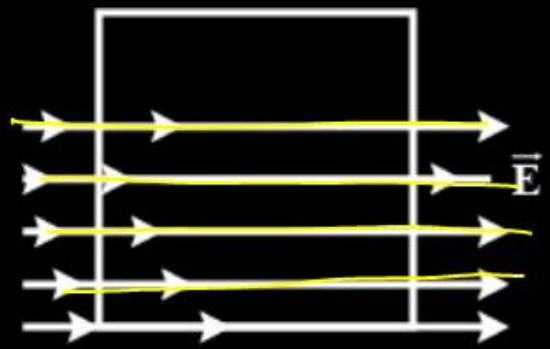
$R + X_L = X_C$

$R + 2\pi f L = \frac{1}{2\pi f C}$

$C = \frac{1}{2\pi f(R + 2\pi f C)}$

Question no. 28

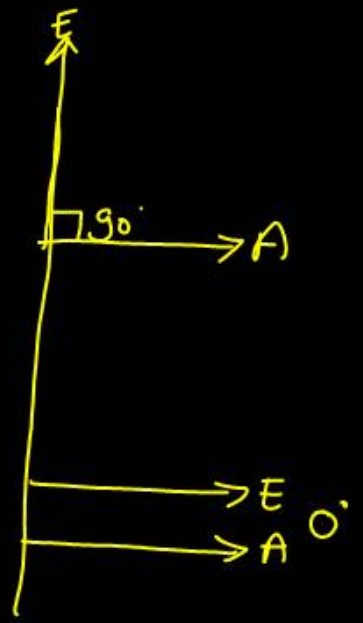
A square surface of side L meters is in the plane of the paper. A uniform electric field $\vec{E}$ (volt/m), also in the plane of the paper, is limited only to the lower half of the square surface (see figure). The electric flux in SI units associated with the surface is



$\theta = 90^\circ$

$\phi = EA\cos 90$

$= 0$



(1) EL^2

(2) $EL^2/2\,\varepsilon_0$

(3) $EL^2/2$

(4) Zero

Question no. 29

The radius of germanium (Ge) nuclide is measured to be twice the radius of $^{9}_{4}Be$. The number of nucleons in Ge are

(1) 72 (2) 73

(3) 74 (4) 75

1

$R_{Ge} = 2 R_{Be}$

$R_0 A^{1/3} = 2 R_0 9^{1/3}$

$\left(\frac{A}{9}\right)^{1/3} = 2$

$\frac{A}{9} = 8$

$A = 72$

Question no. 30

The velocity of electromagnetic radiation in a medium of permittivity ε_0 and permeability μ_0 is given by

(1) $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$

(2) $\sqrt{\frac{\mu_0}{\varepsilon_0}}$

(3) $\sqrt{\frac{\varepsilon_0}{\mu_0}}$

(4) $\sqrt{\mu_0 \varepsilon_0}$

$c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$

Question no. 31

A conducting circular loop is placed in a uniform magnetic field 0.04 T with its plane perpendicular to the magnetic field. The radius of the loop starts shrinking at 2 mm/s. The induced emf in the loop when the radius is 2 cm is

(1) 4.8 πμV

(2) 0.8 πμV

(3) 1.6 πμV

(4) 3.2 πμV

$$e = -N\frac{d}{dt}BA$$

$$e = -B\frac{d}{dt}\pi r^2$$

$$e = B\pi\frac{d}{dt}r^2$$

$$e = B\pi 2r\frac{dr}{dt}$$

$$e = \frac{0{,}04\pi}{100} \times 2\pi \times 2\times10^{-2} \times 2\times10^{-3}$$

$$= \frac{3.2\pi}{100} \times 10^{-5}$$

$$= 3.2\pi \times 10^{-6}$$

$$= 3.2\pi\,\mu V$$

Question no. 32

Young's experiment is performed with light of wavelength 6000 $\mathring{A}$ wherein 16 fringes occupy a certain region on the screen. If 24 fringes occupy the same region with another light of wavelength λ, then λ is

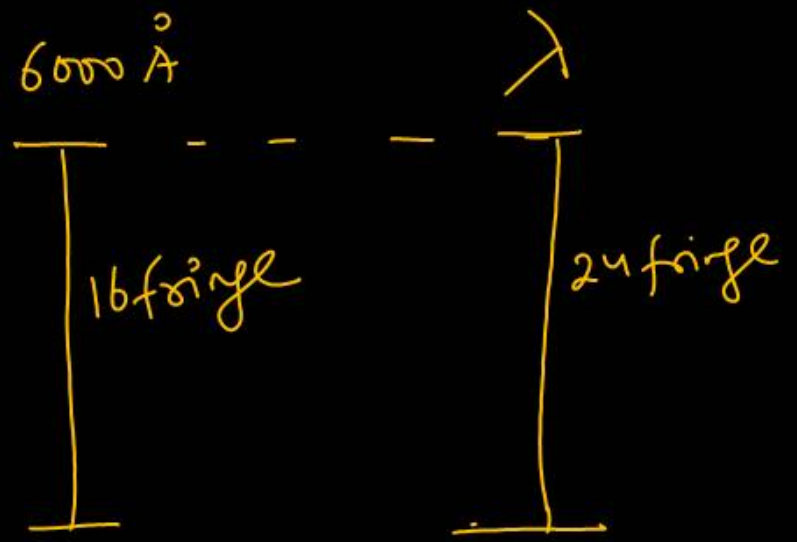
(1) 6000 $\mathring{A}$

(2) 4500 $\mathring{A}$

(3) 5000 $\mathring{A}$

(4) 4000 $\mathring{A}$

(4)



$\lambda_1 N_1 = \lambda_2 N_2$

$6000\mathring{A} \times 16 = \lambda_2 \times 24$

$\lambda_2 = \frac{1000}{6000\mathring{A} \times 16^{4}}{24_{4_1}} = 4000\mathring{A}$

Question no. 33

If the kinetic energy of a particle is increased by 16 times, the percentage change in the de Broglie wavelength of the particle is

(1) 25%
(2) 75%
(3) 60%
(4) 50%

(2)

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

$$\lambda' = \frac{h}{\sqrt{2m(17K)}} = \frac{\lambda}{\sqrt{17}}$$

$$\% \text{ change} = \frac{\lambda' - \lambda}{\lambda} \times 100\ \%$$

$$= \frac{\frac{\lambda}{\sqrt{17}} - \lambda}{\lambda} \times 100\ \%$$

$$\approx -75\ \%$$

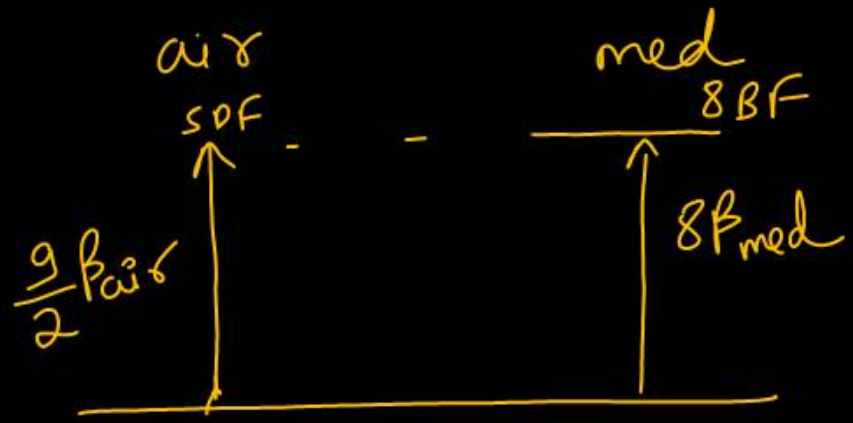
Question no. 34

Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8th bright fringe in the medium lies where 5th dark fringe lies in air. The refractive index of the medium is nearly

(1) 1.59 (2) 1.69

(3) 1.25 (4) 1.78

(4)



$$\frac{9}{2}\beta_{air} = 8\beta_{med}$$

$$\frac{9}{2}\frac{\lambda D}{d} = 8\frac{\lambda D}{d n}$$

$$n = 16/9 \approx 1.77$$

Question no. 35

In a diffraction pattern due to a single slit of width a, the first minimum is observed at an angle 30° when light of wavelength 5000 $\mathring{A}$ is incident on the slit. The first secondary maximum is observed at an angle of

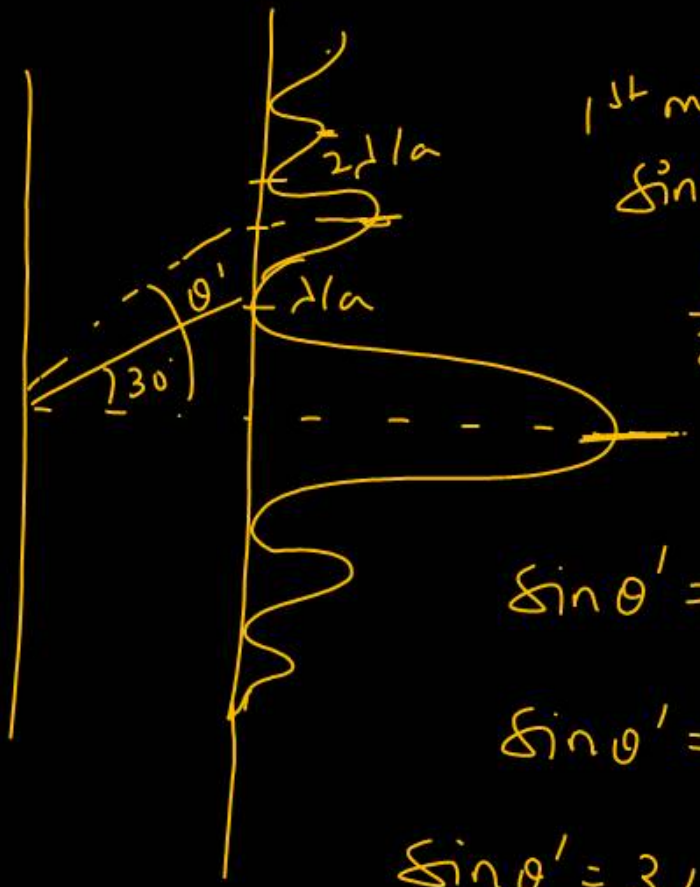
(1) $\sin^{-1}\left(\frac{1}{2}\right)$

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

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

(4) $\sin^{-1}\left(\frac{2}{3}\right)$

2



1st minima

$\sin\theta = \lambda/a$

$\frac{1}{2} = \lambda/a$

$\sin\theta' = \frac{3}{2}\frac{\lambda}{a}$

$\sin\theta' = \frac{3}{2} \times \frac{1}{2}$

$\sin\theta' = 3/4$

$\theta' = \sin^{-1}(3/4)$

Question no. 36

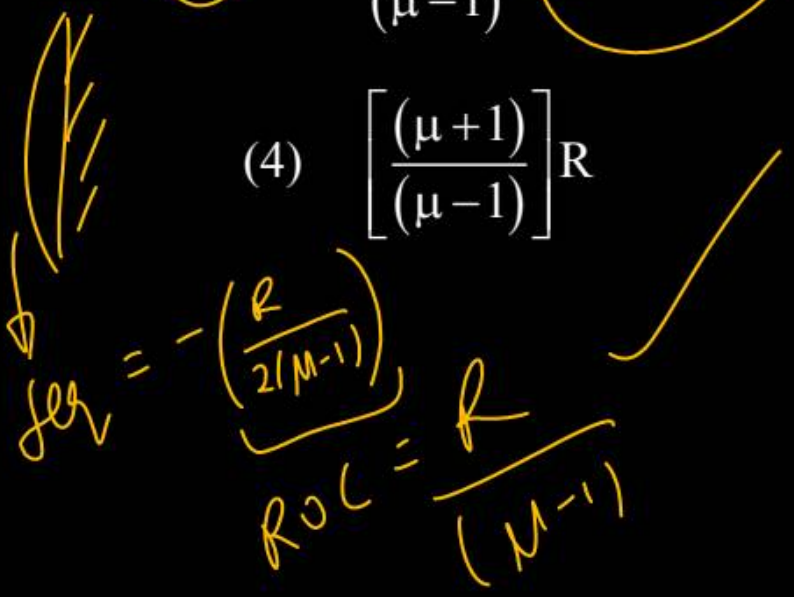
The plane face of a planoconvex lens is silvered. If μ be the refractive index and R, the radius of curvature of curved surface, then the system will behave like a concave mirror of radius of curvature

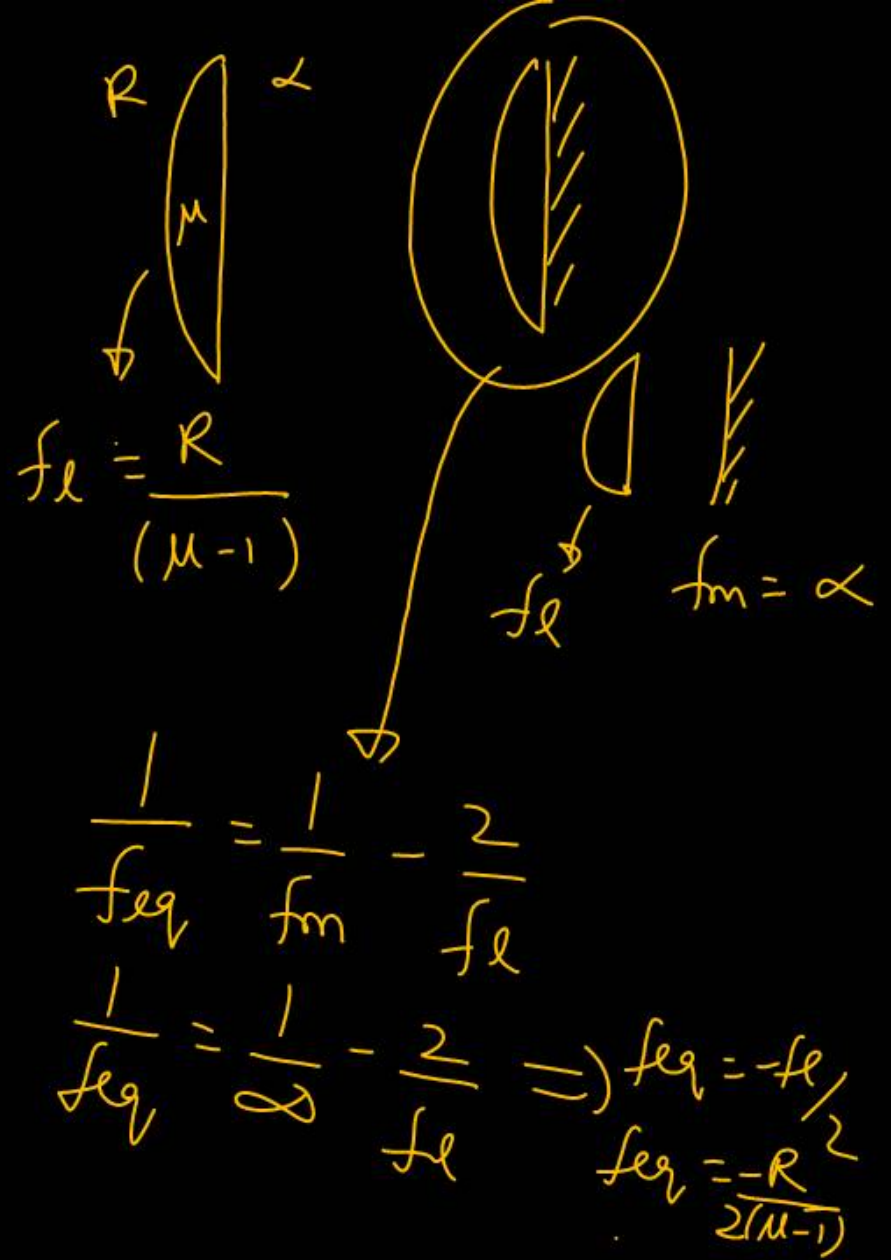
(1) μR

(2) $\dfrac{R}{(\mu-1)}$

(3) $\dfrac{R}{\mu}$

(4) $\left[\dfrac{(\mu+1)}{(\mu-1)}\right]R$





Question no. 37

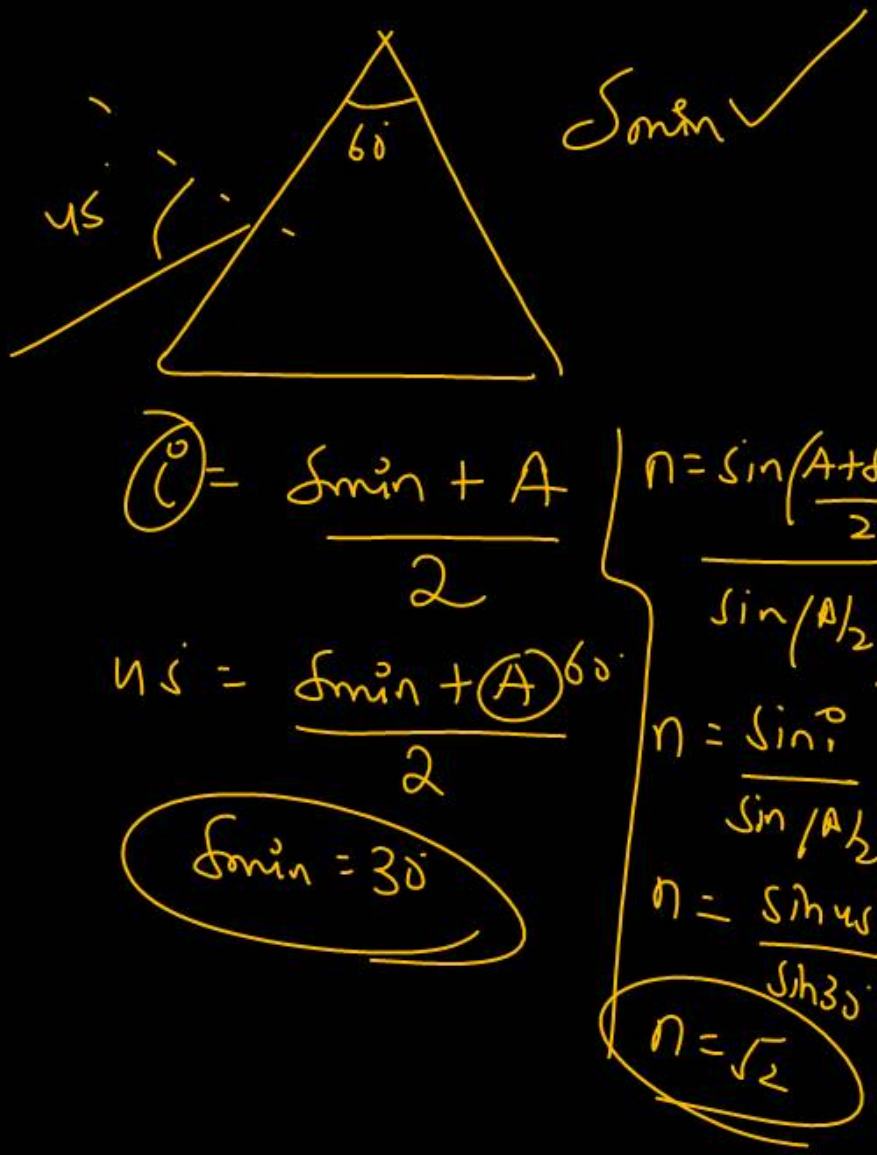
The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are

(1) 45°, $\sqrt{2}$

(2) 30°, $\frac{1}{\sqrt{2}}$

(3) 45°, $\frac{1}{\sqrt{2}}$

(4) 30°, $\sqrt{2}$



Question no. 38

The critical angle of medium for a specific wavelength, if the medium has relative permittivity 3 and relative permeability 4/3 for this wavelength, will be

(1) 15°
(2) 30°
(3) 45°
(4) 60°

2

$\varepsilon_r = 3$

$\mu_r = 4/3$

$n = \sqrt{\mu_r \varepsilon_r} = \sqrt{3 \times \frac{4}{3}} = 2$

$\sin\theta_c = \frac{n_R}{n_D} = \frac{1}{2}$

$\theta_c = 30^\circ$

Question no. 39

Monochromatic light of frequency 6×10^{14} Hz is produced by a laser. The power emitted is 2×10^{-3} W. The number of photons emitted per second is (Given h $=6.63\times10^{-34}$ J s)

(1) 2×10^{15}

(2) 3×10^{15}

(3) 4×10^{15}

(4) 5×10^{15}

4

$$n = \frac{P\lambda}{hc}$$

$$n = \frac{P}{h\nu}$$

$$n = \frac{P}{h\nu} = \frac{2\times10^{-3}}{6.6\times10^{-34}\times6\times10^{14}}$$

$$n = \frac{0.33\times10^{17}}{6.6}$$

$$n = \frac{33}{66}\times10^{17}\times\frac{1}{10} = 0.5\times10^{16} = 5\times10^{15}$$

Question no. 40

The self-inductance L of a solenoid of length l and area of cross-section A, with a fixed number of turns N increases as

(1) l and A increase

(2) l decreases and A increase

(3) l increase and A decreases

(4) both l and A decreases

$$L = \frac{N\phi}{I} = \frac{NBA}{I}$$

$$B = \frac{\mu_0 N I}{l}$$

$$L = \frac{\mu_0 N^2 A}{l}$$

$$L \propto \frac{A\uparrow}{l\downarrow}$$

Question no. 41

The range of magnetic susceptibility and relative magnetic permeability for diamagnetic substances are

(1) $0 \le \chi < 1,\ 0 \le \mu < 1$

(2) $-1 \le \chi < 0,\ -1 \le \mu < 0$

(3) $0 \le \chi < 1,\ -1 \le \mu < 0$

(4) $-1 \le \chi < 0,\ 0 \le \mu < 1$

χ_m = −Ve

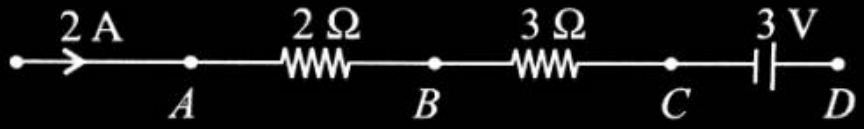
$-1 < \chi_m < 0$

$0 \le \mu < 1$

$1 \rightarrow \mu$ = para

Question no. 42

In the given circuit the potential at point B is zero the potential at A and D will be

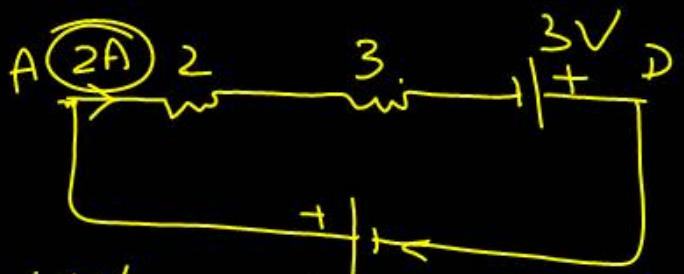


(1) $V_A = 4$ V; $V_D = 9$ V

(2) $V_A = 3$ V; $V_D = 4$ V

(3) $V_A = 9$ V; $V_D = 3$ V

(4) $V_A = 4$ V; $V_D = -3$ V



$V_A - V_D = 7$

② $3 - 4 = -1$

③ $9 - 3 = 6$

$4 - (-3) = 7$.

