JEE MAINS 2026

PAPER SOLUTION

21 JAN, SHIFT 1

•LIVE

eSaral Module EX 1A

Q) $\operatorname{cosec} 10^\circ - \sqrt{3}\sec 10^\circ =$

$$\frac{1}{\sin 10^\circ} - \frac{\sqrt{3}}{\cos 10^\circ}$$

$$\frac{\cos 10^\circ - \sqrt{3}\sin 10^\circ}{\sin 10^\circ \cos 10^\circ} = \frac{2\left(\frac{1}{2}\cos 10^\circ - \frac{\sqrt{3}}{2}\sin 10^\circ\right)}{\frac{1}{2}(2\sin 10^\circ \cos 10^\circ)} = \frac{2(\sin(30^\circ - 10^\circ))}{\frac{1}{2}\sin 20^\circ}$$

$= 4$ ✓

Ans. ( )

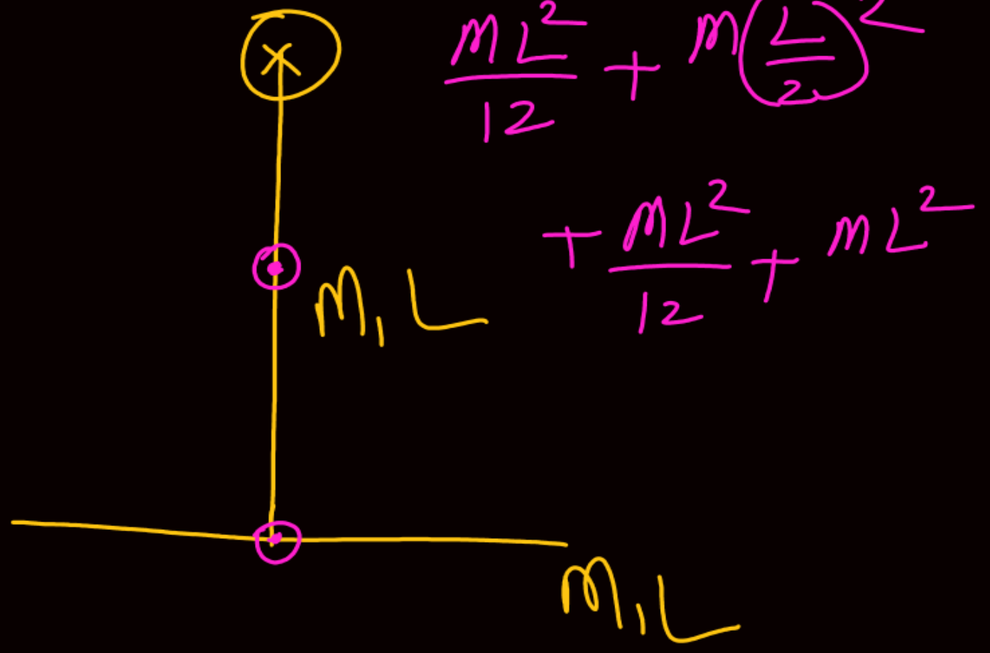
Q) The value of $\text{cosec}10^\circ - \sqrt{3}\sec 10^\circ$

(A) 4
(B) 2
(C) 1
(D) None of these

Q31. Find the value of $\text{cosec}\ 10^\circ - \sqrt{3}\ \sec 10^\circ$.

eSaral Sheet Ex-1A
Chapter Name-Compound Angle

Ans. (A)



Q) If $A = \begin{bmatrix} \alpha & 2 \\ 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 \\ \beta & 1 \end{bmatrix}$ and $A^2 - 4A + 2I = 0$; $B^2 - 2B + I = 0$,
then $|\text{adj}(A^3 - B^3)|$ is equal to

(A) 7 (B) 11 (C) -11 (D) 121

$A^2 - (\alpha+2)A + |A|I = 0$

$\alpha = 2$

$B^2 - tr(B)B + |B|I = 0$

$|B| = 1 \Rightarrow 1 - \beta = 1 \Rightarrow \beta = 0$

$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

$A^2 - tr(A)A + |A|I = 0$

Ans. (B)

$$A = \begin{bmatrix} 2 & 2 \\ 1 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$$

$$A^3 = A \cdot A \cdot A = \begin{bmatrix} 20 & 28 \\ 14 & 20 \end{bmatrix}$$

$$B^3 = B \cdot B \cdot B = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$$

$$A^3 - B^3 = \begin{bmatrix} 19 & 25 \\ 14 & 19 \end{bmatrix}$$

$$|adj(A)| = |A|^{n-1}$$

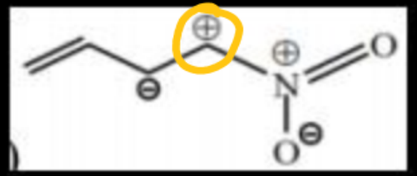
$$|adj(A^2 - B^2)| = |A^2 - B^2|^{2-1}$$

$$= |A^2 - B^2| =$$

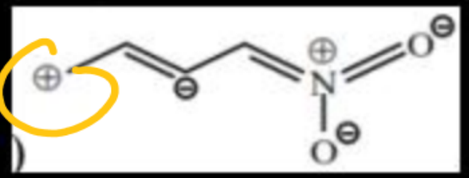
$$= (19)^2 - 14 \times 27$$

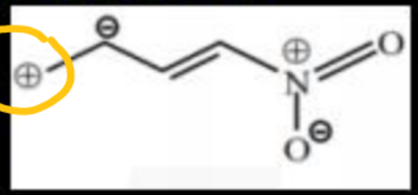
$$= 11$$

Q) Which one among the following resonating structures is not correct?

