JEE MAINS 2026

PAPER SOLUTION

22 JAN, SHIFT 2

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Physics

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Q) Find the dimensions of the expression $\frac{\varepsilon_0 E}{T}$, where ε_0, E and T are permittivity, electric field and time.

(A) MLA^2 **(B) $MA^{-1}L$** **(C) AL^{-2}** **(D) AL**

$$EA = \phi = \frac{q}{\epsilon_0}$$

$$\epsilon_0 E = \frac{q}{A}$$

$$\frac{\epsilon_0 E}{T} = \frac{q}{AT} = \frac{A^1 T^1}{L^2 T^1}$$

$$= A^1 L^{-2}$$

Ans. (c)

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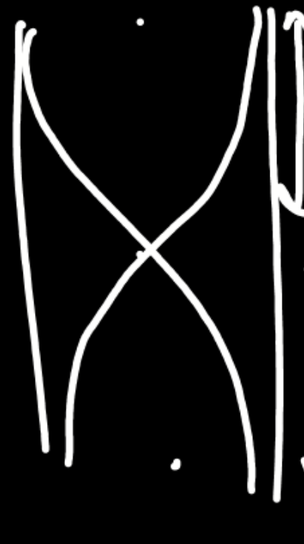
Q) In an open organ pipe 3rd and 6th harmonic frequency differ by 3200 Hz. Find the length of organ pipe (speed of sound = 320 m/s)

(A) 5 cm (B) 10 cm

(C) 15 cm ✓ (D) 20 cm



$\frac{\lambda}{2} = L$

$\lambda = 2L$

$f = \frac{V}{2L}$

$f_1 = \frac{3V}{2L}$

$f_2 = \frac{6V}{2L}$

$f_2 - f_1 = 3200$

$\frac{3V}{2L} = 3200$

Ans. (C)

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$$\frac{3(320)}{2l} = \frac{10}{3200}$$

$$l = \frac{3}{20}$$

$$l = 0.15\ m$$

$$l = 15\ cm$$

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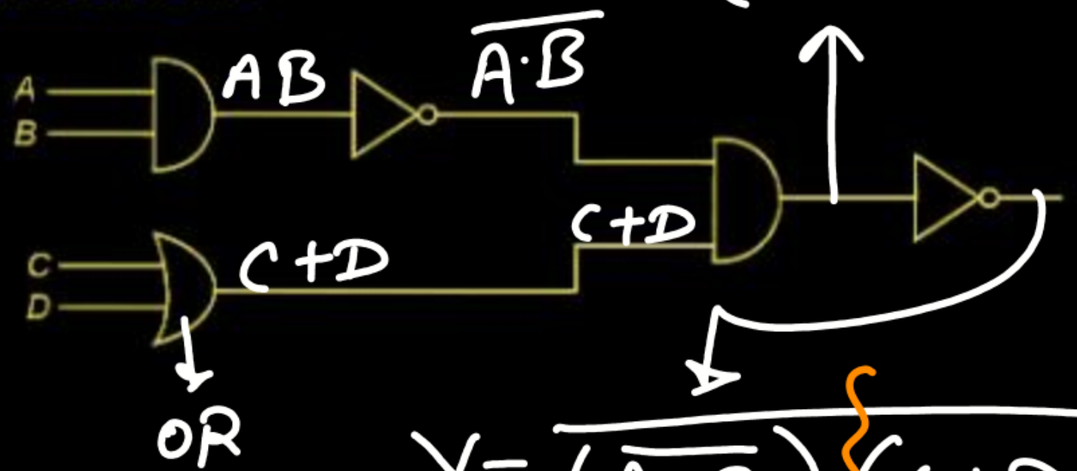
Q) For the given logic gate find output function.

(A) $\bar{A} \cdot \bar{B} + C + D$

(B) $AB + CD$

(C) $\bar{A} + \bar{B} + \bar{C} \cdot \bar{D}$

(D) $AB + \bar{C} \cdot \bar{D}$



$Y = (\overline{A \cdot B}) + (\overline{C+D})$

$Y = (AB) + (\bar{C} \cdot \bar{D})$

Ans. (D)

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Q) In a photoelectric effect experiment, the maximum possible kinetic energy of the emitted photoelectrons is zero. The work function of the metal is $\phi = 20 \times 10^{-19}$ J .Find the frequency of the incident photon.