$\Sigma IR = \Sigma V$

$2 \times 5 = +3 + V_{AD}$

$10 - 3 = V_{AD}$

$V_{AD} = 7$ V

Question no. 43

In a parallel plate capacitor, the capacity increases if

(1) area of the plate is decreases

(2) distance between the plates increases

(3) area of the plate is increases

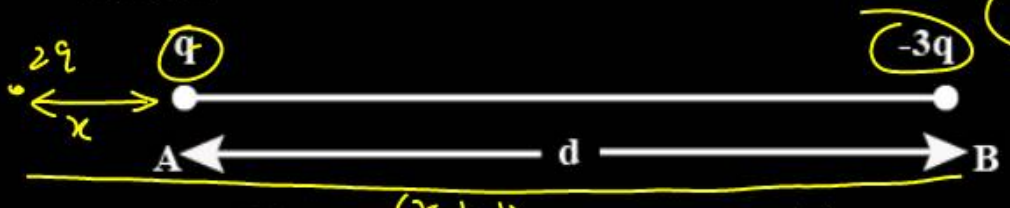
(4) dielectric constant decreases

$$C = \frac{K \epsilon_0 A}{d}$$

$$C \propto \frac{A \uparrow}{d \downarrow}$$

Question no. 44

Two charges q and –3q are fixed on x-axis separated by distance d. Where should a third charge 2q be placed from A such that it will not experience any force?



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

(2) $\frac{\sqrt{3}\,d+d}{2}$

(3) $\frac{\sqrt{2}\,d-d}{2}$

(4) $\frac{\sqrt{2}\,d+d}{2}$

$$\frac{k\,q\times 2q}{x^2}=\frac{k\,2q\times 3q}{(x+d)^2}$$

$$(x+d)^2=3x^2$$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x^2+d^2+2dx=3x^2$$

$$2x^2-2dx-d^2=0$$

$$x=\frac{-(-2d)\pm\sqrt{4d^2+4\times2\times d^2}}{2\times2}$$

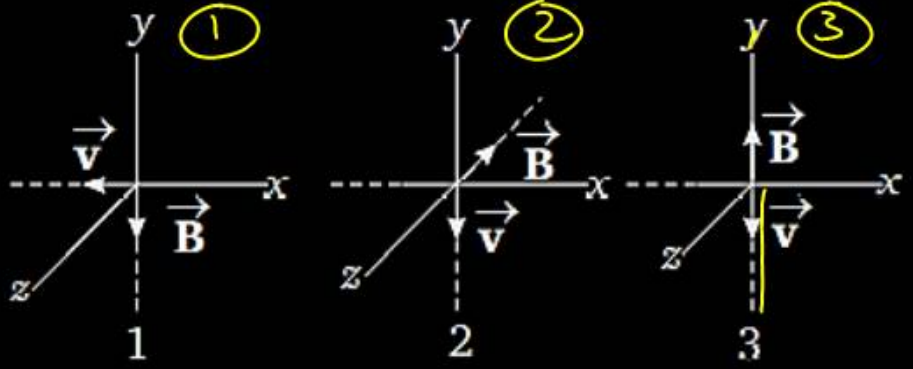
$$x=\frac{2d\pm\sqrt{12d^2}}{4}$$

$$x=\frac{2(d\pm\sqrt{3}d)}{4\times2}$$

$\frac{d-\sqrt{3}d}{2}$ $\frac{d+\sqrt{3}d}{2}$

Question no. 45

The figure shows three situations when an electron with velocity v travels through a uniform magnetic field B. In each case, what is the direction of magnetic force on the electron?



(1) + ve Z–axis, – ve X – axis, + ve Y – axis

(2) – ve Z – axis, – ve X – axis and zero

(3) – ve Z – axis, + ve Y – axis and zero

(4) – ve Z – axis, + ve X – axis and zero

$\vec{F} = (\vec{v} \times \vec{B})q$

(1) $v = -i$

$B = -j$

$-i \times -j = -(i \times j) = -k = -Z\text{axis}$

$j \times -j = 0$

(2) $v = -j$

$B = -k$

$-j \times -k = -(j \times k) = -i$ (x)

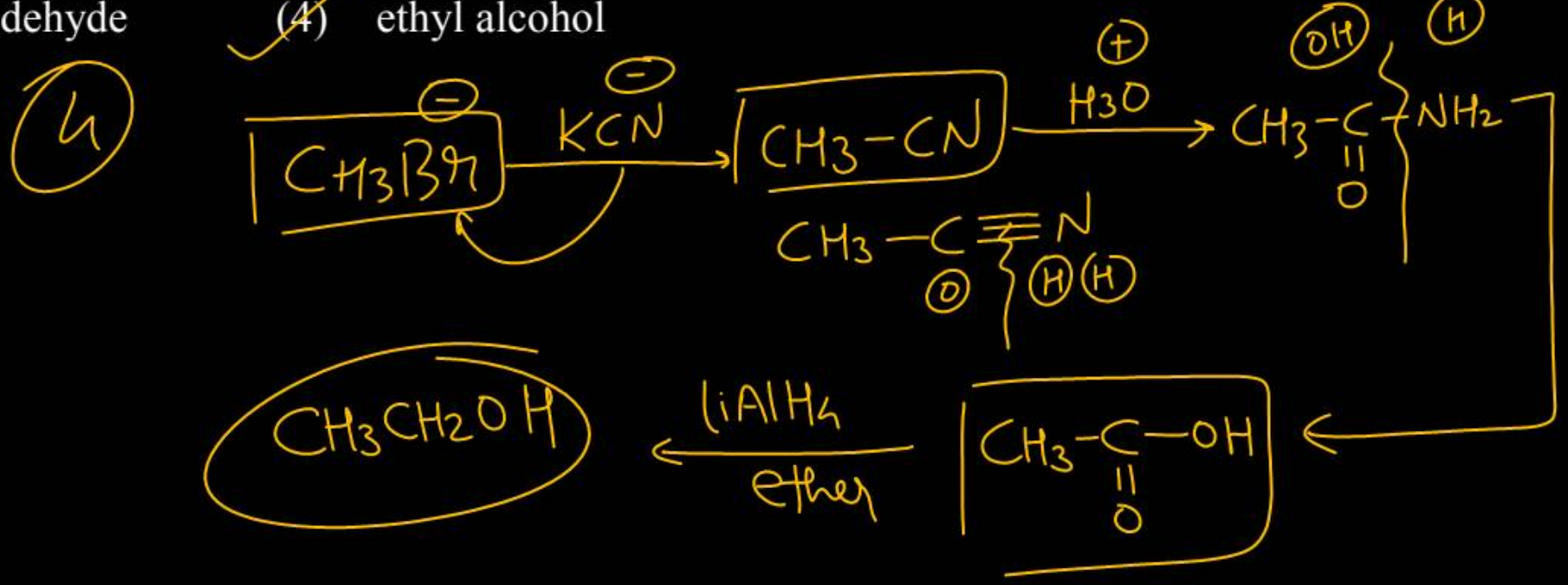
Question no. 46

In the following sequence of reaction,

$$CH_3 - Br \xrightarrow{KCN} A \xrightarrow{H_3O^+} B \xrightarrow[\text{ether}]{LiAlH_4} C$$, C is

(1) acetone (2) methane

(3) acetaldehyde (4) ethyl alcohol



Question no. 47

Suitable reagent for conversion of following reaction

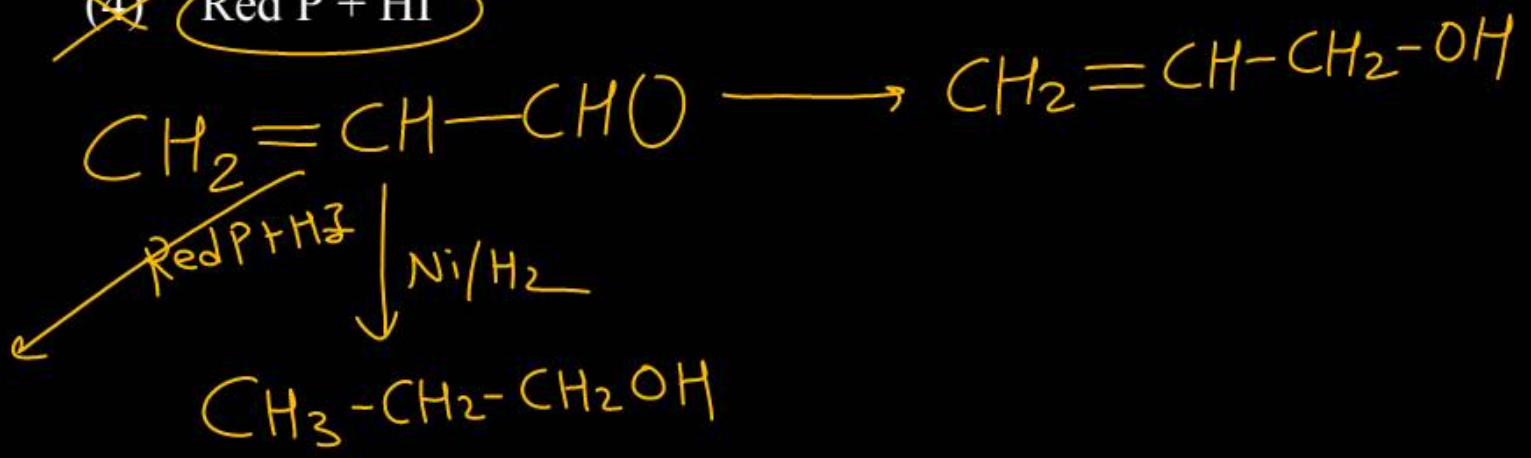
$$CH_2=CH-CHO \xrightarrow{?} CH_2=CH-CH_2-OH\ ?$$

(1) $NaBH_4$

(2) Ni/H_2

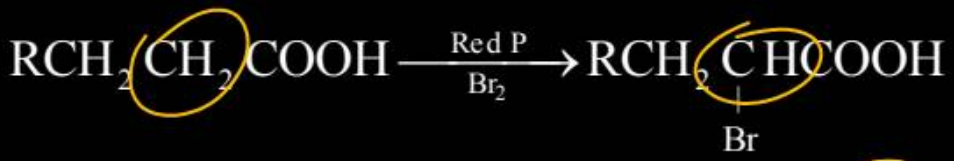
(3) Zn/Hg/HCl

(4) Red P + HI



Question no. 48

The reaction, is called as



(1) Reimer– Tiemann reaction

(2) Hell – Volhard – Zelinsky reaction

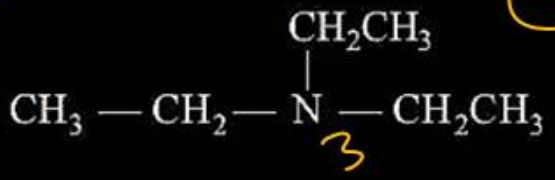
(3) Cannizaro's reaction

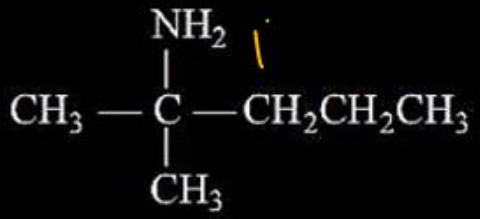
(4) Sandmeyer's reaction

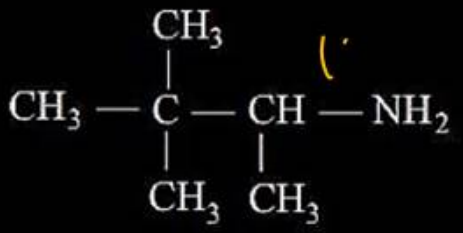
Question no. 49

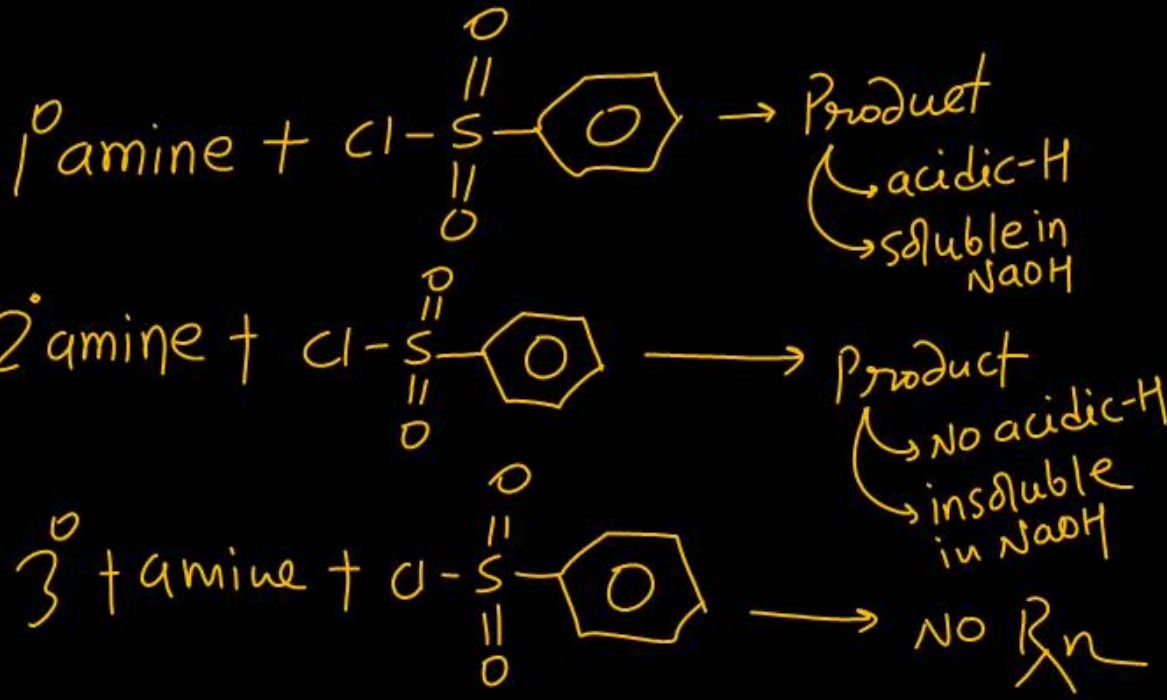
The amine that reacts will Hinsberg's reagent to give an alkali insoluble product is

(1) 

(2) 

(3) 

(4) 



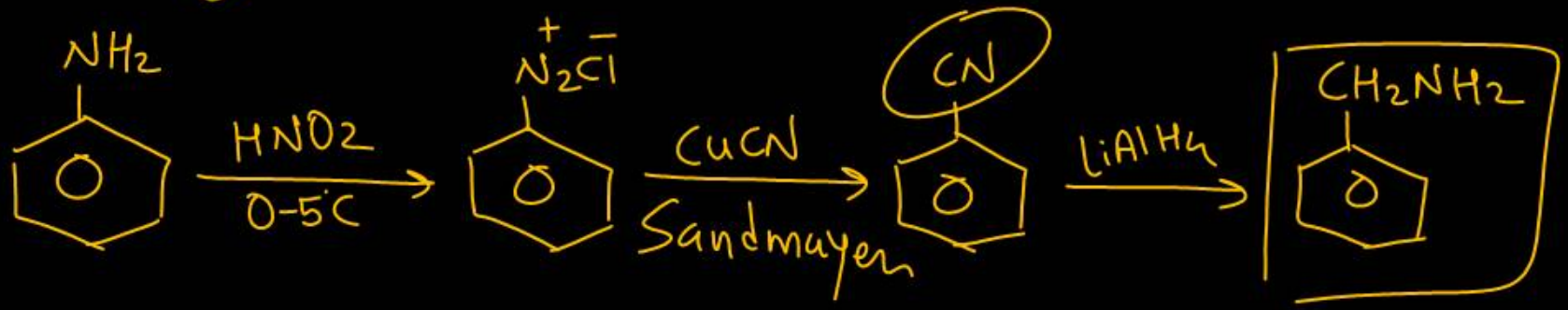
Question no. 50

In the reaction sequence

the product 'C' is

(1) benzonitrile (2) benzaldehyde

(3) benzoic acid (4) benzylamine



Question no. 51

The volume of 10 N and 4 N HCl required to make 1 L of 7 N HCl are

(1) 0.50 L of 10 N HCl and 0.50 L of 4 N HCl

(2) 0.60 L of 10 N HCl and 0.40 L of 4 N HCl

(3) 0.80 L of 10 N HCl and 0.20 L of 4 N HCl

(4) 0.75 L of 10 N HCl and 0.25 L of 4 N HCl

$N_1V_1 + N_2V_2 = N_3V_3$

$10 \times V_1 + 4 \times V_2 = 7 \times 1$

$10V_1 + 4V_2 = 7$

$10 \times 0.5 + 4 \times 0.5$

$= 5 + 2$

$= 7$

Question no. 52

The standard electrode potential for the half–cell reactions are

$Zn^{2+} + 2e^- \longrightarrow Zn;\ E^\circ = -0.76\ V$ Anode

$Fe^{2+} + 2e^- \longrightarrow Fe;\ E^\circ = -0.44\ V$ Cathode

Red

$Fe^{2+} + Zn \longrightarrow Zn^{2+} + Fe$ is

$E^\circ_{cell} = (-0.44) - (-0.76)$

$= +0.32$

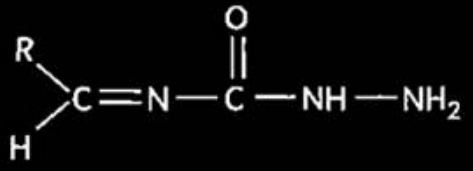
The E°_{cell} of the cell reaction,

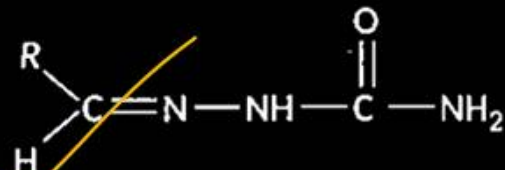
(1) –1.20 V (2) + 1.20 V

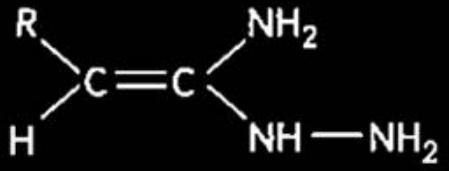
(3) + 0.32 V (4) – 0.32 V

Question no. 53

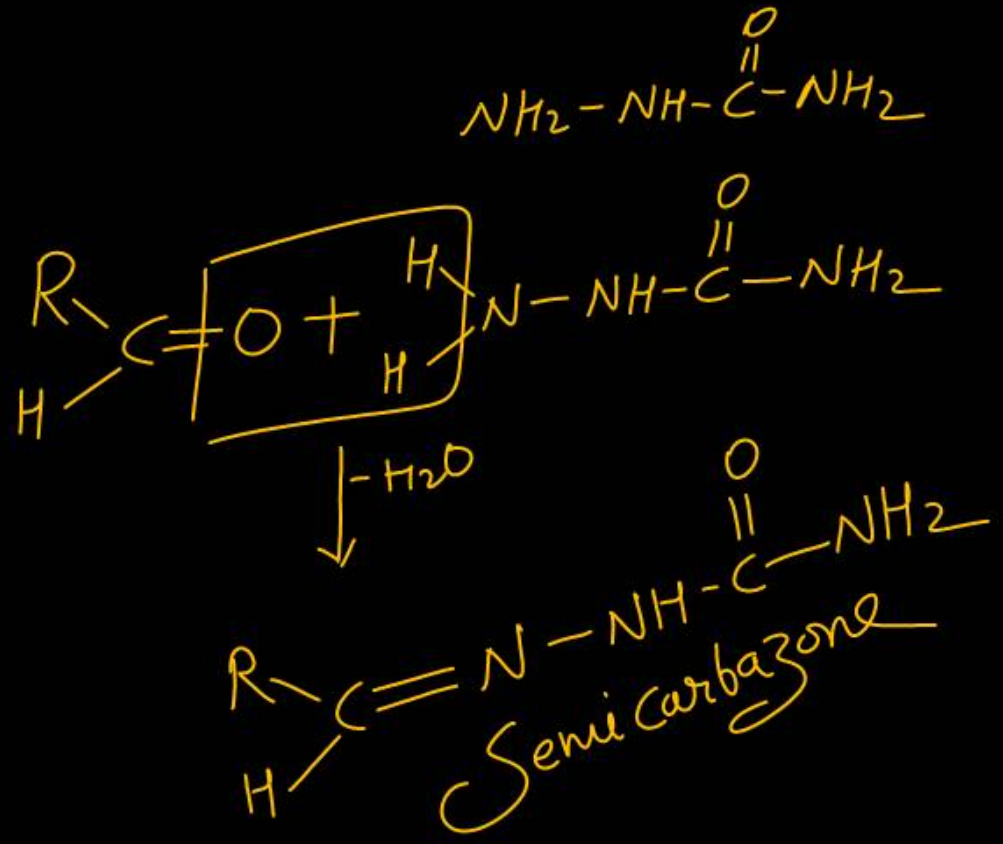
Product of the following reaction,

(1) 