(A) 

(B) 

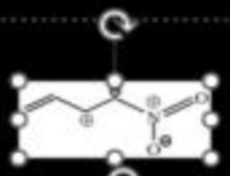
(C) 

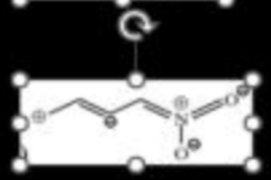
(D) 

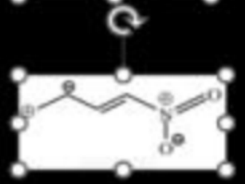
SAME AS MAHAKUMBH

Q) Which one among the following resonating structures is not correct? [PYQ]

(A) 

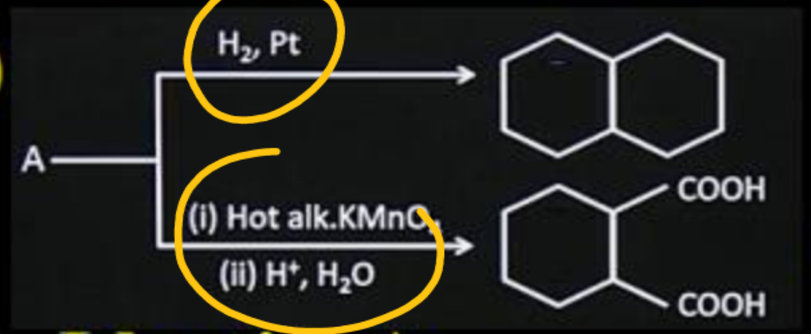
(B) 

(C) 

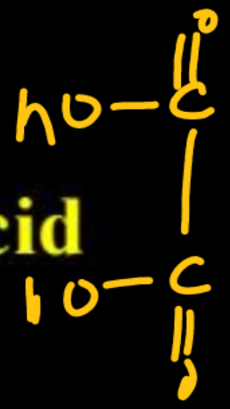
(D) 

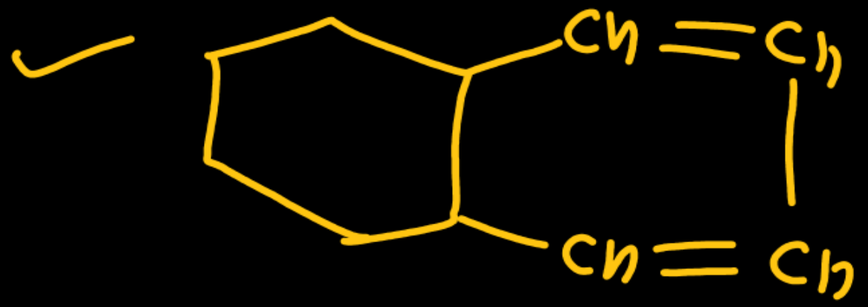
Ans. (A)

Q)



+ oxalic acid





Identify A

Ans. ( )

Q) Statement A: but-2-e show O.I.

Statement B : Propanol & Propanone are F.G.I

Statement C : Pentane & 2,2–Dimethyll propane are C.I

correctly statement

(A) Only A & B

(B) Only A & C

(C) Only B & C

(D) All

Ans. ( )

Q) In 'S' estimation 0.7 g of an organic compound gives 1g $BaSO_4$ in Carius method. What is the % of 'S' in compound? ___

(A) 19.61 (B) 61.20 (C) 80.20 (D) 17.54

$$\% S = \frac{32}{233} \times \frac{1\,gm}{0.7} \times 100$$

$$= 19.61$$

Ans. (A)

Q) Find dimensions of $\frac{A}{B}$ if $\left(P + \frac{At^2}{B}\right) + \frac{1}{2}\rho V^2 = \text{constant}$, where $P \rightarrow$ pressure, $\rho \rightarrow$ density, $V \rightarrow$ speed.

(A) ML^1T^{-4} (B) $ML^{-1}T^{-4}$ (C) ML^2T^{-4} (D) $ML^{-1}T^{-2}$

$$\left[\frac{A}{B}\right] = \left[\frac{P}{t^2}\right] = \frac{ML T^{-2}}{L^2 T^2} = ML^{-1}T^{-4}$$

Q) $\vec{F} = 4t^3\hat{i} - 3t^2\hat{j}$, m = 4 kg at t = 0 particle is at rest and at origin then find velocity and position at t = 2 sec.

$$\vec{a} = \frac{\vec{F}}{4} = t^3\hat{i} - \frac{3}{4}t^2\hat{j}$$

$$\int_0^{\vec{v}} d\vec{v} = \int_0^t \left(t^3\hat{i} - \frac{3}{4}t^2\hat{j}\right)dt$$

$$\vec{v} = \frac{t^4}{4}\hat{i} - \frac{t^3}{4}\hat{j}$$

$$\vec{V} = 4\hat{i} - 2\hat{j}$$

$$\vec{V} = \frac{t^4}{4}\hat{i} - \frac{t^3}{4}\hat{j}$$

$$\int_0^{\vec{s}} d\vec{s} = \int_0^t \frac{t^4}{4}dt\,\hat{i} - \int_0^t \frac{t^3}{4}dt\,\hat{j}$$

$$\vec{s} = \frac{t^5}{20}\hat{i} - \frac{t^4}{16}\hat{j}$$

Q) Find sum of the roots of given equation $(x-1)^2 - 5|x-1| + 6 = 0$ for $x \in R$

$|x-1|^2 - 5|x-1| + 6 = 0$

$t^2 - 5t + 6 = 0$

$t = 2, 3$

$|x-1| = 2, 3$

$x - 1 = \pm 2, \pm 3$

4 sol^n

Ans. (4)

Q) Find the number of relations R which are both reflexive and symmetric R = {a, b, c, d}.

no. of relation both ref & Symm. $= 2^{\frac{n^2-n}{2}} = 2^{\frac{4^2-4}{2}} = 2^6 = 64$

Ans. (64)

Q) If $y = y(x)$ and $(1+x^2)dy + (1-\tan^{-1}x)dx = 0$ and $y(0) = 1$ then $y(1)$ is

(A) $\frac{\pi^2}{32} + \frac{\pi}{4} + 1$ (B) $\frac{\pi^2}{32} - \frac{\pi}{2} + 1$ (C) $\frac{\pi^2}{32} + \frac{\pi}{2} - 1$ (D) $\frac{\pi^2}{32} - \frac{\pi}{4} + 1$

Ans. (D)

$$\int dy + \int \left(\frac{1}{1+x^2}\right)dx - \int \left(\frac{\tan^{-1}x}{1+x^2}\right)dx = 0$$

