Question no. 1

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Match the corresponding entries of column I with column II. [Where m is the magnification produced by the mirror]

	Column I		Column II
A.	$m = -2$	(p)	Convex mirror
B.	$m = -\frac{1}{2}$	(q)	Concave mirror
C.	$m = +2$	(r)	Real image
D.	$m = +\frac{1}{2}$	(s)	Virtual image

(1) A → p & s; B → q & r; C → q & s; D → q & r

(2) A → r & s; B → q & s; C → q & r; D → p & s

(3) A → q & r; B → q & r; C → q & s; D → p & s

(4) A → p & r; B → p & s; C → p & q; D → r & s

Question no. 2

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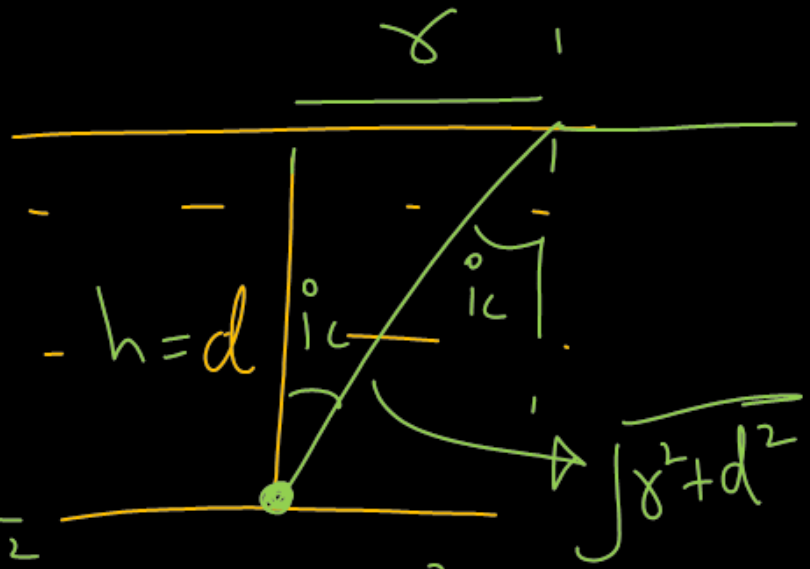
A point source of light is kept at a depth of h in water of refractive index 4/3. The radius of the circle at the surface of water through which light emerges is

(1) $\frac{3}{\sqrt{7}}h$

(2) $\frac{\sqrt{7}}{3}h$

(3) $\frac{\sqrt{3}}{7}h$

(4) $\frac{7}{\sqrt{3}}h$



$\sin i_c = \frac{r}{\sqrt{r^2+d^2}}$

$\frac{3}{4} = \frac{r}{\sqrt{r^2+h^2}}$

$\frac{9}{16} = \frac{r^2}{r^2+h^2}$

$9r^2+9h^2 = 16r^2$

$9h^2 = 7r^2$

$3h = \sqrt{7}r$

$r = \frac{3h}{\sqrt{7}}$

Question no. 3

Two identical glass ($\mu_g = 3/2$) equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with water ($\mu_g = 4/3$). The focal length of the combination is

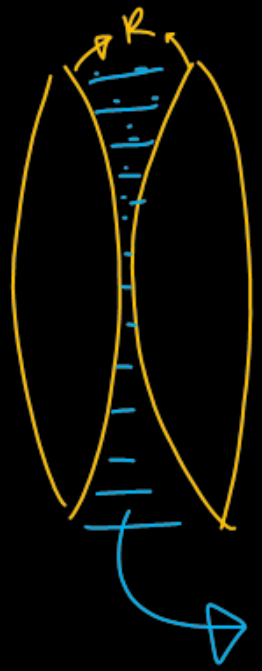
(1) f/3 (2) f

(3) 4f/3 (4) 3f/4

4.

$$\frac{1}{f} = \left(\frac{3}{2} - 1\right)\left(\frac{2}{R}\right)$$

$R = f$



$$\frac{1}{f_{eq}} = \frac{1}{f} + \frac{1}{\frac{-3f}{2}} + \frac{1}{f}$$

$$= \frac{2}{f} - \frac{2}{3f}$$

$$= \frac{2}{f}\left(\frac{2}{3}\right) = \frac{4}{3f}$$

$$\frac{1}{f'} = \left(\frac{4/3}{1} - 1\right)\left(\frac{-2}{f}\right)$$

$$\frac{1}{f'} = \frac{1}{3}\left(\frac{-2}{f}\right)$$

$$f' = -3f/2$$

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Question no. 4

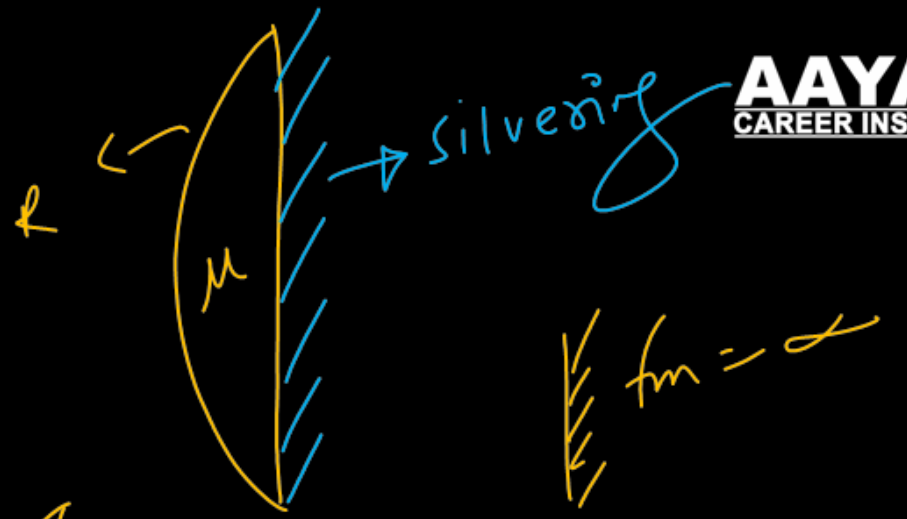
The plane face of a planoconvex lens is silvered. If μ be the refractive index and R, the radius of curvature of curved surface, then the system will behave like a concave mirror of radius of curvature

(1) μR

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

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

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



$$\frac{1}{f_{eqm}} = \frac{1}{f_m} + \frac{2}{f_e} = \frac{-2}{f_e} = \frac{-2(\mu-1)}{R}$$

$$f_{eqm} = \frac{-R}{2(\mu-1)} \Rightarrow ROC = 2f_{eqm} = \frac{-R}{(\mu-1)}$$

2

Question no. 5

A convex lens of refractive index $\frac{3}{2}$ has a power of 2.5 D in air. If it is placed in a liquid of refractive index 2, then the new power of the lens is

(1) – 1.25 D (2) – 1.5 D

(3) 1.25 D (4) 1.5 D

$P = \frac{1}{f} = \left(\frac{n_2}{n_s} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$2.5\,D = \left(\frac{3/2}{1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ — (1)

$P = \left(\frac{3/2}{2} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ — (2)

(1)/(2)

$\frac{2.5}{P} = \frac{1/2}{-1/4} \rightarrow \frac{2.5}{P} = -2$

$P = -\frac{2.5}{2} = -1.25\,D$

(1)

Question no. 6

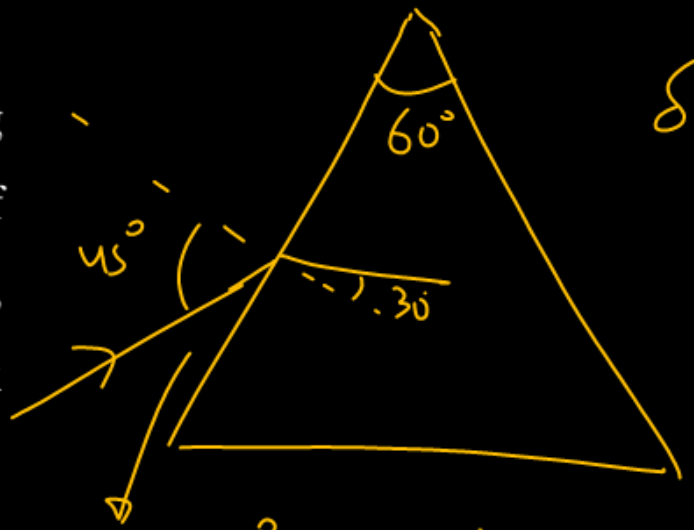
The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are

(1) $45°;\sqrt{2}$

(2) $30°;\frac{1}{\sqrt{2}}$

(3) $45°;\frac{1}{\sqrt{2}}$

(4) $30°;\sqrt{2}$



δ_m

$1 \times \sin 45^\circ = n \times \sin 30$

$\frac{1}{\sqrt{2}} = n \times \frac{1}{2}$

$n = \sqrt{2}$

$\delta_{min} = i + e - A$

$= 2i - A$

$= 90 - 60 = 30^\circ$

4.

Question no. 7

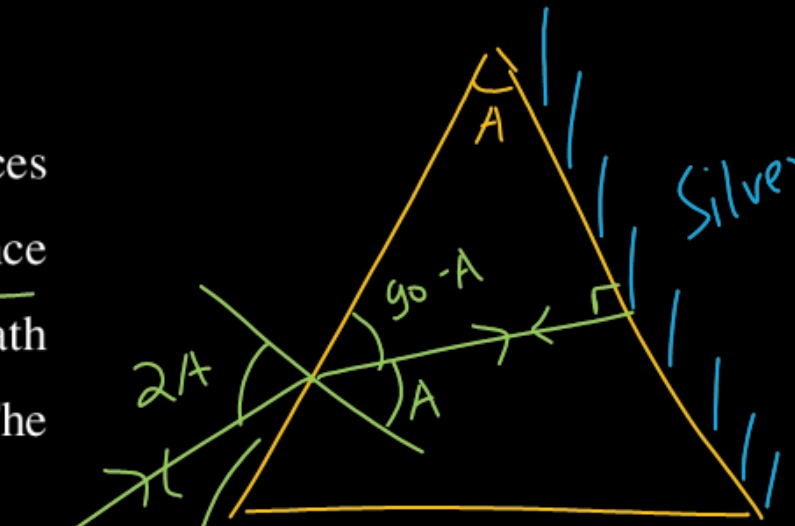
The angle of a prism is A. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence 2A on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index μ, of the prism is

(1) 2 sin A

(2) 2 cos A

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

(4) tan A



Snell's Law

$1 \times \sin 2A = n \sin A$

$2 \sin A \cos A = n \sin A$

$n = 2 \cos A$

2.

Question no. 8

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Two glass prisms P_1 and P_2 are to be combined together to produce dispersion without deviation. The angles of the prisms P_1 and P_2 are selected as 4° and 3° respectively. If the refractive index of prism P_1 is 1.54, then that of P_2 will be

(1) 1.48 (2) 1.58

(3) 1.62 (4) 1.72

$\delta_{net} = 0$

$\delta_1 = \delta_2$

$A_1(n_1 - 1) = A_2(n_2 - 1)$

$4^\circ(1.54 - 1) = 3^\circ(n_2 - 1)$

$\frac{4}{3} \times 0.54 = n_2 - 1$

$0.72 = n_2 - 1$

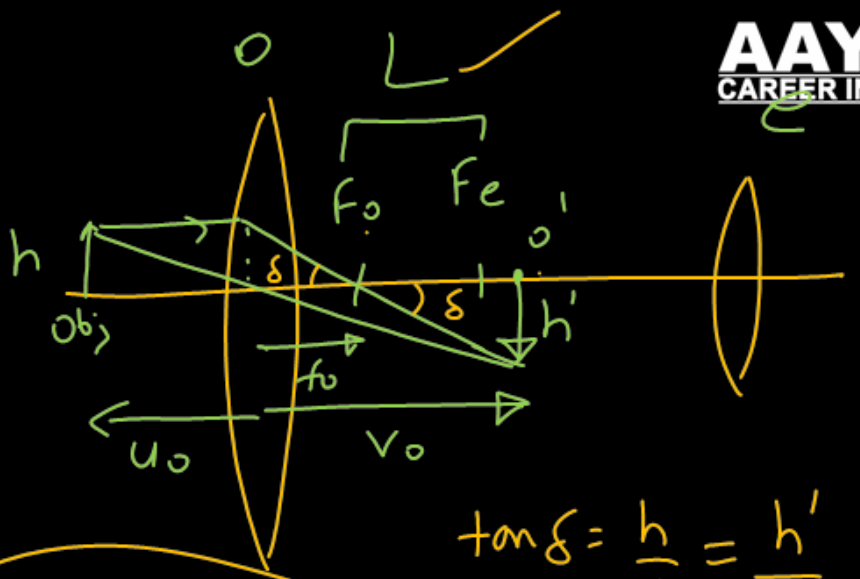
$n_2 = 1.72$

Question no. 9

A microscope is having objective of focal length 1 cm and eye piece of focal length 6 cm. If tube length is 30 cm and image is formed at the least distance of distinct vision, what is the magnification produced by the microscope? Take D = 25 cm.

(1) 25 (2) 6

(3) 125 (4) 150



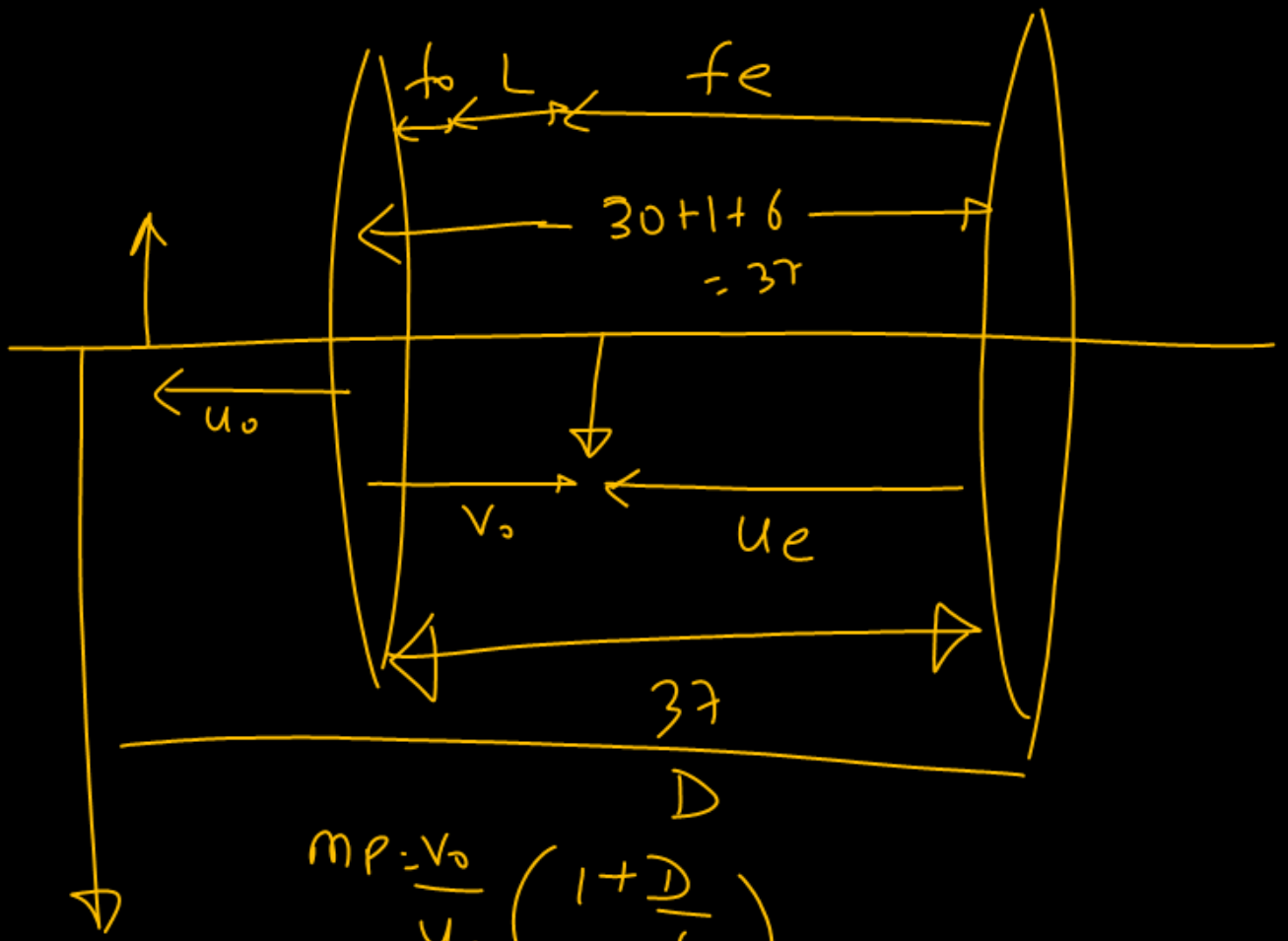
$\tan\delta = \frac{h}{f_o} = \frac{h'}{L}$

$\frac{v_o}{u_o} = \frac{h'}{h} = \frac{L}{f_o}$

$MP = \frac{v_o}{u_o}\left(1+\frac{D}{f_e}\right)$

Approximated $MP = \frac{L}{f_o}\left(1+\frac{D}{f_e}\right)$

$= \frac{30}{1}\left(1+\frac{25}{6}\right) = 30\times\frac{31}{6} = 155$



$$u_e = \frac{fe\,D}{fe+D}$$

$$u_e = \frac{6\times 25}{31} = \frac{150}{31}$$

$$= 4.84\,cm$$

$$v_o = 37 - 4.84$$

$$= 32.16$$

$$\frac{1}{f} = \frac{1}{32.16} - \frac{1}{u_o}$$

$$u_o = \frac{32.16}{31.16}$$

$$mp = \frac{v_o}{u_o}\left(1+\frac{D}{fe}\right)$$

$$= \frac{32.16}{\frac{32.16}{31.16}}\left(1+\frac{25}{6}\right) = 31.16\times\frac{31}{6} \approx 16$$

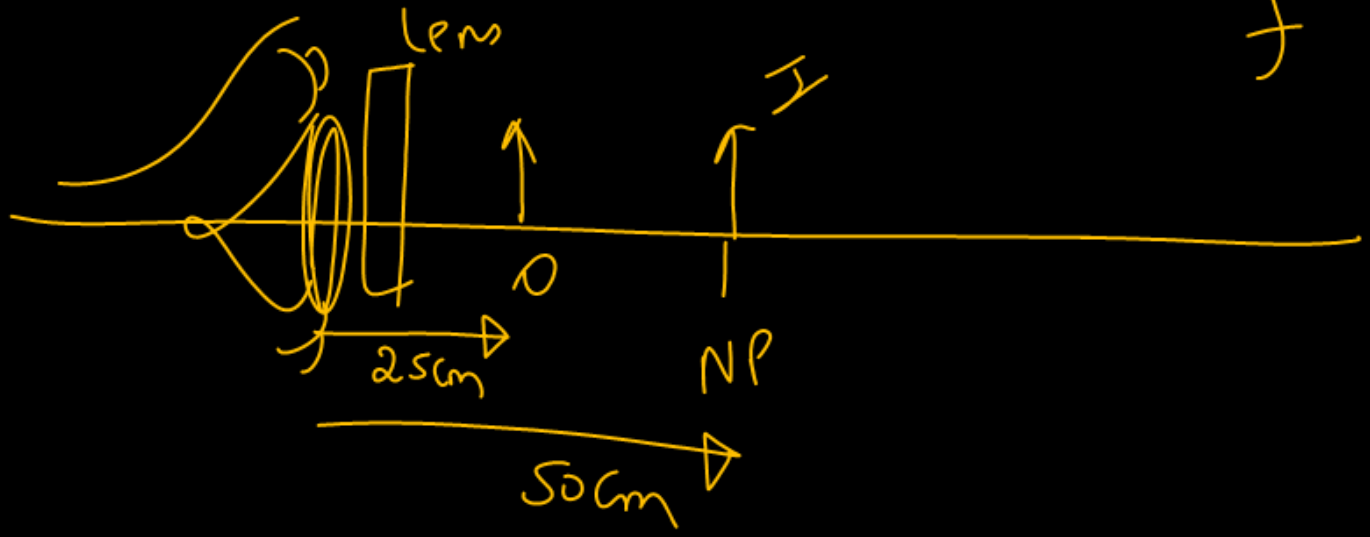
Question no. 10

AAYAM CAREER INSTITUTE

A far sighted person has his near point 50 cm, find the power of lens he should use to see at 25 cm, clearly.

(1) + 1 D (2) + 2 D

(3) – 2 D (4) – 1 D



Ob: $u = -25$

$v = -50$

$$\frac{1}{f} = \frac{1}{-50} - \frac{1}{-25}$$

$$\frac{1}{f} = -\frac{1}{50} + \frac{2}{50} = \frac{1}{50}$$

$f = 50\,cm$

$P = 2\,D$

Question no. 11

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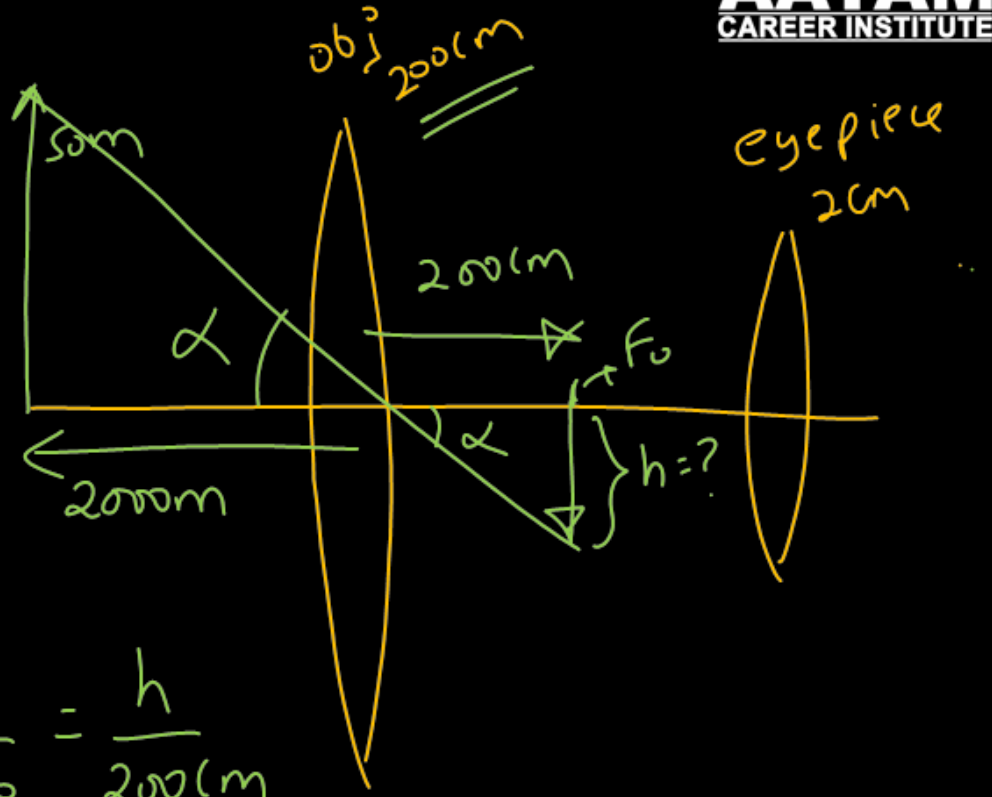
A telescope has an objective of focal length 200 cm and an eye piece with focal length 2 cm. If this telescope is used to see a 50 m tall building at a distance of 2 km, what is the height of the image of the building formed by the objective lens?