(2) 

(3) 

(4) Both (a) and (b)



Question no. 54

The reduction potential of hydrogen half-cell will be negative if

(1) $p(H_2) = 1$ atm and $[H^+] = 2.0$ M

(2) $p(H_2) = 1$ atm and $[H^+] = 1.0$ M

(3) $p(H_2) = 2$ atm and $[H^+] = 1.0$ M

(4) $p(H_2) = 2$ atm and $[H^+] = 2.0$ M

$$2H^+ + 2e^- \longrightarrow H_2(g)$$

$$E_{cell} = E^\circ_{cell} - \frac{0.059}{n} \log \frac{(pH_2)}{[H^+]^2}$$

$$= 0 - \frac{0.059}{2} \log \frac{1/2}{(1/1)}$$

$$\frac{(pH_2)}{[H^+]^2} > 1$$

$-ve$

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

$+ve$

Question no. 55

The effective atomic number of cobalt in the complex $[Co(NH_3)_6]^{+3}$ is

(1) 36

(2) 33

(3) 24

(4) 30

$$EAN = Z - O.N. + 2 \times Co.No.$$

$$= 27 - 3 + 2 \times 6 = 36$$

Question no. 56

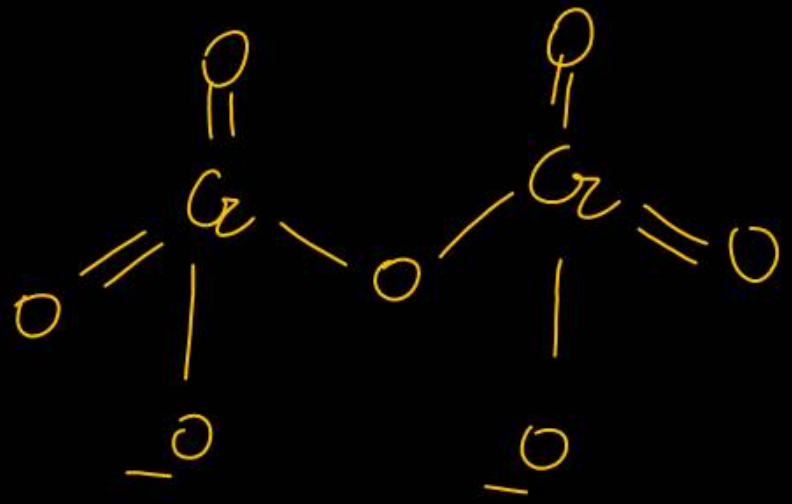
Which is the correct statement about $Cr_2O_7^{2-}$ structure?

(1) It has neither Cr–Cr bonds nor O–O bonds

(2) It has one Cr–Cr bond and six O–O bonds

(3) It has no Cr–Cr bond and has six O–O bonds

(4) It has one Cr–Cr bond and seven Cr–O bonds



Question no. 57

Which of the following compounds exhibits linkage isomerism?

(1) $[Co(en)_3]\ Cl_3$

(2) $[Co(NH_3)_6[Cr(CN)_6]$

(3) $[Co(en)_2NO_2Cl]\ Br$

(4) $[Co(NH_3)_5Cl]\ Br_2$

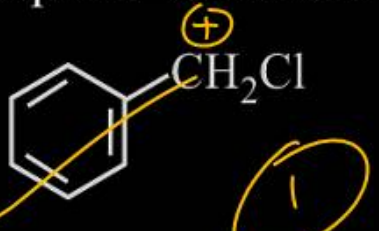
$-NO_2$

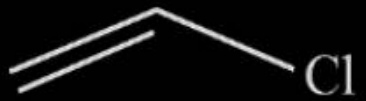
$-SCN$

Question no. 58

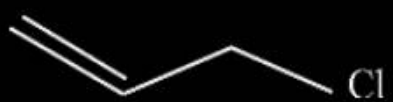
Which one of the following is most reactive towards nucleophilic substitution reaction?

SN Rxn → Allyl Halide, Benzyl Halides → SN1 & SN2

(1) 

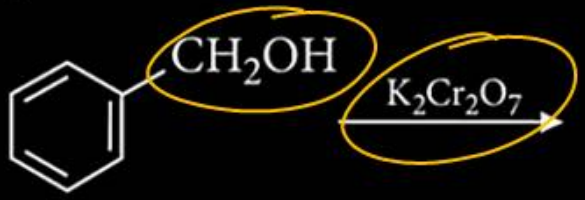
(2) 

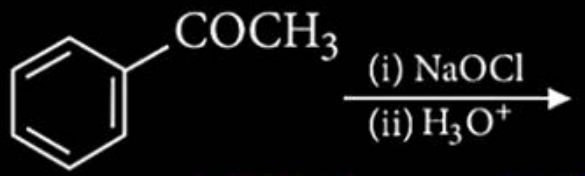
(3) 

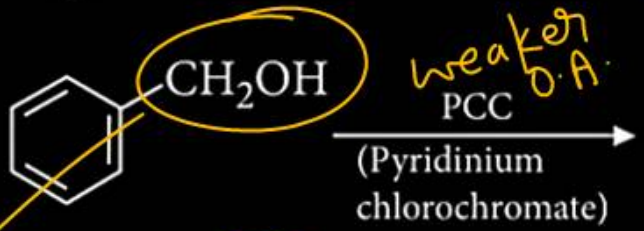
(4) 

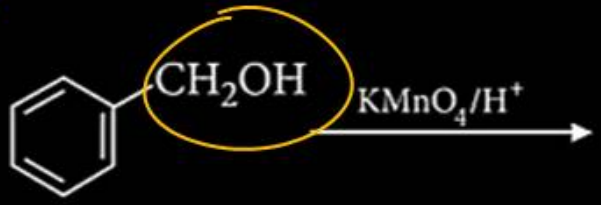
Question no. 59

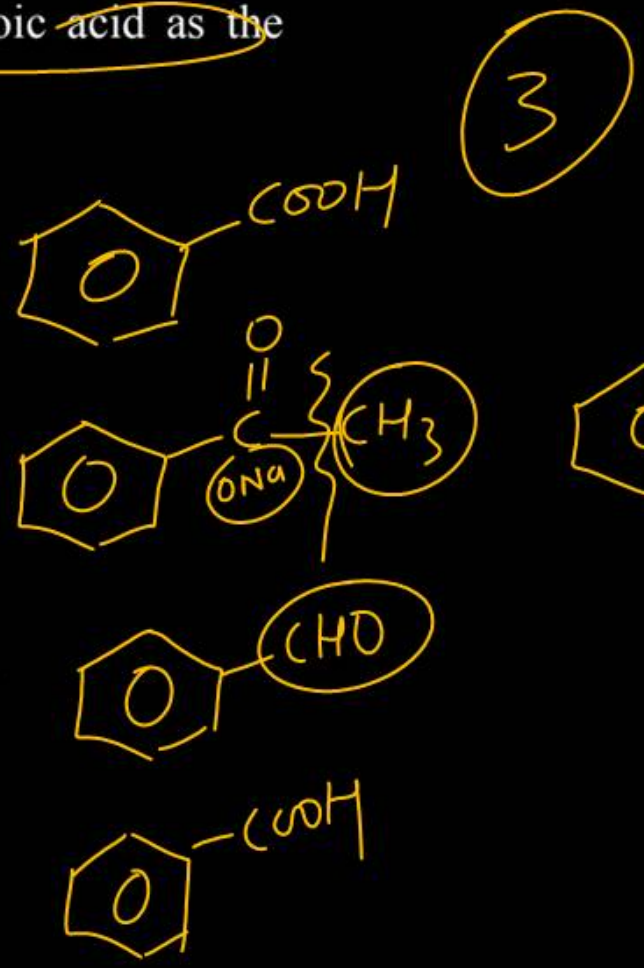
The reaction that does not give benzoic acid as the major product is

(1) 

(2) 

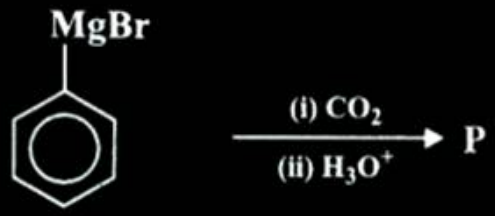
(3) 

(4) 



Question no. 60

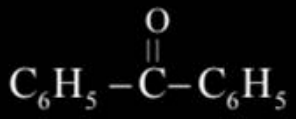
In the above reaction, product P is

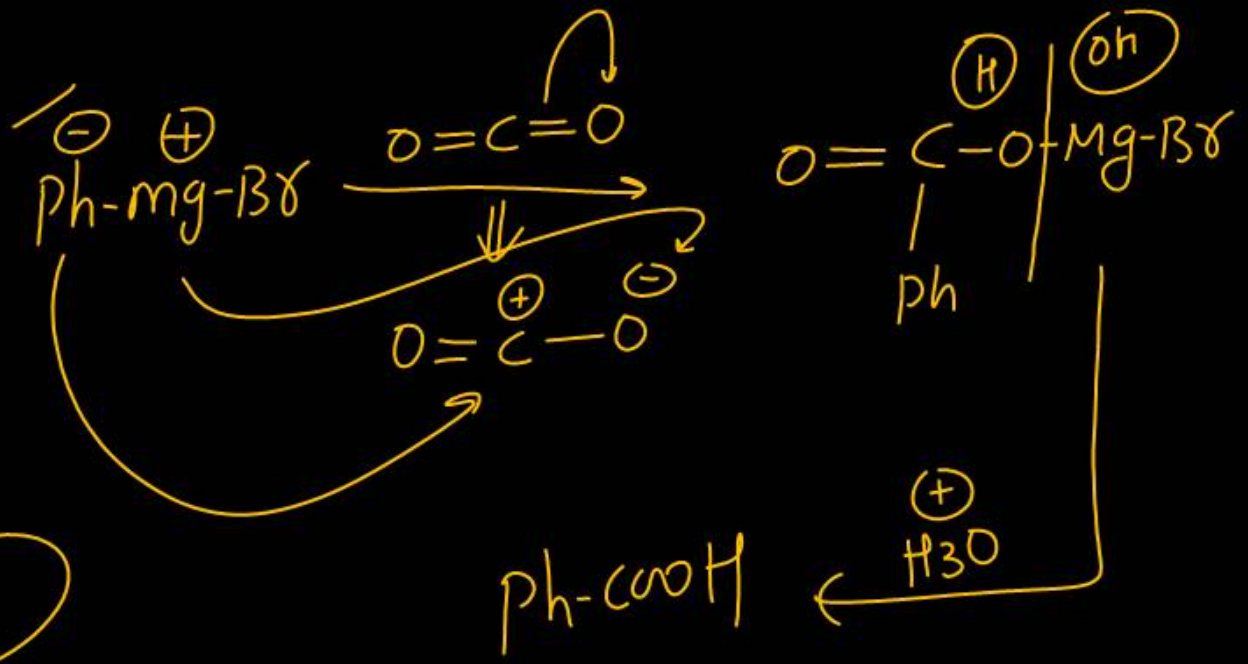


(1) 

(2) 

(3) 

(4) 



Question no. 61

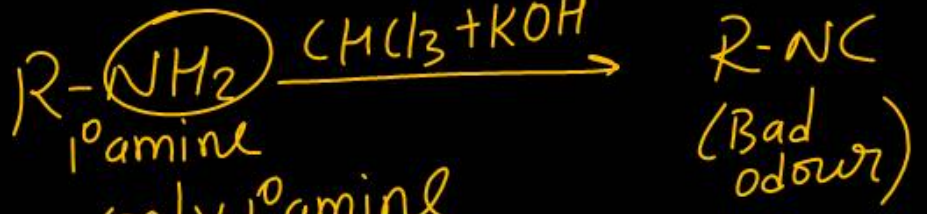
Carbylamine test is not answered by

(1) $C_6H_5NH_2$

(2) $(CH_3)_3\,C–CH_2–NH_2$

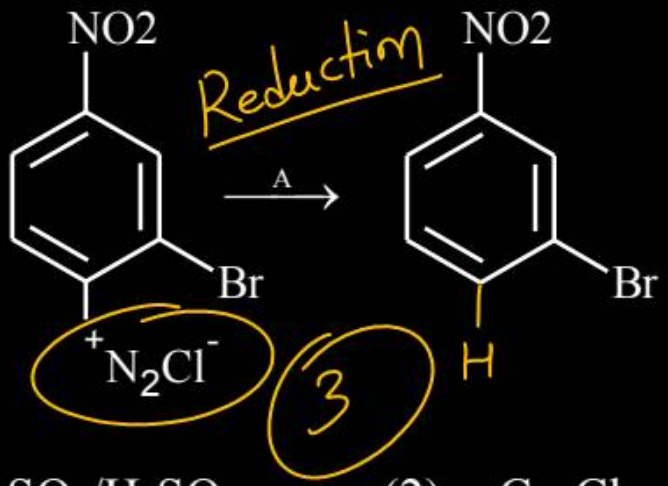
(3) $C_6H_5CH_2NH_2$

(4) $(CH_3)_3\,N$



Question no. 62

In the reaction A is



(1) $HgSO_4/H_2SO_4$ (2) Cu_2Cl

(3) H_3PO_2 and H_2O (4) H^+/H_2O

Question no. 63

Which one of the following is incorrect for ideal solution?

(1) $\Delta H_{mix} = 0$

(2) $\Delta V_{mix} = 0$

(3) $\Delta p = p_{obs} - p_{calculated\ by\ Raoult's\ law} = 0$

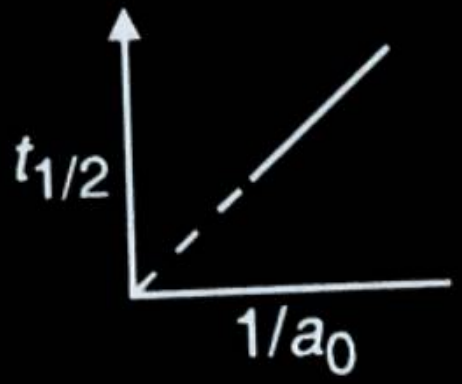
(4) $\Delta G_{mix} = 0$

$\Delta G_{mix} = -ve$

$\Delta P = 0$

Question no. 64

The following graph shows how $t_{1/2}$ (half–life) of a reactant R changes with the initial reactant concentration a_0. The order of the reaction will be



(1) 0 (2) 1

(3) 2 (4) 3

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

n = order of RXn

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

2nd order

stronger

$a_0^{1-0} = a_0$

$t_{1/2} \propto a_0$

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

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

Question no. 65

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

Assertion (A) Carboxylic is acid stronger acid than phenol.

Reason (R) Carboxylate ion is relatively less stable as compared to the phenoxide ion.

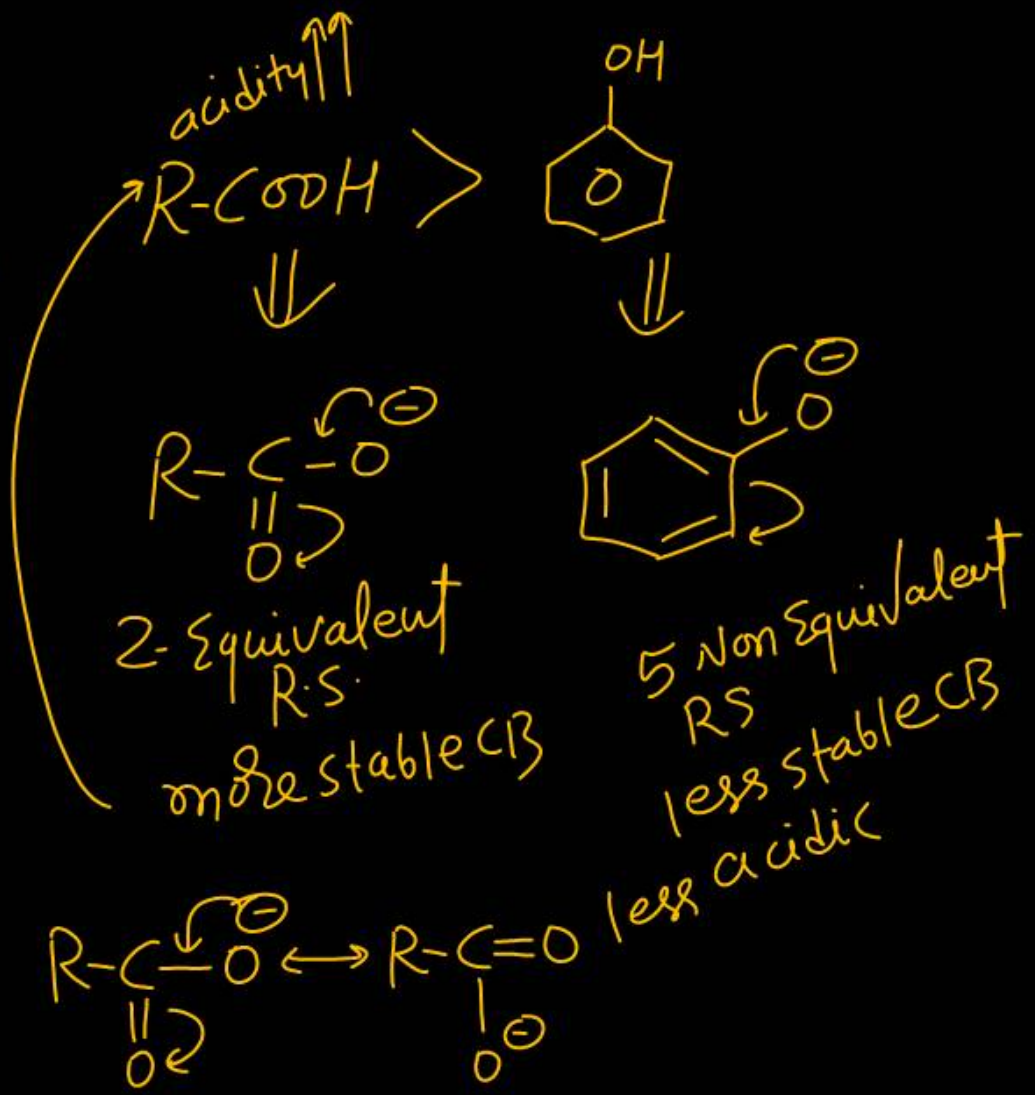
In the light of the above statements, choose the most appropriate answer from the options given below.

(1) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

(2) (A) is correct but (R) is incorrect.

(3) (A) is incorrect but (R) is correct.

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



Question no. 66

Given, $E^{o}_{Cr^{3+}/Cr} = -0.72V$, $E^{o}_{Fe^{2+}/Fe} = -0.42V$. The potential for cell $Cr \mid Cr^{3+}(0.1\ M) \parallel Fe^{2+}(0.01M) \mid Fe$ is

(1) 0.26 V (2) 0.399V

(3) – 0.339V (4) – 0.26V

$$2Cr + 3Fe^{+2} \longrightarrow 2Cr^{+3} + 3Fe$$

10^{-2} 10^{-1}

$$E^{o}_{cell} = (-0.42) - (-0.72)$$

$$= +0.30\ V$$

$$E_{cell} = 0.30 - \frac{0.059}{6} \log \frac{(10^{-1})^2}{(10^{-2})^3}$$

$$= 0.30 - \frac{0.059}{6} \log 10^{4}$$

$$= 0.30 - \frac{0.059 \times 4}{6}$$

$$= 0.30 - 0.04$$

Question no. 67

The E° (M^{2+}/M) value for copper is positive (0.34 V).