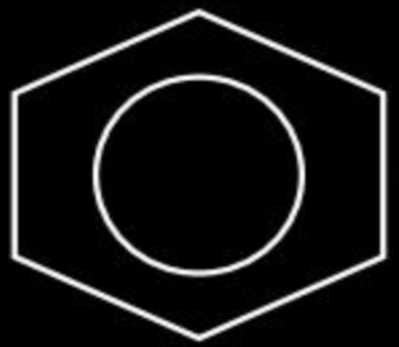
$\tan^{-1}x \Rightarrow t$, $dx = dt$

$$y + \tan^{-1}(x) - \frac{(\tan^{-1}(x))^2}{2} = C$$

$C = 1$

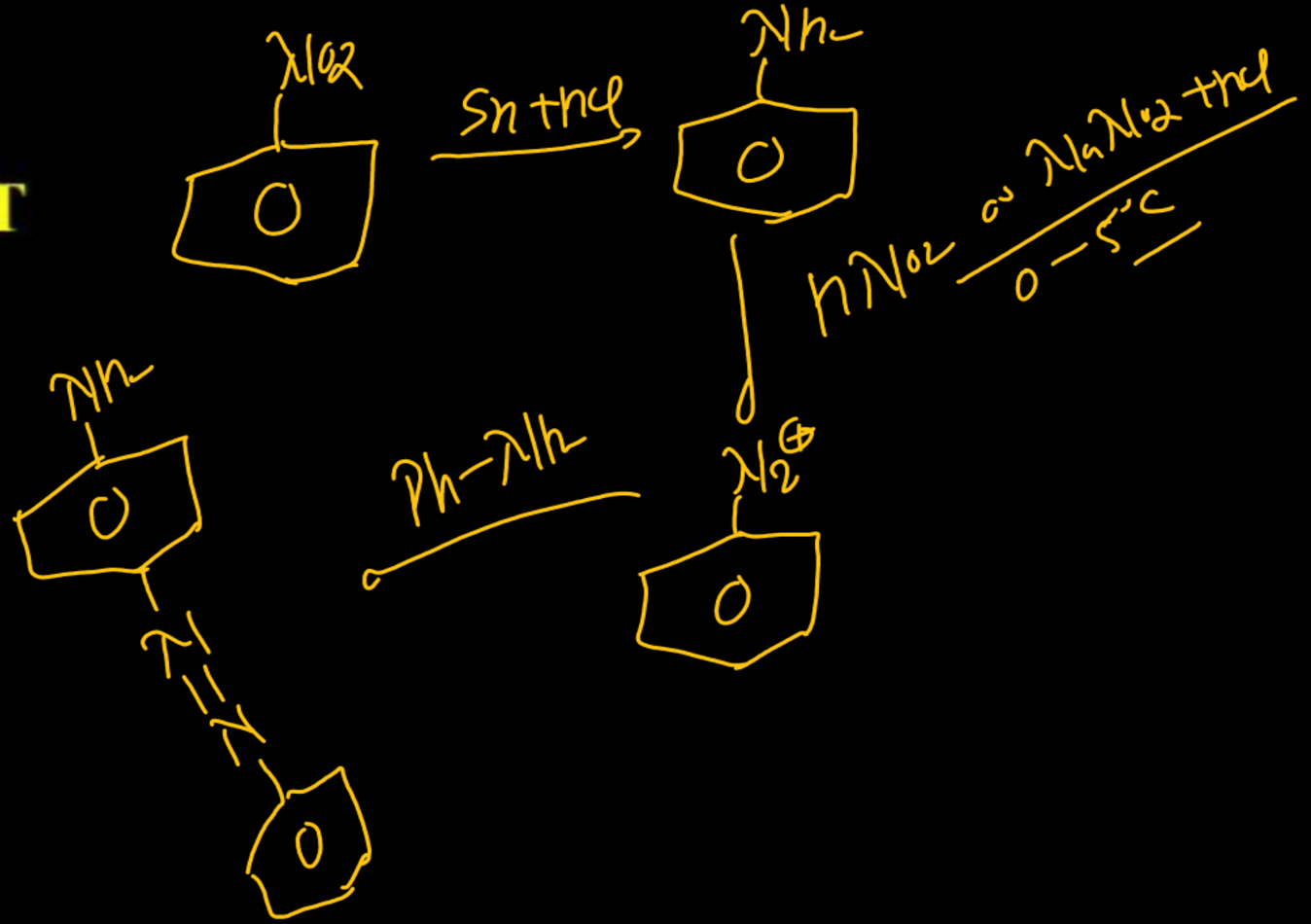
$$y + \left(\frac{\pi}{4}\right) - \frac{\pi^2}{32} = 1$$

Q)



$$\xrightarrow[\text{(iii)}\,HNO_2,0-5^\circ]{\substack{\text{(i)}\,H_2SO_4+HNO_3\\ \text{(ii)}\,Sn+HC\ell\\ \\ \text{(iv)}\,Ph-NH_2}} T$$

% of nitrogen in product T ?



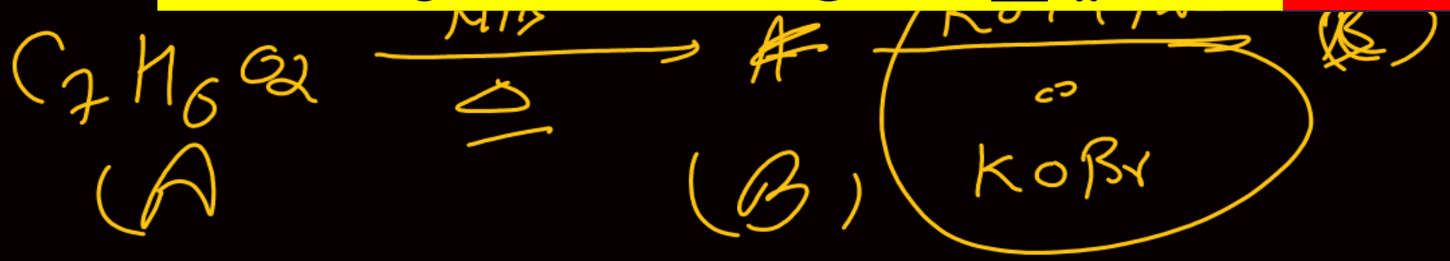
Ans. ( )

Q) Statement - A : Tryptophan, arginine are essential amino Asid
Statement - B : Glycine has no chiral center
Statement - C : proline has 6–membered ring
Statement – D : cysteine is amino acid having sulphur atom

Identity correct statement

(A) A,B
(B) A,B,C
(C) A,C,D
(D) A,B,D

Ans. (D)



$\frac{1}{K_1}+\frac{1}{K_2}=$

Q) Spring constant $k_1 = 2 \pm 0.1$ N/m, $k_2 = 4 \pm 0.1$ N/m are parallel so find % error.