(1) 5 cm (2) 10 cm

(3) 1 cm (4) 2 cm



$$\tan\alpha = \frac{50}{2000} = \frac{h}{200\text{cm}}$$

$$h = \frac{50}{2000} \times 200\text{cm} = 5\text{cm}$$

(1)

Question no. 12

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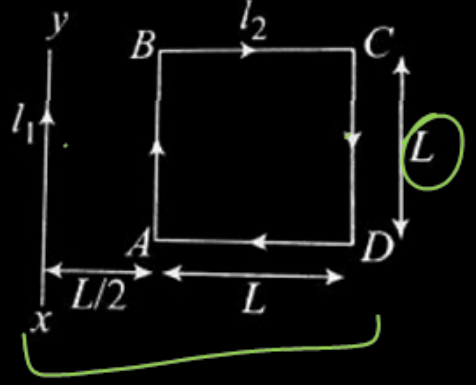
A square loop ABCD carrying a current I_2, is placed near and coplanar with a long straight conductor XY carrying a current I_1, as shown in figure. The net force on the loop will be

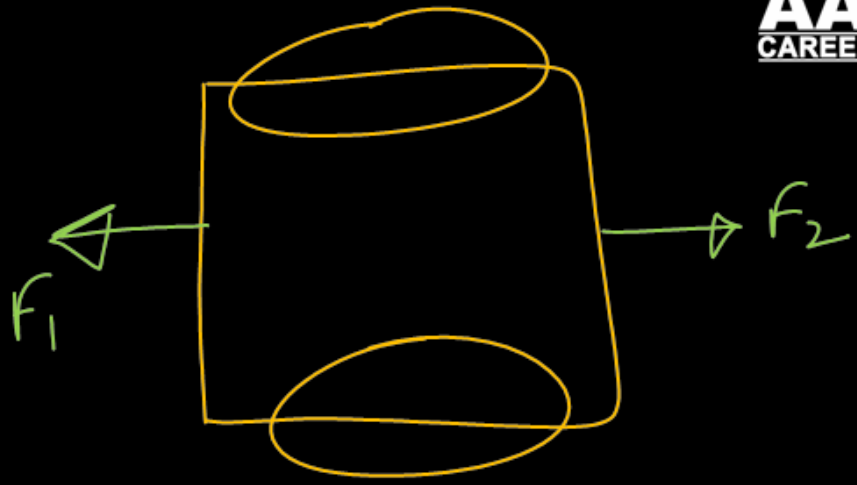


(1) $\frac{\mu_0 I_1 I_2}{2\pi}$

(2) $\frac{\mu_0 I_1 I_2 L}{2\pi}$

(3) $\frac{2\mu_0 I_1 I_2 L}{2\pi}$

(4) $\frac{2\mu_0 I_1 I_2 L}{3\pi}$



$$F_{net} = F_1 - F_2$$

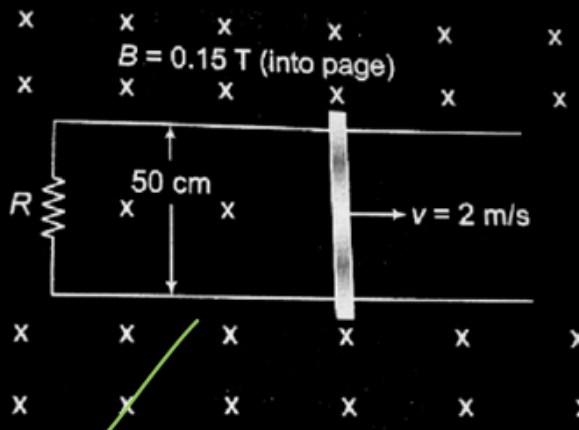
$$= \frac{\mu_0 I_1 I_2}{2\pi \frac{L}{2}} \times L - \frac{\mu_0 I_1 I_2}{2\pi \frac{3L}{2}} \times L$$

$$= \frac{\mu_0 I_1 I_2 L}{\pi L}\left(1 - \frac{1}{3}\right) = \frac{2}{3}\frac{\mu_0 I_1 I_2}{\pi}$$

Question no. 13

AAYAM CAREER INSTITUTE

As shown in the figure, a metal rod makes contact with a partial circuit and completes the circuit. The circuit area is perpendicular to a magnetic field with B = 0.15 T. If the resistance of the total circuit is 3 Ω, the force needed to move the rod as indicated with a constant speed of 2 m s^{-1} will be equal to



(1) 3.75×10^{-3} N (2) 2.75×10^{-3} N

(3) 6.57×10^{-4} N (4) 4.36×10^{-4} N

$$F = \frac{B^2 v l^2}{R}$$

$$F = \frac{225}{100 \times 100} \times 2 \times \frac{1}{2}$$

$$F = 37.5 \times 10^{-4}$$

$$F = 3.75 \times 10^{-3}\ N$$

1.

Question no. 14

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The fission properties of $^{239}_{94}Pu$ are very similar to those of $^{235}_{92}U$. The average energy released per fission is 180 MeV. If all the atoms in 1 kg of pure $^{239}_{94}Pu$ undergo fission, then the total energy released in MeV is

(1) 4.53×10^{26} MeV (2) 2.21×10^{14} MeV

(3) 1×10^{13} MeV (4) 6.33×10^{24} MeV

1 atom → 180 MeV

239 g → N_A atoms

1 g → $\frac{N_A}{239}$ atoms

1000 g → $\frac{1000 N_A}{239}$ atom

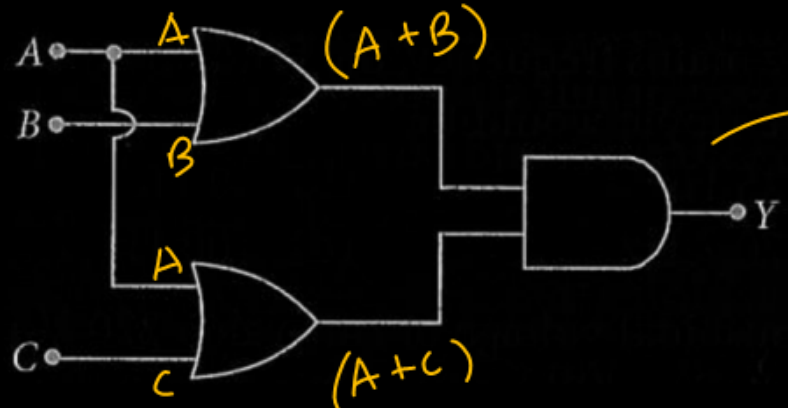
Total energy released = $180\,MeV \times \frac{1000}{239} \times 6\times10^{23}$

$= 4.53\times10^{26}\,MeV$

Question no. 15

AAYAM CAREER INSTITUTE

The output of given logic circuit is



$Y = (A+B).(A+C)$

3.

(1) A.(B+C)

(2) A.(B.C)

(3) (A+B).(A+C)

(4) A+B+C

Question no. 16

The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio $\frac{I_{max}-I_{min}}{I_{max}+I_{min}}$ will be

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

(3) $\frac{\sqrt{n}}{(n+1)^2}$ (4) $\frac{2\sqrt{n}}{(n+1)^2}$

$\frac{I_1}{I_2}=\frac{n}{1}=\frac{nI_0}{I_0}$

$I_{min}=(\sqrt{n}I_0-\sqrt{I_0})^2$

$I_{max}=(\sqrt{n}I_0+\sqrt{I_0})^2$

$\frac{I_{min}}{I_{max}}=\left(\frac{\sqrt{n}-1}{\sqrt{n}+1}\right)^2$

$\frac{1-\frac{I_{min}}{I_{max}}}{1+\frac{I_{min}}{I_{max}}}$

$\frac{1-\left(\frac{\sqrt{n}-1}{\sqrt{n}+1}\right)^2}{1+\left(\frac{\sqrt{n}-1}{\sqrt{n}+1}\right)^2}$

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

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

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Question no. 17

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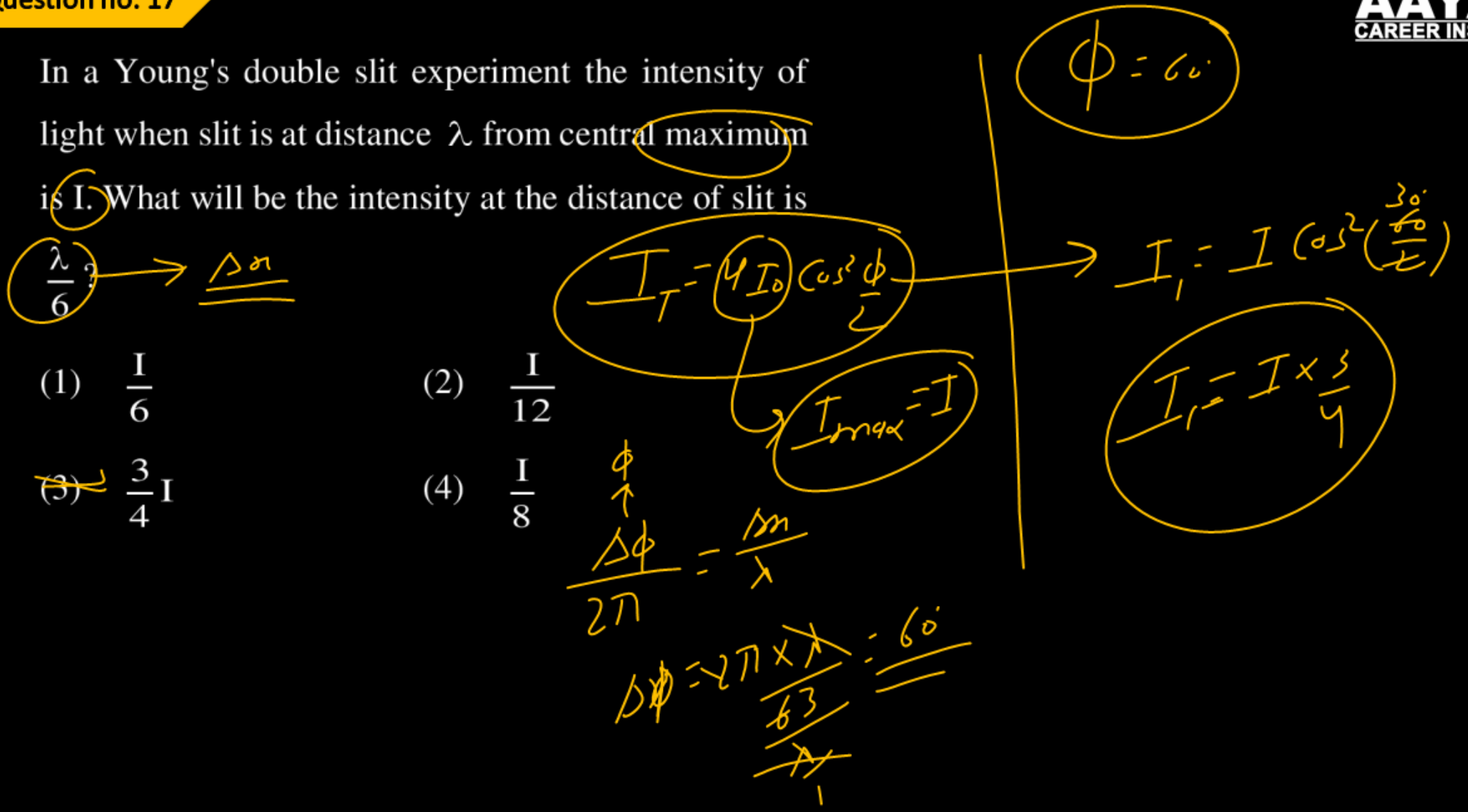
In a Young's double slit experiment the intensity of light when slit is at distance λ from central maximum is I. What will be the intensity at the distance of slit is $\frac{\lambda}{6}$?

(1) $\frac{I}{6}$

(2) $\frac{I}{12}$

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

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



Question no. 18

In a Young's double slit experiment the spacing between the slits is 0.3 mm and the screen is kept at a distance of 1.5 m. The second bright fringe is found 6 mm from the central fringe. The wavelength of the light used in the experiment is

(1) 625 nm (2) 600 nm

(3) 550 nm (4) 500 nm

$\beta = \frac{\lambda D}{d}$

$y_n = n\beta$

$y = 6\,mm$

$6\times10^{-3} = 2\times\left(\frac{\lambda\times3\times10}{2\times3\times10^{3}}\right)$

$\lambda = 600\,nm$

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Question no. 19

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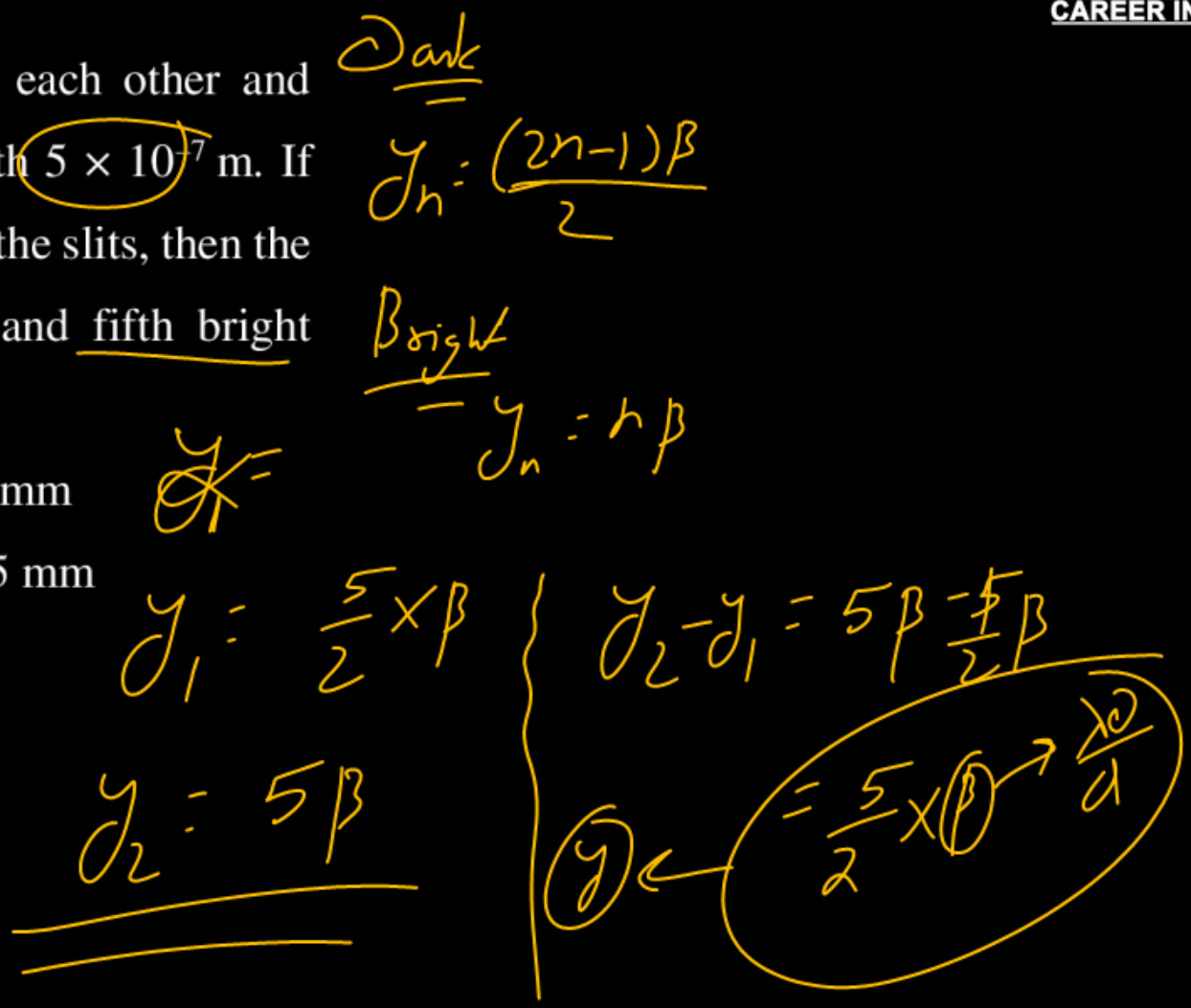
The two slits are 1 mm apart from each other and illuminated with a light of wavelength 5×10^{-7} m. If the distance of the screen is 1 m from the slits, then the distance between third dark fringe and fifth bright fringe is

(1) 1.5 mm (2) 0.75 mm

(3) 1.25 mm (4) 0.625 mm



Question no. 20

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In a Fraunhofer diffraction at single slit of width d with incident light of wavelength 5500 Å, the first minimum is observed, at angle 30°. The first secondary maximum is observed at an angle Θ =

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

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

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

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

$d\sin\theta = n\lambda$

$d \times \sin 30^\circ = 1 \times \lambda$

$d = 2\lambda$

$d\sin\theta_2 = \left(\frac{2n+1}{2}\right)\lambda$

$d\sin\theta_2 = \frac{3}{2} \times \lambda$

$2\lambda\sin\theta_2 = \frac{3}{2}\lambda$

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

$\theta_2 = \sin^{-1}\left(\frac{3}{4}\right)$

Question no. 21

AAYAM CAREER INSTITUTE

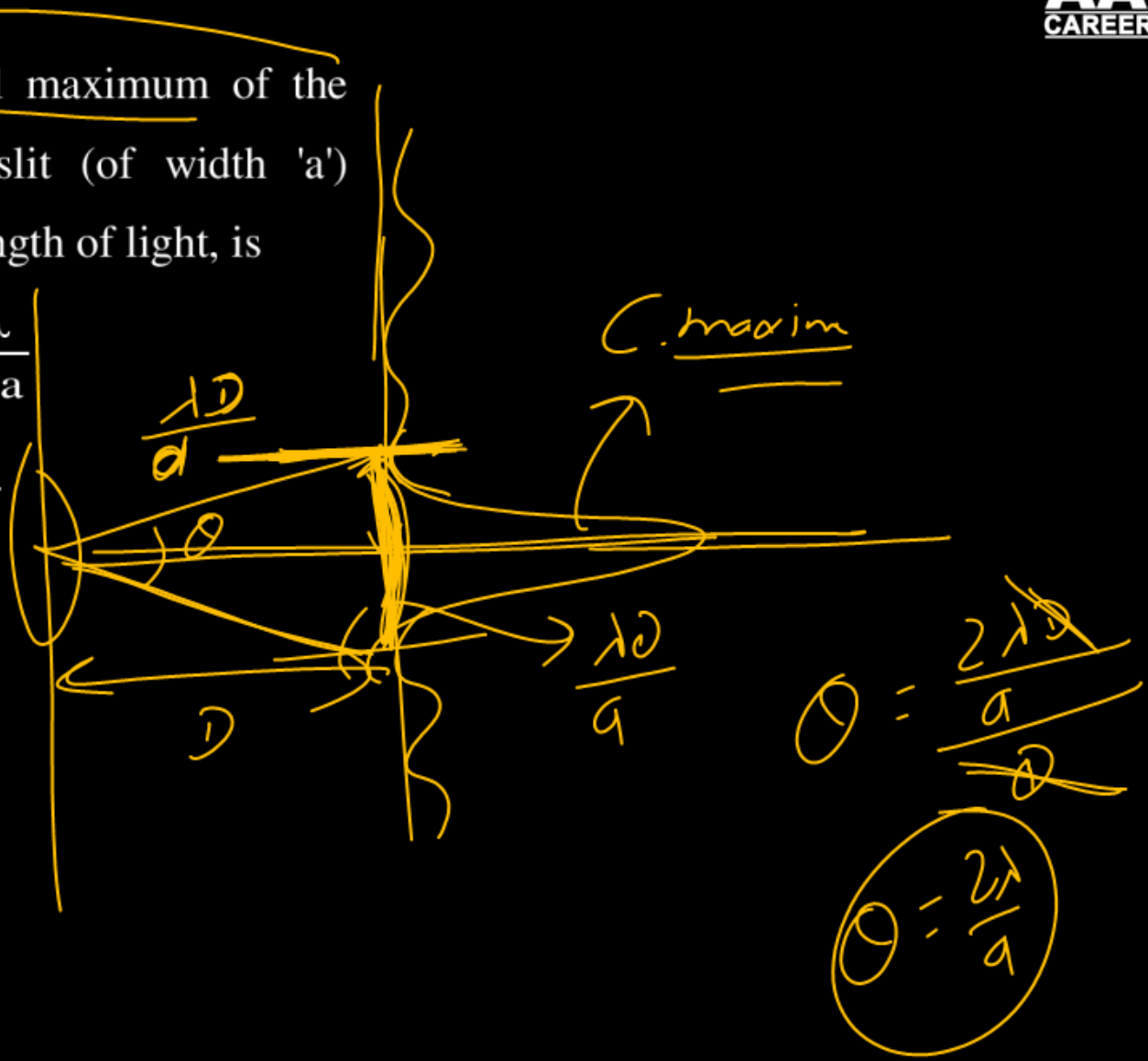
The angular width of the central maximum of the diffraction pattern in a single slit (of width 'a') experiment, with λ as the wavelength of light, is

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

(2) $\frac{\lambda}{2a}$

(3) $\frac{2\lambda}{a}$

(4) $\frac{\lambda}{a}$



Question no. 22

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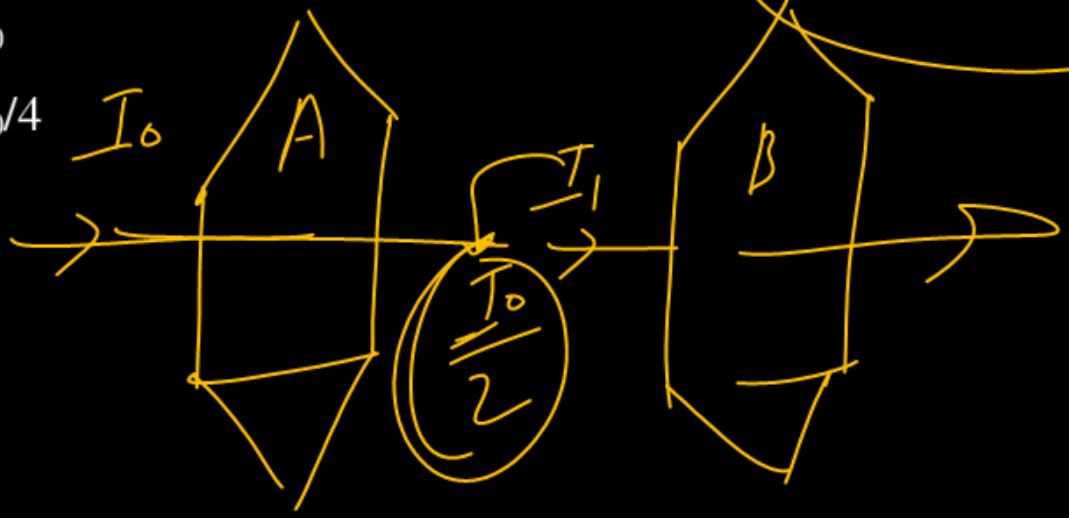
A beam of unpolarised light of intensity I_0 is passed through a polaroid A and then through another polaroid B which is oriented so that its principal plane makes an angle of 45° relative to that of A. The intensity of the emergent light is

(1) $I_0/8$ (2) I_0

(3) $I_0/2$ (4) $I_0/4$

$I = I_1 \cos^2\theta$

$I = \frac{I_0}{2} \times \frac{1}{2} = \frac{I_0}{4}$



Question no. 23

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The critical angle of a certain medium is $\sin^{-1}\left(\frac{3}{5}\right)$.