This is because

(1) copper has high enthalpy of atomisation

(2) copper has low enthalpy of hydration

(3) the high energy required to transform Cu(s) to $Cu^{2+}(aq)$ is not balanced by its hydration enthalpy

(4) all the three above

Question no. 68

The electronic configuration of Gd^{2+} is (At. No. of Gd is 64)

(1) [Xe] $4f^7$

(2) [Xe] $4f^7 5d^1$

(3) [Xe] $4f^8$

(4) [Xe] $4f^7 5d^1 6s^2$

$Gd = 6s^2 5d^1 4f^7$

$Gd^{+2} = 5d^1 4f^7$

Question no. 69

The complex used as an anticancer agent is

(1) meso – $[CO(NH_3)_3Cl_3]$

(2) cis – $[PtCl_2(NH_3)_2]$

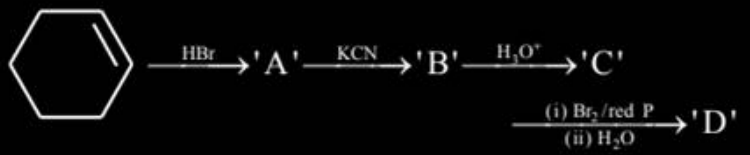
(3) cis–$K_2[PtCl_2Br_2]$

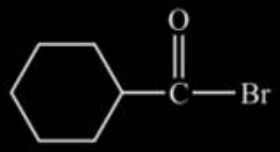
(4) Na_2CoCl_4

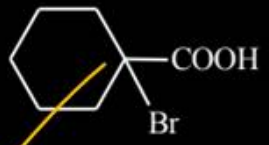
cis-platin

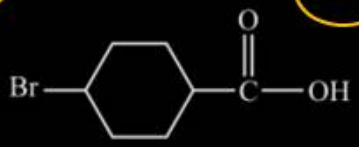
Question no. 70

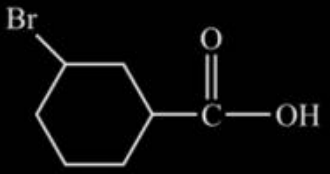
Identify the compound D in the above mentioned series of reactions.

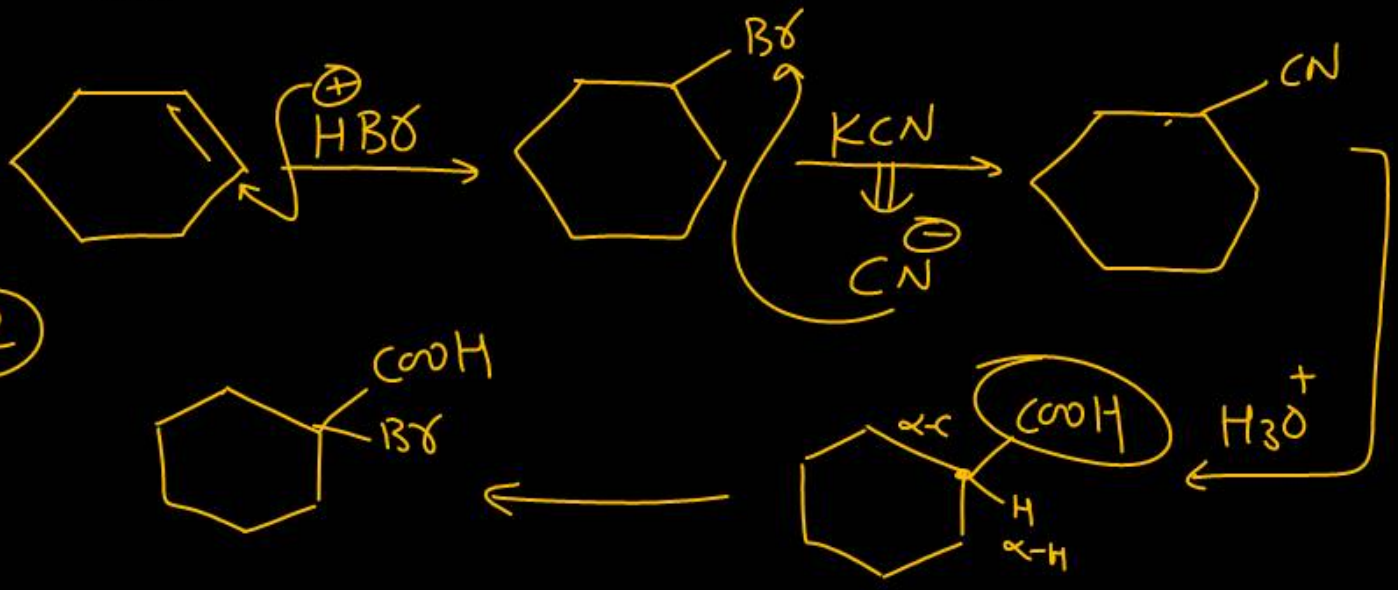


(1) 

(2) 

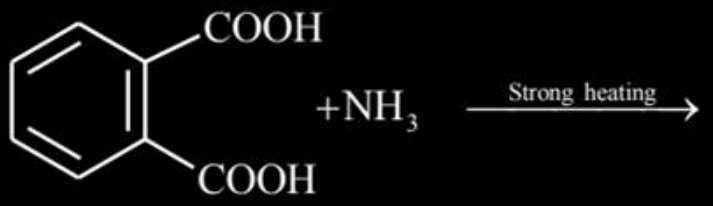
(3) 

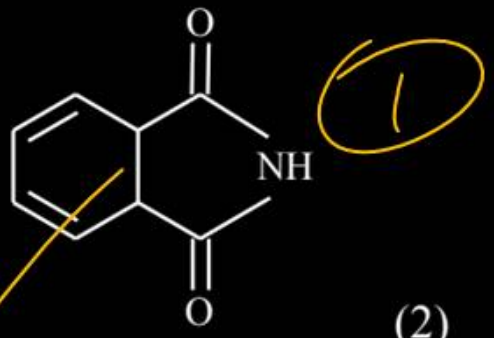
(4) 

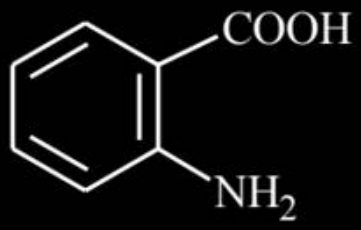


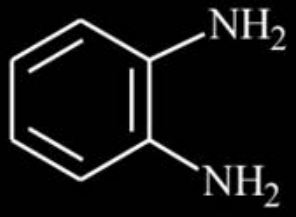
Question no. 71

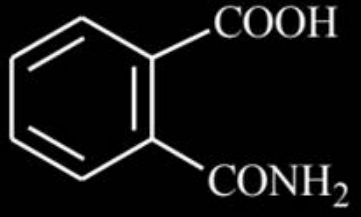
The major product of the following reaction is

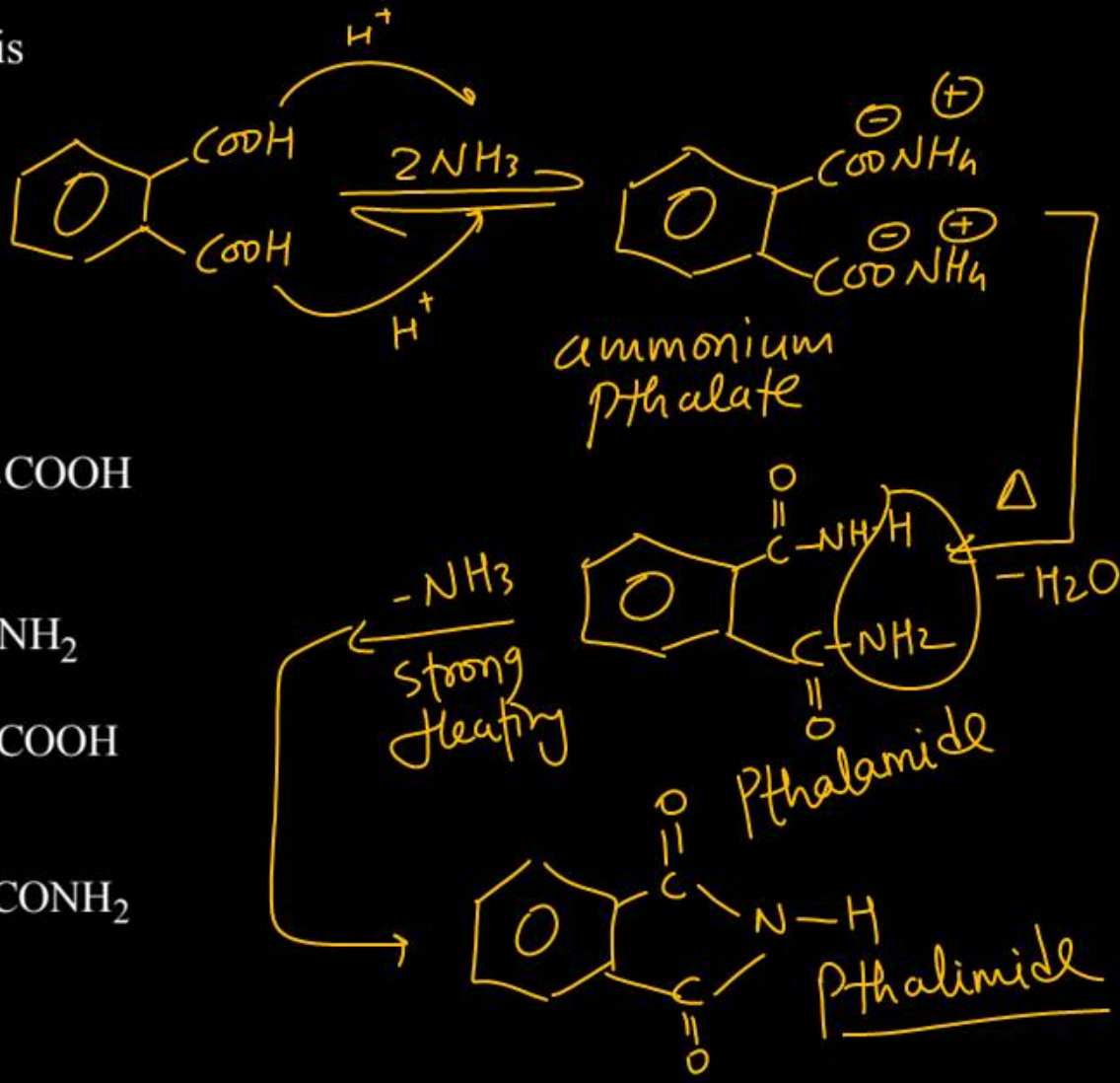


(1) 

(2) 

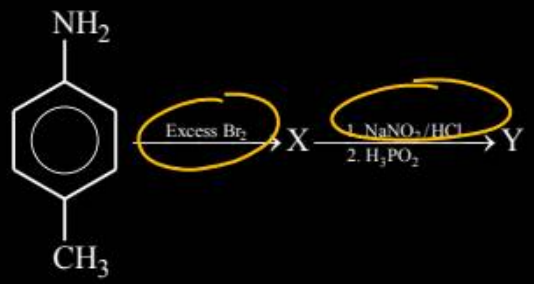
(3) 

(4) 

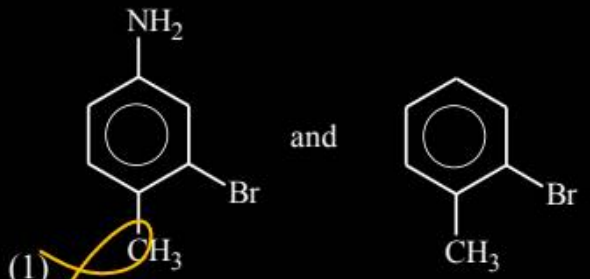


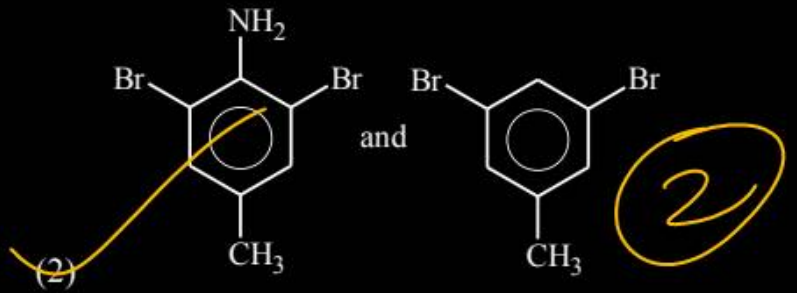
Question no. 72

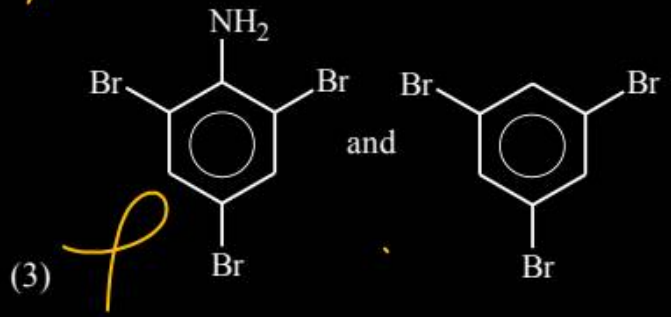
In the following reaction sequence,

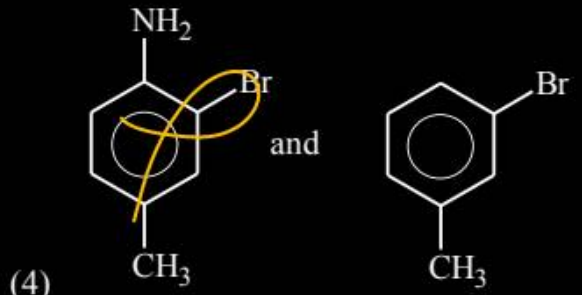


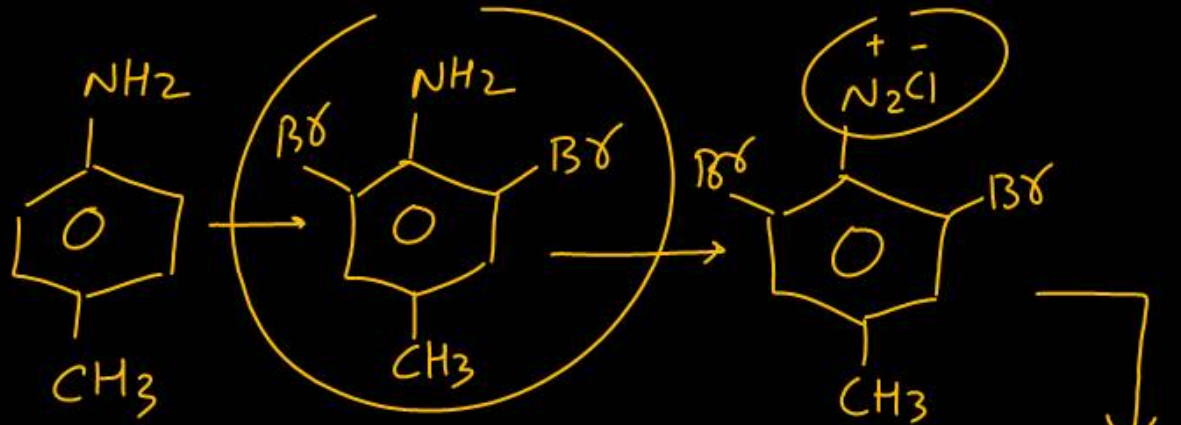
The compounds X and Y are respectively,

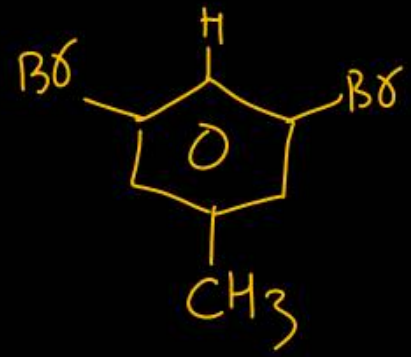
(1) 

(2) 

(3) 

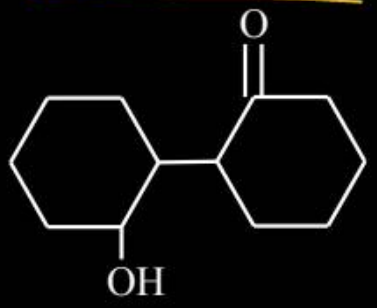
(4) 

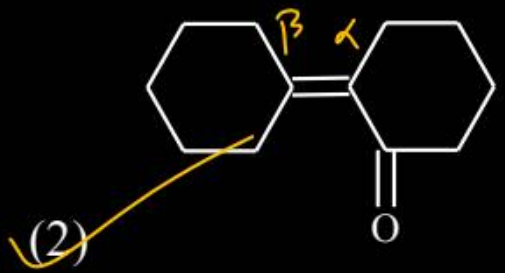


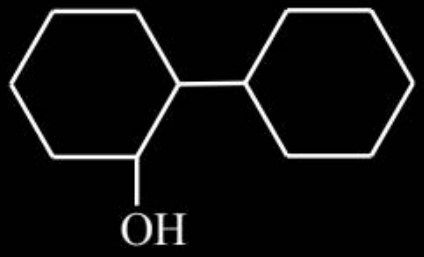


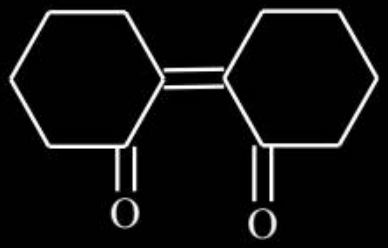
Question no. 73

Of the following which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?

(1) 

(2) 

(3) 

(4) 

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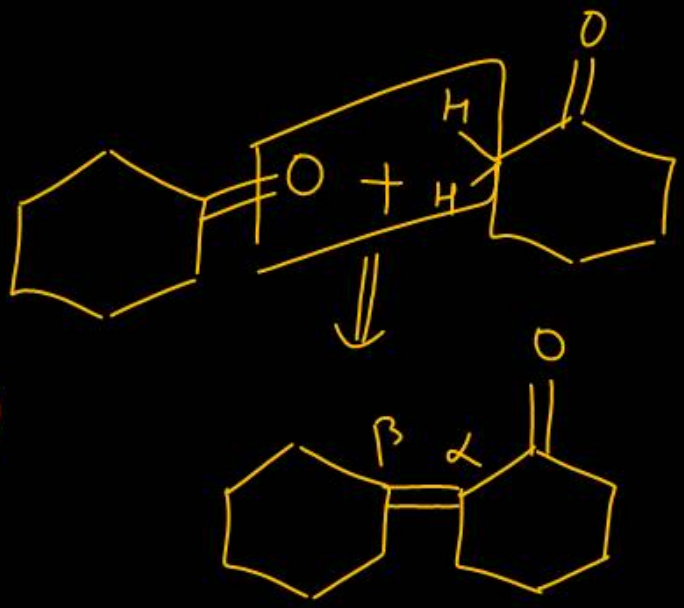


Question no. 74

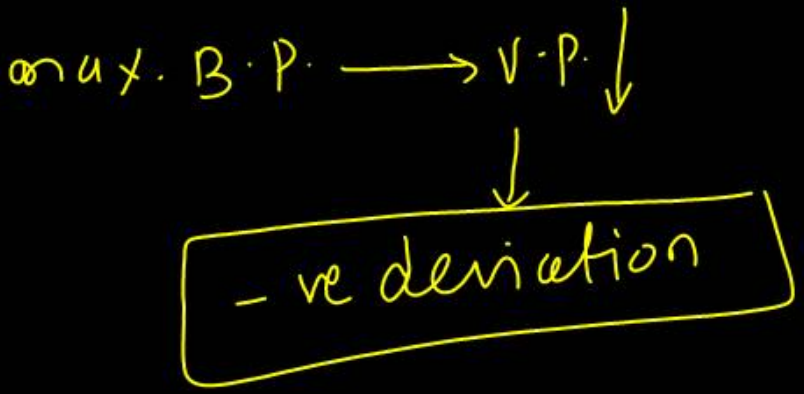
The mixture that forms maximum boiling azeotrope is

(1) ethanol + water

(2) acetone + carbon disulphide

(3) heptane + octane

(4) water + nitric acid



Question no. 75

The rate constant k_1 and k_2 for two different reactions are $10^{16}\times e^{-2000/T}$ and $10^{15}\times e^{-1000/T}$, respectively. The temperature (T) at which $k_1 = k_2$ is

(1) 1000 K

(2) $\frac{2000}{2.303}$ K

(3) 2000 K

(4) $\frac{1000}{2.303}$ K

$k_1 = 10^{16} \times e^{-2000/T}$

$k_2 = 10^{15} \times e^{-1000/T}$

$k_1 = k_2$

$10^{16} e^{-2000/T} = 10^{15} e^{-1000/T}$

$10\, e^{-2000/T} = e^{-1000/T}$

$10 = \frac{e^{-1000/T}}{e^{-2000/T}} = e^{+1000/T}$

$10 = e^{1000/T}$

$\log_e 10 = \frac{1000}{T}$

$=1$

$2.303 \log_{10} 10 = \frac{1000}{T}$

$T = \frac{1000}{2.303}$

Question no. 76

Match the List–I with List–II.

Choose the correct answer from the options given below.