$K_{eq} = K_1 + K_2$

$= (2 \pm 0.1) + (4 \pm 0.1)$

$\boxed{K_{eq} = (6 \pm 0.2)}$

$\% = \frac{0.2}{6} \times 100$

$\% \text{ error} = \frac{10}{3}$

$= 3.33\%$

3 Ans

Ans. (3)

Q) Find power in the circuit

$P = VI$

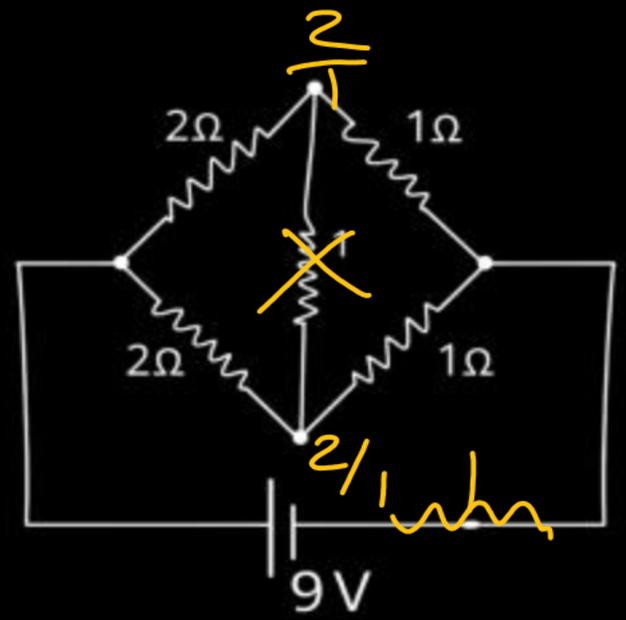
$P = 9 \times 6$

$= 54\ A$

$R_{eq} = \frac{3}{2}$

$i = \frac{9}{3} \times 2$

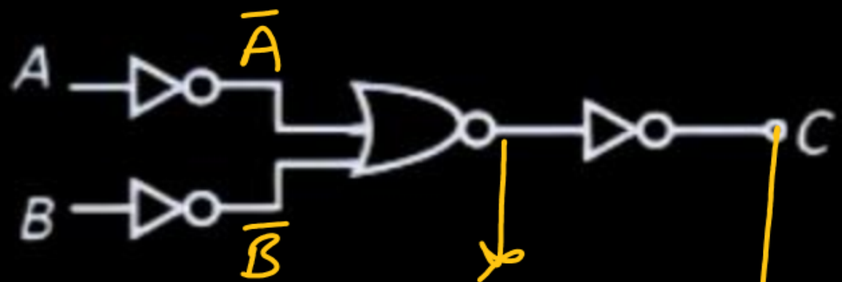
$= 6A$



Ans. (54)

Q) Which logic gate is given in the figure?

(A) XOR (B) NOR
(C) NAND (D) OR

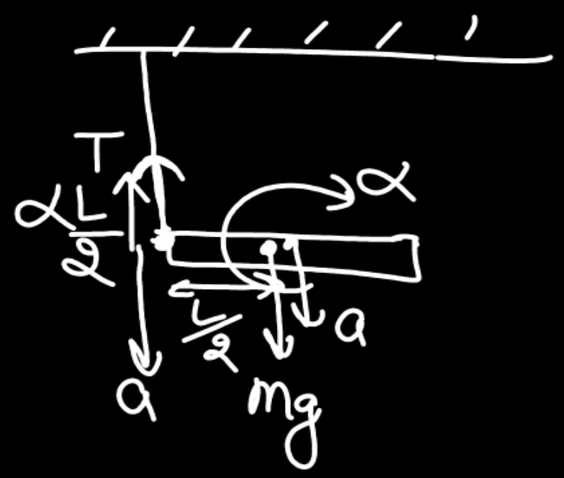


Ans. ( )

Q) A rod of mass m and length *l* is attached to two ideal strings. Find tension in left string just after right string is cut.

(A) $\frac{2}{3}$mg **(B) $\frac{mg}{4}$** **(C) $\frac{mg}{5}$** **(D) $\frac{mg}{2}$**

Ans. (B)



$\alpha\frac{L}{2} = a$

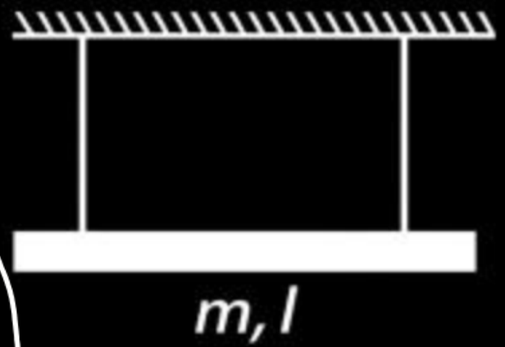
$\alpha L = 2a$

$mg - T = ma \quad \ldots(i)$

$T\left(\frac{L}{2}\right) = \frac{ML^2}{12}\alpha$

$T = \frac{m\alpha L}{6} \quad \ldots(ii)$

$T = \frac{m}{6}(2a) \Rightarrow T = \frac{ma}{3}$



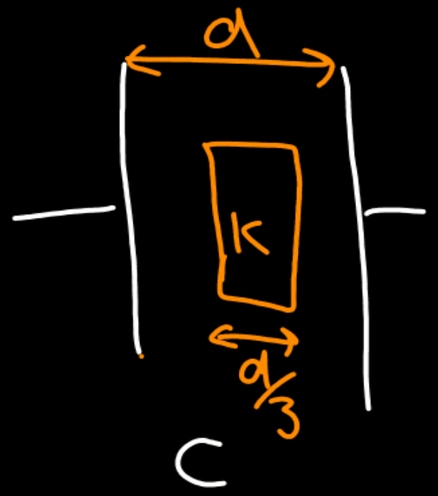
$mg - \frac{ma}{3} = ma$

$mg = \frac{4ma}{3}$

$a = 3g/4$

Q) A capacitor of capacitance C having vacuum if dielectric of width d/3 is inserted in between of dielectric constant k.
Find new capacitance of capacitor