The polarizing angle of the medium is

(1) $\sin^{-1}\left(\frac{4}{5}\right)$

(2) $\tan^{-1}\left(\frac{5}{3}\right)$

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

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

$\sin i_c = \frac{n_r}{n_d}$

$\frac{3}{5} = \frac{1}{n_d}$

$n_d = \frac{5}{3}$

$n = \tan i_p$

$\frac{5}{3} = \tan i_p$

$i_p = \tan^{-1}\left(\frac{5}{3}\right)$

Question no. 24

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The length of a metal wire is L_1 when the tension is T_1 and L_2 when the tension is T_2. The unstretched length of the wire is

l_0

(1) $\frac{L_1 + L_2}{2}$ (2) $\sqrt{L_1 L_2}$

(3) $\frac{T_2 L_1 - T_1 L_2}{T_2 - T_1}$ (4) $\frac{T_2 L_1 + T_1 L_2}{T_2 + T_1}$

$Y = \frac{F}{A} \Big/ \frac{\Delta l}{l}$

$Y = \frac{Fl}{\Delta l A}$

$l_f - l_i$

$\Delta l = \frac{Fl}{YA}$

$L_1 - l_0 = \frac{T_1 l_0}{YA}$

$L_2 - l_0 = \frac{T_2 l_0}{YA}$

$\frac{L_1 - l_0}{L_2 - l_0} = \frac{T_1}{T_2}$

$L_1 T_2 - l_0 T_2 = L_2 T_1 - l_0 T_1$

$l_0 (T_1 - T_2) = L_2 T_1 - L_1 T_2$

$l_0 = \frac{L_2 T_1 - L_1 T_2}{T_1 - T_2}$

Question no. 25

AAYAM CAREER INSTITUTE

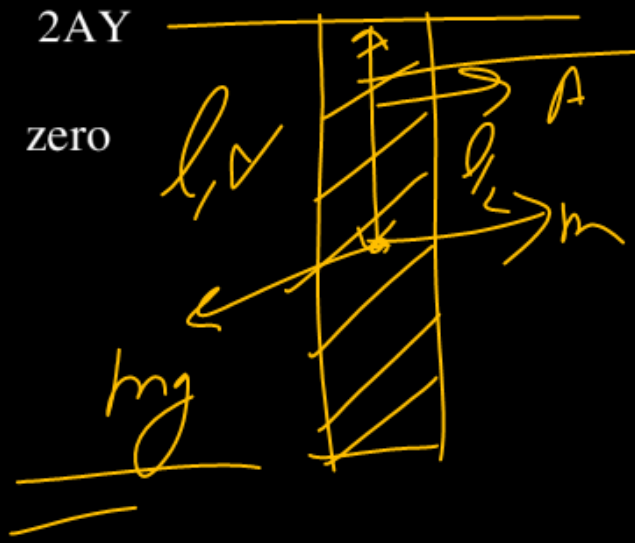
A uniform rod of mass m, length L, area of cross–section A and Young's modulus Y hangs from a rigid support. It elongation due to its own weight will be

(1) $\frac{mgL}{AY}$

(2) $\frac{mgL}{2AY}$

(3) $\frac{2mgL}{AY}$

(4) zero



$Y = \frac{F \times l}{A \times \Delta l}$

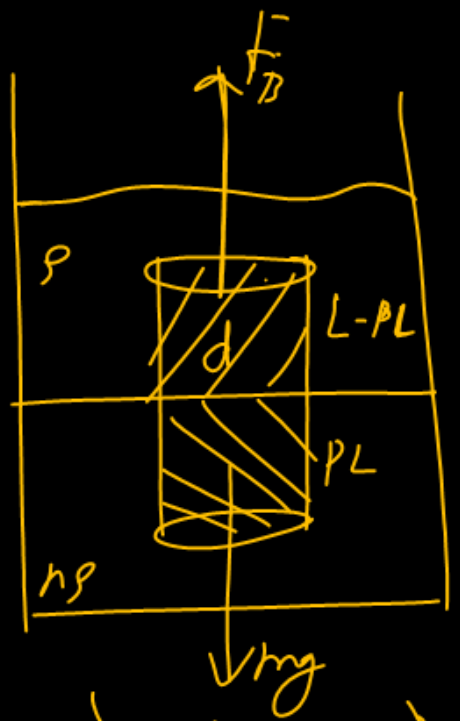
$Y = \frac{mg \times l}{2 \times A \Delta l}$

$\Delta l = \frac{mgl}{2AY}$

Question no. 26

AAYAM CAREER INSTITUTE

Two non–mixing liquids of densities ρ and $n\rho\,(n>1)$ are put in a container. The height of each liquid is h. A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length pL $(p<1)$ in the denser liquid. The density d is equal to



(1) $\{2+(n-1)p\}\rho$ (2) $\{1+(n-1)p\}\rho$

(3) $\{1+(n+1)p\}\rho$ (4) $\{2+(n+1)p\}\rho$

$A\times(L-PL)\times\rho g+A(PL)h\rho g=A\times L\times d\times g$

$(L-PL)\rho+PLh\rho=L\times d$

$(1-P)\rho+h\rho=d \rightarrow \rho((1-P)+hp)=d$

Question no. 27

AAYAM CAREER INSTITUTE

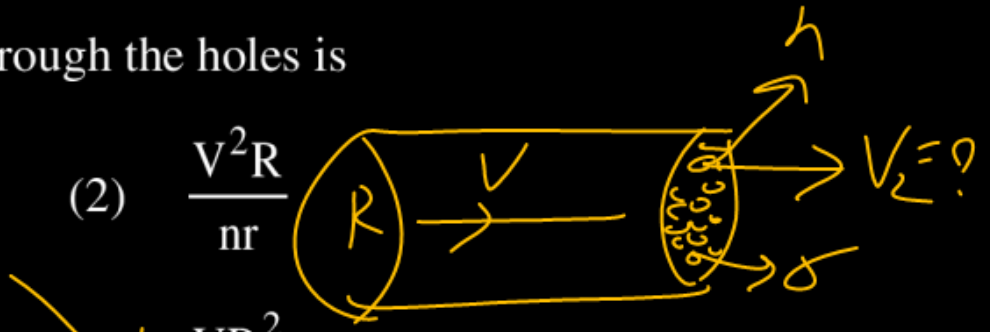
The cylindrical tube of a spray pump has radius R, one end of which has n fine holes, each of radius r. If the speed of the liquid in the tube is V, the speed of the ejection of the liquid through the holes is

(1) $\frac{VR^2}{n^3r^2}$

(2) $\frac{V^2R}{nr}$

(3) $\frac{VR^2}{n^2r^2}$

(4) $\frac{VR^2}{nr^2}$



$\pi R^2 \times V = n \times \pi r^2 \times V_2$

$V_2 = \frac{VR^2}{nr^2}$

Question no. 28

AAYAM CAREER INSTITUTE

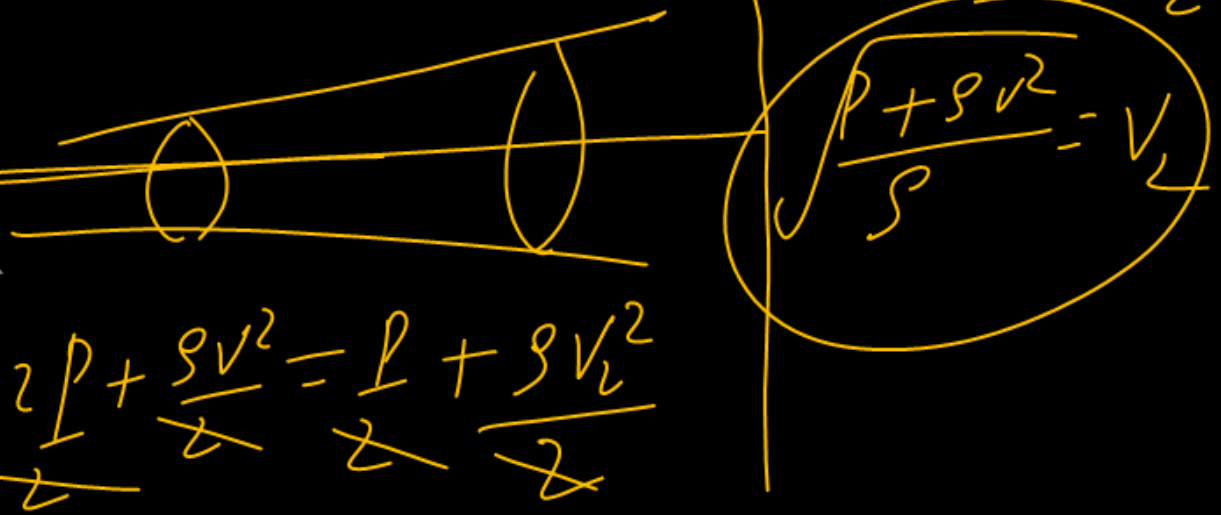
Water is flowing streamline motion through a horizontal tube. The pressure at a point in the tube is p where the velocity of flow is v. At another point, where the pressure is p/2, the velocity of flow is (density of water = ρ)

(1) $\sqrt{v^2 + \frac{p}{\rho}}$

(2) $\sqrt{v^2 - \frac{p}{\rho}}$

(3) $\sqrt{v^2 + \frac{2p}{\rho}}$

(4) $\sqrt{v^2 - \frac{2p}{\rho}}$



Question no. 29

AAYAM CAREER INSTITUTE

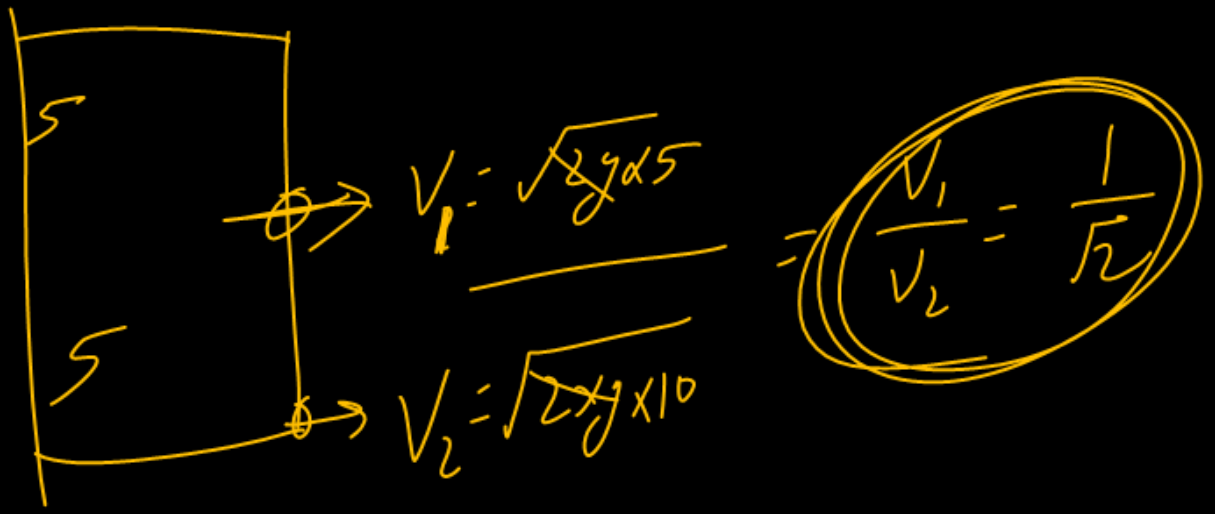
A container of height 10 m which is open at the top, has water to its full height. Two small openings are made on the walls of the container one exactly at the middle and the other at the bottom. The ratio of the velocities with which water comes out from the middle and the bottom region respectively is

(1) 2

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

(3) $\sqrt{2}$

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



Question no. 30

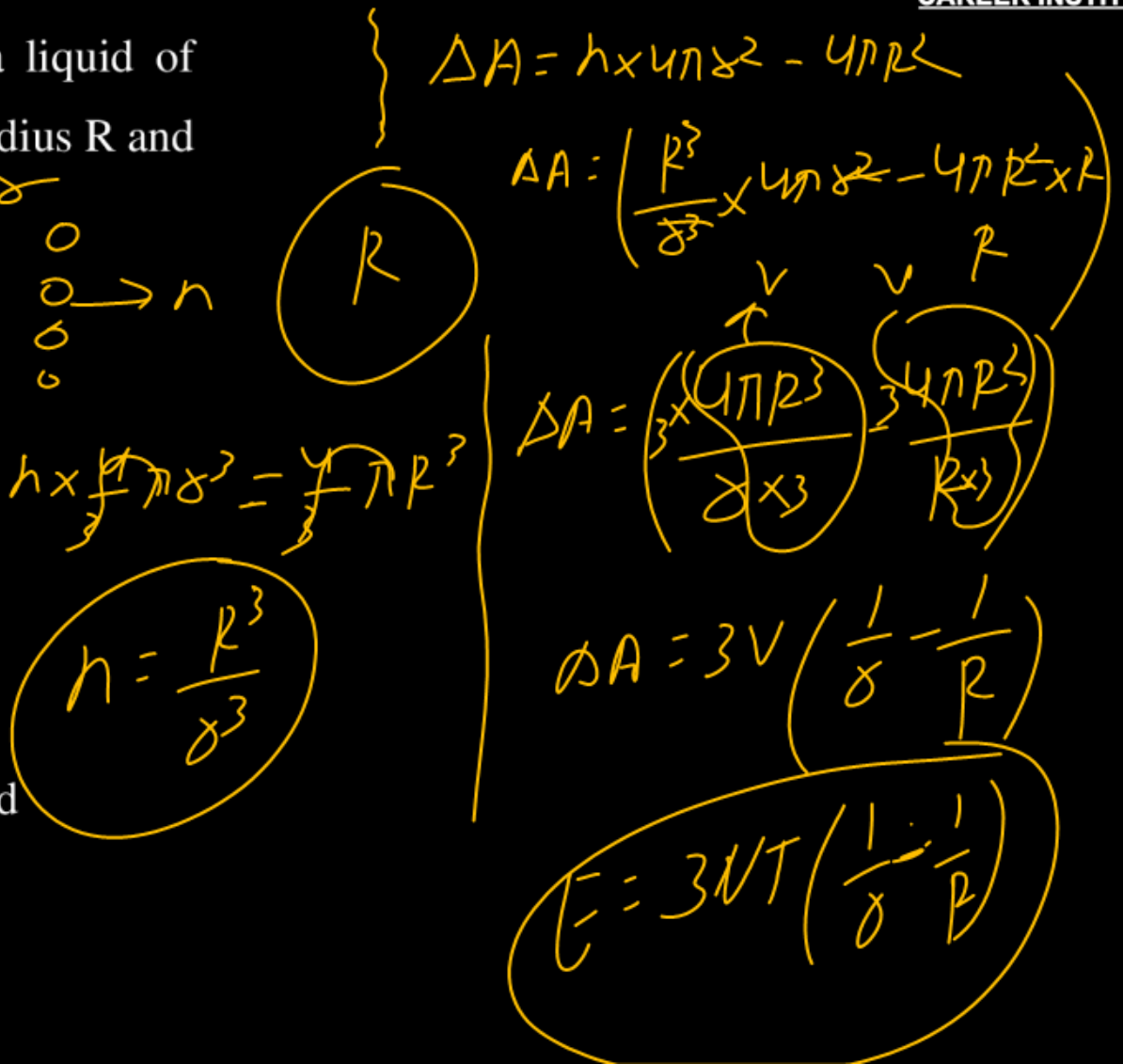
A certain number of spherical drops of a liquid of radius r coalesce to from a single drop of radius R and volume V. If T is the surface

(1) energy = $= 4VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released.

(2) energy $= 3VT\left(\frac{1}{r} + \frac{1}{R}\right)$ is absorbed.

(3) energy $= 3VT\left(\frac{1}{r} - \frac{1}{R}\right)$ is released.

(4) energy is neither released nor absorbed



Question no. 31

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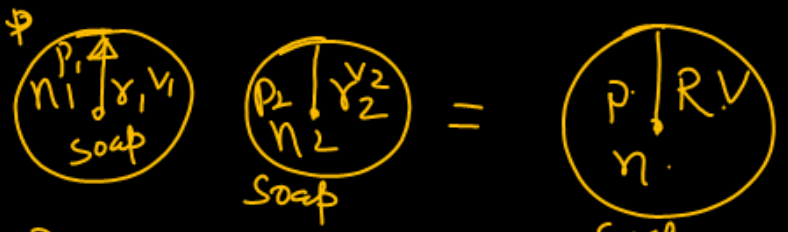
Two soap bubbles each with radius r_1 and r_2 coalesce in vacuum under isothermal conditions to form a bigger bubble of radius R. Then R is equal to

(1) $\sqrt{r_1^2 + r_2^2}$ (2) $\sqrt{r_1^2 - r_2^2}$

(3) $r_1 + r_2$ (4) $\frac{\sqrt{r_1^2 + r_2^2}}{2}$

T = const



$P = \frac{4T}{\gamma}$ → const.

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

$PV = nRT$

$PV = n$.

$n_1 + n_2 = n$.

$P_1V_1 + P_2V_2 = PV$

$\frac{1}{\gamma_1} \times \frac{4}{3}\pi\gamma_1^3 + \frac{1}{\gamma_2} \times \frac{4}{3}\pi\gamma_2^3 = \frac{4}{3}\pi\gamma^3 \times \frac{1}{\gamma}$

$P_1V_1 + P_2V_2 = PV$

$\gamma_1^2 + \gamma_2^2 = \gamma^2$

$\gamma = \sqrt{\gamma_1^2 + \gamma_2^2}$

$R = \sqrt{r_1^2 + r_2^2}$

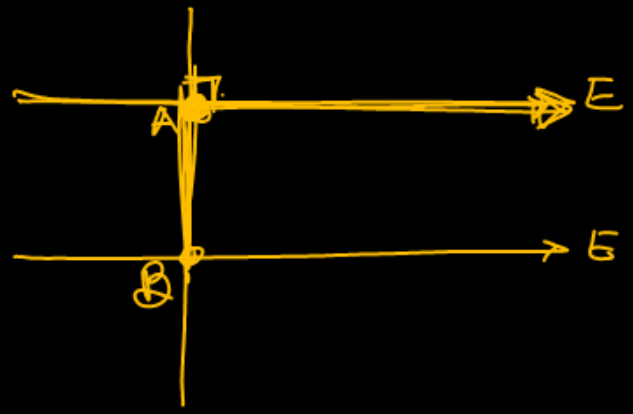
Question no. 32

AAYAM CAREER INSTITUTE

What is the angle between electric field and equipotential surface?

(1) 90° always (2) 0° always

(3) 0° to 90° (4) 0° to 180°



E.P.S.