	List–I (Reagent)		List–II (Product)
A.	Semicarbazide	(i)	Hydrazone
B.	2, 4–DNP	(ii)	2, 4–dinitrophenyl Hydrazone
C.	Hydrazine	(iii)	Oxime
D.	Hydroxylamine	(iv)	Semicarbazone

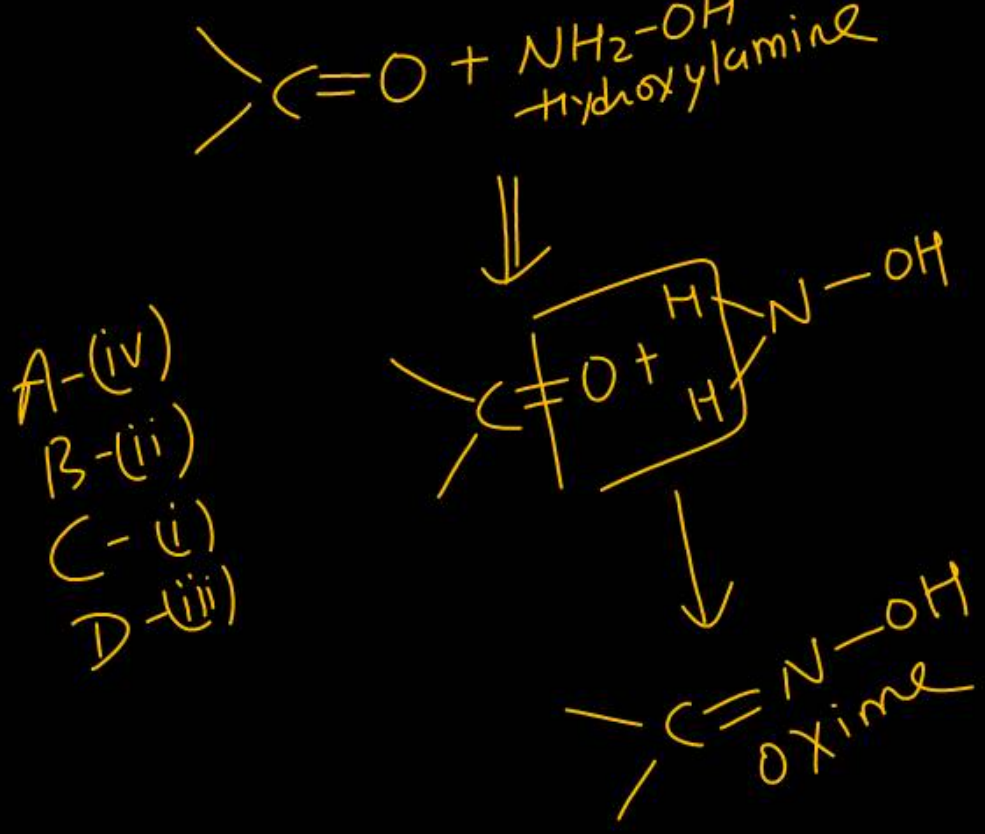
Choose the correct answer from the options given below.

(1) A–(iv), B–(ii), C–(i), D–(iii)

(2) A–(i), B–(ii), C–(iii), D–(iv)

(3) A–(ii), B–(iv), C–(i), D–(iii)

(4) A–(iii), B–(iv), C–(ii), D–(i)



Question no. 77

Among the transition metals of 3d series, the one that has the highest negative M^{2+}/M standard electrode potential is

(1) Ti

(2) Cu

(3) Mn

(4) Ni

Question no. 78

The reason for greater range of oxidation states in actionoids is attributed to

(1) actinoid contraction

(2) 5 *f*, 6 d and 7 s levels having comparable energies

(3) 4 *f* and 5 d levels being close in energies

(4) the radioactive nature of actionoids

Question no. 79

Match List-I with List-II.

	List - I		List – II
A.	$Cd(s) + 2Ni(OH)_3(s) \rightarrow CdO(s) + 2Ni(OH)_2(s) + H_2O(l)$	i.	Primary battery
B.	$Zn(Hg) + HgO(s) \rightarrow ZnO(s) + Hg(l)$	ii.	Discharging of secondary battery
C.	$2PbSO_4(s) + 2H_2O(l) \rightarrow Pb(s) + PbO_2(s) + 2H_2SO_4(aq)$	iii.	Fuel cell
D.	$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$	iv.	Charging of secondary battery

Choose the correct answer from the options given below.

(1) A – i, B → ii, C → iii, D → iv

(2) A – iv, B → i, C → ii, D → iii

(3) A – ii, B → i, C → iv, D → iii

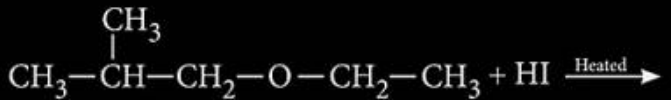
(4) A – ii, B → i, C → iii, D → iv

A B C D

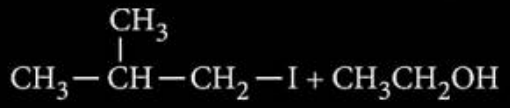
ii i iv iii

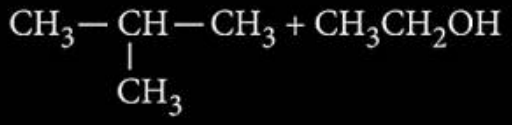
Question no. 80

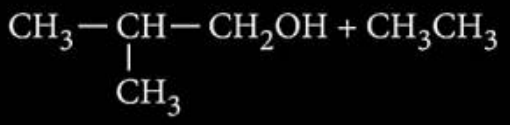
The reaction,

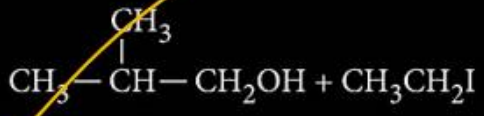


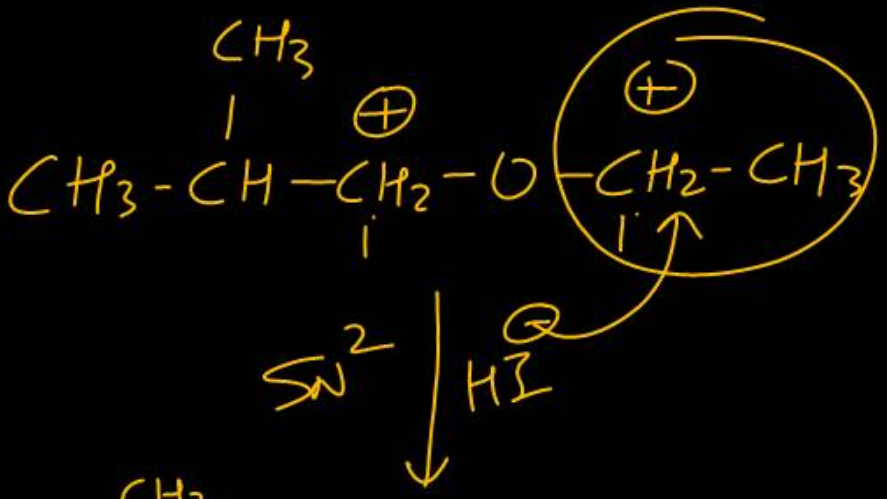
Which of the following compounds will be formed?

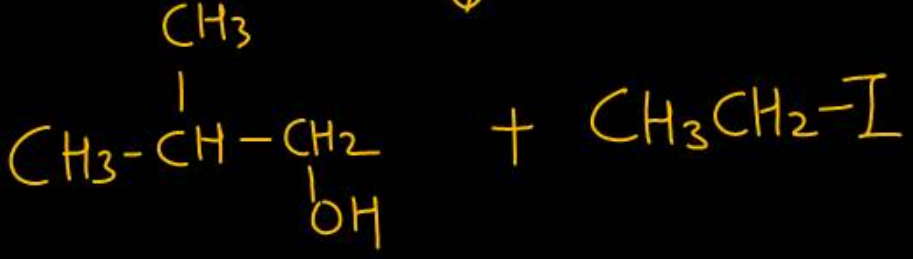
(1) 

(2) 

(3) 

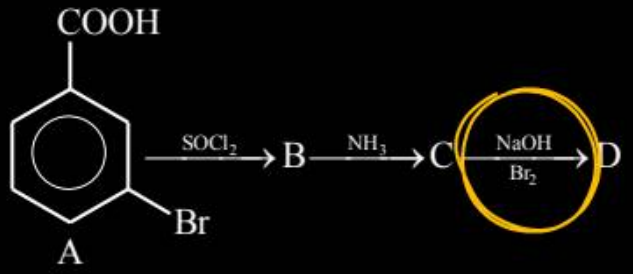
(4) 

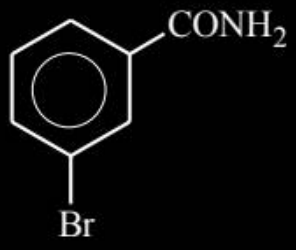


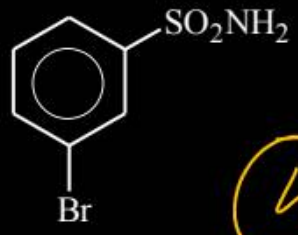


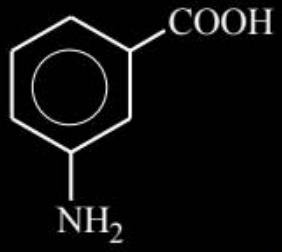
Question no. 81

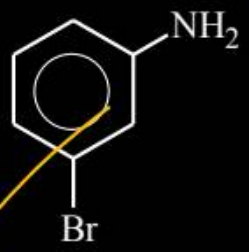
In a set of reactions m – bromobenzoic acid gave a product D. Identify the product D.

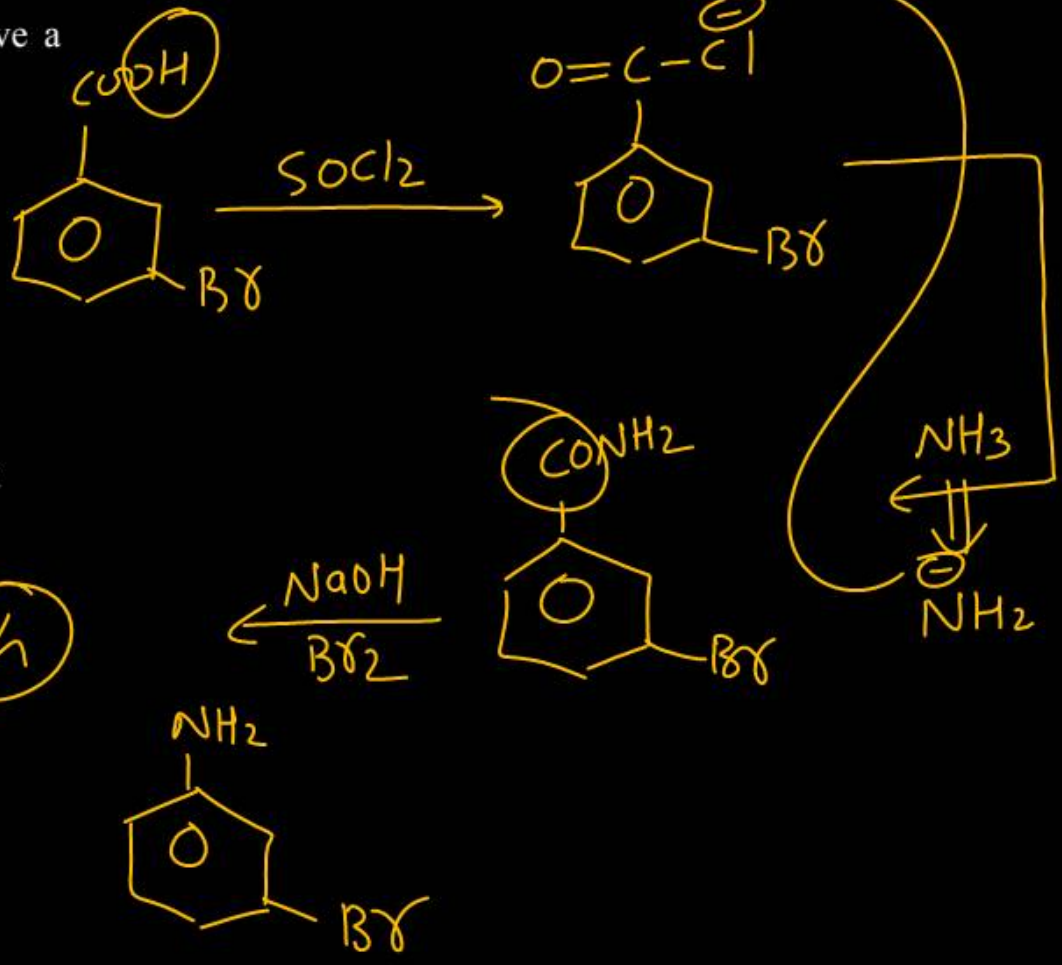


(1) 

(2) 

(3) 

(4) 



Question no. 82

Which of the following will not give a primary amine?

(1) $CH_3CONH_2 \xrightarrow{Br_2, KOH}$ CH_3-NH_2 1°

(2) $CH_3CN \xrightarrow{LiAlH_4}$ $CH_3-CH_2-NH_2$ 1°

(3) $CH_3NC \xrightarrow{LiAlH_4}$ $CH_3-NH-CH_3$ 2°

(4) $CH_3CONH_2 \xrightarrow{LiAlH_4}$ $CH_3-CH_2NH_2$ 1°

3

Question no. 83

Match the following Columns.

	Column I (Reactants)		Column II (Products)
A.	$RX + KCN \xrightarrow{\text{Ethanol}}$	1.	
B.	$RX + CH_3COOAg \longrightarrow$	2.	RCN
C.	$H_3CC \equiv N \xrightarrow{LiAlH_4}$	3.	CH_3COOR
D.		4.	$CH_3CH_2NH_2$
E.	$R-NH_2 \xrightarrow[CHCl_3/KOH]{\text{Carbylamine reaction}}$	5.	RNC

Codes

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

A - 2

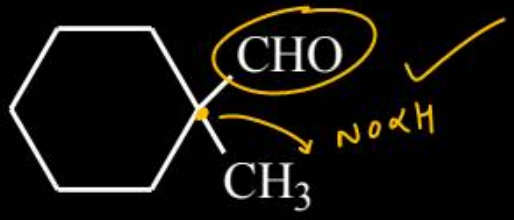
A-2
B-3
C-4
D-1
E-5

(2)

Question no. 84

Cannizzaro reaction is not shown by

(1) 

(2) 

(3) CH_3CHO

(4) $HCHO$

Question no. 85

At 300 K two pure liquids A and B have vapour pressures respectively 150 mm Hg and 100 mm Hg. In an equimolar liquid mixture of A and B, the mole fraction of B in the vapour at this temperature is

(1) 0.6 (2) 0.5

(3) 0.8 (4) 0.4

mol A & mol B = equal

$$\frac{Y_A}{Y_B} = \frac{P_A^0 n_A}{P_B^0 n_B}$$

$n_A = n_B = 1$

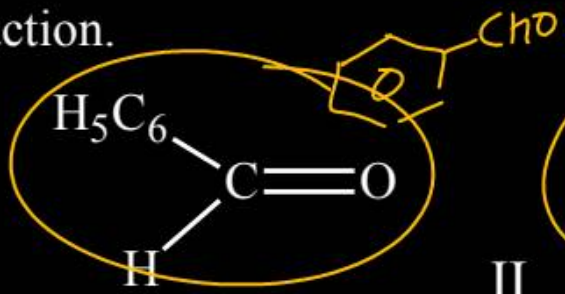
$$\frac{Y_A}{Y_B} = \frac{150 \times 1}{100 \times 1} = \frac{3}{2}$$

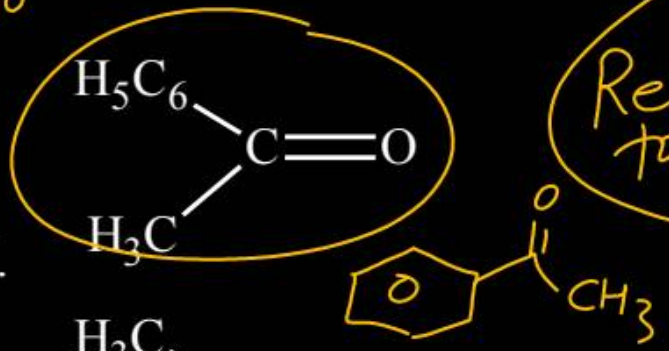
$Y_A = \frac{3}{5} = 0.6$

$Y_B = \frac{2}{5} = 0.4$

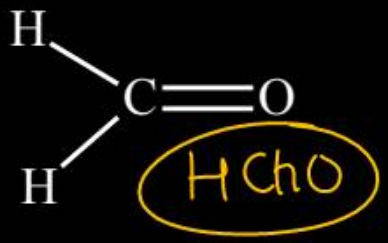
Question no. 86

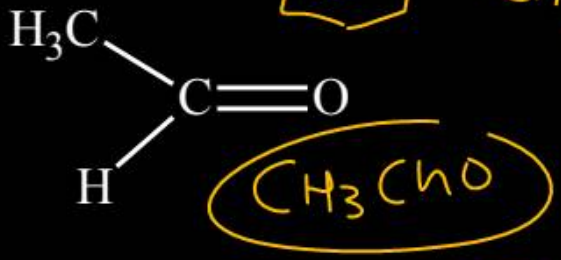
Choose the correct order of nucleophilic addition reaction.

I. 

II. 

Reactivity towards NAR $\propto \frac{+ve \text{ charge on } sp^2\text{-}C}{\text{Stearic Hindrance}}$

III. 

IV. 

Select the correct reaction.

(1) II < I < IV < III

(2) ~~II < I < III < IV~~

(3) ~~IV < III < I < II~~

(4) ~~IV < III < II < I~~

1

Question no. 87

If 60% of first order reaction was completed in 60 min, 50% of the same reaction would be completed in approximately

(1) 45 min (2) 60 min

(3) 40 min (4) 50 min

$$K = \frac{2.303}{t} \log_{10} \frac{A_0}{A}$$

$$K = \frac{2.303}{60} \log_{10} \frac{100}{40}$$

$$K = \frac{2.303}{60} [\log 10 - \log 4]$$

$$K = \frac{2.303}{60} [1 - 0.6]$$

45 min

$$\boxed{K = \frac{2.303}{60} \times 0.4}$$

$$t_{1/2} = \frac{0.693}{K} = \frac{0.693}{\frac{2.303}{60} \times 0.4}$$

0.3

$$= \frac{60 \times 0.3}{0.4}$$

$$= 180/4 = 45$$

Question no. 88

The highest possible oxidation states of uranium an plutonium, respectively, are

(1) 7 and 6

(2) 6 and 7

(3) 6 and 4

(4) 4 and 6

Question no. 89

Which one of the following is a diamagnetic ion?

(1) Co^{2+} (2) Cu^{2+}

(3) Mn^{2+} (4) Sc^{3+}

$Co^{+2} = 3d^7 4s^0$

$Cu^{+2} = 3d^9 4s^0$

$Mn^{+2} = 3d^5 4s^0$

$Sc^{+3} = 3d^0 4s^0$

Question no. 90

Which of the following has an optical isomer?

(1) $[Co\ (en)\ (NH_3)_2]^{2+}$ (2) $[Co\ (H_2O)_4\ (en)]^{3+}$

(3) $[Co\ (en)_2\ (NH_3)_2]^{3+}$ (4) $[Co\ (NH_3)_5\ Cl]^{+}$

Question no. 91

Study the following statements and select the correct option.

A. Tapetum nourishes the developing pollen grains.

B. Hilum represents the junction between ovule and funicle

C. In aquatic plants such as water hyacinth and water lily, pollination is by water.

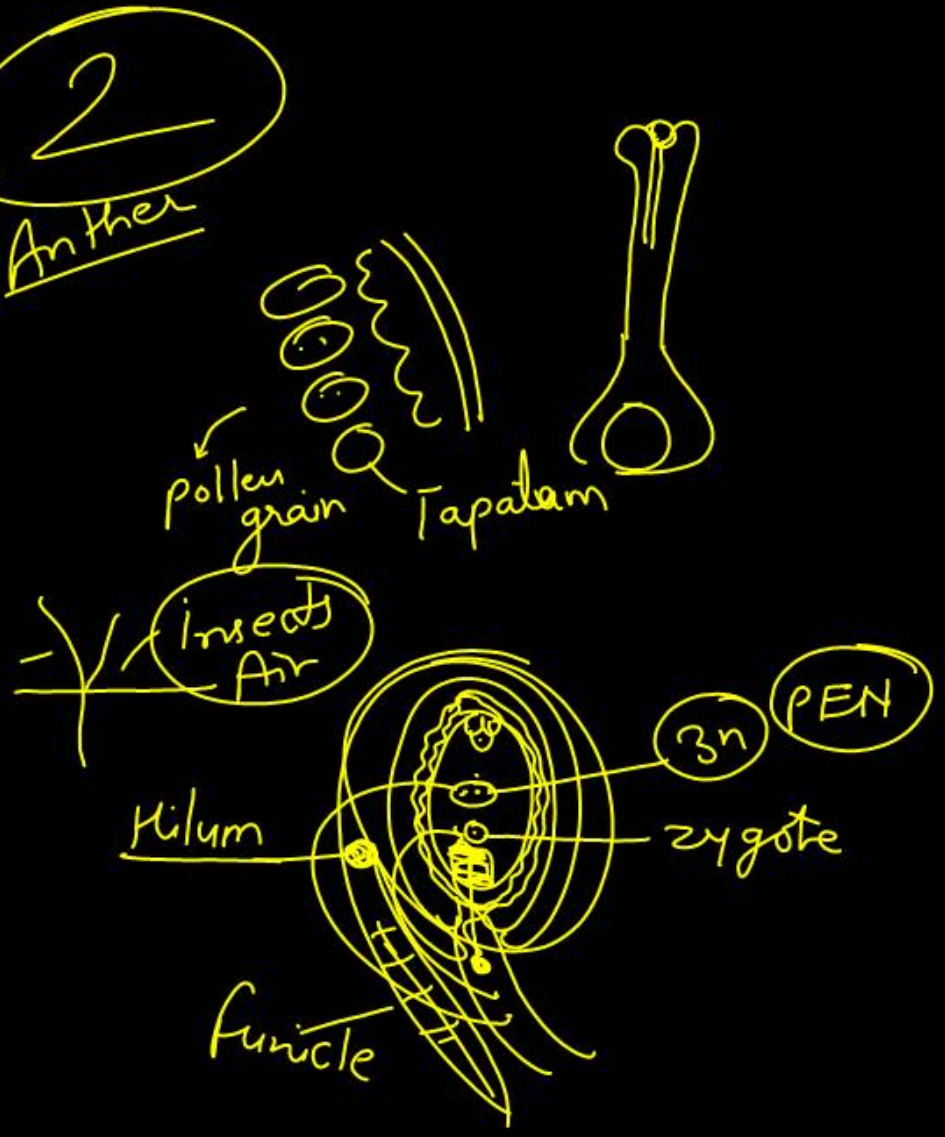
D. The primary endosperm nucleus is triploid.