(A) $\frac{3kC}{k+1}$ **(B)** $\frac{kC}{2k+1}$ **(D)** $\frac{3kC}{2k}$ **(D)** $\frac{3kC}{2k+1}$



$$C' = \frac{\epsilon_0 A}{d - t + \frac{t}{k}}$$

$$= \frac{\epsilon_0 A}{d - \frac{d}{3} + \frac{d}{3k}}$$

$$C' = \frac{\epsilon_0 A}{d\left(\frac{2}{3} + \frac{1}{3k}\right)}$$

$$C' = \frac{3k\epsilon_0 A}{d(2k+1)}$$

$$C' = \frac{3kC}{2k+1}$$

Ans. (D)

Q) If $a_1, a_2, a_3, \ldots$ are in increasing geometric progression such that
$a_1 + a_3 + a_5 = 21$,
$a_1 a_3 a_5 = 64$
then $a_1 + a_2 + a_3$ is

(A) 7 **(B) 10** **(C) 5** **(D) 15**

$a, ar, ar^2, \ldots$

$ar^4 = ar^2 \cdot r^2 = 4\left(\frac{4}{a}\right) = \frac{16}{a}$

$a^3 \cdot r^6 = 2^6$

$ar^2 = 4$

$r^2 = \frac{4}{a}$

$a + \underbrace{ar^2}_{4} + ar^4 = 21$

$a + 4 + \frac{16}{a} = 21$

$a^2 + 9a + 16 = 21a$

$a^2 - 17a + 16 = 0 \Rightarrow a = 1, 16$

$(a=1), r = 2$ ✓

$a + ar + ar^2 =$

$1 + 2 + 4 = 7$

Ans. (A)

Q) If $x^2 + x + 1 = 0$,

then $\left(x + \frac{1}{x}\right)^4 + \left(x^2 + \frac{1}{x^2}\right)^4 + \left(x^3 + \frac{1}{x^3}\right)^4 + \cdots + \left(x^{25} + \frac{1}{x^{25}}\right)^4$ is

$x^2 + x + 1 = 0 \Rightarrow x = \omega, \omega^2$

$8\left((-1)^4 + (-1)^4 + (2)^4\right) + (-1)^4$

$= 145$

$\omega + \frac{1}{\omega} = \omega + \omega^2 = -1$

$\omega^2 + \frac{1}{\omega^2} = \omega^2 + \omega = -1$

$\omega^3 + \frac{1}{\omega^3} = 2$

Ans. (145)

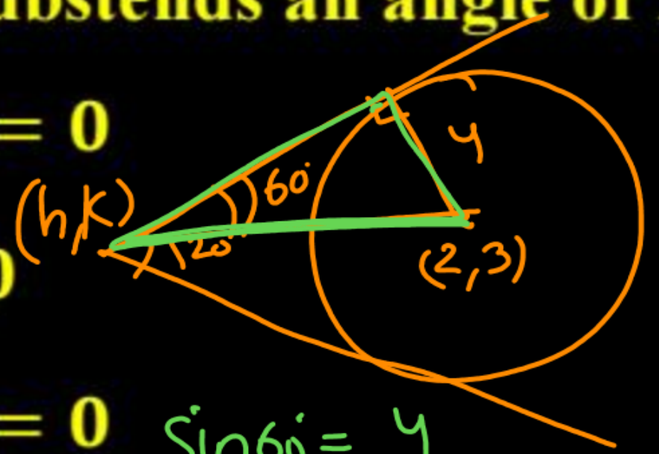
Q) The locus of point of intersection of tangent drawn to the circle $(x-2)^2+(y-3)^2=16$, which substends an angle of 120° is

(A) $3x^2+3y^2+12x+18y-25=0$

(B) $x^2+y^2-12x-18y-25=0$

(C) $3x^2+3y^2-12x-18y-25=0$

(D) $x^2+y^2+12x+18y-25=0$



$\sin 60^\circ = \dfrac{4}{\sqrt{(h-2)^2+(k-3)^2}}$

$(h-2)^2+(k-3)^2=\left(\dfrac{4}{\sqrt{3}}\times 2\right)^2$

Ans. (C)

Q) The value of $\int_0^{\pi/2} |\sin x + \sin 2x + \sin 3x|\, dx$ is

(A) 17 **(B) 16** **(C) 15** **(D) 14**

$$\int_0^{\pi} |2\sin 2x\cos x + \sin 2x|\, dx$$

$$= \int_0^{\pi} |\sin 2x|\,|2\cos x + 1|\, dx$$

$$= 2\int_0^{\pi} \sin x\,|\cos x(2(\cos x + 1)|\, dx$$

$\cos x = t$

$-\sin x\, dx = dt$

$$-2\int_1^{-1} |t(2t+1)|\, dt$$

$$\int_{-1}^{1} |2t^2 + t|\, dt$$

$$\int_{-1}^{-\frac{1}{2}} + \int_{-\frac{1}{2}}^{0} -(\,) + \int_{0}^{1} (\,)\, dt$$

$$= \frac{17}{6}$$

Ans. (A)

Q) Which of the following is the correct order with respect to the property indicated?

(A) Cl > F (Ionisation energy)

(B) (K_2O > Na_2O > Al_2O_3 (Basic nature)

(C) K > Na > Al > Mg (metallic character)

(D) None of these

Ans. (B)

Q) For two chemical reactions A and B, if the difference between their activation energy is 20 kJ at 300 K ($R = 8.3\ J\ K^{-1}\ mol^{-1}$).

Determine $\ln \frac{k_2}{k_1}$.

$$K_1 = A\, e^{-E_1/RT}$$

$$K_2 = A\, e^{-E_2/RT}$$

$$\frac{K_2}{K_1} = e^{(E_{a_1} - E_{a_2})/RT} \Rightarrow \ln \frac{K_2}{K_1} = \frac{\Delta E}{RT}$$