$\Delta V = -EA\gamma\cos\theta$

$\Delta V = -EA\gamma\cos 90$

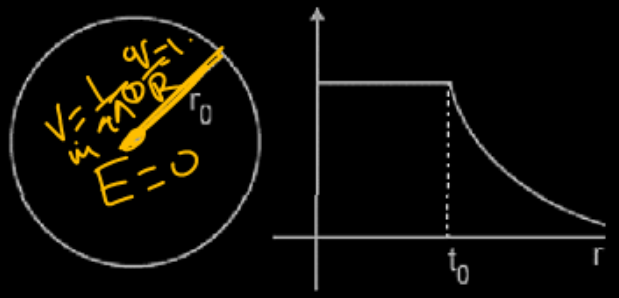
$V_f - V_i = 0$

$V_i = V_f$

$V_A = V_B$

Question no. 33

The given graph shows variation (with distance r from centre) of



$V=\frac{1}{4\pi\epsilon_0}\frac{q}{r}$

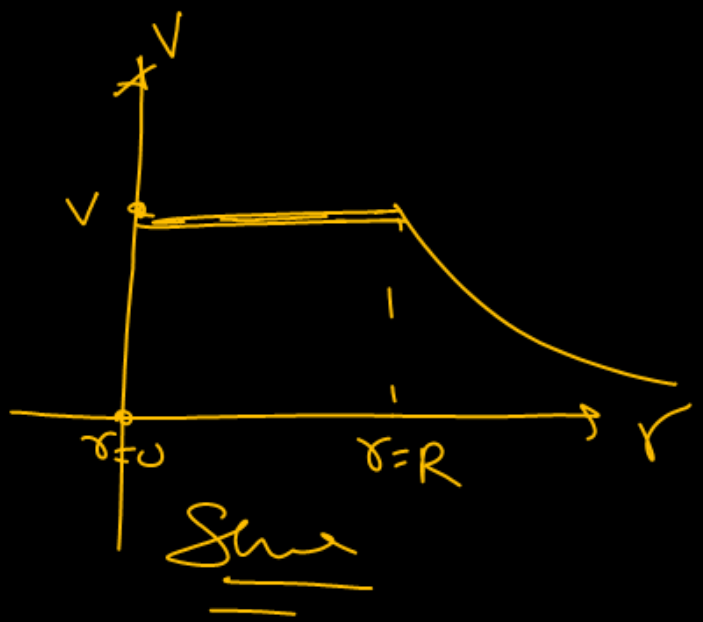
$V\propto\frac{1}{r}$

(1) electric field of a uniformly charged spherical shell

(2) electric field of a uniformly charged sphere

(3) potential of a uniformly charged spherical shell

(4) potential of a uniformly charged sphere



Shell

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Question no. 34

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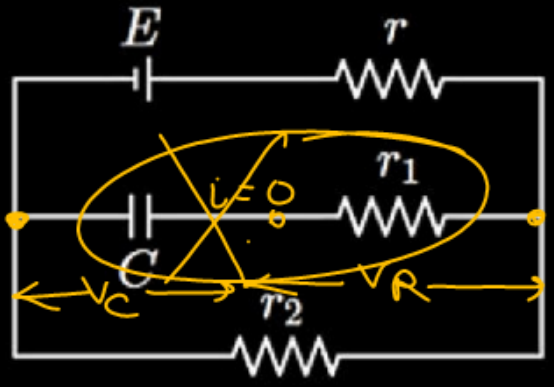
In the given circuit diagram when the current reaches steady state in the circuit, the charge on the capacitor of capacitance C will be

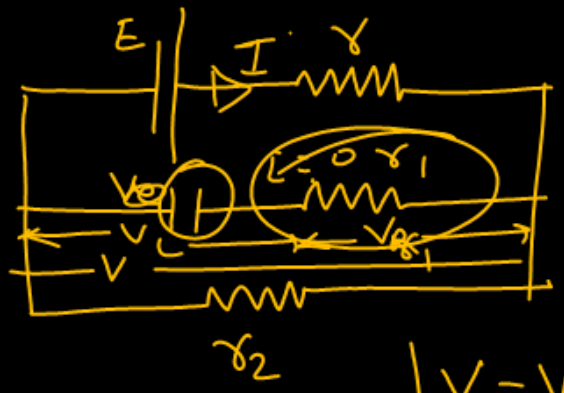


(1) CE

(2) $CE\frac{r_1}{(r_2+r)}$

(3) $CE\frac{r_2}{(r+r_2)}$

(4) $CE\frac{r_1}{(r_1+r)}$



$V_{cell} = I R_{eq}$

$E = I(r + r_2)$

$$I = \frac{E}{r + r_2}$$

$V = I r_2$

$$V = \frac{E}{r + r_2} \cdot r_2$$

$V = V_C + V_{r_1}$

$\left(\frac{E}{r+r_2}\right) r_2 = V_C + I(0)$

$$V_C = \left(\frac{E \cdot r_2}{r + r_2}\right)$$

$q = CV_C$

$$q = \frac{CEr_2}{r + r_2}$$

Question no. 35

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An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?

(1) The electron will be accelerated along the axis.

(2) The electron path will be circular about the axis.

(3) The electron will experience a force at 45° to the axis and hence excrte a helical path.

(4) The electron will continue to move with uniform velocity along the axis of the solenoid.

$F = qVB\sin\theta$

$F = qVB\sin 0$

$F = 0$

$a = 0$

$V = \text{const}$

Question no. 36

A paramagnetic sample shows a net magnetization of 8 A m^{-1} when placed in an external magnetic field of 0.6 T at a temperature of 4K. When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16 K, the magnetization will be

(1) $\frac{32}{3}$ A m^{-1}

(2) $\frac{2}{3}$ A m^{-1}

(3) 6 A m^{-1}

(4) 2.4 A m^{-1}

$$M = \frac{BC}{T} \rightarrow (CT)$$

$$\frac{M_2}{M_1} = \frac{\frac{B_2}{T_2}}{\frac{B_1}{T_1}}$$

$$\frac{M_2}{M_1} = \frac{B_2}{T_2} \times \frac{T_1}{B_1}$$

$$\frac{M_2}{M_1} = \left(\frac{B_2}{B_1}\right)\left(\frac{T_1}{T_2}\right)$$

$$\frac{M_2}{8} = \frac{0.2}{0.6}\left(\frac{4}{16}\right)$$

$$\frac{M_2}{8} = \frac{1}{3} \times \frac{1}{4} \Rightarrow M_2 = \frac{2}{3}$$

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Question no. 37

A series resonant LCR circuit has a quality factor (Q-factor) = 0.4. If $R = 2\ k\Omega$, $C = 0.1\ \mu F$, then the value of inductance is

(1) 0.1 H

(2) 0.064 H

(3) 2 H

(4) 5 H

$$Q = \frac{1}{R}\sqrt{\frac{L}{C}}$$

$$0.4 = \frac{1}{2\times10^{3}}\sqrt{\frac{L}{0.1\times10^{-6}}}$$

$$0.8\times10^{3} = \sqrt{L\times10\times10^{6}}$$

$$0.8\times10^{3} = 10^{3}\times\sqrt{10L}$$

$$\left(\frac{8}{10}\right)^{2} = 10\times L$$

$$\frac{64}{1000} = L$$

$$L = 0.064\ H$$

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Question no. 38

The output of a step-down transformer is measured to be 24 V when connected to a 12 watt light bulb. The value of the peak current is

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

(2) $\sqrt{2}$A

(3) 2A

(4) $2\sqrt{2}$A

$V_{out} = 24$ volt

$P_{In} = 12$ Watt

$P_{In} = P_{out}$

$12 = V_{out} \cdot I_{RMS}$

$12 = 24 \times I_{RMS}$

$I_{RMS} = \frac{1}{2}(A)$

$I_{RMS} = \frac{I_0}{\sqrt{2}}$

$\frac{1}{2} \times \sqrt{2} = I_0$

$I_0 = \frac{\sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{1}{\sqrt{2}}(A)$

Question no. 39

A blue lamp mainly emits light of wavelength 4500 Å . The lamp is rated at 150 W and 8% of the energy is emitted as visible light. The number of photons emitted by the lamp per second is

(1) 3×10^{19} (2) 3×10^{24}

(3) 3×10^{20} (4) 3×10^{18}

$P_{light} = \frac{150 \times 8}{100}$

$P_{light} = 12$ Watt

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

$E = \frac{6.6\times10^{-34}\times3\times10^{8}}{4500\times10^{-10}}$

$E = 4.42\times10^{-19}$

$P_{light} = n E$

$12 = n \times 4.42\times10^{-19}$

$n = \frac{12}{4.42\times10^{-19}}$

$n = 3\times10^{19}$ approx

Question no. 40

AAYAM CAREER INSTITUTE

The de Broglie wavelength λ of an electron accelerated through a potential V in volt is

(1) $\frac{1.227}{\sqrt{V}}$ nm

(2) $\frac{0.1227}{\sqrt{V}}$ nm

(3) $\frac{0.01227}{\sqrt{V}}$ nm

(4) $\frac{12.27}{\sqrt{V}}$ nm

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

$$\lambda_e = \frac{h}{\sqrt{2meV}}$$

$$\lambda_e = \frac{12.27\ \text{Å}}{\sqrt{V}}$$

$$\lambda = \frac{1.227}{\sqrt{V}}\ (\text{nm})$$

Question no. 41

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In a photoelectric experiment, increasing the intensity of incident light

I ↑ n ↑

(1) increases the number of photons incident and also increases the K.E. of the ejected electrons.

(2) increases the frequency of photons incident and increases the K.E. of the ejected electrons.

(3) increases the number of photons incident and the K.E. of the ejected electrons remains unchanged.

(4) increases the frequency of photons incident and the K.E. of the ejected electrons remains unchanged.

Question no. 42

AAYAM CAREER INSTITUTE

Dimensional formula for energy in terms of momentum (p), area (A) and time (T) is

(1) $p^2A^2T^{-1}$ (2) $P^1A^{1/2}T^{-1}$

(3) $P^{1/2}A^1T^{-1}$ (4) $P^0A^{-2}T^{-2}$

Energy = mgh

$= MLT^{-2} \cdot L$

$= ML^2T^{-2}$

$P^2A^2T^{-1}$

$(MLT^{-1})^2 \cdot (L^2)^2 \cdot T^{-1}$

$M^2L^2T^{-2} \cdot L^4 \cdot T^{-1}$

ML^6T^{-3}

$P A^{\frac{1}{2}} T^{-1}$

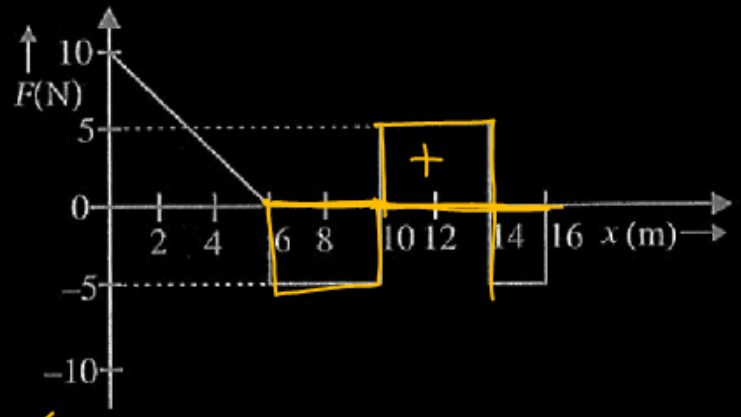
$MLT^{-1} (L^2)^{\frac{1}{2}} T^{-1}$

$MLT^{-1} \cdot L \cdot T^{-1}$

ML^2T^{-2}

Question no. 43

A particle is acted upon by a force F which varies with position x as shown in figure. If the particle at x = 0 has kinetic energy of 25 J, then the kinetic energy of the particle at x=16 m is



(1) 45 J
(2) 30 J
(3) 70 J
(4) 20 J

$W = \frac{1}{2} \times 6 \times 10 - 4 \times 5 + 4 \times 5$

$W = 30 - 10$

$W = 20\ J$

$W = K_f - K_i$

$20 = K_f - 25$

$20 + 25 = K_f$

$K_f = 45\ J$

Question no. 44

An ideal gas has pressure P, volume V and absolute temperature T. If m is the mass of each molecule and K is the Boltzmann constant then density of the gas is

(1) $\frac{Pm}{KT}$ (2) $\frac{KT}{Pm}$

(3) $\frac{Km}{PT}$ (4) $\frac{PK}{Tm}$

$PV = KT$ $\rho = \frac{m}{V}$

$P \cdot \frac{m}{\rho} = KT$ $V = \frac{m}{\rho}$

$\boxed{\frac{Pm}{KT} = \rho}$

$PV = nKT$

$P \frac{m}{\rho} = nKT \Rightarrow \rho = \frac{Pm}{KT}$

$\frac{Pnm}{\rho} = KT$

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Question no. 45

Out of the following function representing motion of a particle which represents SHM?

1. $x = \sin^3 \omega t$
2. $1 + \omega t + \omega^2 t^2$
3. $x = \cos \omega t + \cos 3\omega t + \cos 5\omega t$
4. $x = \sin \omega t + \cos \omega t$

(1) Only 1 (2) Only 1 and 3

(3) Only 1 and 4 (4) Only 4

$x = \sin\omega t + \cos\omega t$

$\frac{dx}{dt} = \omega\cos\omega t - \omega\sin\omega t$

$\frac{d^2x}{dt^2} = -\omega^2\sin\omega t - \omega^2\cos\omega t$

$A = -\omega^2(\sin\omega t + \cos\omega t)$

$A = -\omega^2 \cdot x$

$\frac{d^2x}{dt^2} + \omega^2 x = 0$ $A \propto (-x)$

Question no. 46

One mole of an ideal gas expands isothermally and reversibly from 10 dm^3 to 20 dm^3 at 300 K. ΔU, q and work done in the process respectively are:

Given : R = 8.3 JK^{-1} mol^{-1}

In 10 = 2.3

log 2 = 0.30

log 3 = 0.48

(1) 0, 21.84 kJ, –1.26 kJ

(2) 0, –17.18 kJ, 1.718 J

(3) 0, 21.84 kJ, 21.84 kJ

(4) 0, 1.78 kJ, –1.718 kJ

$\Delta T = 0$; T → Const

$\Delta E = 0$

$\Delta E = q + w$

$0 = q + w$

$q = -w$

$1 dm^3 = 1$ lit

$w = -2.303 n R T \log \frac{V_2}{V_1}$

$= -2.303 \times 1 \times 8.314 \times 300 \log \frac{20}{10}$

$= -2.303 \times 8.314 \times 300 \log 2$

$= -2.303 \times 8.314 \times 300 \times 0.3$

$= -\frac{2.303 \times 831.4 \times 3 \times 0.3}{1000}$

$w = -1.718$ kJ

$w = -q$

$q = -w$

$q = -(-1.718$ kJ$)$

$q = +1.718$ kJ

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Question no. 47

500 J of energy is transferred as heat to 0.5 mol of Argon gas at 298 K and 1.00 atm. The final temperature and the change in internal energy respectively are :

Given : R = 8.3 JK^{-1} mol^{-1}

(1) 348 K and 300 J

(2) 378 K and 300 J

(3) 368 K and 500 J

(4) 378 K and 500 J

$C_V = \frac{3}{2}R = 12.45$

$C_p = \frac{5}{2}R = 20.4$

at Const Pressure

$q_p = nC_p dT$

$500 = 0.5 \times 20.4 \times dT$

$48.5 = dT$

$\Delta U = nC_V dT$

$= 0.5 \times 12.45 \times 48.5$

$\Delta U = 300$

$dT = T_f - T_i$

$T_f = dT + T_i$

$= 48.5 + 298$

$T_f = 346.5\ K$ | 348k

ΔE = heat at Const. volume

$q_V = nC_V dT$

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Question no. 48

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Among the following, the set of parameters that represents path functions, is :

A. $q + w$

B. q

C. w

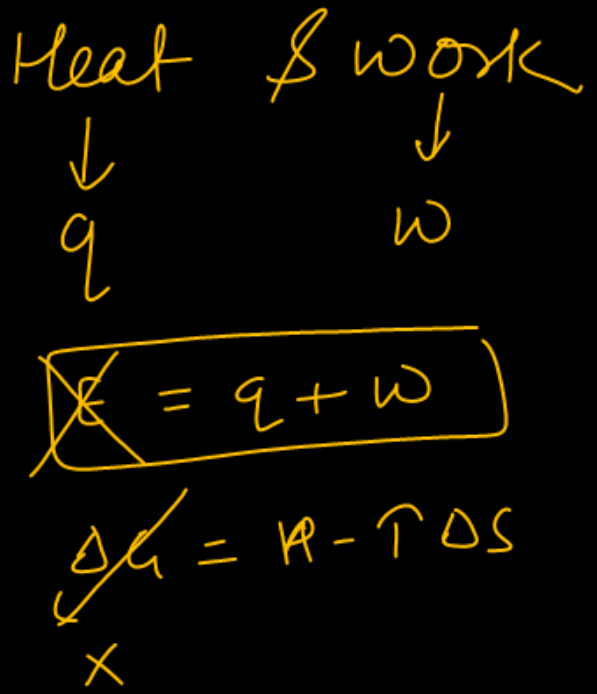
D. $H - TS$

(1) B and C

(2) B, C and D

(3) A and D

(4) A, B and C



Question no. 49

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$$S(g)+\frac{3}{2}O_2(g)\rightarrow SO_3(g)+2xkcal \qquad \Delta H=-2x \quad -(1)$$

$$SO_2(g)+\frac{1}{2}O_2(g)\rightarrow SO_3(g)+ykcal \qquad \Delta H=-y=y \quad -(2)$$

The heat of formation of $SO_2(g)$ is given by:

(1) $\frac{2x}{y}$ kcal

(2) $y-2x$ kcal

(3) $2x+y$ kcal

(4) $x+y$ kcal

$\Delta H = y-2x$

Eqn (2) + Eqn (1)

$\Delta H = y-2x$

Question no. 50

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Based on the below termochemcial equations, find out which one of the following algebraic relationships is correct?

i. $C(\text{graphite}) + O_2(g) \rightarrow CO_2(g); \Delta_r H^0 = x \text{ kJ mol}^{-1}$

ii. $C(\text{graphite}) + \frac{1}{2}O_2(g) \rightarrow CO(g); \Delta_r H^0 = y \text{ kJ mol}^{-1}$

iii. $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g); \Delta_r H^0 = z \text{ kJ mol}^{-1}$

(1) $x = y + z$ (2) $z = x + y$

(3) $y = 2z - x$ (4) $x = y - z$

x

i → x − ①

ii → y − ②

iii → z − ③

Eqn ③ + Eqn ② = Eqn ①

z + y = x

x = y + z

Question no. 51

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$\Delta H = \Delta E$ $\Delta n_g = 0$

For which of the following reactions, ΔH is equal to ΔU?

(1) $N_2(g) + 3H_2(g) \rightarrow 2\ NH_3(g)$ $\Delta n_g = 2 - 4 = -2$

(2) $2\ HI(g) \rightarrow H_2(g) + I_2(g)$ $\Delta n_g = 2 - 2 = 0$

(3) $2\ SO_2(g) + O_2(g) \rightarrow 2\ SO_3(g)$ $\Delta n_g = 2 - 3 = -1$

(4) $2\ NO_2(g) \rightarrow N_2O_4(g)$ $\Delta n_g = 1 - 2 = -1$

Question no. 52

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The heats of combustion of carbon and carbon monoxide are –393.5 and –283.5 kJ mol^{-1}, respectively. The heat of formation (in kJ) of carbon monoxide per mole is:

(1) –676.5 (2) –110.5

(3) 110.5 (4) 676.5

① $C + O_2 \longrightarrow CO_2$ $\Delta H = -393.5$

② $CO + \frac{1}{2} \longrightarrow CO_2$ $\Delta H = -283.5$

$C + \frac{1}{2}O_2 \longrightarrow CO$

Eqn ① + Eqn ② → Sign change ↓ Reverse

$CO + \frac{1}{2}O_2 \longrightarrow CO_2$

$C + O_2 \longrightarrow CO_2$

$CO_2 \longrightarrow CO + \frac{1}{2}O_2$

$C + O_2 \longrightarrow CO + \frac{1}{2}O_2$

$-393.5 + (+283.5)$

$= -110$ kJ

Question no. 53

The enthalpy of neutralization of NH_4OH with HCl is -51.46 kJ mol^{-1} and the enthalpy of neutralisation of NaOH with HCl is -55.90 kJ mol^{-1}. The enthalpy of ionization of NH_4OH is

(1) -107.36 kJ mol^{-1} (2) -4.44 kJ mol^{-1}

(3) $+107.36$ kJ mol^{-1} (4) $+4.44$ kJ mol^{-1}

WB SA

① SA + SB ⟶ Heat = −55.90

② WB + SA ⟶ Heat = −51.46

↳ weak → strong Heat

Eqⁿ ② − Eqⁿ ①

= −51.46 − (−55.90)

= +4.44 kJ/mol

Question no. 54

The enthalpy changes for the following processes are listed below:

$Cl_2(g) = 2\,Cl\,(g)$	242.3 kJ mol^{-1}
$I_2(g) = 2I(g)$,	151.0 kJ mol^{-1}
$ICI(g) = I(g) + Cl(g)$	211.3 kJ mol^{-1}
$I_2(s) = I_2(g)$	62.76 kJ mol^{-1}

Given that the standard states for iodine and chlorine are I_2 (s) and Cl_2(g), the standard enthalpy of formation for ICI(g) is

(1) +16.8 kJ mol^{-1} (2) +244.8 kJ mol^{-1}

(3) −14.6 kJ mol^{-1} (4) −168 kJ mol^{-1}

① $I_2(s) \longrightarrow I_2(g)$ 62.7 $= \frac{1}{2} \times 62.7$ $= 31.35$

② $I_2(g) \longrightarrow 2I(g)$ $= \frac{1}{2} \times 151.0$ $= 75.5$

③ $Cl_2(g) \longrightarrow 2Cl(g)$ $= \frac{1}{2} \times 242.3$ $= 121.3$

④ $I(g) + Cl(g) \longrightarrow ICl(g) = -211.3$

Eq ① + ② + ③ + ④

$= 31.35 + 75.5 + 121.3 - 211.3$

$= +16.8$ kJ

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Question no. 55

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If the bond dissociation energies of XY, X_2 and Y_2 (all diatomic molecules) are in the ratio of 1 : 1 : 0.5 and ΔH_f for the formation of XY is –200 kJ $mole^{-1}$. The bond dissociation energy of X_2 will be

(1) 400 kJ mol^{-1} (2) 300 kJ mol^{-1}

(3) 200 kJ mol^{-1} (4) 100 kJ mol^{-1}

$\frac{1}{2}X_2 + \frac{1}{2}Y_2 \longrightarrow XY$

$x \quad x \quad x/2$

$X_2 + Y_2 \longrightarrow 2XY$

$x \quad x/2 \quad x$

$\frac{1}{2}X_2 + \frac{1}{2}Y_2 \longrightarrow XY$

$x/2 \quad x/4 \quad x/2$

$\Delta H_f = H_R - H_P$

$-200 = [x/2 + x/4] - [x/2]$

$-200 = \frac{2x+x}{4} - x/2$

$-200 = \frac{3x}{4} - x/2$

$-200 = \frac{3x-2x}{4}$

$-800 = x$

$x = -800$

$x/2 = -400$ → Sign रही लगाना

$x = 800$

Question no. 56

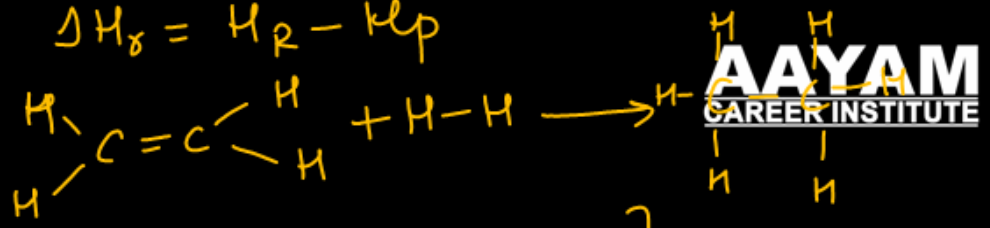
If at 298 K, the bond energies of C – H, C – C, C = C and H – H bonds are respectively 414, 347, 615 and 435 kJ mol^{-1}, the value of enthalpy change for the reaction.