(1) A and B are correct but C and D are incorrect.

(2) A, B and D are correct but C is incorrect.

(3) B, C and D are correct but A is incorrect.

(4) A and D are correct but B and C are incorrect.



Question no. 92

The endosperm is absent in the seed of:

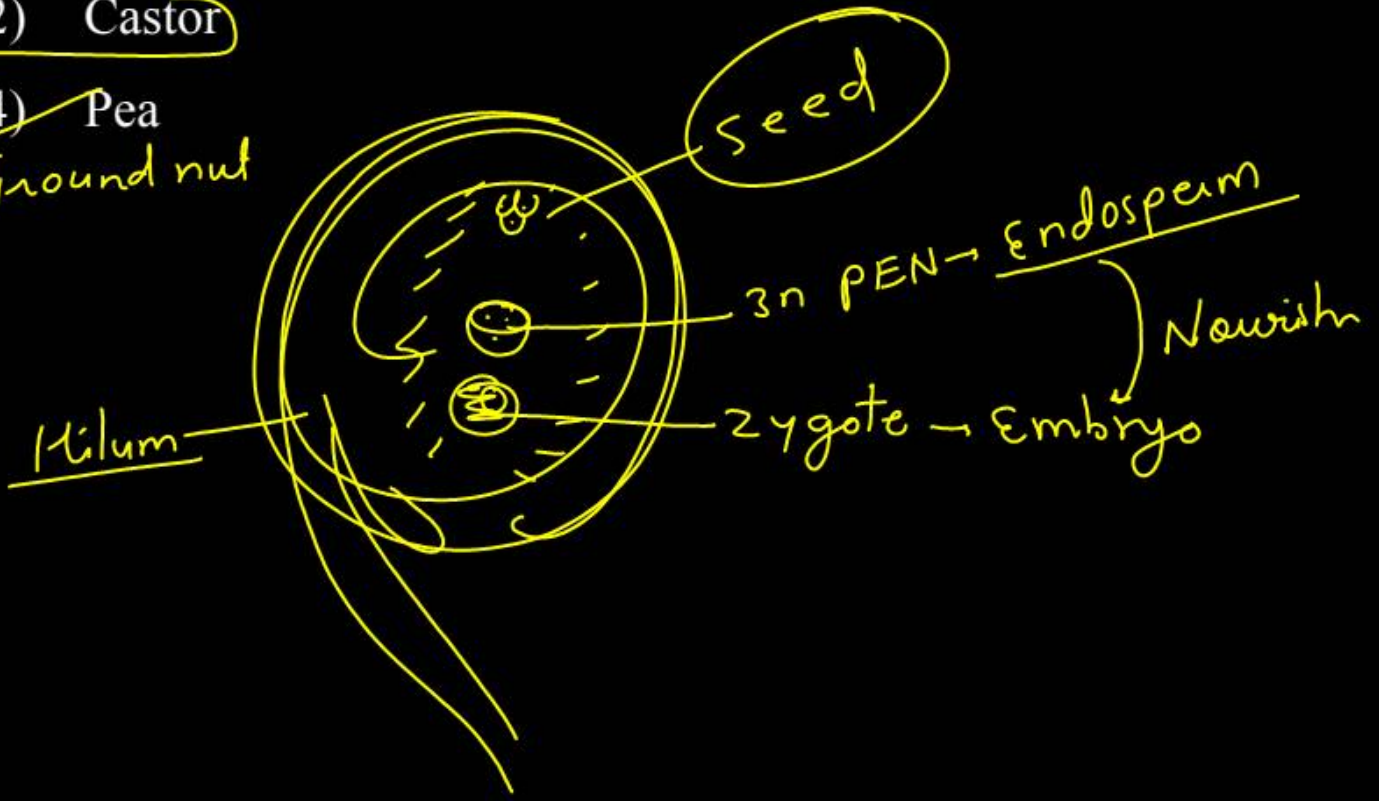
(1) Wheat (2) Castor

(3) Maize (4) Pea

Angiosperm
Double fertilization

Ground nut

4



Question no. 93

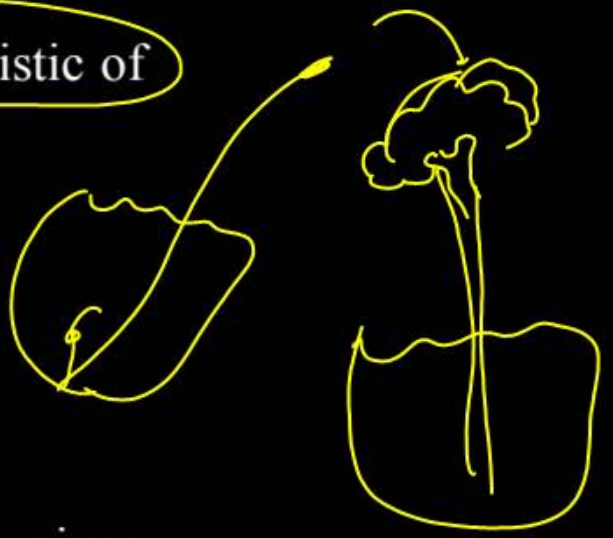
Which of the following is/are not the characteristic of wind pollinated flowers?

A. Light and non–sticky

B. Possess well exposed stamens

C. Large and often feathery stigma

D. Often have many ovules in each ovary.



Choose the correct answer from the options given below:

(1) A and C only

(2) C only

(3) B and D only

(4) D only

Question no. 94

The fruits that develop without fertilization are called as

(1) True fruits (2) False fruits

(3) Parthenocarpic fruits (4) Hybrid fruit

3

ovum → organism

Parthenogenis

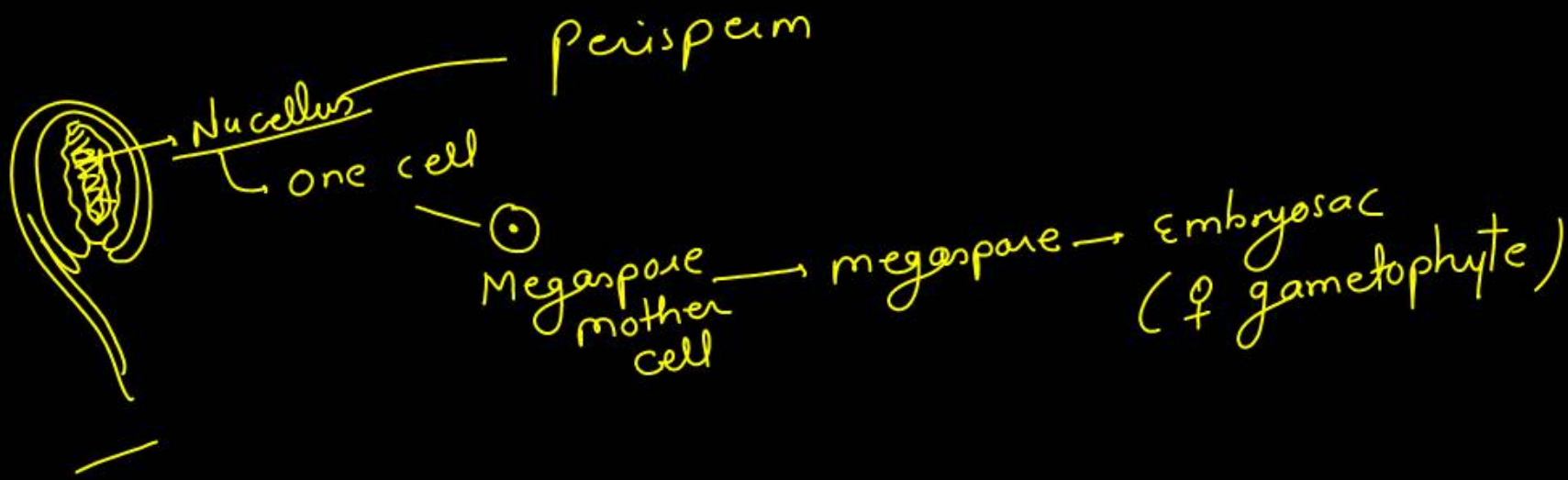
Parthenocarpic fruit

Question no. 95

Persistent nucellus in the seed in known as:

(1) Chalaza
(2) Perisperm
(3) Hilum
(4) Tegmen

2



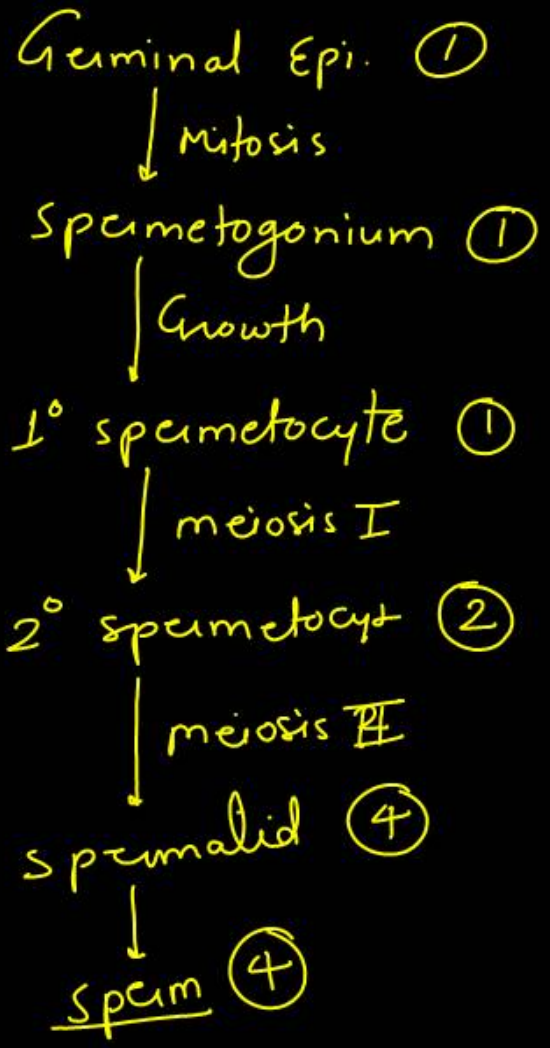
Question no. 96

How many secondary spermatocytes are required to form 400 million spermatozoa?

(1) 400 million (2) 50 million

(3) 100 million (4) 200 million

4



Question no. 97

Select the hormones produced in women only during pregnancy

A. Estrogen

B. Human chorionic gonadotrophin

C. Progesterone

D. Human placental lactogen

E. Relaxin

4

Choose the correct answer from the options given below:

(1) B and D only

(2) B and E only

(3) A, B and C only

(4) B, D and E only

Question no. 98

Refer to the given table if '+' sign has been assigned for beneficial interaction '-' sign for detrimental interaction and '0' for neutral interaction, identify the type of interaction (i), (ii) and (iii) and select the correct option.

Species A	Species B	Type of interaction
–	–	(i)
+	–	(ii)
+	0	(iii)

(1) I – Predation, II – Parasitism, III – Amensalism

(2) I–Competition, II–Predation, III–Commensalism

(3) I-Competition, II-Parasitism, III-Commensalism

(4) Both (2) and (3)

Competition
Parasitism / Predation
Commensalism

4

Question no. 99

The correct sequence of hormone secretion from beginning of menstruation is

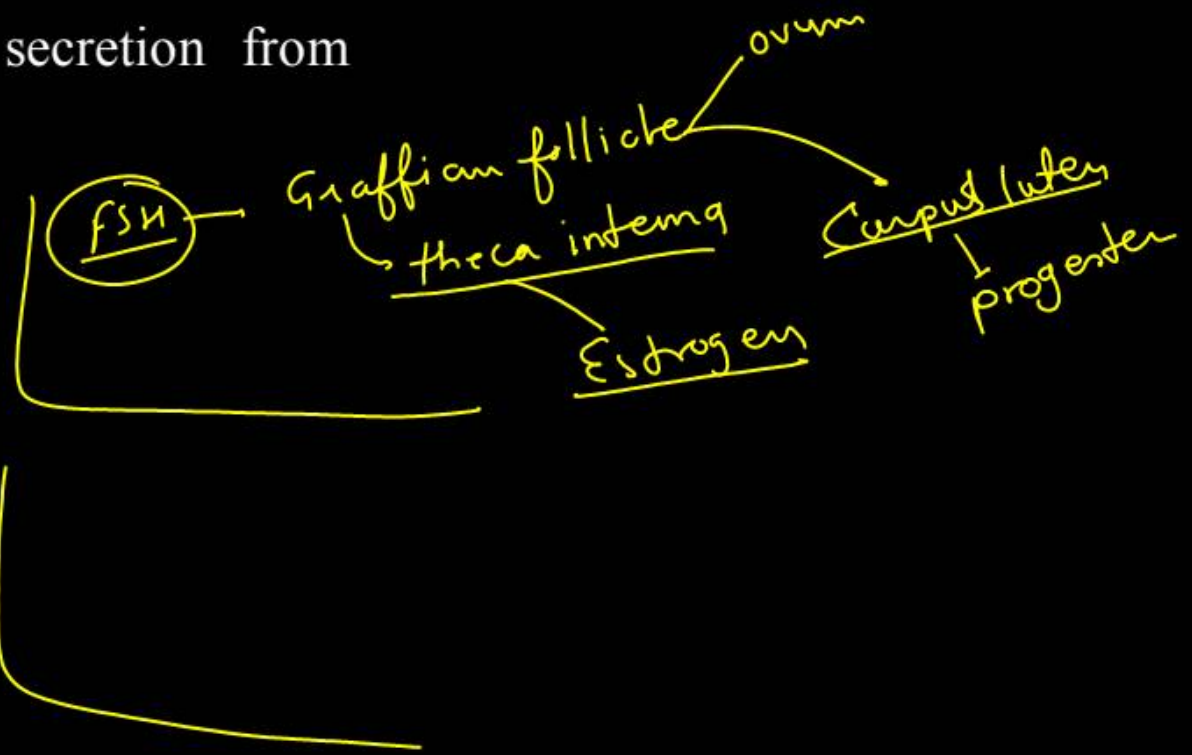
(1) FSH, progesterone, estrogen.

(2) Estrogen, FSH, progesterone.

(3) FSH, estrogen, progesterone.

(4) estrogen, progesterone, FSH.

3



Question no. 100

Progestasert and LNG–20 are the example of:

(1) Copper releasing IUD's

(2) Hormone releasing IUD's

(3) Oral Contraceptives

(4) Non–medicated IUD's

2

Question no. 101

A daughter cannot be colourblind unless her:

(1) Mother is colourblind

(2) Father is colourblind

(3) Both parents are colourblind

(4) Grandfather is colourblind

when will daughter could be color blind?

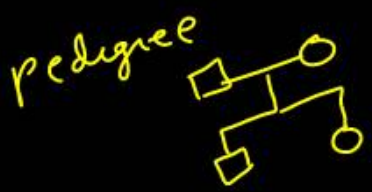
(2)

∴ Mother = Carrier

∴ Father is colorblind

Question no. 102

Myotonic dystrophy is:



(1) Autosomal dominant disorder

(2) Autosomal recessive disorder

(3) Sex–linked dominant disorder

(4) Sex–linked recessive disorder

Question no. 103

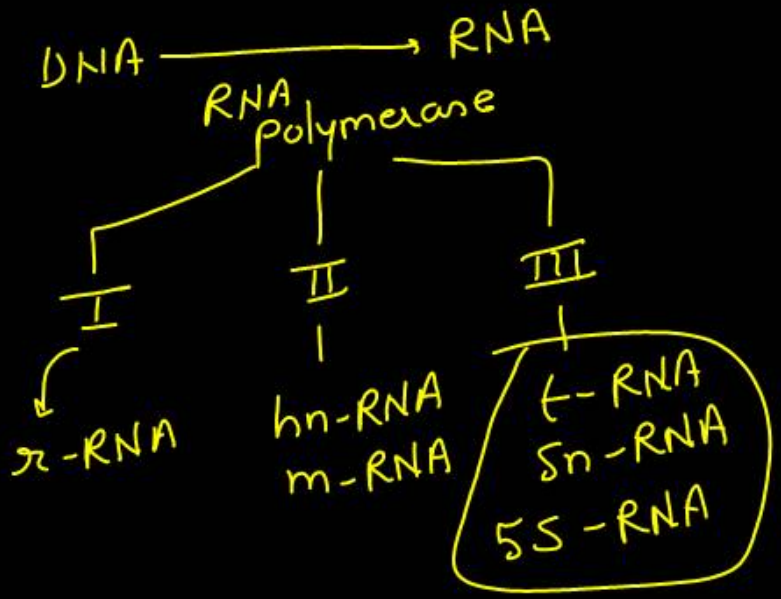
Removal of RNA polymerase III from nucleoplasm will affect the synthesis of:

(1) t RNA

(2) hn RNA

(3) m RNA

(4) r RNA



Question no. 104

Read the statements regarding structure of polynucleotide chain and choose the correct option.

A. A nitrogenous base is linked to the pentose sugar through a phosho–diester linkage.

B. Two nucleotides are linked through 3'–5' N-glycosidic linkage to form a dinucleotide.

C. The polynucleotide backbone is formed by sugar and phosphate.

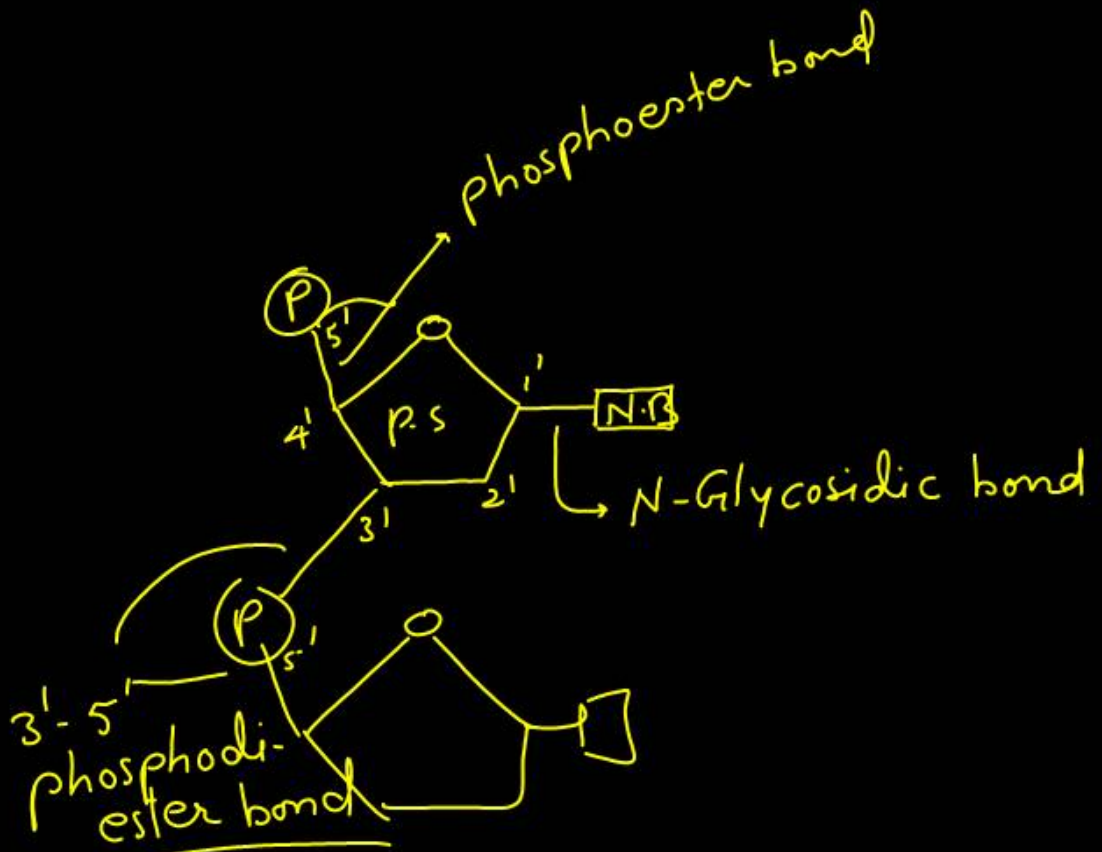
D. A phosphate group is linked to 5' – OH of a nucleoside through a N–glycosidic linkage to form a nucleotide.