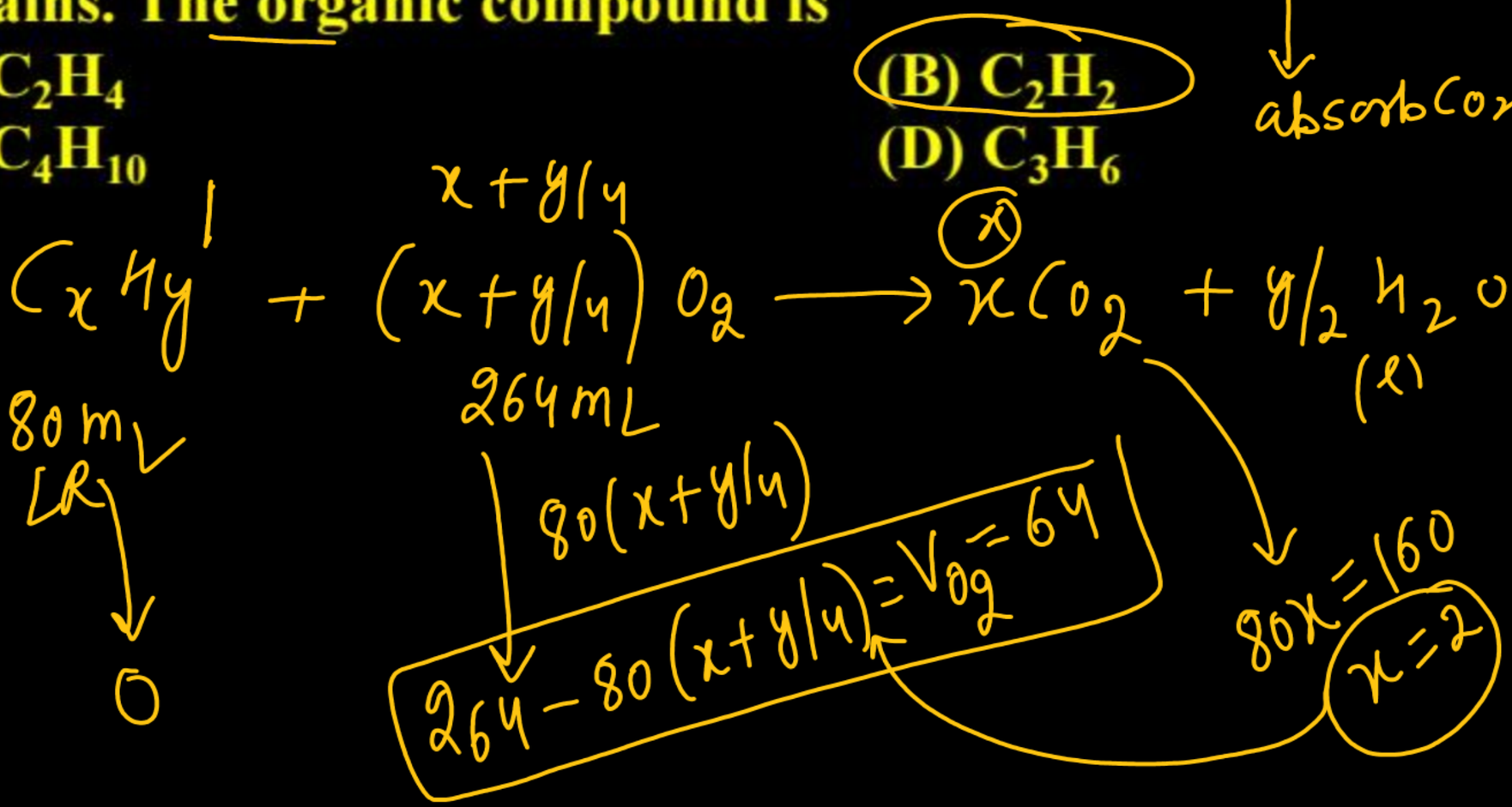
$$= \frac{20 \times 10^3}{8.3 \times 300}$$

Ans. ( )

$\frac{200}{80} = (x + y/4)$ $y = 2$

Q) 80 mL of organic compound is mixed with 264 mL O_2 and ignited. It gives 224 mL of gaseous mixture at NTP. After passing KOH 64 mL of gas remains. The organic compound is

(A) C_2H_4
(B) C_2H_2
(C) C_4H_{10}
(D) C_3H_6



remain
$O_2 + CO_2$
= 224 mL
KOH
O_2 remain = 64 mL
(O_2 = 224 − 64
= 160 mL

Q) Consider the following reaction $\underset{LR}{Ca} + \underset{excess}{2HCl} \rightarrow CaCl_2 + H_2$

We have 14 g Ca reacts with excess of HCl. Choose the incorrect option.

(A) Mass produced of $CaCl_2$ is 38.85 g ✓

(B) Mole of H_2 produced is 0.35 mol ✓

(C) Volume of H_2 produced at STP is 7.945 L ✓

(D) Mass of $CaCl_2$ produced is 3.885 g

$n_{Ca} = n_{CaCl_2}$ (40 + 71)

$\frac{14}{40} = \frac{W}{111}$

$n_{H_2} = n_{Ca} = \frac{14}{40}$

$n_{H_2} = 0.35$

V_{H_2} at STP $= 0.35 \times 22.7$

Ans. ( )

Q) 10 moles of O_2 is Heated at Constant volume from 30°C to 40°C. The change in internal energy is _____ Cal.
$(C_{P,m} = 7\ Cal/mol^\circ C \quad R = 2\ Cal/mol^\circ C)$

$$C_{V,m} = C_{P,m} - R$$
$$= 7 - 2$$
$$= 5$$

$$\Delta U = n\, C_{V,m}\, \Delta T$$
$$= 10 \times 5 \times 10$$
$$= 500\ (cal.$$

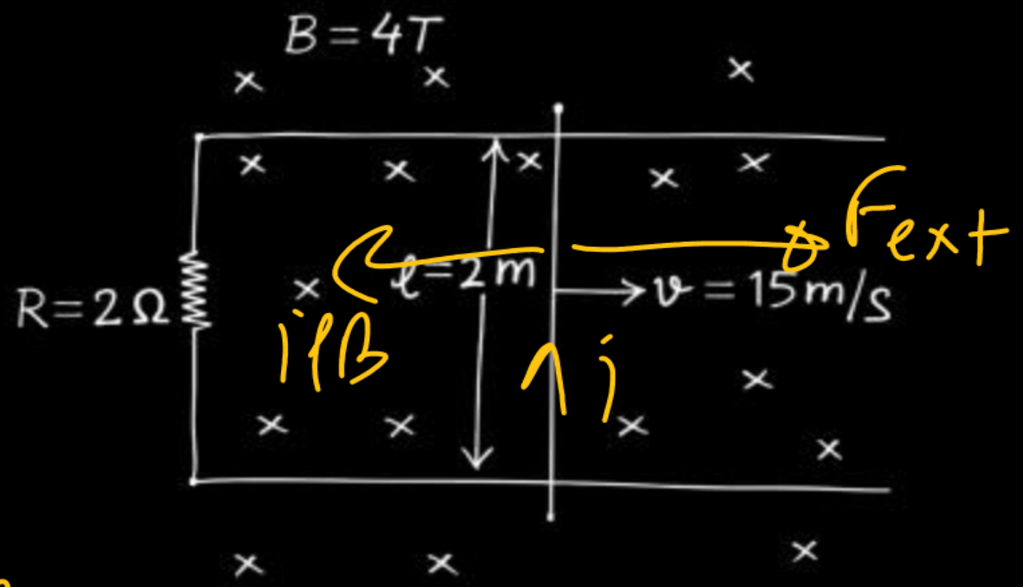
Ans. ( )