(A) 3.0×10^{14} Hz

(B) 3.02×10^{15} Hz

(C) 1.5×10^{15} Hz

(D) 6.6×10^{14} Hz

$$K.E_{max} = 0$$

$$K.E_{max} = h\nu - \phi$$

$$\nu = \frac{\phi}{h} = \frac{20 \times 10^{-19}}{6.6 \times 10^{-34}} \simeq 3.02 \times 10^{15}\ Hz$$

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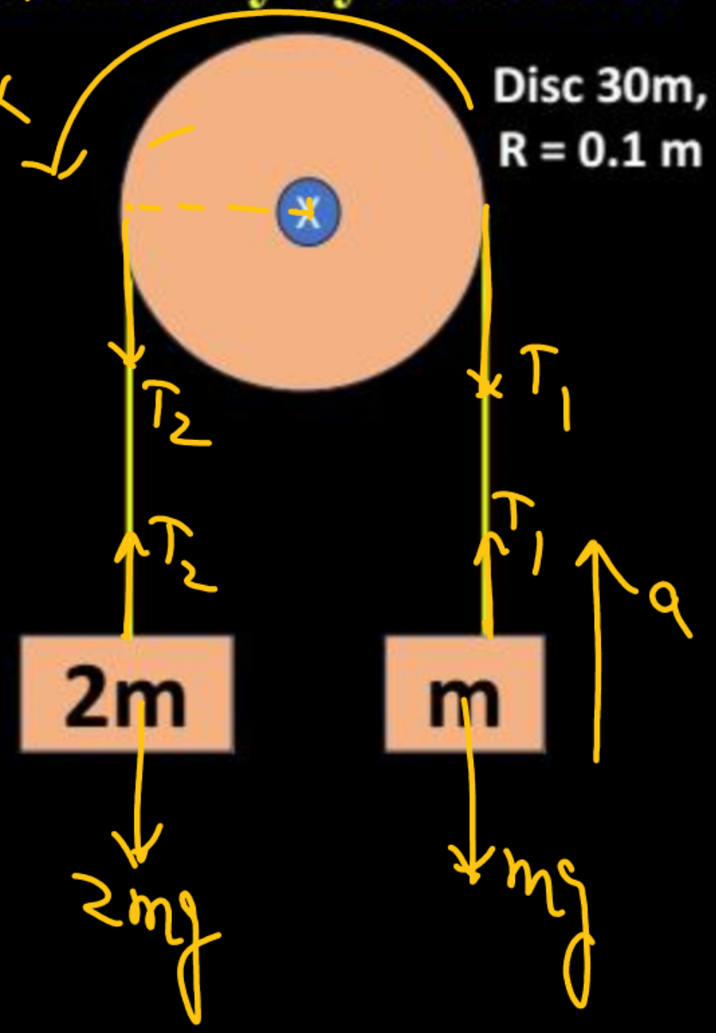
Q) Find speed of blocks when 2m has move by 3.6 m, initially system is at rest.



$2mg - T_2 = 2ma$ — (1)

$T_1 - mg = ma$ — (2)

$(T_2 - T_1)R = \left(\frac{30m R^2}{2}\right)\left(\frac{a}{R}\right)$

$T_2 - T_1 = 15ma$ — (3)

$mg = 18ma \Rightarrow a = g/18$

$v^2 = u^2 + 2rs$ ($u^2 \to 0$)

$v^2 = 2\left(\frac{10}{18}\right)(3.6)$ ($3.6 \to 0.2$)

$v = 2\,m/s$

Ans. ()

Ans. (2 m/s)

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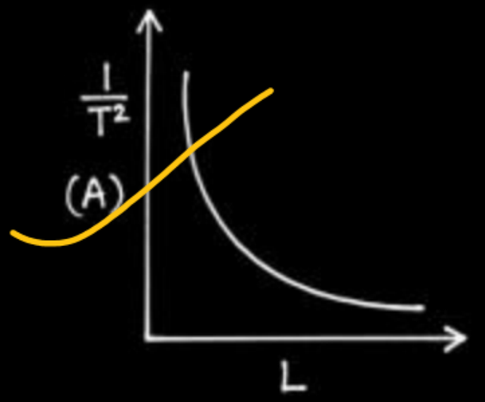
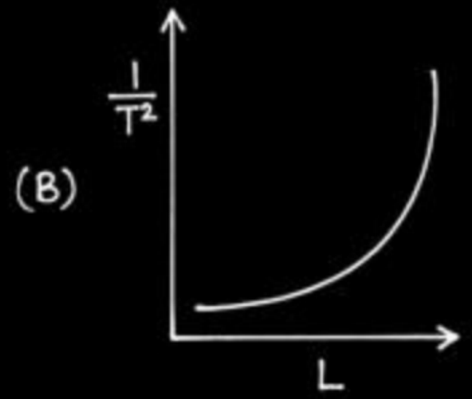
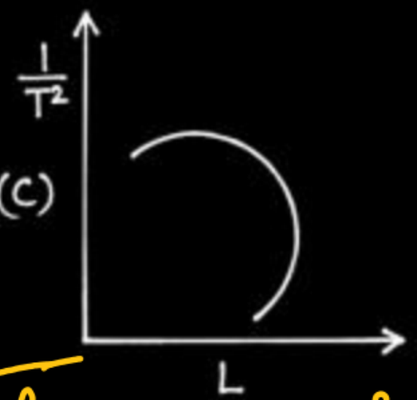
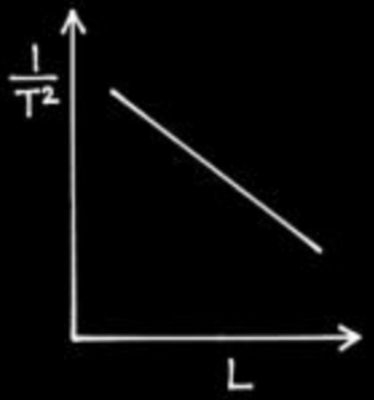
Q) using a simple pendulum experiment g is determined by measuring its time period T, Which of the following plots represent correct relation between the pendulum length ℓ time period T.