(1) D alone is correct

(2) C alone is correct

(3) A, C and D alone are correct

(4) A and D alone are correct



2

Question no. 105

Which enzymes will be produced in a cell in which there is a nonsense mutation in the lac Y gene?

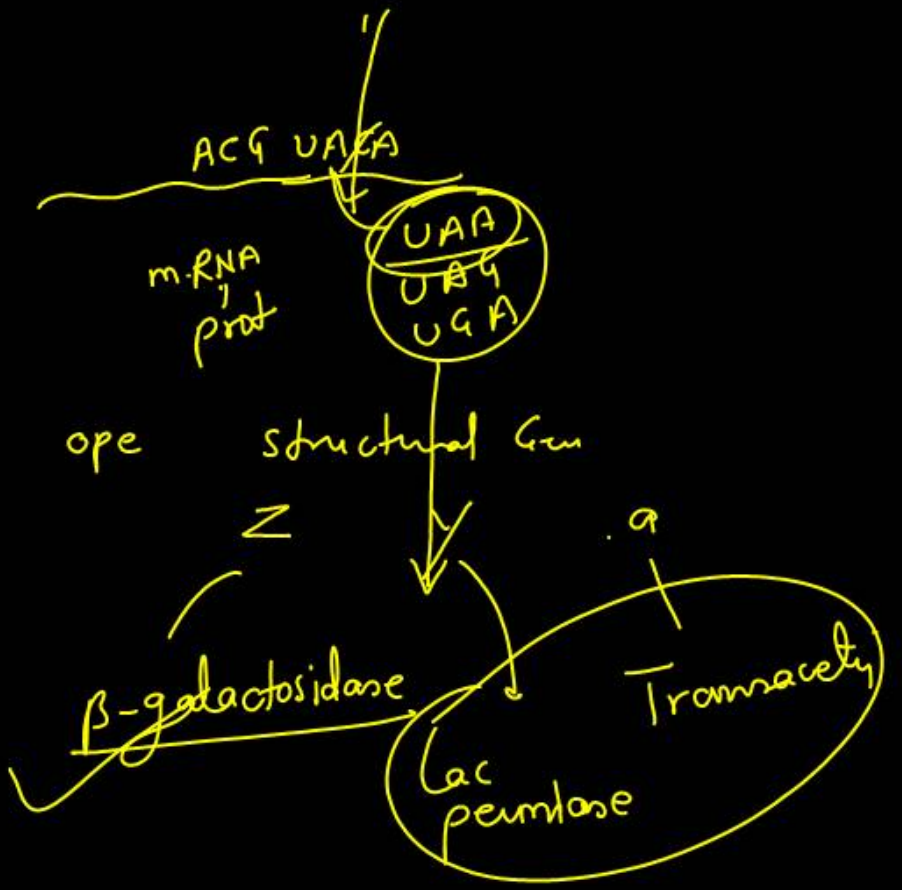
(1) Lactose permease

(2) Transacetylase

(3) Lactose permease and transcetylase

(4) β–galactosidase

4



Question no. 106

Identify the wrong statement about RNA

(1) RNA was the first genetic material to evolve in the living systems.

(2) Apart from being a genetic material, it is also a catalyst.

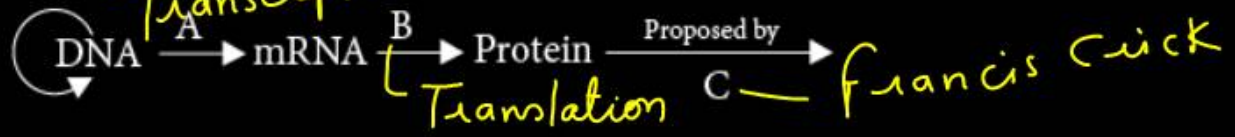
(3) DNA evolved from RNA with chemical modifications.

(4) For initiation, ribosomes binds to the mRNA at the start codon.

4

Question no. 107

The diagram shows an important concept in the genetic implication of DNA. Fill in the blanks A to C.



(1) A–translation B– transcription C– Erwin Chargaff

(2) A–transcription B – translation C– Francis Crick

(3) A–translation B– extension C–Rosalind Franklin

(4) A–transcription B–replication C–James Watson

Question no. 108

Match column–I to the column –II and select the option having correct matching.

	Column–I		Column–II
A.	Bacteriophage	I.	5386 nucleotides
B.	E.coli	II.	3.3×10^{9} bp
C.	Human genome	III.	4.6×10^{6} bp
D.	$\phi \times 174$	IV.	48502 bp

(1) A–IV; B–III; C–II; D–I

(2) A–III; B–II; C–I; D–IV

(3) A–IV; B–III; C–I; D–II

(4) A–IV; B–I; C–II; D–III

Question no. 109

Histones are rich in

(1) alanine and glycine

(2) lysine and arginine

(3) histidine and serine

(4) cysteine and tyrosine

Question no. 110

Which RNA picks up specific amino acid from the amino acid pool in the cytoplasm to the ribosome during protein synthesis?

(1) tRNA
(2) mRNA
(3) rRNA
(4) snRNA

Question no. 111

Which of the following factor does not affect Hardy–Weinberg's equilibrium

(1) Gene migration

(2) Natural selection

(3) Genetic drift

(4) Replication of genetic material

4

Question no. 112

Match the hominids with their correct brain size:

A.	Homo habilis	I.	900 cc
B.	Homo neanderthalensis	II.	1350 cc
C.	Homo erectus	III.	650 – 800 cc
D.	Homo sapiens	IV.	1400 cc

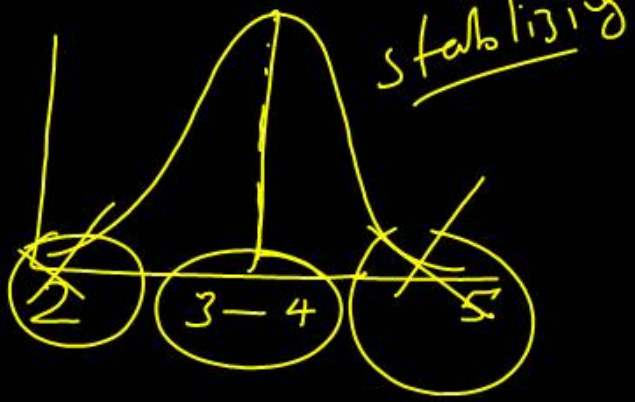
	A	B	C	D
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(i)	(ii)
(4)	(iv)	(iii)	(i)	(ii)

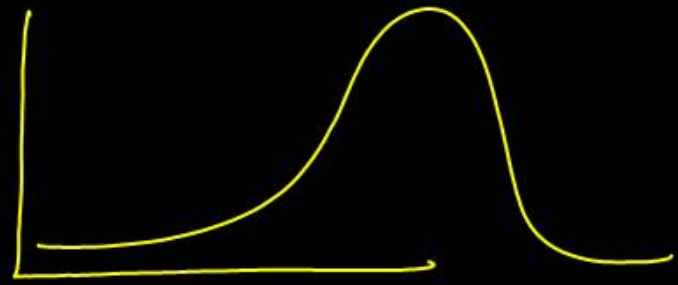
Question no. 113

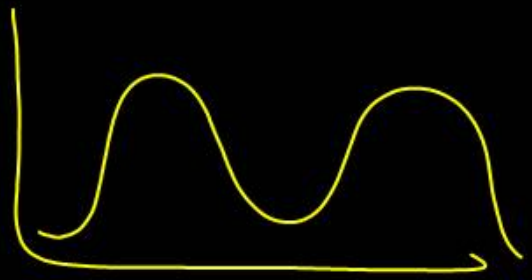
In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with weights from 2 to 2.5 kg of 4.5 to 5 kg die. Which type of selection process is taking place?

(1) Directional selection (2) Stabilising selection

(3) Disruptive selection (4) Cyclical selection







Question no. 114

What is the effect of particular type of drug that is obtained from the plant whose one flowering branch is shown below?

Drug

Datura → Hallucinogen

(1) hallucinogen

(2) Depressant

(3) Stimulant

(4) Pain killer

1

Question no. 115

Which one of the following in not a property of cancerous cells whereas the remaining three are?

(1) They divide in an uncontrolled manner

(2) They show contact inhibition

(3) they compete with normal cells for vital nutrients

(4) They do not remain confined in the area of formation.

Question no. 116

Retrovirus have genetic material

(1) DNA only

(2) RNA only

(3) DNA or RNA only

(4) either DNA or RNA only

Question no. 117

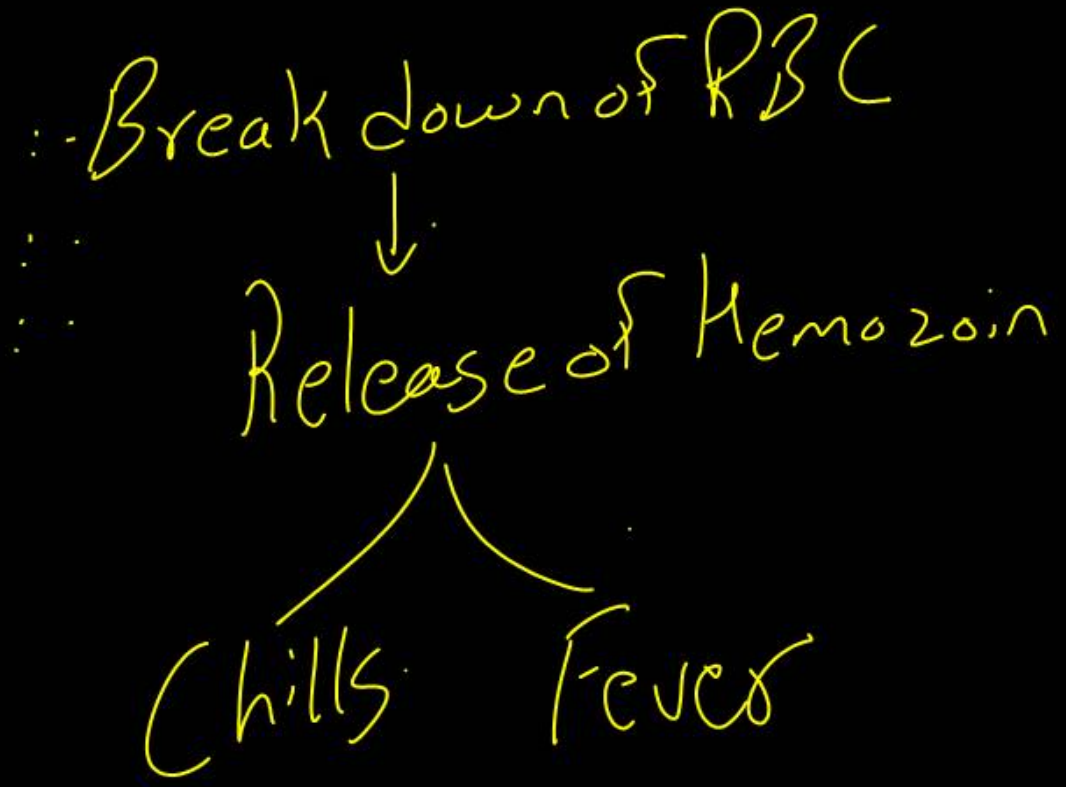
The toxic substance, 'Haemozoin', related to the high fever and chill, is released during following disease

(1) Dengue

(2) Malaria

(3) Diphtheria

(4) Penumonia



Question no. 118

Ringworms are caused by

Fungal Disease

A. Wuchereria

B. Microsporum

C. Haemophilus

D. Epidermophyton

(1) A and B

(2) B and C

(3) B and D

(4) A and D

3

Question no. 119

Match List –I with List –II.

	List I		List II
A.	Cytokine barriers	I.	Mucus coating of respiratory tract
B.	Cellular barriers	II.	Interferons
C.	Physiological	III.	Neutrophils and Macrophages
D.	Physical barriers	IV.	Tears and Saliva

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

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

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

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

Question no. 120

Statins are obtained from

(1) Streptococcus

(2) MucorJavanicus

(3) Monascus purpureus

(4) Clostridium butyricum

Blood cholesterol lowering agents.

Fungus

3

Question no. 121

The taq polymerase enzyme is obtained from

(1) Thermus aquaticus

(2) Thiobacillus ferroxidans

(3) Bacillus subtilis

(4) Pseudomonas putida

PCR

DNA amplification

Taq polymerase

Thermus aquaticus

Bacteria

1

Question no. 122

cry II Ab and cry I Ab produce toxins that control:

(1) cotton bollworms and corn borer respectively

(2) cotton borer and cotton bollworms respectively

(3) tobacco budworms and nematodes respectively

(4) nematodes and tobacco budworms respectively

(Bt) cotton
Bacillus thuringiensis
↓
Cry protein — Gene (Cry gene)

Cry I Ab → Corn borer
Cry II Ab] — Cotton boll worm
Cry I Ac]

Question no. 123

Milk of transgenic 'Cow Rosie' was nutritionally more balanced product for human babies than natural cow milk because it contained:

(1) Human enzyme Adenosine Deaminase (ADA)

(2) Human protein α-1-antitrypsin

(3) Human alpha-lactalbumin

(4) Human insulin-like growth factor

1997

α- lactalbumin

2.4 gm/lt

3

Question no. 124

Identify curative method (s) used to treat ADA deficiency disease in human.

A. Gene Therapy

B. Bone Marrow Transplantation

C. Complete Blood Replacement

D. Enzyme Replacement Therapy

Adenosine deaminase

↳ lymphocyte

Gene

ADA cDNA

Recombinant

Choose the correct answer from the options given below:

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

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

Question no. 125

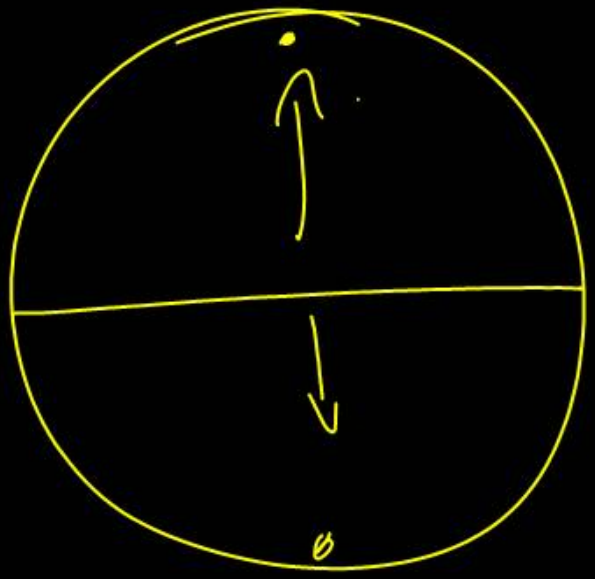
Read the following statements carefully.

I. Species diversity increases as we move away from the equator towards the poles.

II. Stellar's sea cow and passenger pigeon got extinct due to overexploitation by man.

III. Lantana and Eichhornia are invasive weed in India.

IV. The historic convention on biological diversity was held in 1992.



Choose the option containing correct statements.

(1) I and II

(2) I, II and IV

(3) I, III and IV

(4) II, III and IV

Question no. 126

The alien species introduced into lake Victoria that was responsible for the extinction of cichlid fishes is

(1) African catfish
(2) water hyacinth
(3) carrot grass
(4) Nile perch

4

Question no. 127

Which one of the following is not observed in biodiversity hotspots?

(1) Endemism

(2) Accelerated species loss

(3) Lesser interspecific competition

(4) Species richness

Question no. 128

The breakdown of detritus into small particles by detritivores is called.

(1) leaching
(2) humification
(3) catabolism
(4) fragmentation

4

Question no. 129

The primary producers of the deep sea hydrothermal vent ecosystem are

(1) gree algae

(2) chemosynthetic bacteria

(3) blue-green algae

(4) coral reefs

Question no. 130

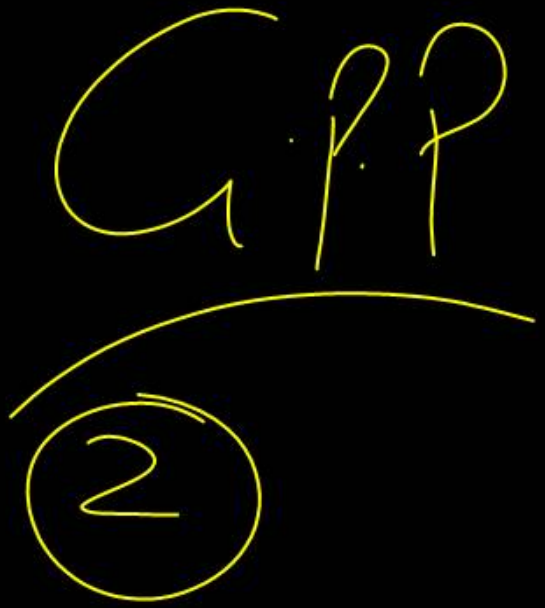
In an ecosystem, the rate of production of organic matter during photosynthesis is termed as

(1) net primary productivity

(2) gross primary productivity

(3) secondary productivity

(4) net productivity



Question no. 131

What type of ecological pyramid would be obtained with the following data?

Secondary consumer : 320g, Primary consumer : 560g

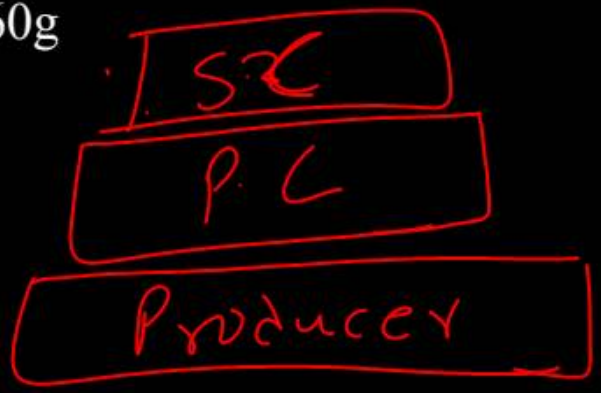
Primary producer : 1000g

(1) Upright pyramid of numbers

(2) Pyramid of energy

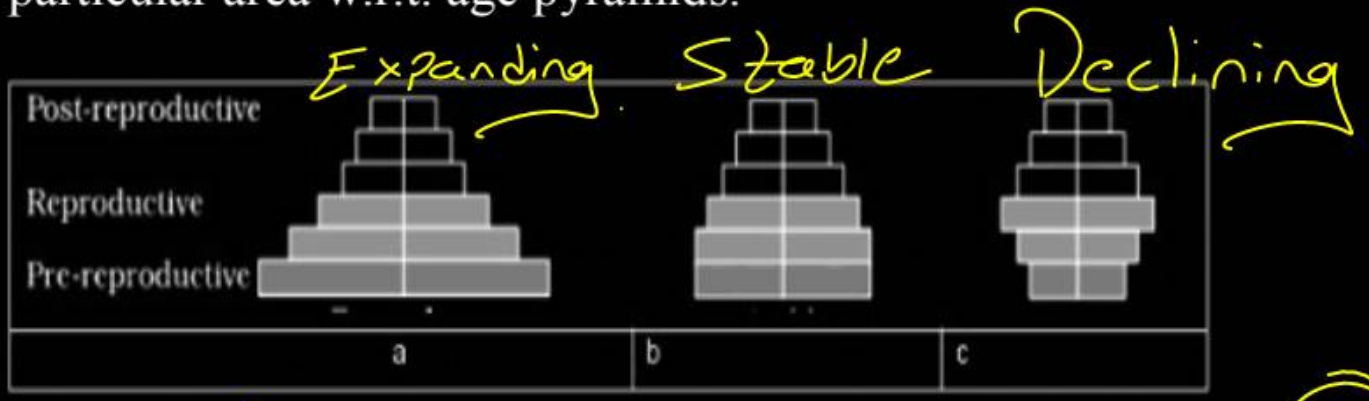
(3) Inverted pyramid of biomass

(4) Upright pyramid of biomass



Question no. 132

Select the correct option about population in a particular area w.r.t. age pyramids.



(1) a –Expanding, b-Stable, c-Declining

(2) a-Stable, b-Expanding, c-Declining

(3) a-Stable, b-Declining, c-Expanding

(4) a-Declining, b-Stable, c-Expanding

Question no. 133

An orchid growing as an epiphyte on a mango tree is an example for

(1) parasitism
(2) predation
(3) commensalism
(4) mutualism

Question no. 134

In the equation $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$, where r stands for

(1) intrinsic rate of natural increase

(2) death rate

(3) carrying capacity

(4) base of natural logarithms

1

Question no. 135

A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is

(1) 10 (2) 15

(3) 05 (4) zero

250 + 20 = 270

240 + 30 = 270

4

Question no. 136

An enzyme catalyzing the removal of nucleotides from ends of DNA is

(1) DNA ligase
(2) endonuclease
(3) exonuclease
(4) protease

3

Question no. 137

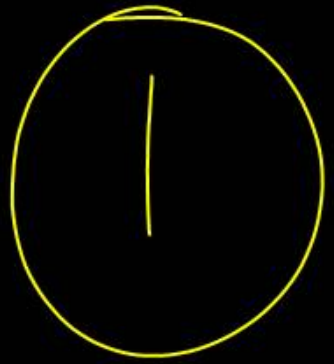
DNA precipitation out of a mixture of biomolecules can be achieved by treatment with

(1) chilled ethanol

(2) methanol at room temperature

(3) chilled chloroform

(4) isopropanol



Question no. 138

Among the following pairs of microbes, which pair has both the microbes that can be used as biofertilisers?