Q) Force required to move the wire AD with constant velocity

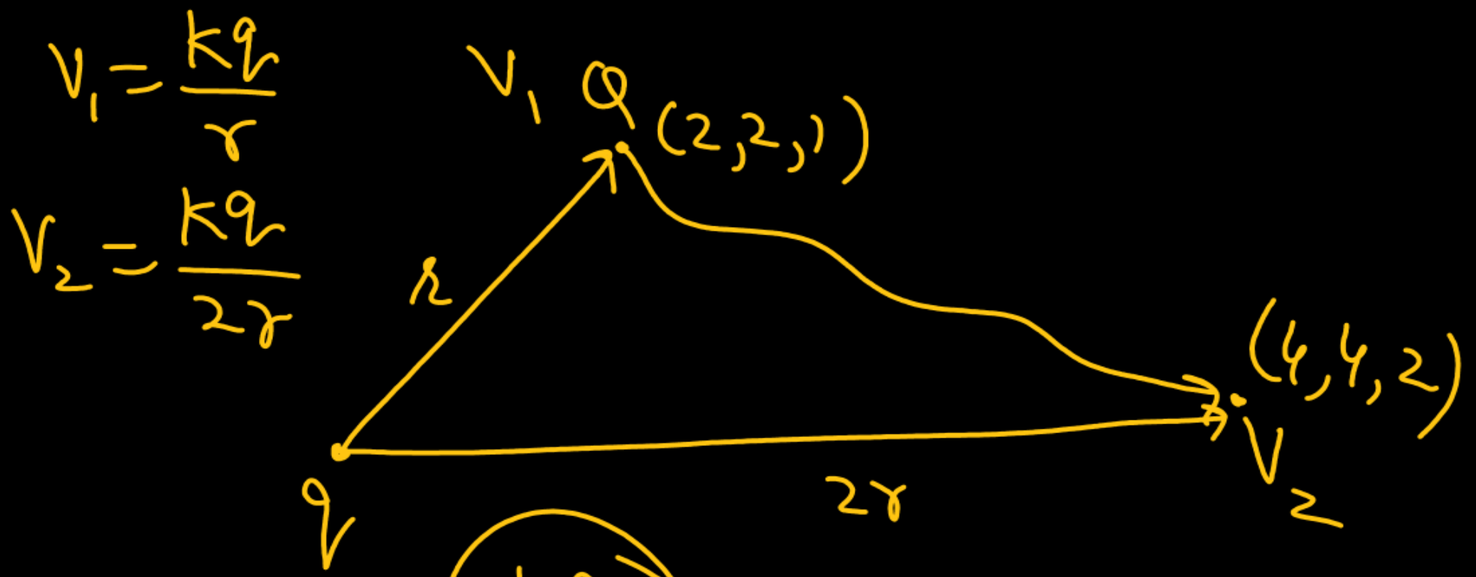
$$e = BVl$$

$$i = \frac{BVl}{R}$$

$$F_{ext} = ilB$$



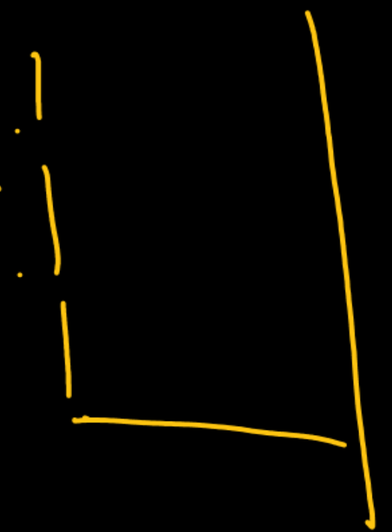
Q) A charge of 10^{-8} C in at origin another charge of 2 μC at (2, 2, 1) now this charge is taken to point B. (4, 4, 2) find work done in the process



$$W = q\Delta V = q\frac{kq}{2r}$$

Q) In a double slit experiment the distance between the Slits 0.1 cm and the screen is placed at 50 cm from the slit plane. when one slit is covered with a transparent sheet having thickness t and refractive index n = 1.5 the central fringe shifts by 0.2 cm. The value of t is