$H_2C = CH_2(g) + H_2(g) \rightarrow H_3C - CH_3(g)$ at 298 will be

(1) –220 kJ (2) +125 kJ

(3) –125 kJ (4) +250 kJ

$\Delta H_r = H_R - H_P$



$\Delta H_r = [4\,C-H + C=C + H-H] - [6\,C-H + C-C]$

$\Delta H_r = [4\times414 + 615 + 435] - [6\times414 + 347]$

$= [1656 + 615 + 435] - [2484 + 347]$

$= 2706 - 2831$

$= -125\ kJ$

Question no. 57

The effect of temperature on spontaneity of reactions are represented as:

	ΔH	ΔS	Temperature	Spontaneity
A.	+	–	Any T	Non spontaneous
B.	+	+	low T	Spontaneous
C.	–	–	low T	Non spontaneous
D.	–	+	Any T	Spontaneous

The incorrect combinations are:

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

(3) B and C only (4) A and C only

Question no. 58

At temperature T, compound $AB_{2(g)}$ dissociates as $AB_{2(g)} \rightleftharpoons AB_{(g)} + \frac{1}{2} B_{2(g)}$ having degree of dissociation x (small compared to unity). The correct expression for x in terms of K_p and p is

(1) $\sqrt[3]{\frac{2K_p}{P}}$ (2) $\sqrt[4]{\frac{2K_p}{P}}$

(3) $\sqrt[3]{\frac{2K_p^2}{P}}$ (4) $\sqrt[3]{K_p}$

$AB_2 \rightleftharpoons AB + \frac{1}{2}B_2$

$2AB_2 \rightleftharpoons 2AB + B_2$

1	0	0	$\Delta n_g = 1$
$(1-x)$	x	$x/2$	$n_T = 1 - x + x + x/2$
			$n_T = (1 + x/2)$

$$K_p = \frac{x^2 \times x/2}{(1-x)^2} \times \frac{P_T^1}{(1+x/2)^1}$$

$$K_p = \frac{x^3 \times P_T \times 2}{(1-x)^2 (2+x)} = \frac{x^3 P_T}{(1-x)^2(2+x)}$$

When x is very small then $1 - x = 1$ and $2 + x = 2$

$$K_p = \frac{x^3 P_T}{2} \qquad \frac{2K_p}{P_T} = x^3$$

$$x = \sqrt[3]{\frac{2K_p}{P_T}}$$

Question no. 59

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

$X \rightleftharpoons Y$; $K_1 = 1.0$

$Y \rightleftharpoons Z$; $K_2 = 2.0$

$Z \rightleftharpoons W$; $K_3 = 4.0$

A → B
B → C
C → D
A → D $K_{eq} = K_1 \times K_2 \times K_3$

$= 1 \times 2 \times 4 = 8$

The equilibrium constant for the reaction $X \rightleftharpoons W$ is

(1) 6.0 (2) 12.0

(3) 8.0 (4) 7.0

Question no. 60

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The equilibrium constant for the reaction.

$SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2}O_2(g)$ is $K_c = 4.9\times10^{-2}$. The value of K_c for the reaction given below is

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

(1) 4.9 (2) 41.6

(3) 49 (4) 416

$K_{eq} = \frac{1}{(K)^2} = \frac{1}{(4.9\times10^{-2})^2}$

$= \frac{1}{4.9\times4.9\times10^{-4}}$

$= \frac{10000}{4.9\times4.9}$

$= 416$

Question no. 61

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In which one of the following equilibria , $K_p \neq K_c$?

(1) $2C(s) + O_2(g) \rightleftharpoons 2CO(g)$ $\Delta ng = 2 - 1 = 1$

(2) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$ $\Delta ng = 0$ $K_p = K_c$

(3) $NO_2(g) + SO_2(g) \rightleftharpoons NO(g) + SO_3(g)$ $\Delta ng = 0$ $K_p = K_c$

(4) $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$ $\Delta ng = 0$ $K_p = K_c$

Question no. 62

At a certain temperature in a 5L vessel, 2 moles of carbon monoxide and 3 moles of chlorine were allowed to reach equilibrium according to the reaction $CO + Cl_2 \rightleftharpoons COCl_2$. At equilibrium, if one mole of CO is present then equilibrium constant (K_c) for the reaction is

(1) 2.5 (2) 4

(3) 2 (4) 3

$CO + Cl_2 \longrightarrow COCl_2$ $\Delta n_g = -ve$

2 3 0

$(2-x)$ $(3-x)$ x

$2-x=1$

$x=1$

$2-1 = 1$ $3-1 = 2$ $= 1$

$K_c = \frac{1}{1\times 2} \times 5$

$= \frac{5}{2} = 2.5$

$K_c = 2.5$

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Question no. 63

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K_1, K_2 and K_3 are the equilibrium constants of the following reactions (I), (II) and (III) respectively.

(I) $N_2 + 2O_2 \rightleftharpoons 2NO_2 \rightarrow K_1$

(II) $2NO_2 \rightleftharpoons N_2 + 2O_2 \rightarrow K_2 = 1/K_1$

(III) $NO_2 \rightleftharpoons \frac{1}{2}N_2 + O_2 \rightarrow K_3 \Rightarrow \frac{1}{(K_1)^{1/2}}$

$K_1 \longrightarrow k_1$

$k_1 = 1/k_2$

$(k_1)^{1/2} = \frac{1}{k_3} = k_1 = \frac{1}{(k_3)^2}$

The correct relation from the following is

(1) $K_1 = \frac{1}{K_2} = \frac{1}{K_3}$

(2) $K_1 = \frac{1}{K_2} = \frac{1}{(K_3)^2}$

(3) $K_1 = \sqrt{K_2} = K_3$

(4) $K_1 = \frac{1}{K_2} = K_3$

$$K_1 = \frac{1}{k_2} = \frac{1}{(k_3)^2}$$

Question no. 64

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Consider the following equation:

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g), \Delta H = -190\ kJ$ Exothermic

The number of factors which will increase the yield of SO_3 at equilibrium from the following is _____

A. increasing temperature

B. Increasing pressure

C. Adding more SO_2

D. Adding more O_2

E. Addition of catalyst

(1) 3 (2) 3

(3) 4 (4) 7

Question no. 65

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200 mL of 0.01 M HCl is mixed with 400 mL of 0.01 M H_2SO_4. The pH of the mixture is ___.

(1) 1.14 (2) 1.78

(3) 2.34 (4) 3.02

$N = 0.01 \times 2 = 0.02\ N$

$[H^+] = [N_R] = \frac{N_1V_1 + N_2V_2}{V_1 + V_2}$

$= \frac{0.01 \times 200 + 0.02 \times 400}{600}$

$= \frac{2+8}{600} = \frac{10}{600} = \frac{1}{60}$

$= \frac{100}{60} \times 10^{-2} = 1.66 \times 10^{-2}$

$[H^+] = 1.66 \times 10^{-2}$

$pH = 2 - \log 1.66$

$= 2 - 0.2$

$= 1.8 = 1.78$

Question no. 66

NaOH is a strong base. What will be pH of 5.0×10^{-2} M NaOH solution? (log 2 = 0.3)

(1) 14.00 (2) 13.70

(3) 13.00 (4) 12.70

$[OH^-] = 5 \times 10^{-2}$

$pOH = 2 - \log 5$

$= 2 - 0.7 = 1.3$

$pH = 14 - 1.3$

$= 12.7$

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Question no. 67

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Species acting as both Bronsted acid and base is

(1) HSO_4^- ✓

(2) Na_2CO_3 ✗

(3) NH_3 ✗

(4) OH^- ✗

-ve ion
- Proton Donate → Acid
- Proton Accept → Base

↳ Amphiprotic substance.

$HSO_4^- \longrightarrow SO_4^{-2} + H^+$

$HSO_4^- + H^+ \longrightarrow H_2SO_4$

Question no. 68

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The first and second dissociation constants fo an acid H_2A are 1.0×10^{-5} and 5.0×10^{-10} respectively. The overall dissociation constant of the acid will be

(1) 0.2×10^{5} (2) 5.0×10^{-5}

(3) 5.0×10^{15} (4) 5.0×10^{-15}

$K_{eq} = K_1 \times K_2$

$K_{eq} = 1\times10^{-5} \times 5\times10^{-10}$

$= 10^{-15} \times 5$

$K_{eq} = 5 \times 10^{-15}$

$H_2A \rightarrow HA^- + H^+$ K_1

$HA^- \rightarrow H^+ + A^{-2}$ K_2

$H_2A \rightarrow 2H^+ + A^{-2}$

$K_{eq} = K_1 \times K_2$

Question no. 69

For a sparingly soluble salt AB_2, the equilibrium concentrations of A^{2+} ions and B- ions are 1.2×10^{-4} M and 0.24×10^{-3} M, respectively. The solubility product of AB_2 is

(1) 0.069×10^{-12}

(2) 6.91×10^{-12}

(3) 0.276×10^{-12}

(4) 27.65×10^{-12}

$AB_2 \longrightarrow A^{+2} + 2B^-$

$S \quad 2S$

$[A^{+2}] = S = 1.2\times10^{-4}$

$[B^-] = 2S = 0.24\times10^{-3}$

$S = 0.12\times10^{-3} = 1.2\times10^{-4}$

$K_{sp} = [A^{+2}][B^-]^2$

$= [S][2S]^2 = 4S^3$

$= 4\times(1.2\times10^{-4})^3$

$= 4\times1.2\times1.2\times1.2\times10^{-12}$

$= 6.9\times10^{-12}$

12×12

$= 144\times125$

1728×4

6.992

Question no. 70

If K_{sp} of Ag_2CO_3 is 8×10^{-12}, the molar solubility of Ag_2CO_3 in 0.1 M $AgNO_3$ is

(1) 8×10^{-12} M (2) 8×10^{-11} M

(3) 8×10^{-10} M (4) 8×10^{-13} M

$Ag_2CO_3 \rightarrow 2Ag^+ + CO_3^{-2}$

$2s \quad s$

$AgNO_3 \rightarrow Ag^+ + NO_3^-$

$c \quad c$

$K_{sp} = [Ag^+]^2 [CO_3^{-2}]$

$= [2s+c]^2 [s]$

$= [4s^2 + c^2 + 4sc][s]$

$= 4s^3 + sc^2 + 4s^2c$

$K_{sp} = sc^2$

$s' = \frac{K_{sp}}{c^2} = \frac{8 \times 10^{-12}}{(0.1)^2}$

$s' = 8 \times 10^{-10}$

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Question no. 71

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The solubility in water of a sparingly soluble salt AB_2 is 1.0×10^{-5} mol L^{-1}. Its solubility product will be

(1) 4×10^{-10}

(2) 1×10^{-15}

(3) 1×10^{-10}

(4) 4×10^{-15}

$AB_2 \longrightarrow A^{+2} + 2B^-$

$S \quad 2S$

$K_{sp} = [S][2S]^2$

$= 4S^3$

$= 4 \times (10^{-5})^3$

$K_{sp} = 4 \times 10^{-15}$

Question no. 72

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Match List – I with List – II.

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

Choose the most appropriate answer from the options given below.

(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

Salt analysis

Basic Radical

I - Ag^{+}, Pb^{+2} → $(NH_4)_2S_8$ → Insoluble

II(A) Cu^{+2} → (H_2S, HCl) → CuS↓ black

II(B) As^{+3} → As_2S_3↓ Yellow

Yellow → YAS. → Soluble

III Al^{+3} → (NH_4OH, NH_4Cl) → $Al(OH)_3$

IV Mn^{+2} → (H_2S, NH_4OH) → MnS↓

Question no. 73

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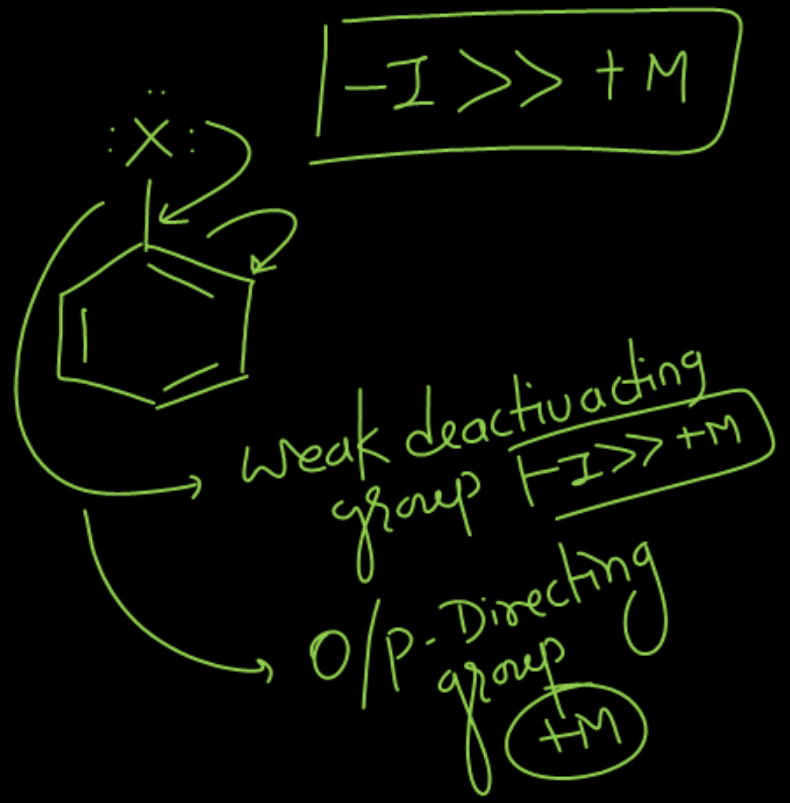
For an electrophilic substitution reaction, the presence of a halogen atom in the benzene ring.

(1) Deactivates the ring by inductive effect.

(2) Deactivates the ring by resonance.

(3) Decreases the electron density at ortho and para-position by resonance.

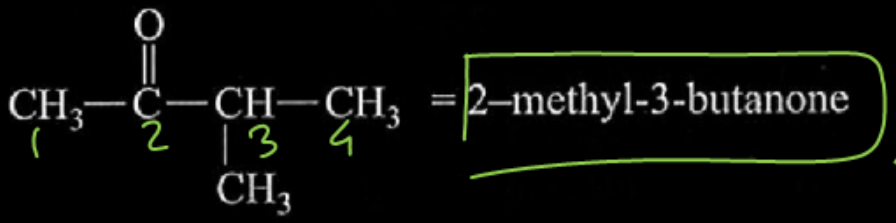
(4) Directs the incoming electrophile to meta-position by increasing the charge density relative to ortho and para-position.



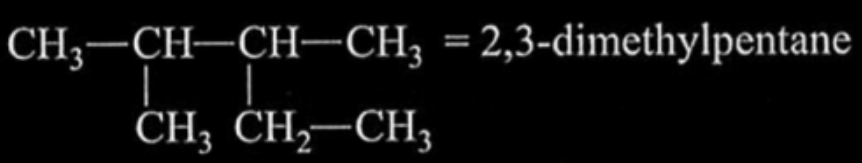
Question no. 74

AAYAM CAREER INSTITUTE

Incorrect IUPAC name is

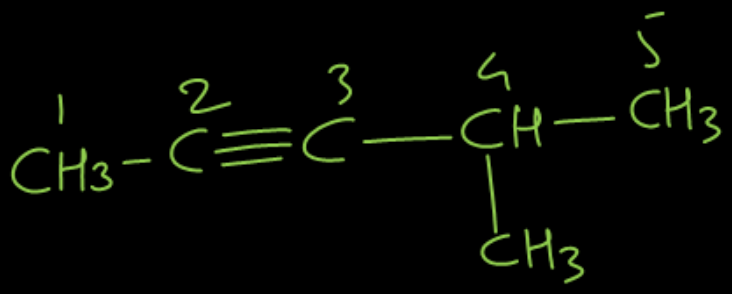
(1)  = 2–methyl-3-butanone

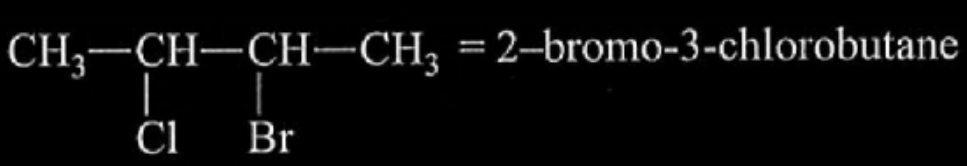
3-methyl butan-2-one

(2)  = 2,3-dimethylpentane

(1)

(3) $CH_3C \equiv C - CH(CH_3)_2$ = 4-methylpent-2-yne



(4)  = 2–bromo-3-chlorobutane

Question no. 75

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Which of the following is a free radical substitution reaction?

(1) Propene with HBr/$(C_6H_5COO)_2$ (FRAR) FRSIR

(2) Benzene with $Br_2/AlCl_3$ (ESR)

(3) Acetylene with HBr (EAR)

(4) Methane with Br_2/hv ⟶ FRSR (4)

Question no. 76

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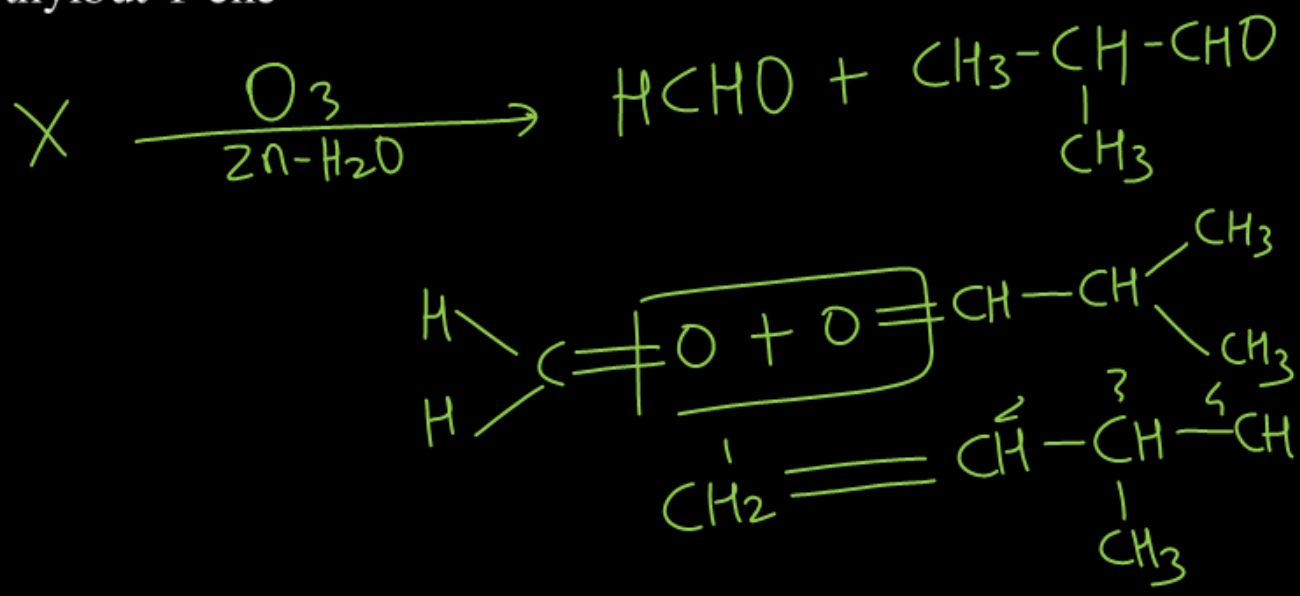
Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methylpropanal as products. The compound X is

(1) 2-Methylbut-2-ene (2) Pent-2-ene

(3) 3-Methylbut-1-ene (4) 2-Methylbut-1-ene

(3)



Question no. 77

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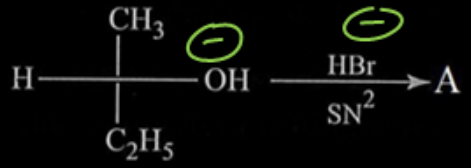
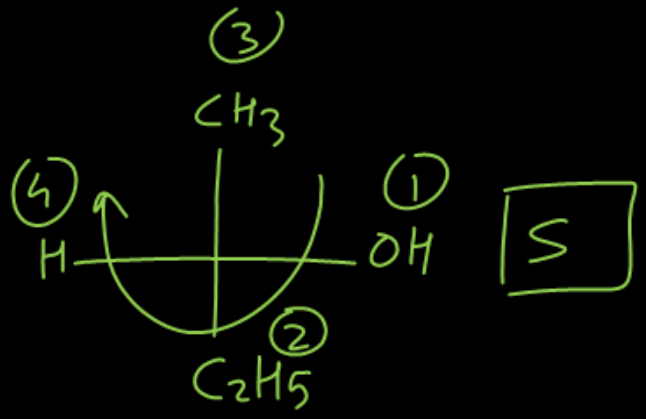
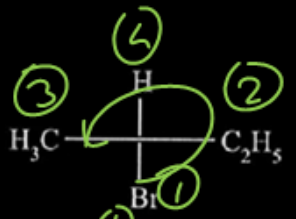
Identify the product A for the following S_N2 reaction–



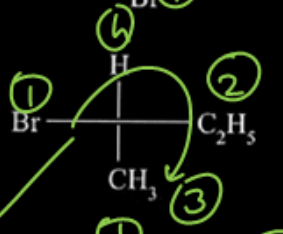


(1)



S

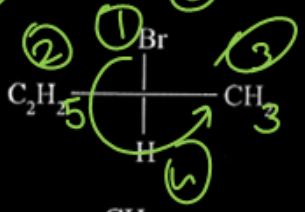
(2)



R

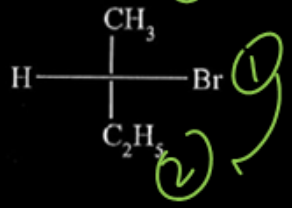
2

(3)



S

(4)



S

Question no. 78

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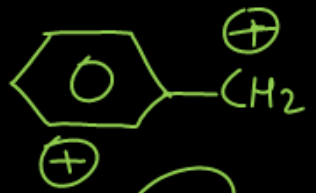
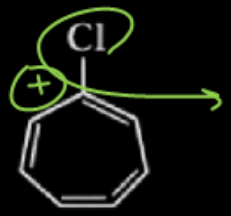
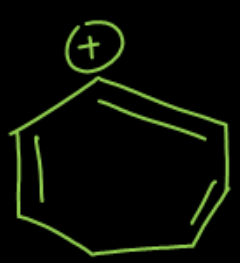
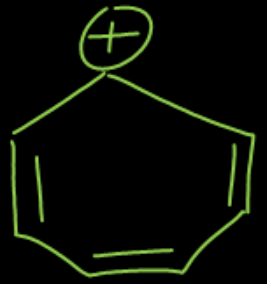
Arrange the following compounds in decreasing order of reactivity in S_Nl reaction.