(1) Aspergillus and Rhizopus

(2) Rhizobium and Rhizopus

(3) Cyanobacteria and Rhizobium

(4) Aspergillus and Cyanobacteria

Question no. 139

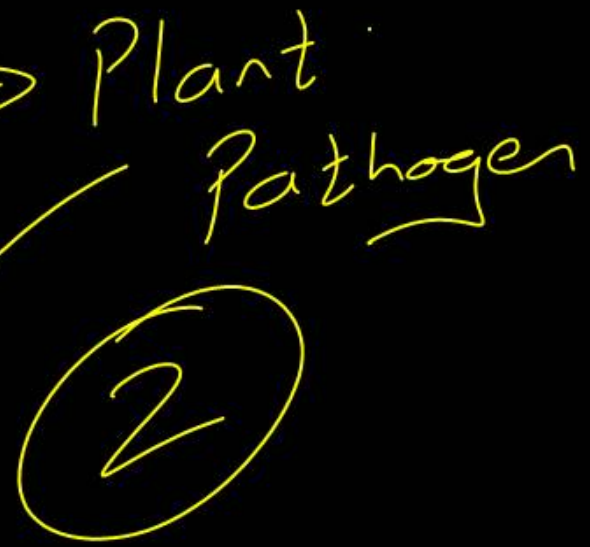
Which of the following is not used as a biopesticide?

(1) Bacillus thuringiensis

(2) Xanthomonas campertris

(3) Nuclear Polyhedrosis Virus (NPV)

(4) Trichoderma harzianum



Question no. 140

What is meant by the term 'Darwin fitness'?

(1) inheritance of acquired characters

(2) natural selection

(3) recapitulation

(4) continuity of germplasm

Question no. 141

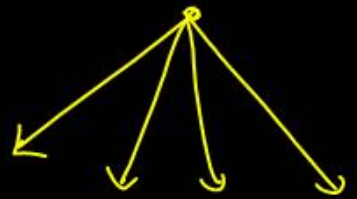
Thorns of Bougainvillea and tendrils of Cucurbita are example for

(1) convergent evolution

(2) divergent evolution

(3) adaptive evolution

(4) coevolution



2

Question no. 142

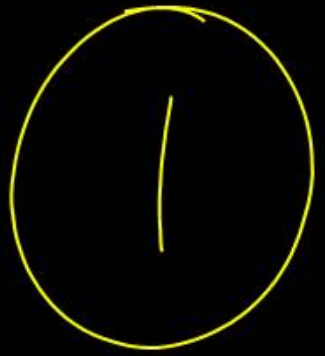
Whose experiments cracked the DNA and discovered unequivocally that genetic code is a triplet?

(1) Nirenberg and Matthaei

(2) Hershey and Chase

(3) Morgan and Strutevant

(4) Beadle and Tatum



Question no. 143

The one aspect which is not a salient feature of genetic code, is its being

(1) degenerate
(2) Non ambiguous ×
(3) universal
(4) specific

GGG
GGC
GGA
GGU

Degenerate
Glycine
Non-ambiguous

2

Question no. 144

What is ribonucleotide?

(1) Ribose + Uracil + Phosphate

(2) Deoxyribose + Uracil + Phosphate

(3) Deoxyribose + Thymine + Phosphate

(4) Ribose + Thymine + Phosphate

Question no. 145

Isotopes used by Hershey and Chase were

(1) ^{32}P and ^{35}S

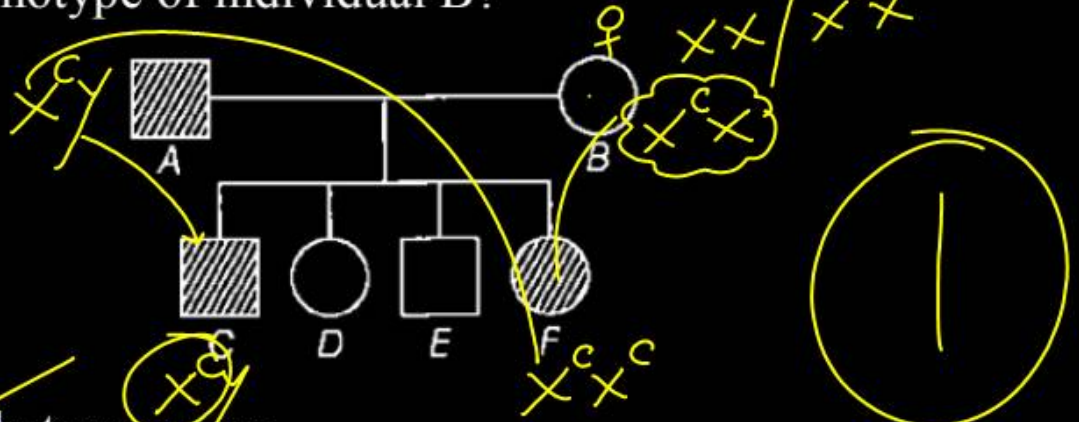
(2) ^{35}P and ^{32}S

(3) ^{34}P and ^{31}S

(4) ^{30}P and ^{32}S

Question no. 146

In the given pedigree, the shaded individuals are homozygous recessive for colour blindness. What is the genotype of individual B?



(1) heterozygous

(2) Homozygous recessive

(3) Homozygous dominant

(4) None of the above

Question no. 147

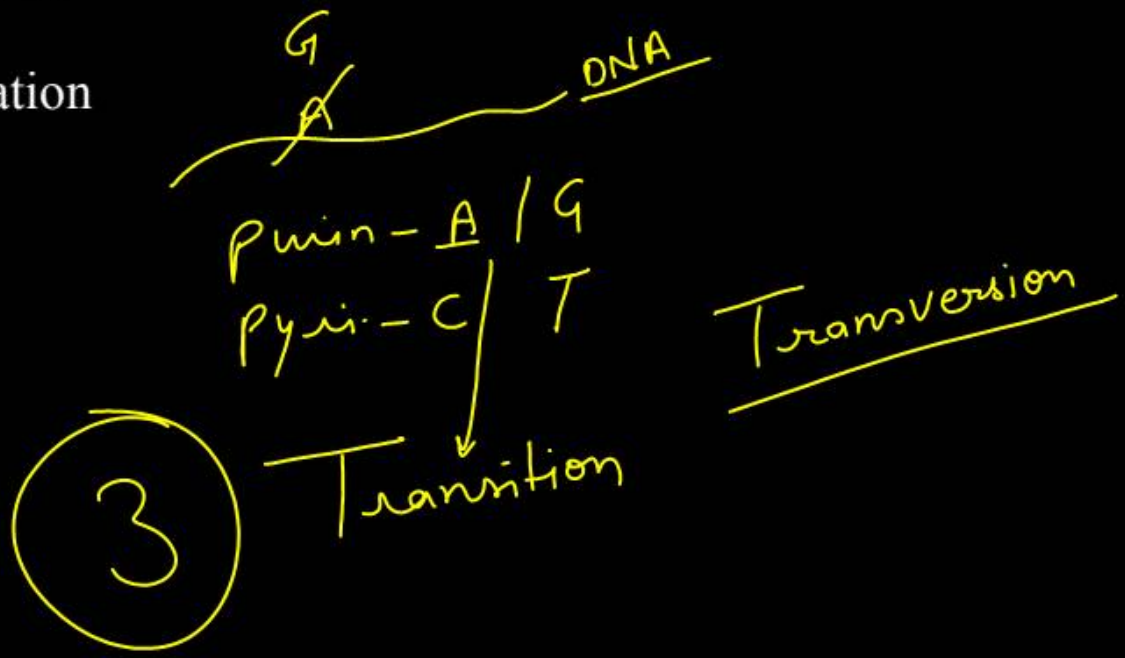
In a mutational event, when adenine is replaced by guanine, it is the case of

(1) frameshift mutation

(2) transciription

(3) transition

(4) tansversion



Question no. 148

In Morgan's experiments on linkage, the percentage of white eye, miniature-winged recombinants in F_2-generation is

(1) 1.3

(2) 37.2

(3) 73.2

(4) 62.8

2

Question no. 149

Experimental verification of the chromosomal theory of inheritance was given by

(1) Thomas Hunt Morgan

(2) Hugo de Vries

(3) Langdon Down

(4) Henking

Question no. 150

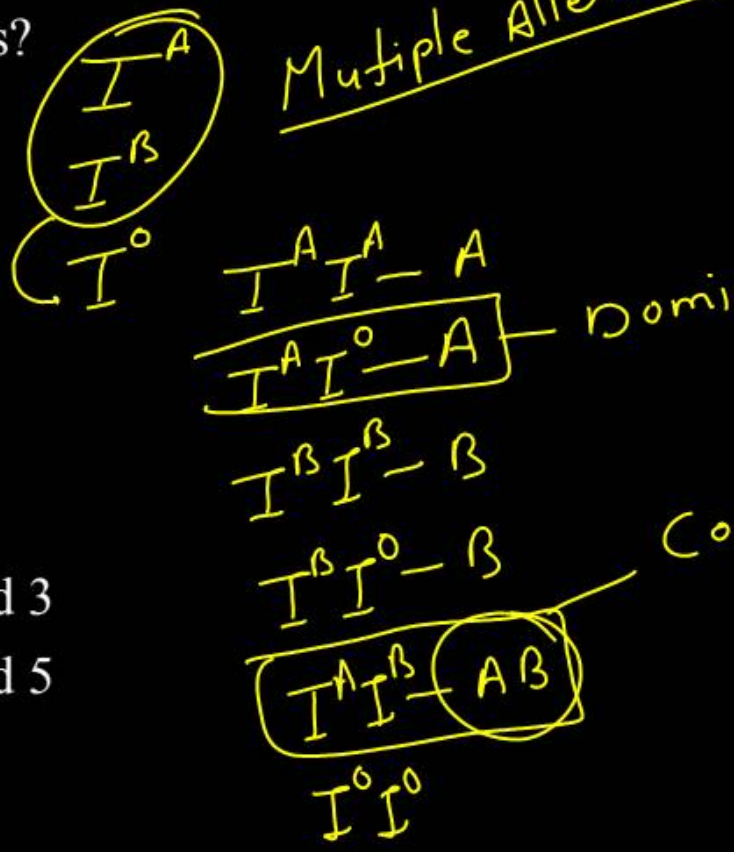
Which of the following characteristics represents 'Inheritance of blood groups' in humans?

1. Dominance
2. Codominance
3. Multiple allele
4. ~~Incomplete dominance~~
5. ~~Polygenic inheritance~~

Choose the correct option:

(1) 2, 4 and 5 (2) 1, 2 and 3

(3) 2, 3 and 5 (4) 1, 3 and 5



Question no. 151

If two pea plants having red (dominant) coloured flowers with unknown genotypes are crossed 75% of the flowers are red and 25% are white. The genotypic constitution of the parents having red coloured flowers will be

(1) Both homozygous

(2) One homozygous and other heterozygous

(3) Both heterozygous

(4) Both hemizygous

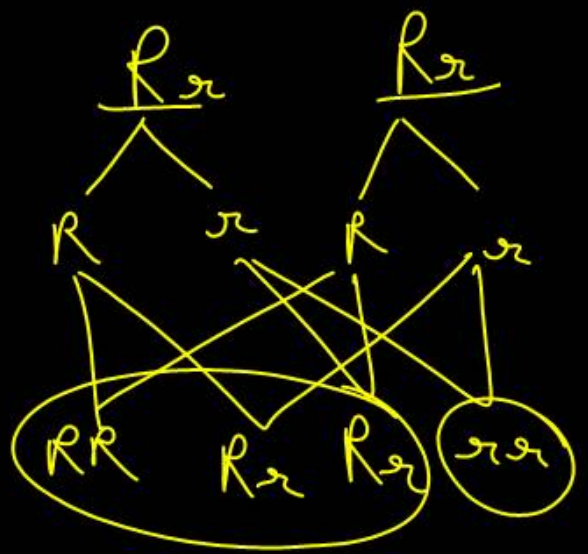
RR × RR

RR × Rr

3

Rr × Rr
Red Red

75% Red 3
25% white 1



Question no. 152

Identify the pair of incorrect statements in the following.

I. Intine of pollen grain is made up of sporopollenin. Exine

II. Pollen grains are well-preserved as fossils because of the presence of sporopollenin.

III. Enzymes can degrade the organic material of the exine of pollen grain.

IV. Sporopollenin can withstand high temperatures, strong acids and alkali.

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

2

Question no. 153

Cleistogamous flowers are

(1) bisexual flowers which remain opened

(2) bisexual flowers which remain closed

(3) open female flower

(4) open male flower

2

Question no. 154

Which of the following pairs in angiosperms are diploid and triploid, respectively?

(1) Secondary nucleus and endosperm

(2) Microspore mother cell and ~~egg cell~~

(3) Polar nucleus and ~~secondary nucleus~~

(4) Endosperm and ~~antipodal cells~~

Question no. 155

The second maturation division of the mammalian ovum occurs

(1) Shortly after ovulation before the ovum makes entry into the Fallopian tube

(2) after the ovum has been penetrated by a sperm

(3) until the nucleus of the sperm has fused with that of the ovum

(4) in the Graafian follicle following the first maturation division

Question no. 156

The correct sequence of embryonic development is

(1) Blastula – Morula – Zygote – Gastrula –Embryo

(2) Zygote –Blastula –Morula – Gastrula – Embryo

(3) Zygote –Morula –Blastula – Gastrula – Embryo

(4) Zygote –Morula –Gastrula –Blastula – Embryo

Question no. 157

Some genomic representations of skin colour are given below:

I. AA bb CC

II. AA bb cc

III. AA BB CC

IV. aa bb cc

Which of the option is correct for showing the darkness of colour of the skin in decreasing order?

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

(3) III → I → II → IV (4) I → III → II → IV

Question no. 158

During incomplete dominance, F_2-generation will have

(1) 3 : 1 genotypic ratio

(2) 3 : 1 phenotypic ratio

(3) 1 : 2 : 1 genotypic ratio

(4) 1 : 2 : 2 phenotypic ratio

1 : 2 : 1 Genotype ≠ phenotype

3

Question no. 159

In split genes, the coding sequences are called

(1) introns (2) exons

(3) cistrons (4) operons

2

Question no. 160

What is a split gene?

(1) A gene with a crack in it

(2) A gene which has no promoter

(3) A jumping gene

(4) A gene whose entire sequences are not retained in the mature RNA.

4

Question no. 161

The structures in chromatin see as 'beads-on string' when viewed under electron microscope are called:

(1) Nucleotides (2) Nucleosides

(3) Histone octamers (4) Nucleosomes

Question no. 162

HGP methodology which includes identification of all the genes that express as RNA is referred as

(1) RFLR

(2) ESTs → Expressed sequence Tags

(3) VNTR

(4) RAPD's

2

Question no. 163

If one strand of DNA has the nitrogenous base sequence at ATCTG what would be the complementary RNA strand sequence

(1) TTAGU
(2) UAGAC
(3) AACTG
(4) ATCGU

ATCTG DNA

UAGAC RNA

Question no. 164

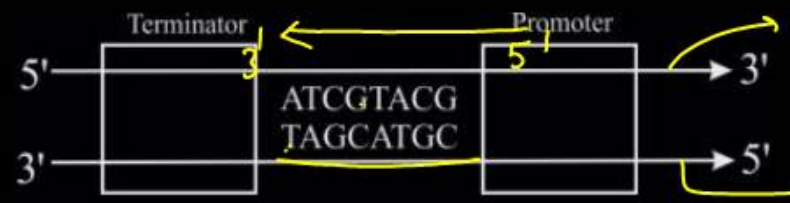
The commonly used 'DNA finger printing technique' in forensic science is simply a method called

(1) Southern blotting (2) Northern blotting

(3) Western blotting (4) Eastern blotting

Question no. 165

Find the sequence of nucleotide in m-RNA produced by transcription of above given DNA.



Template

Coding seq

(1) 5' ATCGTACG' (2) 3' TAFCATGC 5'

(3) 5' CGUACGAU 3' (4) 5' GCATGCTA 3'

5' UAGCAUGC 3'

3' 5'

3

5' CGUACGAU 3'

Question no. 166

Which of the following law of Mendel does not have any exception?

(1) Law of segregation

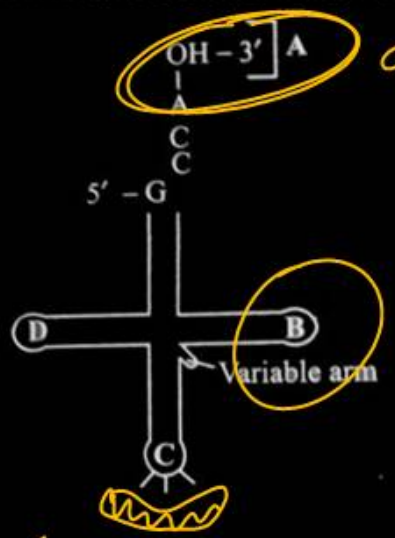
(2) Law fo independent assortment (linkage

(3) Law of dominance Co - Incomp

(4) None of these

Question no. 167

Identify the labels A, B, C and D in the given structure of tRNA and select the correct option.



(1) A – Anticodon loop, B - TψC loop, C - AA binding site, D - DHU loop

(2) A - AA binding site, B - TψC loop, C - TψC loop, D - DHU loop

(3) A - AA binding, B - DHU loop, C - DHU loop, D - DHU loop

(4) A - DHU loop, B - DHU loop, C - DHU loop, D - DHU loop

aa.

A = Amino acid Binding site

B = TψC loop → attachment for Ribosome

C = Anticodon loop

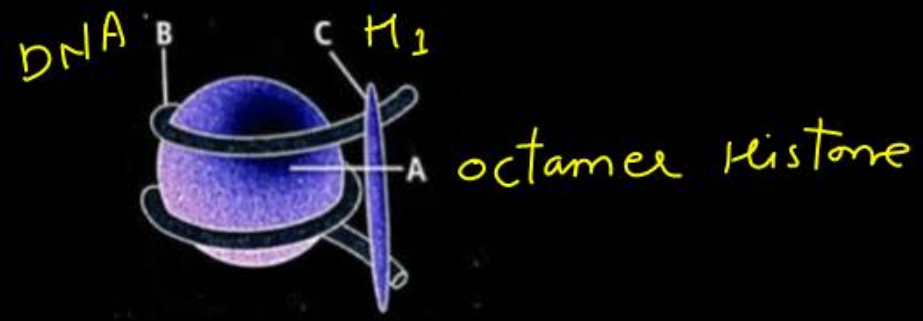
D = DHU loop

2

Anticodon loop

Question no. 168

Refer the given figure of nucleosome and select the option that correctly identifies the parts A, B and C.



	A	B	C
(1)	DNA	Histone octamer	H_1 histone
(2)	Histone octamer	H_1 histone	DNA
(3)	Histone octamer	DNA	H_1 histone
(4)	DNA	H_1 histone	Histone octamer

3

Question no. 169

Which of the following pairs contains an infectious and a non-infectious disease respectively?

(1) Typhoid and AIDS

(2) AIDS and cancer

(3) Pneumonia and malaria

(4) Cancer and malaria

Question no. 170

The drugs used to quickly reduce the symptoms of allergy are

(1) anti – histamine and adrenaline

(2) histamine and thyroxine

(3) adrenaline and α -interferon

(4) all of these

Cause = Histamine

1

Question no. 171

The primary lymphoid organs are

(1) spleen and thymus

(2) bone marrow and thymus

(3) bone marrow and lymph node

(4) thymus and MALT

Primary

↳ Production

↳ Maturation.

(2)

Question no. 172

The cells called 'HIV factory' is

(1) helper T-cells (2) macrophages

(3) dendritic cells (4) WBCs

2

Question no. 173

In agarose gel electrophoresis, DNA molecules are separated on the basis of their

(1) charge only

(2) size only

(3) charge to size ratio

(4) all of the above

2

Question no. 175

Who among the following was awarded the Nobel Prize for the development of PCR technique?

(1) Hergbert Boyer

(2) Hargovind Khurana

(3) Kary Mullis

(4) Arthur Kornberg

Question no. 176

Totipotency refers to

(1) capacity to generate genetically identical plants

(2) capacity to generate a whole plant from any plant cell/explant

(3) capacity to generate hybrid protoplasts

(4) recovery of healthy plants from diseased plants

2

Question no. 177

Somaclones are

(1) somatic hybrids

(2) genetically identical to the original plant

(3) used to recover disease free plants

(4) sterile plants

2

Question no. 178

The term " competent" refers to

(1) increasing the competition between cells

(2) making cells impermeable for DNA

(3) increasing the efficiency with which DNA enters the bacterium through pores in its cell wall

(4) making cells permeable for divalent cations

Question no. 179

Which of the following steps are catalyzed by Taq polymerase in a PCR reaction?

(1) Denaturation of template DNA

(2) Annealing of primers to template DNA

(3) Extension of primer end on the template DNA

(4) All of the above

Question no. 180

Two different species cannot live for long duration in the same niche or habitat. This law is called

(1) Blakman's law

(2) Gloger rule

(3) competitive exclusion principle

(4) Weisman's theory

3