$$\text{shift} = \frac{(\mu - 1)t}{d}$$



Q) Compare magnitude of force in different region

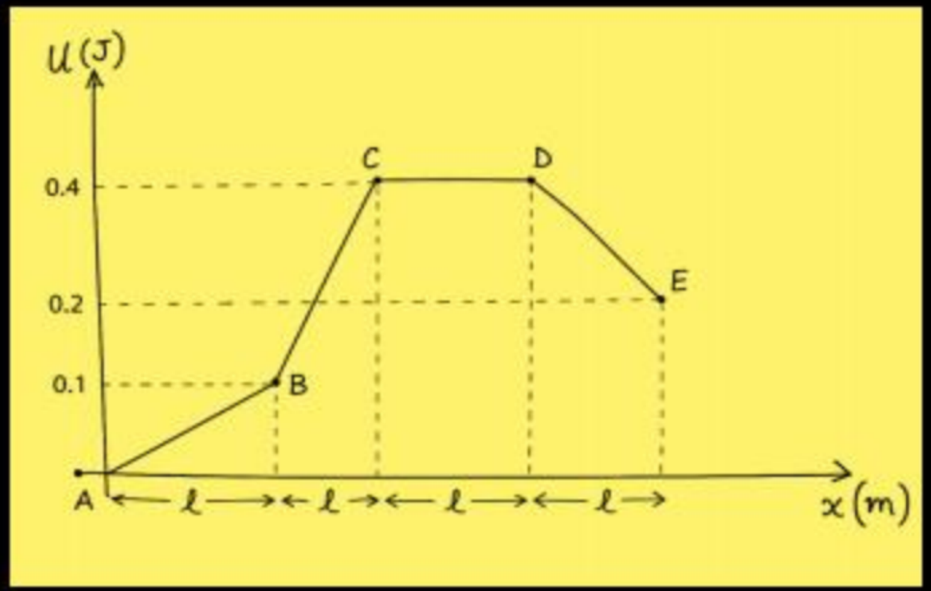
0·3/ℓ 0·2/ℓ

(A) $F_{AB} > F_{BC} > F_{CD} > F_{DE}$

(B) $F_{BC} > F_{DE} > F_{AB} > F_{CD}$

(C) $F_{BC} > F_{DE} > F_{CD} > F_{AB}$

(D) $F_{AB} > F_{CD} > F_{BC} > F_{DE}$



$|F| = |\text{slope}|$

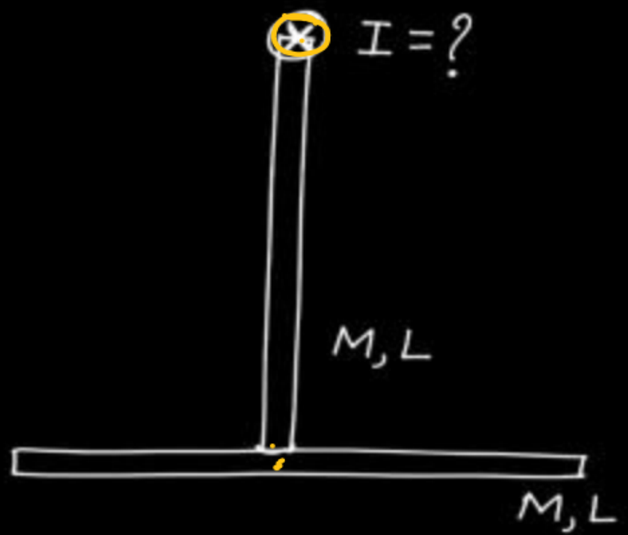
U ∪ S X

0·1/ℓ

Ans. ( )

Q) Find moment of inertia about given axis

$$I = \frac{ML^2}{3} + \left(\frac{ML^2}{12} + M(L)^2\right)$$



Ans. ( )

Q) Temperature of 10 mole ideal gas having molar sp. heat capacity at constant pressure $C_p = 7R$ in increased by 10K find increase in internal energy of gas. $\left(R = \frac{25}{3}\right)$

$C_V = C_p - R$

$= 6R$

$\Delta U = n C_V \Delta T$

$\Delta U = (10)(6)\left(\frac{25}{3}\right)(10)$

Q) In a microscope the objective is having focal length $f_0 = 20$ cm eyepiece is having focal length $f_e = 4$ cm. The tube length is 32 cm. Then magnification produced by this microscope for normal adjustment is_____.

$D = 25$

$$M = \frac{L}{f_0}\frac{D}{f_e}$$

Q) A conducting circular loop of area $1.0\ m^2$ is placed perpendicular to a magnetic field which varies as $B = \sin(100t)$ tesla. If the resistance of the loop is 100Ω then average thermal energy dissipated in the loop in one period is

$T = \frac{2\pi}{100}$

$\phi = BA$

$\varepsilon = \frac{d\phi}{dt} = A\frac{dB}{dt} = 100\cos 100t$

$i = \frac{\varepsilon}{R} = \cos(100t)$

$P = \varepsilon i$

$P = 100\cos^2 100t$

$\langle P \rangle = 50$

Q) Ellipse E: $\frac{x^2}{36}+\frac{y^2}{16}=1$, A hyperbola confocal with ellipse and eccentricity of hyperbola is equal to 5. The length of latus rectum of hyperbola is, if principle axis of hyperbola is x-axis?

$\frac{2\left(\frac{96}{5}\right)}{\frac{2}{\sqrt{5}}}$

(A) $\frac{96}{\sqrt{5}}$ (B) $24\sqrt{5}$ (C) $18\sqrt{5}$ (D) $12\sqrt{5}$

Ans. (A)

$a=6$

$b=4$

$e=\sqrt{1-\frac{16}{36}}=\frac{\sqrt{5}}{3}$

$a_1e_1=A_1E_1$

$2\sqrt{5}=A(5)$

$\frac{2}{\sqrt{5}}=A$, $A^2=\frac{4}{5}$

$E_1^2=25=1+\frac{5b^2}{4}$

$\frac{96}{5}=b^2$

Q) If the mean and variance of observations x, y, 12, 14, 4, 10, 2 is 8 and 16 respectively where x > y. Then, the value of 3x – y is

(A) 24 **(B) 22** **(C) 20** **(D) 18**

$$\frac{x+y+(42)}{7} = 8$$

$$x+y = 14$$

$$x = 8,\quad y = 6$$

$$16 = \frac{x^2+y^2+144+196+16+100+4}{7} - 64$$

$$80 \times 7 = x^2+y^2+460$$

$$x^2+y^2 = 100$$

Ans. (D)

Q) The value of $\int_{-\pi/6}^{\pi/6} \left(\frac{\pi+4x^{11}}{1-\sin\left(|x|+\frac{\pi}{6}\right)}\right) dx$ **is equal to**

(A) 8π **(B) 7π** **(C) 6π** **(D) 4π**

$$2\int_0^{\pi/6} \frac{\pi\, dx}{1-\sin\left(x+\frac{\pi}{6}\right)} + \int_{-\pi/6}^{\pi/6} \frac{4x^{11}\, dx}{1-\sin\left(|x|+\frac{\pi}{6}\right)}$$

Ans. (D)

$$2\int_{\pi/6}^{\pi/3} \frac{\pi\, dt}{1-\sin t} \qquad x+\frac{\pi}{6}=t$$

$$= 2\pi \int_{\pi/6}^{\pi/3} \frac{1+\sin t}{\cos^2 t}\, dt = 2\pi\left(\tan t + \sec t\right)_{\pi/6}^{\pi/3}$$

$$2\pi\left(\left(\sqrt{3}+2\right)-\left(\frac{1}{\sqrt{3}}+\frac{2}{\sqrt{3}}\right)\right) = \frac{2\pi(\sqrt{3}+2-\sqrt{3})}{} = 4\pi$$