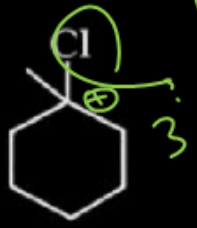
$S_N1 \propto$ stability of $C^{\oplus}$

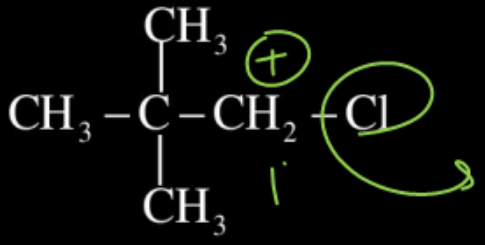
A. 

B. 





C. 

D. 

(1) A > C > B > D

(2) C > D > B > A

(3) A > B > C > D

(4) B > A > C > D

Question no. 79

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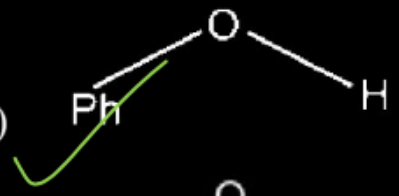
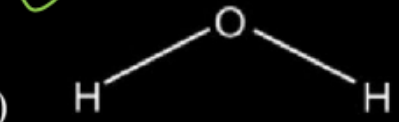
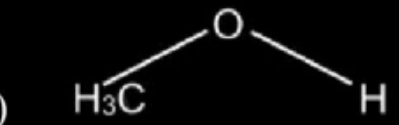
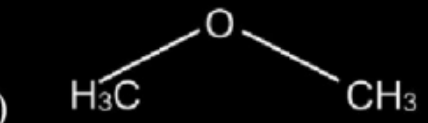
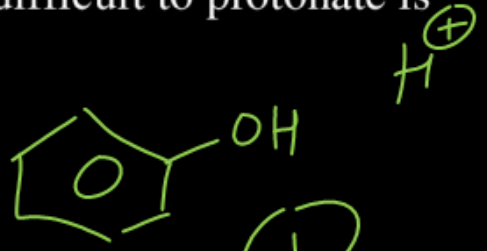
The compound that is most difficult to protonate is

(1) 

(2) 

(3) 

(4) 



$H^{\oplus}$

CH_3OH

CH_3-O-CH_3

Weak Base ⇒ less tendency to accept H^+

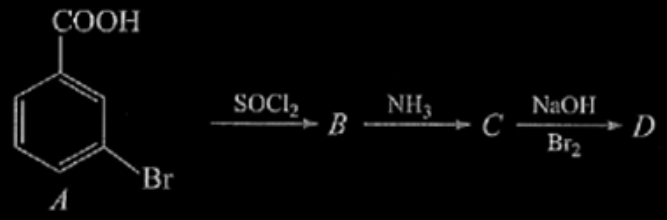
⇓

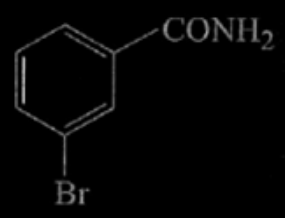
SA

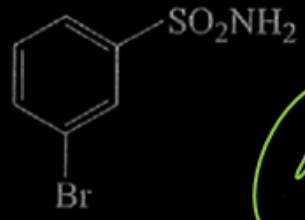
Question no. 80

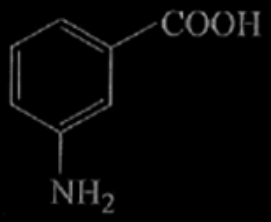
AAYAM CAREER INSTITUTE

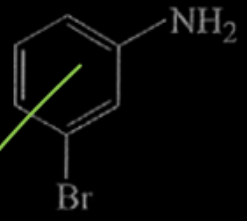
In a set of reactions, m-bromobenzoic acid gave a product D. Identify the product D.

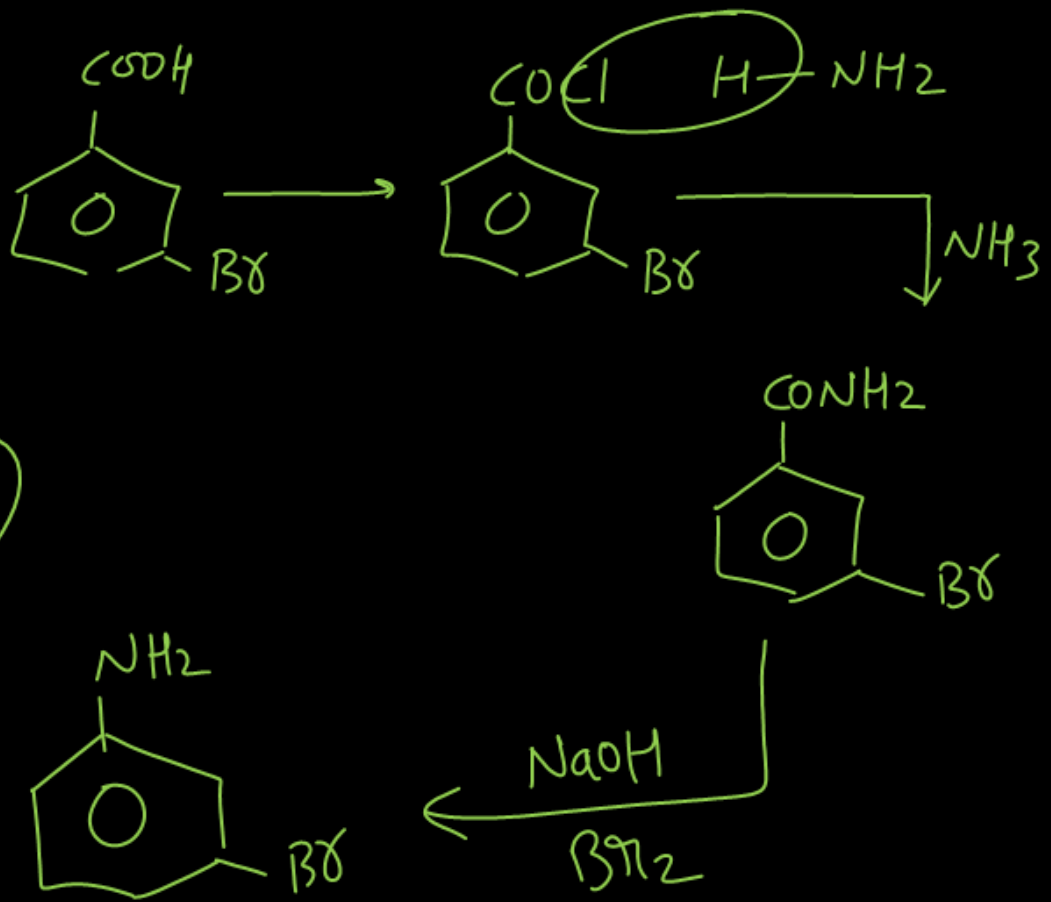


(1) 

(2) 

(3) 

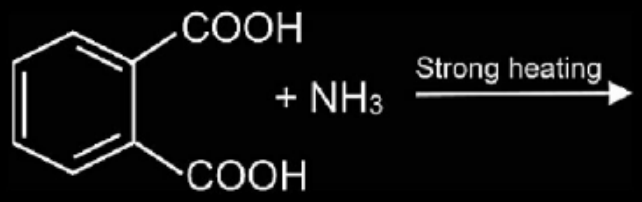
(4) 

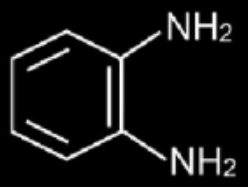


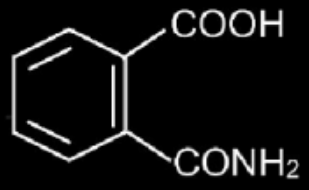
Question no. 81

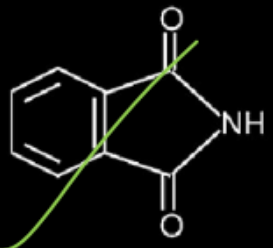
AAYAM CAREER INSTITUTE

The major product of the following reaction is

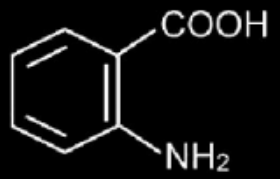


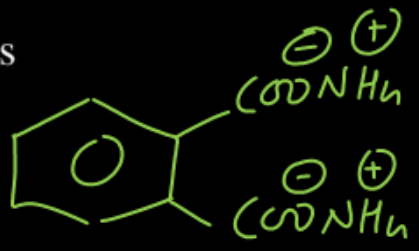
(1) 

(2) 

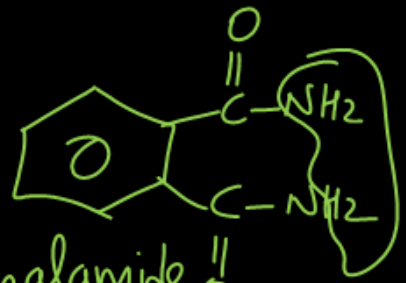
(3) 

3

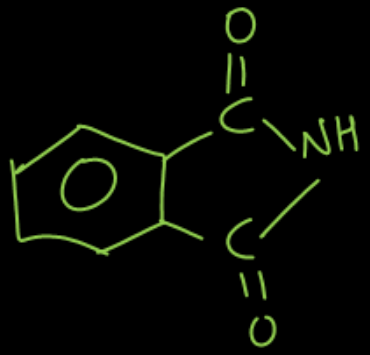
(4) 



Δ
$\xrightarrow{-2H_2O}$



Pthalamide !!



Δ
Strong Heat
$-NH_3$

Question no. 82

AAYAM CAREER INSTITUTE

Match List-I with List-II.

	List-I (Products formed)		List-II (Reaction of carbonyl compound with)
A.	Cyanohydrin	i.	NH_2OH
B.	Acetal	ii.	RNH_2
C.	Schiff's base	iii.	Alcohol
D.	Oxime	iv.	HCN

Choose the correct answer from the options given below:

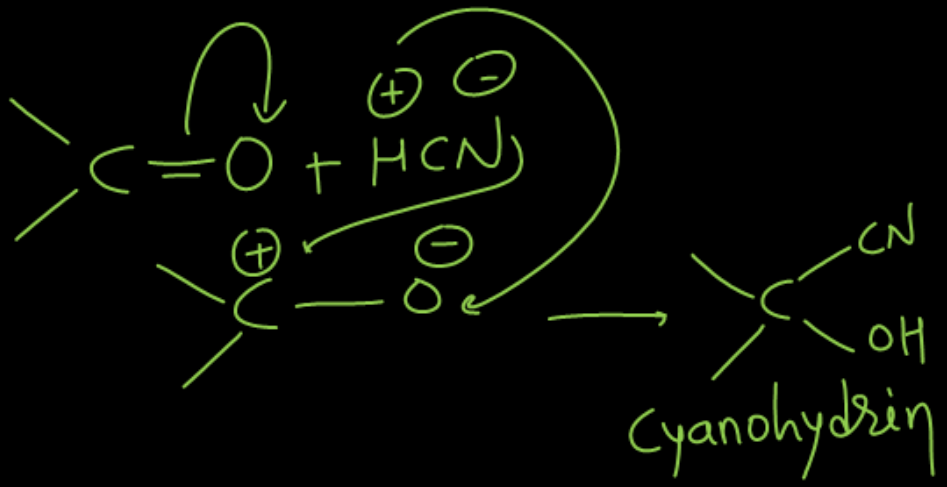
(1) A – i, B – iii, C – ii, D – iv

(2) A – iv, B – iii, C – ii, D – i

(3) A – iii, B – iv, C – ii, D – i

(4) A – ii, B – iii, C – iv, D – i

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



Question no. 83

AAYAM CAREER INSTITUTE

Which of the following reaction is used for the preparation of amine having one C-atom more than the starting material?

(1) $CH_3-CH_2-Cl \xrightarrow[(ii)\ LiAlH_4]{(i)\ KCN} CH_3-CH_2-CN \longrightarrow CH_3-CH_2-CH_2-NH_2$ (2C → 3C)

(2) $CH_3-CH_2-CN \xrightarrow{LiAlH_4} CH_3-CH_2-CH_2NH_2$

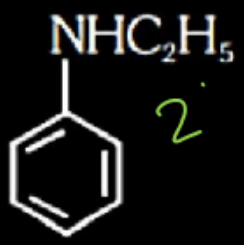
(3) $CH_3-CH_2-NO_2 \xrightarrow{LiAlH_4}$ (1)

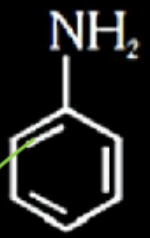
(4) $CH_3-\overset{\overset{O}{\|}}{C}-NH_2 \xrightarrow{LiAlH_4}$

Question no. 84

AAYAM CAREER INSTITUTE

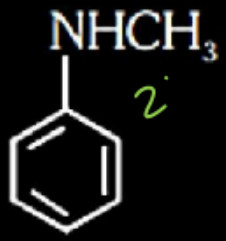
Which of the following amine will give the carbylamines test?

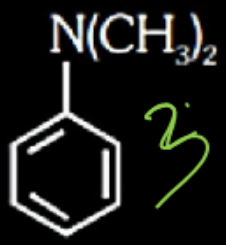
(1) 

(2) 

1° amine
R-NH2

2

(3) 

(4) 

Question no. 85

AAYAM CAREER INSTITUTE

An organic compound 'A' (C_3H_9N) reacts with benzenesulphonyl chloride to give a solid which is insoluble in alkali. The structure of 'A' is.

(1) $CH_3 NH C_2H_5$ 2° amine

(2) $(CH_3)_3N$

(3) $CH_3 CH_2 CH_2 NH_2$

(4) None of these

Hinsberg Reagent

Question no. 86

AAYAM CAREER INSTITUTE

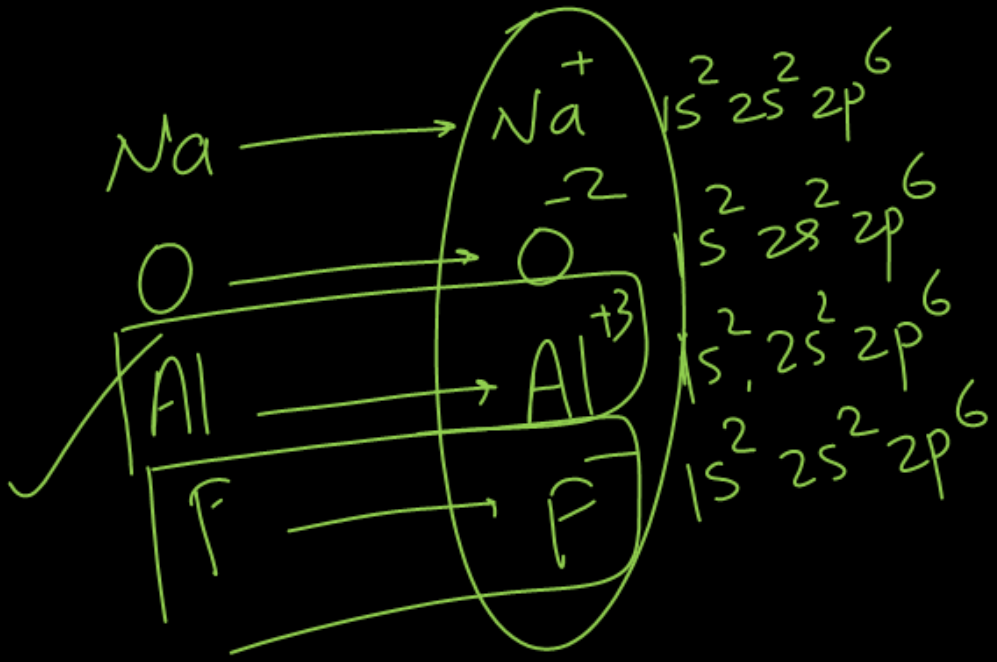
Which of following element will form smallest ion having noble gas configuration.

(1) Na

(2) O

(3) Al

(4) F



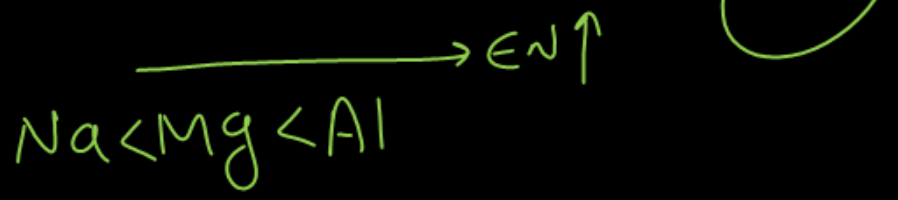
Question no. 87

AAYAM CAREER INSTITUTE

Which of the following electronegativity order is incorrect?

(1) Al < Mg < B < N (2) Al < Si < C < N

(3) Mg < Be < B < N (4) S < Cl < O < F



Question no. 88

AAYAM CAREER INSTITUTE

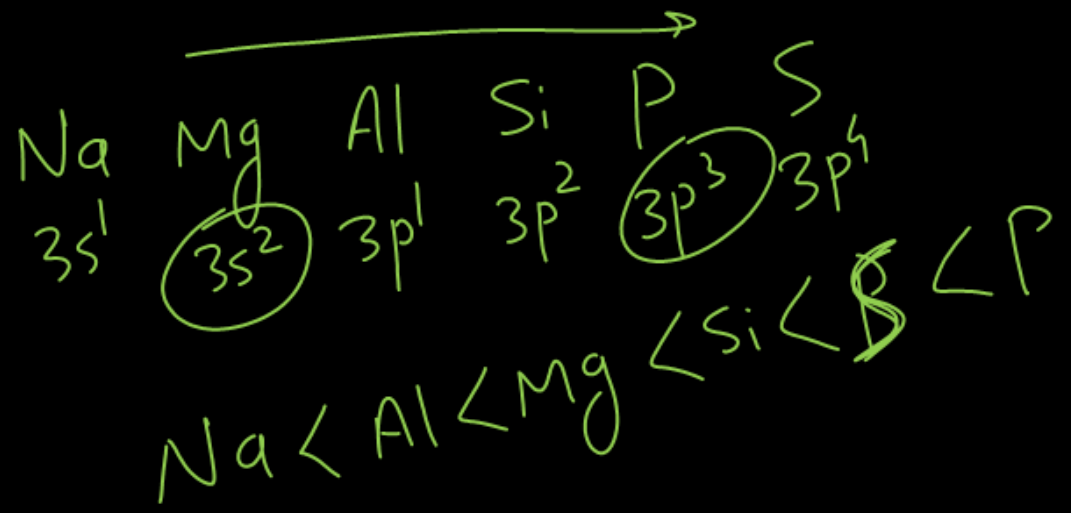
Consider the elements Mg, Al, S, P and Si, the correct increasing order of their first ionization enthalpy is

(1) Mg < Al < Si < S < P

(2) Al < Mg < Si < S < P

(3) Mg < Al < Si < P < S

(4) Al < Mg < S < Si < P



Question no. 89

AAYAM CAREER INSTITUTE

How many of the following statements about C_2 are correct.

(A) It has one Sigma and one Pi – bond.

(B) It has bond order equal to 2.

(C) It has only two Pi bonds and no Sigma bond.

(D) It is a diamagnetic molecule.

(1) Three

(2) One

(3) Two

(4) Four

C_2 B.O. = 2

12 e^- → Diamagnetic

C ≡ C

↳ 2-Bonds

2-Pi-Bonds

0 σ-Bond

Question no. 90

AAYAM CAREER INSTITUTE

Identify the incorrect statements about group 15 elements.

(A) Dinitrogen is a diatomic gas which acts like an inert gas at room temperature.

(B) The common oxidation states of these elements are –3, +3 and +5

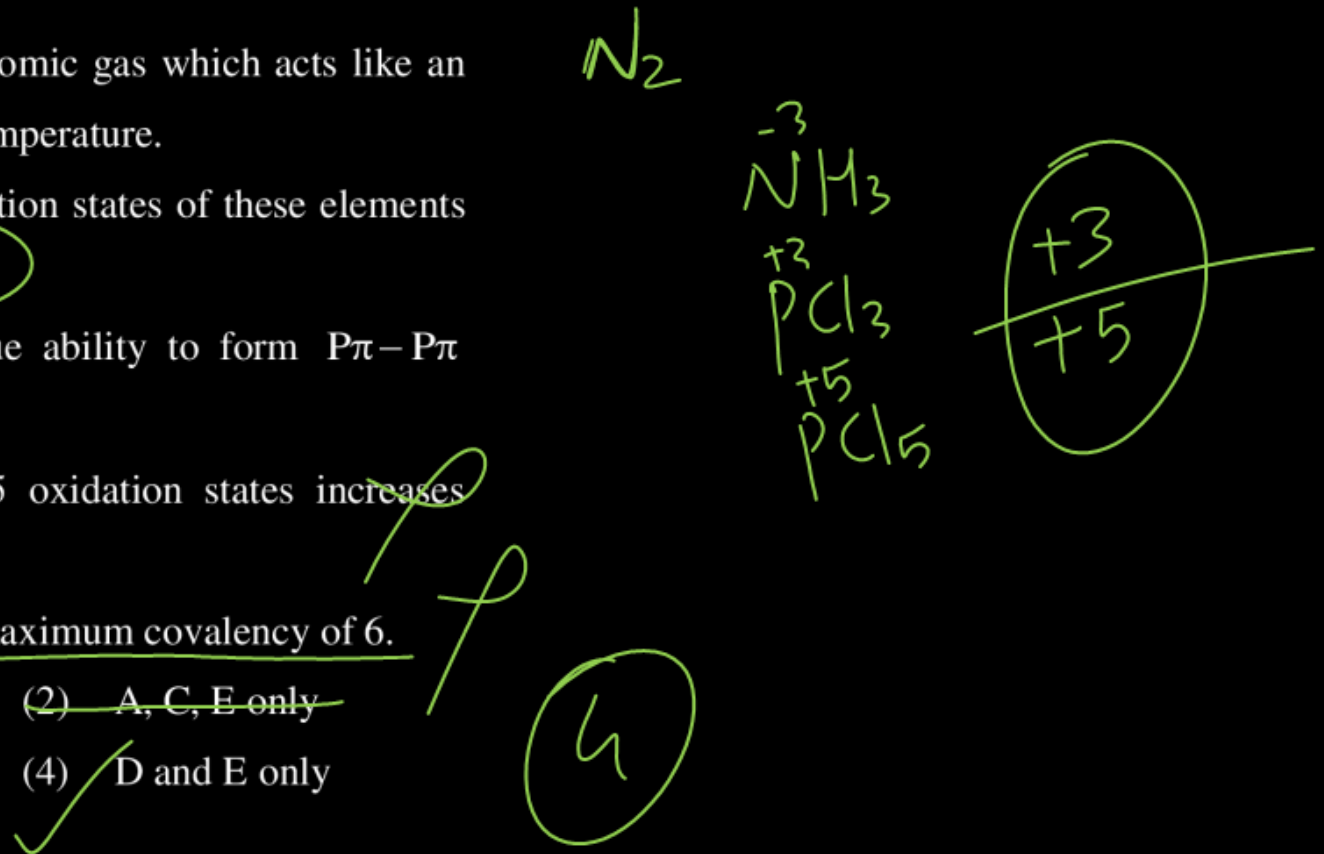
(C) Nitrogen has unique ability to form $P\pi - P\pi$ multiple bonds.

(D) The stability of +5 oxidation states increases down the group.

(E) Nitrogen shows a maximum covalency of 6.

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

(3) B, D, E only (4) D and E only



Question no. 91

AAYAM CAREER INSTITUTE

Plasticity

Environmental heterophylly is seen in

(1) Cotton
(2) Coriander
(3) Larkspur
(4) Buttercup

4

Question no. 92

AAYAM CAREER INSTITUTE

Which plant hormone promotes seed dormancy, bud dormancy and causes stomatal closure?

(1) IAA
(2) Abscisic acid
(3) GA
(4) Cytokinin

2

Question no. 93

AAYAM CAREER INSTITUTE

Which one of the following is a natural growth inhibitor?

(1) NAA

(2) ABA

(3) IAA

(4) GA

2

Question no. 94

AAYAM CAREER INSTITUTE

The ability of plants to follow different pathways in response to environment or phase of life to form different kind of structure is called?

(1) Adaptation
(2) Differntiation
(3) Maturation
(4) Plasticity

Question no. 95

AAYAM CAREER INSTITUTE

I. Lag phase

II. Stationary phase

III. Exponential phase

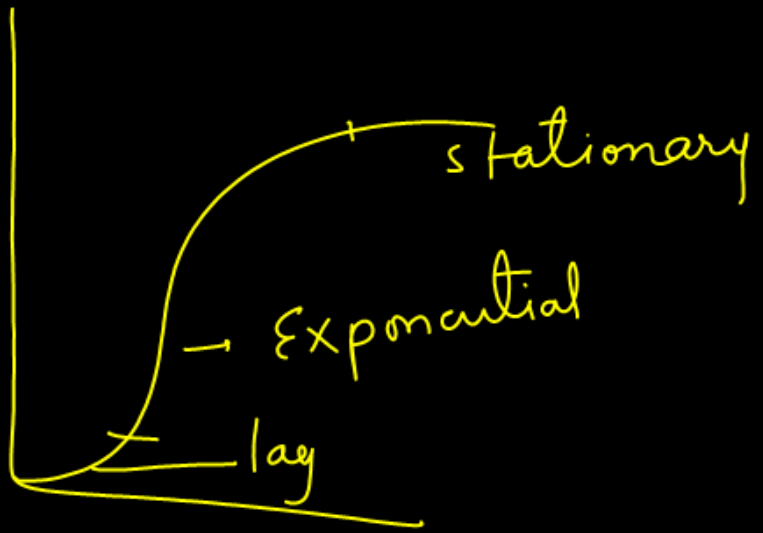
Arrange the above steps of geometrical growth (from beginning to last) in a correct sequence of their occurrence and choose the correct option accordingly

(1) I → II → III

(2) I → III → II

(3) III → II → I

(4) III → I → II



2

Question no. 96

Ethylene

AAYAM CAREER INSTITUTE

One hormone helps in ripening of fruits, while the other is stress hormone. These are respectively-

ABA

(1) Abscisic acid and auxin

(2) Ethylene and abscisic acid

(3) Auxin and ethylene

(4) Ethylene and gibberellic acid

2

Question no. 97

AAYAM CAREER INSTITUTE

Arithmetic growth is linear because

(1) One daughter cell remains meristematic and otherdifferentiates and mature.

(2) Both daughter cell remains meristematic

(3) Both daughter cells gets matured

(4) All of the above

Question no. 98

AAYAM CAREER INSTITUTE

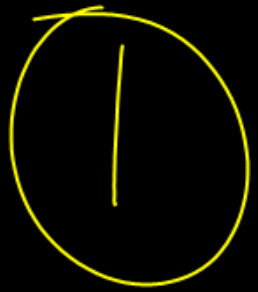
From the following pair of equations which one represents growth in elongation zone and meristematic zone respectively-

(1) $L_t = L_0 + rt$ and $W_t = W_0e^{rt}$

(2) $W_t = W_0e^{rt}$ and $L_t = L_0 + r$

(3) $L_0 = L_t + rt$ and $L_t = L_0 + rt$

(4) $W_t = W_0e^{rt}$ and $W_t = W_0e^{rt}$



Question no. 99

AAYAM CAREER INSTITUTE

Match the following and choose the correct combination.

	Column I		Column II
a.	Zeatin	i.	Terpenes
b.	GA_3	ii.	Synthetic auxin
c.	IBA	iii.	Natural Cytokinin
D.	NAA	iv.	Natural auxin

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

Question no. 100

AAYAM CAREER INSTITUTE

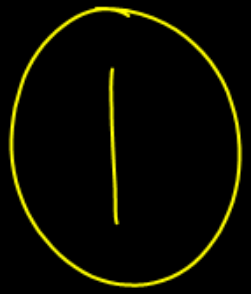
Identify to which plant hormone, the given functions belongs :-

I. Initiates folowering in pineapples.

II. Induces flowering in mango.

III. Root growth and root hair promotion.

	I	II	III
(1)	C_2H_4	C_2H_4	C_2H_4
(2)	C_2H_4	IAA	GA
(3)	C_2H_4	GA	IAA
(4)	C_2H_4	IAA	IBA



Question no. 101

AAYAM CAREER INSTITUTE

Choose the correct statement:-

I. Cytokinin-Delay of leaf senescence ✓

II. Auxin - Xylem differentiation ✓

III. Ethylene - Seed dormancy ✗

IV. Gibberellins - Immature falling of leaves ✗

(1) I and II

(2) I and IV

(3) II and III

(4) II and IV

Question no. 102

AAYAM CAREER INSTITUTE

Study the following statement:-

I. Cytokinins are formed primarily in roots

II. Auxin and cytokinin are antagonistic in apical dominance

III. Kinetin (a modified DNA purine) was discovered from herring sperm

IV. Zeatin is auxin

V. Zeatin was firstly extracted from herring sperm

Choose the incorrect one

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

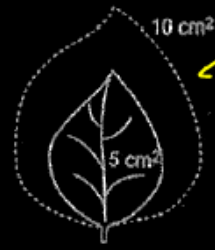
(3) II and III (4) IV and V

4

Question no. 103

AAYAM CAREER INSTITUTE

In the given figure find out the absolute and relative growth rate and choose the correct option:-



Time period 1 - day

Absolute Growth Rate	Relative Growth Rate
(1) 1 cm^2	1 cm^2
(2) 100 cm^2	5 cm^2
(3) 5 cm^2	100 cm^2
(4) 0.5 cm^2	100 cm^2

3

Final - initial

10 - 5

$= 5\ cm^2$

$$\frac{\text{Final - initial}}{\text{initial}} \times 100\%$$

$$= \frac{10-5}{5} \times 100$$

$$= \frac{5}{5} \times 100$$

$= 100\ cm^2$

Question no. 104

AAYAM CAREER INSTITUTE

The following statements are given about plant growth hormones:

I. Cytokinins suppress the synthesis of chlorophyll.

II. Auxins promote abscission in older mature leavesand fruits

III. Gibberellins promote shoot elongation.

IV. Abscisic acid enabling seeds to withstand desiccation.

Which of the above statements are correct?

(1) I and II

(2) II and III

(3) I and III

(4) II, III and IV

4

Question no. 105

AAYAM CAREER INSTITUTE

Match the Column-I and Column-II.

	Column I		Column II
a.	Ethylene	i.	Elongation of stalk of grapes
b.	Gibberellins	ii.	Flowering in mango
c.	Cytokinin	iii.	Avena coleoptile test
d.	Auxin	iv.	Lateral shoot growth

(1) a-i b-ii c-iii d-iv

(2) a-ii b-i c-iii d-iv

(3) a-ii b-i c-iv d-iii

(4) a-ii b-iv c-i d-iii

Question no. 106

AAYAM CAREER INSTITUTE

Which of the following statement(s) with regard to photosynthesis is/are correct?

A. In C_4 plants, the first stable compound is OAA

B. In the photosynthetic process, PS II absorbs energy at or just below 680 nm.

C. The reaction centre that is present in the pigment system I is P_{673}

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

(3) C only (4) A and B only

Question no. 107

AAYAM CAREER INSTITUTE

Arrange the given steps of expiration in the sequence of event occurring first:-

I. Relaxation of the diaphragm and intercostal muscle

II. Reduction of the thoracic volume

III. Expulsion of air from the lungs

IV. Increase in intra pulmonary pressure

(1) I → II → III → IV

(2) I → II → IV → III

(3) IV → III → II → I

(4) IV → II → III → I

Question no. 108

AAYAM CAREER INSTITUTE

Emphysema is a chronic disorder which is characterized:-

(1) Inflammation of trachea

(2) Prolonged nasal congestion

(3) Damaged alveolar walls

(4) Inflammation of lungs

Question no. 109

Match the following columns.

	Column I		Column II
A.	Inspiratory Capacity (IC)	i.	Total air, a person can inspire after normal expiration
B.	Expiratory Capacity (EC)	ii.	Maximal volumeof the air, a person can breath in after a forcedexpiration
C.	Functional Residual Capacity (FRC)	iii.	Volume of the air thatwill remain in lungs after a normal Expiration
D.	Vital Capacity (VC)	iv.	Total volume of air a person can expire after a normal inspiration

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

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

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

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

2

IC :- TV + IRV

EC :- TV + ERV

FRC :- RV + ERV

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Question no. 110

AAYAM CAREER INSTITUTE

Arrange the following in the order of increasing volume :-

I. Tidal volume 500 ml

II. Residual volume 1200 ml

III. Expiratory reserve volume 1100 ml

IV. Vital capacity 4600 ml

(1) I < II < III < IV

(2) I < III < II < IV

(3) I < IV < III < II

(4) I < IV < II < III

2

Question no. 111

$\uparrow CO_2 + H_2O \rightarrow H_2CO_3$ (Acid) $\uparrow$ $\downarrow pH$

AAYAM CAREER INSTITUTE

Mark the correct statement :-

(1) Rise of pCO_2 or fall in pH decreases the affinity of O_2 with haemoglobin

(2) Decrease of pCO_2 or fall in pH increases the affinity of haemoglobin with O_2.

(3) When PO_2 in arterial blood decreases, Breathing becomes faster.

(4) Shifting of the oxygen-dissociation curve to left side shows decreasing affinity.

1

Question no. 112

AAYAM CAREER INSTITUTE

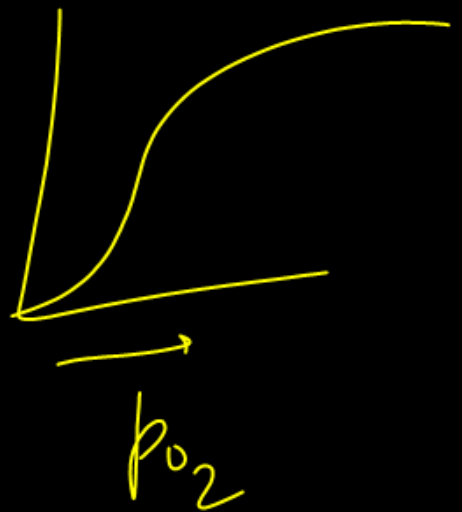
The most important primary factor in determining the percent saturation of haemoglobin with oxygen is :

(1) Partial pressure of oxygen

(2) Acidity

(3) Partial pressure of carbon dioxide

(4) Temperature



Question no. 113

AAYAM CAREER INSTITUTE

Which substances when present in high level can activate the chemosensitive area present adjacent to rhythm centre?

(1) CO_2 and O_2

(2) H^+ ions and O_2

(3) CO_2 and H^+ ions

(4) H^+ and HCO_3 ions

H^+

HCO_3^-

H_2CO_3

H^+

HCO_3^-

4

Question no. 114

AAYAM CAREER INSTITUTE

Find out the amount of O_2 which is delivered by 100 ml of oxygenated blood to the tissue under normal physiological conditions -

(1) 50 ml
(2) 20 ml
(3) 5 ml
(4) 25 ml

3

Question no. 115

If in a person functional residual capacity is 2300 ml, residual volume is 1200 ml and inspiratory capacity is 3500 ml then find out its vital capacity -

(1) 5800 ml (2) 7000 ml

(3) 4600 ml (4) 2300 ml

FRC = RV + ERV

2300 = 1200 + 1100

IC = TV + IRV

3500 = 500 + 3000

VC = TV + IRV + ERV

= 500 + 3000 + 1100

4600 ml

3

Question no. 116

AAYAM CAREER INSTITUTE

Find out the correct match from the following table.

	Column I	Column II	Column III
i.	At tissue level	Po_2 = 40 mm Hg	Pco_2 = 45 mm Hg
ii.	In pulmonar yvein	Po_2 = 95 mm Hg	Pco_2 = 50 mm Hg
iii.	In systemic artery	Po_2 = 40 mm Hg	Pco_2 = 40 mm Hg
iv.	In alveoli	Po_2 = 104 mm Hg	Pco_2 = 40 mm Hg

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

Question no. 117

AAYAM CAREER INSTITUTE

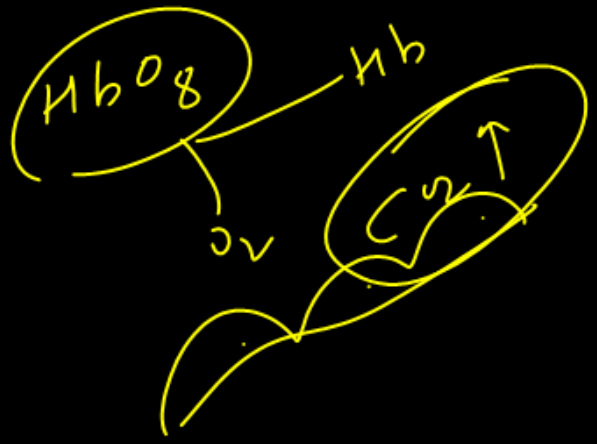
Body tissues obtain oxygen from haemoglobin because of its dissociation in tissues caused by:-

(1) High oxygen concentration

(2) Low oxygen concentration & low CO_2 concentration

(3) Low carbon dioxide concentration

(4) High carbon dioxide concentration & low O_2 concentration



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Question no. 118

AAYAM CAREER INSTITUTE

Which of the following statements is /are correct?

(A) A high concentration of carbonic anhydrase is present in RBC

(B) Minute quantities of carbonic anhydrase is present in plasma

(C) Every 100 ml blood delivers approximately 4 ml of CO_2 to the alveoli

(D) 20-25% CO_2 is carried by heamoglobin as carbaminoheamoglobin

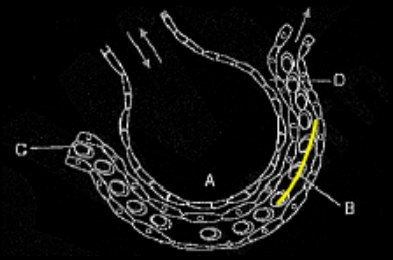
(1) A, C and D (2) A and D

(3) All correct (4) Only A

Question no. 119

AAYAM CAREER INSTITUTE

Choose the option with correct identification of the structures labelled as A, B, C and D with their functions:-



(1) A - Alveolar cavity - main site of exchange of respiratory gases

(2) D - Capillary wall - exchange of gases takes place here

(3) B - Red blood cell - transport of mainly CO_2

(4) C - Arterial capillary - carries oxygen to tissues

Question no. 120

AAYAM CAREER INSTITUTE

Match the following columns:-

	Column I		Column II
A.	Earthworms	i.	Tracheal system
B.	Aquatic arthropods	ii.	Lungs
C.	Molluscs	iii.	Gills
D.	Terrestrial vertebrates	iv.	Moist skin
E.	Insects		

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

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

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

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

Question no. 121

AAYAM CAREER INSTITUTE

When you hold your breathe which of the following gas changes in blood would leads to the urge to breathe?

(1) Falling O_2 concentration

(2) Tuberculosis

(3) Rising CO_2 concentration

(4) Rising CO_2 and falling O_2 concentration

Question no. 122

Cytoplasm

Glycolysis occurs in the ..... and produces ..... Pyruvate

which in the presence of O_2 enters the ..... mitochondria

(1) Cytosol; pyruvate; mitochondrion

(2) Cytosol; glucose; mitochondrion

(3) Mitochondrion; pyruvate; chloroplast

(4) Chloroplast; glucose; cytosol

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Question no. 123

AAYAM CAREER INSTITUTE

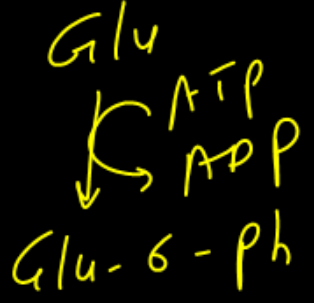
Which of the following steps during glycolysis is associated with utilization of ATP?

(1) Glucose → Glucose-6-Phosphate

(2) Fructose-6-phosphate → Fructose-1,6 bisphosphate

(3) PEP → Pyruvic acid

(4) Both (1) and (2)



Question no. 124

AAYAM CAREER INSTITUTE

Enzyme associated with substrate . level phosphorylation in krebs cycle?

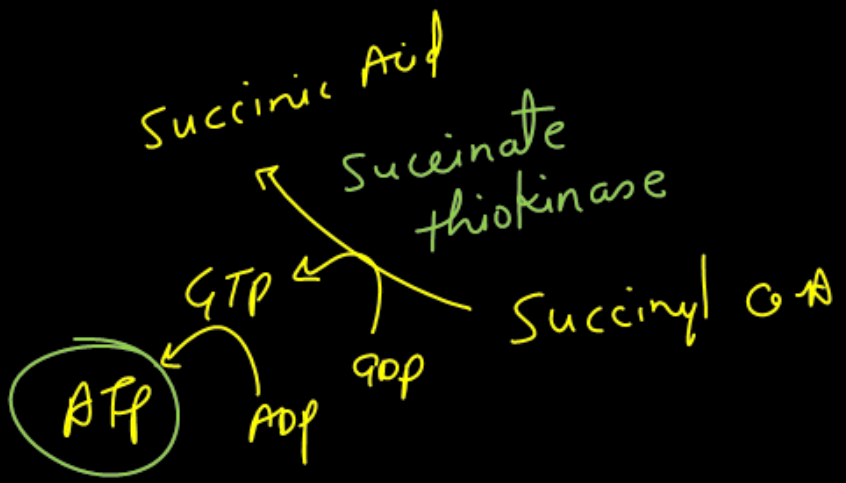
(1) Citrate synthase

(2) Alpha ketoglutarate dehydrogenase

(3) Succinate thiokinase

(4) Malate dehydrogenase

3



Question no. 125

AAYAM CAREER INSTITUTE

Assertion: Krebs cycle is called tricarboxylic acid cycle.

Reason: The first product of krebs cycle is citric acid which is tricarboxylic in nature.

(1) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

(2) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion

(3) Assertion is correct but Reason is incorrect

(4) Both Assertion and Reason are incorrect

Question no. 126

AAYAM CAREER INSTITUTE

Which statement is wrong for Kreb's cycle?

(1) There is one point in the cycle where FAD^+ is reduced to $FADH_2$.

(2) During conversion ofsuccinyl CoA to succinic acid, a molecule of GTP is synthesized.

(3) The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid.

(4) There are three points in the cycle where NAD is reduced to $NADH + H^+$.

OAA

3

Question no. 127

AAYAM CAREER INSTITUTE

Select the incorrectly matched pair.

(1) End products of alcoholic fermentation-Ethanol $+CO_2$

(2) End products of lactic acid fermentation-Lactic acid $+CO_2$

(3) Glycolysis - Cytoplasm

(4) Key product ofglycolysis - Pyruvic acid

2

Question no. 128

AAYAM CAREER INSTITUTE

Choose the correct statements:

(i) Electron transport system occurs in the inner mitochondrial membrane.

(ii) Cytochrome c acts as a mobile electron carrier.

(iii) Oxygen acts as the terminal electron acceptor.

(iv) $FADH_2$ donates electrons to Complex I.

(1) i and ii only

(2) i, ii and iii only

(3) ii, iii and iv only

(4) All i, ii, iii and iv

Question no. 129

AAYAM CAREER INSTITUTE

Out of 38 ATP molecules produced per glucose molecule during respiration:-

(1) Two are produced during Krebs' cycle and 36 during glycolysis

(2) Two are produced outside mitochondria and 36 inside mitochondria

(3) Two are produced during glycolysis, and 36 during Krebs' cycle

(4) All are formed inside mitochondria

2

Question no. 130

AAYAM CAREER INSTITUTE

Match the column-I with column-II and choose the correct combination from the options given below.

	Column I		Column II
A.	Inner mitochondrial membrane	I.	Krebs cycle
B.	Pyruvic acid is converted into CO_2 and ethanol.	II.	ETC
C.	Cytoplasm	III.	Fermentation
D.	Mitochondrial matrix	IV.	Glycolysis

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

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

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

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

Question no. 131

AAYAM CAREER INSTITUTE

In the given columns, column-I contain complexes and column-II contain their alternative names. Select the correct match from the option given below.

	Column I		Column II
A.	Complex I	I.	Cytochrome bc_1 complex
B.	Complex II	II.	NADH dehydrogenase
C.	Complex III	III.	ATP Synthase
D.	Complex IV	IV.	$FADH_2$ dehydrogenase / succinate dehydrogenase
E.	Complex V		Cytochrome c oxidase

(1) A - III; B - V; C - I; D - IV; E - II

(2) A - II; B - V; C - I; D - IV; E - III

(*3) A - II; B - IV; C - I; D - V; E - III

(4) A - IV; B - I; C - II; D - V; E - III

3

Question no. 132

AAYAM CAREER INSTITUTE

Fermentation takes place:-

(1) under anaerobic conditions in many prokaryotes and unicellular eukaryotes.

(2) under aerobic conditions in many prokaryotes and unicellular eukaryotes.

(3) under anaerobic conditions in all prokaryotes and unicellular eukaryotes.

(4) under aerobic conditions in all prokaryotes and unicellular eukaryotes.

Question no. 133

AAYAM CAREER INSTITUTE

Pyruvatedehydrogenase complex is used in converting-

(1) Pyruvate to glucose

(2) Glucose to pyruvate

(3) Pyruvic acid to lactic acid

(4) Pyruvate to acetyl Co-A

4

Question no. 134

AAYAM CAREER INSTITUTE

The enzyme which converts glucose to glucose-6-phosphate -

(1) Phosphorylase

(2) Gluco-phosphorylase

(3) Hexokinase

(4) Phosphoglucomutase

3

Question no. 135

AAYAM CAREER INSTITUTE

Select the incorrect statements:

(i) RQ of fats is less than 1.

(ii) RQ of organic acids is less than 1.

(iii) RQ of proteins is less than 1.

(iv) RQ of carbohydrate is 1.

(1) ii only

(2) I and iii

(3) ii and iii

(4) i, ii and iii

Question no. 136

AAYAM CAREER INSTITUTE

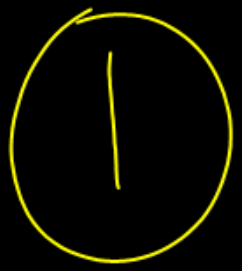
The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that adenosine triphosphate (ATP) is form because-

(1) A proton gradient forms across the inner membrane of mitochondria.

(2) There is a change in the permeability of the inner mitochondrial membrane toward adenosine diphosphate (ADP)

(3) High energy bonds are formed in mitochondrial Proteins

(4) ADP is pumped out of the matrix into the intermembrane space



Question no. 137

AAYAM CAREER INSTITUTE

In glycolysis, the conversion of 1 molecule of glucose to 2 molecules of pyruvic acid produces a net gain of:

(1) 2 ATP and 2 NADH

(2) 4 ATP and 2 NADH

(3) 2 ATP and NADH

(4) 4 ATP and 4 NADH

Question no. 138

AAYAM CAREER INSTITUTE

Match the following :

	Column I		Column II
A.	Heart attack	i.	Due to closer of atrioventricular valves
B.	Lub sound	ii.	Heart muscle is suddenly damaged
C.	Cardiac arrest	iii.	Due to closer of semilunar valves
D.	Dub sound	iv.	Heart stop pumping blood effectively
		v.	Heart stop beating

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

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

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

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

3

Question no. 139

AAYAM CAREER INSTITUTE

Cardiac output is defined as the-

(1) Amount of blood pumped out by each ventricle in one minute

(2) Amount of blood pumped out by each atrium in one minute

(3) Amount of blood pumped out by each ventricle in one second

(4) Amount of blood pumped out by each ventricle in one hour

Question no. 140

AAYAM CAREER INSTITUTE

Which of the following statements is/are correct for blood group?

(i) Blood group O^+ is universal donor.

(ii) Blood group AB^+ is universal recipients.

(iii) Blood group A contains antigen B and anti-A antibodies.

(iv) Blood group B contains antigen B and anti-A antibodies.

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

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

2

Question no. 141

AAYAM CAREER INSTITUTE

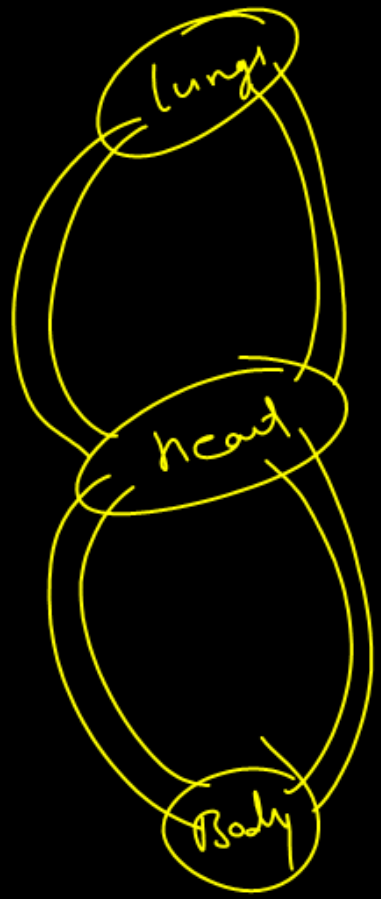
Mammals are said to have a "double circulatory system". This means:

(1) That the blood vessels are paired

(2) That there are two types of blood vessels attached to every organ an artery and a vein

(3) That there are two systems: one from the heart to the lungs and back to the heart and other carries blood from the heart to all parts of body and back again.

(4) That the blood circulates only one time through the heart during one heartbeat.



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Question no. 142

AAYAM CAREER INSTITUTE

Properties of leucocytes are

(I) They are nucleated

(II) They are enucleated like RBC

(III) They are 6000-8000 mm^{-3} of blood

(IV) They are long lived

(V) They are short lived

(1) I, III and V

(2) II, IV and V

(3) I, IV and V

(4) I, III and IV

Question no. 143

AAYAM CAREER INSTITUTE

In which of the following situations, ~~situations~~ there is a risk is factor for children acquiring erythroblastosisfoetalis?

(1) Mother is Rh -ve and father is Rh -ve

(2) Mother is Rh-ve and father is Rh+ve

(3) Mother is Rh +ve and father is Rh+ve

(4) Mother is Rh+ve and father is Rh-ve

2

Question no. 144

AAYAM CAREER INSTITUTE

The thickest layer of the heart which is made up of cardiac muscles is known as:

(1) Endocardium

(2) Pericardium

(3) Epicardium

(4) Myocardium

Question no. 145

AAYAM CAREER INSTITUTE

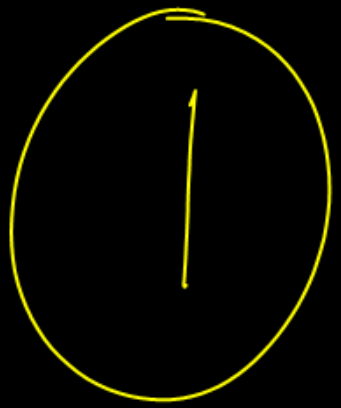
Photosynthetic pigments found in chloroplasts occur in:

(1) Thylakoid membranes

(2) Lumen of thylakoid

(3) Stroma

(4) Chloroplast envelope



Question no. 146

AAYAM CAREER INSTITUTE

Choose the correct statements :-

(i) PS-I absorbs light best at 700 nm

(ii) PS-II absorbs light best at 680 nm

(iii) Both PS-I and PS-II are involved in non- cyclic electron flow.

(iv) Only PS-I is involved in cyclic photophosphorylation.

(1) i, ii and iv

(2) ii, iii and iv

(3) i and iii

(4) All of the above

4

Question no. 147

AAYAM CAREER INSTITUTE

(i) Primary CO_2 acceptor in Hatch and Slack pathway

(ii) Present in mesophyll cell

(iii) Three-carbon compound

Which of the following is defined by the above statements?

(1) Malic acid (2) OAA

(3) PEP (4) RuBP

Question no. 148

AAYAM CAREER INSTITUTE

Photorespiration produces :

(1) Sugar but not ATP

(2) ATP but not sugar

(3) Both ATP and sugar

(4) neither ATP nor sugar

Question no. 149

AAYAM CAREER INSTITUTE

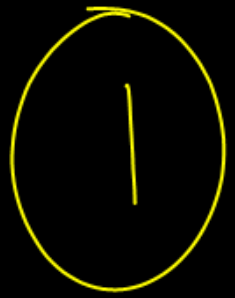
When CO_2 concentration in atmosphere is increased, the rate of photosynthesis in C_3 and C_4 plants will change as follows:

(1) Increased in C_3 and no effect in C_4 plants

(2) Increased in C_3 and C_4 plants

(3) Increased in C_3 and decreased in C_4 plants

(4) No effect on both C_3 and C_4 plants



Question no. 150

AAYAM CAREER INSTITUTE

Choose the correct statements.

(i) Light reaction occurs in the thylakoid membranes.

(ii) Dark reaction occurs only in darkness.

(iii) ATP synthesis in chloroplasts occurs by chemiosmosis.

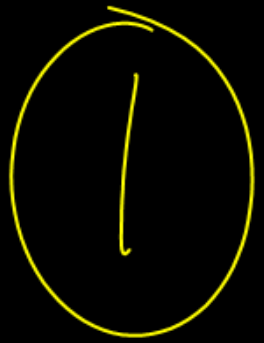
(iv) Photolysis of water occurs in PS-II.

(1) i, iii and iv

(2) i, ii and iii

(3) ii, iii and iv

(4) All of the above



Question no. 151

AAYAM CAREER INSTITUTE

CO_2 saturation point and optimum temperature for C_4 plants respectively is:-

(1) 360 ul/L and above 40° C

(2) 450 ul/L and above 40° C

(3) 450 u/L and at 25° C

(4) 360 ul/Land at 25° C

2

Question no. 152

AAYAM CAREER INSTITUTE

Which photosystem is involved only in cyclic photophosphorylation?

(1) PS-II ×

(2) PS-I ✓

(3) Xanthophyll and PS-II

(4) Xanthophyll and PS-I

Question no. 153

AAYAM CAREER INSTITUTE

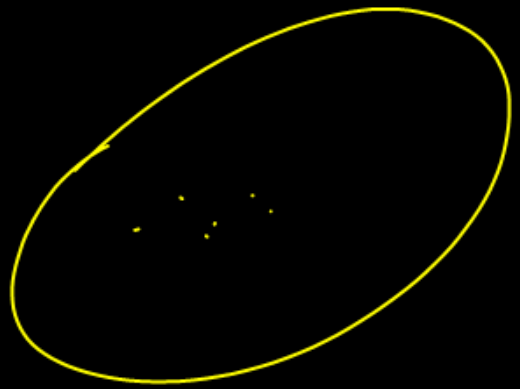
In a chloroplast, the highest number of protons are found in:-

(1) Lumen of thylakoid

(2) Intermembrane space

(3) Antennae complex

(4) Stroma



Question no. 154

AAYAM CAREER INSTITUTE

Which of these is incorrect for C_4 plants?

(1) Kranz anatomy

(2) CO_2acceptor is PEP

(3) PEPcase in mesophyll

(4) RuBisCO in mesophyll

4

Question no. 155

AAYAM CAREER INSTITUTE

What is the site of C_3 cycle in C_3 and C_4 plants?

(1) In C_3 plants-Mesophyll cell and in C_4 plants Bundle sheath cell

(2) In C_3 plants-Bundle sheath cell and in C_4 plants-Bundle sheath cell

(3) In C_4 plants-Mesophyll cell and in C_3 plants-Mesophyll cell

(4) In C_3 plants-Bundle seath cell and in C_4 plants-Mesophyll cell

Question no. 156

AAYAM CAREER INSTITUTE

How many ATP and NADPH are required for the fixation of one molecule of CO_2 in C_4 cycle:-

(1) 3, 2 respectively (2) 2, 2 respectively

(3) 5,2 respectively (4) 2, 3 respectively

3

$6CO_2$ → 30 ATP/6, 12 $NADPH_2$/6 → 1 Glucose

5 ATP
2 NADPH

Question no. 157

AAYAM CAREER INSTITUTE

In C_4 plants synthesis of sugars (final CO_2 fixation) occurs in:-

(1) Epidermal cells

(2) Spongy cells

(3) Undifferentiated mesophyll cells

(4) Bundle sheath cells

Question no. 158

AAYAM CAREER INSTITUTE

Statement I- The stromal lamellae are rich in PS- I and PS-II.

Statement II- The granal membranes are rich in ATP synthase.

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

(2) Statement I is incorrect and statement II is correct

(3) Both statements I and II are correct.

(4) Both statements I and II are incorrect.

2

Question no. 159

AAYAM CAREER INSTITUTE

Find out the correct sequence of main reactions of C_3 cycle.

(1) Carboxylation, reduction, regeneration

(2) Fixation, Decarboxylation, regeneration

(3) Carboxylation, regeneration, reduction

(4) Decarboxylation, Fixation, regeneration

Question no. 160

AAYAM CAREER INSTITUTE

According to widely accepted "fluid mosaic model" cell membranes are semi-fluid, where lipids and integral proteins can diffuse randomly. In this regard, which of the following statement is not correct?

(1) Proteins in cell membranes can travel within the lipid bilayer.

(2) The ability to move within the membrane is measured as its elasticity.

(3) This model was proposed by Singer and Nicolson.

(4) Manyproteins remain completely embedded within the lipid bilayer.

2

Question no. 161

AAYAM CAREER INSTITUTE

Which of the following terms is not correctly matched with its feature?

(1) Osmosis - Movement of water by diffusion.

(2) Nucleoplasm - Site of active synthesis of ribosomal RNA.

(3) Mesosome - Infolding of cell membrane **and** characteristics of ~~eukaryotes~~.

(4) Pili - Elongated tubular surface structures (made of special protein) of bacteria.

3

Question no. 162

AAYAM CAREER INSTITUTE

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

Assertion (A): In honey bee drone have 16 chromosomes while queen has 32 numbers of chromosomes.

Reason (R): Male bees develop from unfertilized egg and female bees from fertilized eggs.

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

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

(2) Both A and R are true but R is **NOT** the correct explanation of A.

(3) A is true but R is false.

(4) A is false but R is true.

Question no. 163

AAYAM CAREER INSTITUTE

Which of the following statement is correct about DNApolymerase ?

(1) DNA polymerase can synthesise mRNA in the 3' → 5' direction.

(2) DNA polymerase can synthesise DNA in the 5' → 3' direction.

(3) DNA polymerase can synthesise mRNA in the 5' → 3' direction.

(4) DNA polymerase can synthesise DNA in the 3' → 5' direction.

2

Question no. 164

AAYAM CAREER INSTITUTE

Cell division cannot be stopped in which phase of the cell eycle?

(1) G_1-phase (2) G_2 phase

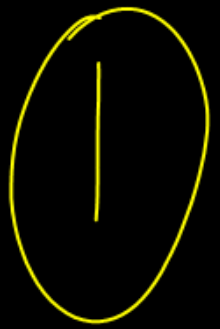
(3) S-phase (4) Prophase

Question no. 165

AAYAM CAREER INSTITUTE

Which of the following is a parasitic fungi on the mustard plant ?:

(1) Albugo
(2) Puccinia
(3) Yeast
(4) Ustilago



Question no. 166

AAYAM CAREER INSTITUTE

From the statements given below choose the **correct** option:

A. Calyx and corolla are reproductive organs of a flower.

B. Zygomorphic flower can be divided into two equal halves through any one plane.

C. Flowers without bracts are termed as ebracteate.

D. Parthenocarpic fruit is formed after fertilization of the ovary.

E. In legumes, seed is non-endospermic.

(1) A, B, C and D

(2) A, B and E only

(3) C, D and E only

(4) B, C and E only

Question no. 167

AAYAM CAREER INSTITUTE

Match **List-I** with **List-II.**

	Column I		**Column II**
A.	Aspergillus niger	i.	Bread
B.	Clostridium butylicum	ii.	Cyclosporin A
C.	Saccharomyces cerevisiae	iii.	Citric acid
D.	Trichoderma polysporum	iv.	Butyric acid

Choose the **correct** answer from the options given below:

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

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

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

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

3

Question no. 168

AAYAM CAREER INSTITUTE

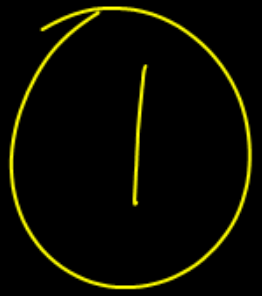
Protein synthesis in an animal cell occurs

(1) on ribosomes present in cytoplasm as well as in mitochondria.

(2) on ribosomes present in the nucleolus as well as in cytoplasm.

(3) only on ribosomes attached to the nuclear envelope and endoplasmic reticulum.

(4) only on the ribosomes present in cytosol.



Question no. 169

AAYAM CAREER INSTITUTE

From the statements given below choose the **correct** option:

(1) Mammals have the ability to produce a concentrated urine.

(2) The flow of filtrate in the two limbs of Henle's loop is in same directions.

(3) NaCl is transported by the descending limbs

(4) PCT is lined by Columnar epithelilum

Question no. 170

AAYAM CAREER INSTITUTE

Match **List-I** with **List-II.**

	Column I		Column II
A.	ICSI	i.	Artificially introduction of semen into the vagina
B.	IUI	ii.	Transfer of ovum collected from a donor into the fallopian tube where fertilisation occurs
C.	IUT	iii.	Formation of an embryo by directly injecting sperm into the ovum
D.	GIFT	iv.	Transfer of embryo with more than 8 blastomeres into the uterus

Choose the **correct** answer from the options given below:

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

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

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

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

Question no. 171

AAYAM CAREER INSTITUTE

Identify the correct statements and choose the appropriate option accordingly.

A. Bowman's capsule is single-layered structure at the end of Henle's loop.

B. Glomerulus along with Bowman's capsule is called the malpighian body.

C. Glomerular filtration rate is amount of filtrate formed by the kidneys per minute.

D. Vasa recta runs parallel to the Henle's loop in the juxtamedullary nephron.

Choose the correct option.

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

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

Question no. 172

AAYAM CAREER INSTITUTE

What will happen to pregnancy if placenta fails to function during the gestation?

(1) The pregnancy would not continue.

(2) The foetus would be born permaturely.

(3) There would be no effect on the pregnancy.

(4) The corpus luteum would continue producing hormone as an alternative source until birth.

Question no. 173

AAYAM CAREER INSTITUTE

Match List-I with List-II.

	List-I		List-II
A.	Ribs are attached to the sternum ventrally and to the vertebrae dorsally.	i.	Trueribs
B.	Ribs join the seventh rib with the help of hyaline cartilage.	ii.	False ribs
C.	Ribs are not attached	iii.	Floating ribs
D.	Flat bone	iv.	Sternum

Choose the correct answer from the options given below:

(1) A – i, B – ii, C – iii, D – iv

(2) A – i, B – iii, C – ii, D – iv

(3) A – ii, B – i, C – iii, D – iv

(4) A – iii, B – ii, C – i, D – iv

Question no. 174

AAYAM
CAREER INSTITUTE

Which of the following best describes an artery?

(1) Carries blood away from the heart.

(2) Carries oxygenated blood.

(3) Contains valves.

(4) Has thin walls.

Question no. 175

AAYAM CAREER INSTITUTE

Staple cereals like rice, wheat, maize, barley and millet are derived from :

(1) Malvaceae
(2) Asteraceae
(3) Poaceae
(4) Brassicaceae

3

Question no. 176

AAYAM CAREER INSTITUTE

Given below are two statements:

Statement I : Cockraches are dioecious.

Statement II : Anal cerci occur in both male and female.

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

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

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

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

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

Anal Style = Male

1

Question no. 177

AAYAM CAREER INSTITUTE

The brain-stem includes the parts of

(1) fore brain and mid brain

(2) mid brain and hind brain

(3) fore brain, mid brain and hind brain

(4) hind brain only

Pons
Medulla.

2

Question no. 178

AAYAM CAREER INSTITUTE

Match List-I with List-II.

	List-I		List-II
A.	Ketonuria	i.	125 mL/minute
B.	GFR	ii.	Mass of crystallised salts within the kidney
C.	Renal calculi	iii.	Inflammation in glomeruli of kidney
D.	Glomerulonephritis	iv.	Presence of ketone bodies in urine

Choose the correct answer from the options given below:

(1) A – iii, B – ii, C – iv, D – i

(2) A – i, B – ii, C – iii, D – iv

(3) A – iv, B – i, C – ii, D – iii

(4) A – ii, B – iii, C – i, D – iv

Question no. 179

AAYAM CAREER INSTITUTE

From the statements given below choose the correct option:

A. Proteins, are heteropolymers containing strings of amino acids.

B. Biologists describe the protein structure at four levels.

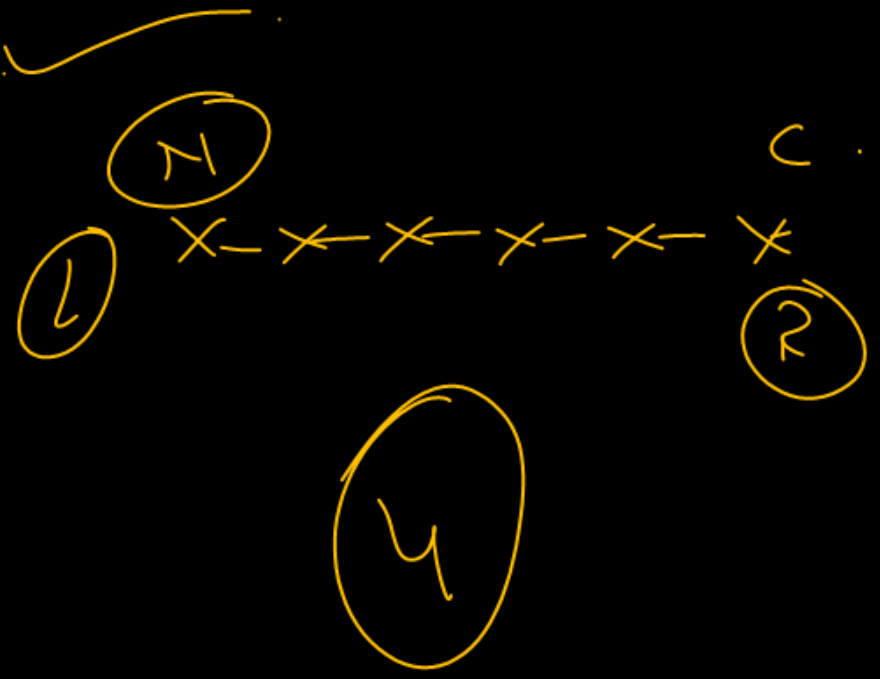
C. The first amino acid is also called as N-terminal amino acid.

D. Only some portions of the protein thread are arranged in the form of a helix.

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

(1) B and C only (2) D and E only

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



Question no. 180

AAYAM CAREER INSTITUTE

Number of carbons in the primary CO_2 fixation products in C_3 plant is.

(1) 3 (2) 4

(3) 5 (4) 6