(A)

$\frac{1}{T^2} = c\frac{1}{\ell}$

$\frac{1}{T^2} \leftarrow y = \frac{c}{x} \rightarrow \ell$

$T = 2\pi\sqrt{\frac{\ell}{g}} \Rightarrow T^2 = \frac{(2\pi)^2}{g}\ell$

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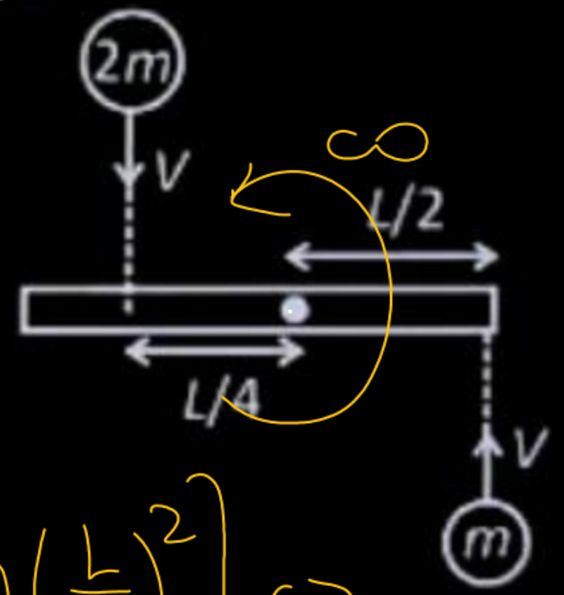
Q) Two balls of mass 2m and m collides with rod of mass m and length L as shown balls stick to the rod after collision. Find $\frac{V}{\omega}$ if rod is hinged at centre. (L = 8 m)

(A) 11/2
(B) 11/3
(C) 11/4
(D) 9/4



$$(mv\frac{L}{2}) + (2mv\frac{L}{4}) = \left[\frac{ML^2}{12} + 2m\left(\frac{L}{4}\right)^2 + m\left(\frac{L}{2}\right)^2\right]\omega$$

Ans. (B)

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Q) A gas undergoes a process in which state variable changes from (1 atm, 60 ml, 27°C) to (P atm, 30 ml, 77°C) then P is

(A) $\frac{7}{3}$ atm (B) 2 atm (C) 5 atm (D) 7 atm

$$PV = nRT$$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

Ans. (A)

$$\frac{(1)\text{Atm} \times 60\text{ml}}{300} = \frac{P\,(30\text{ml})}{350}$$

$$P = ?$$

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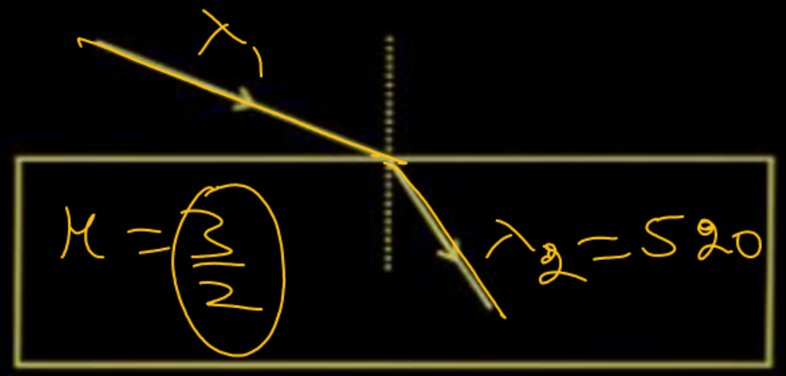
Q) A light ray incident on a slab of refractive index $\frac{3}{2}$. If wavelength of refracted ray is 520 nm . Find wavelength of incident ray.

(A) 780 nm (B) 560 nm
(C) 1460 nm (D) 360 nm



$$\frac{\lambda_1}{\mu} = 520$$

$$\lambda_1 = \frac{3}{2} \times 520 = 780 \text{ nm}$$

Ans. (A)

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Chemistry

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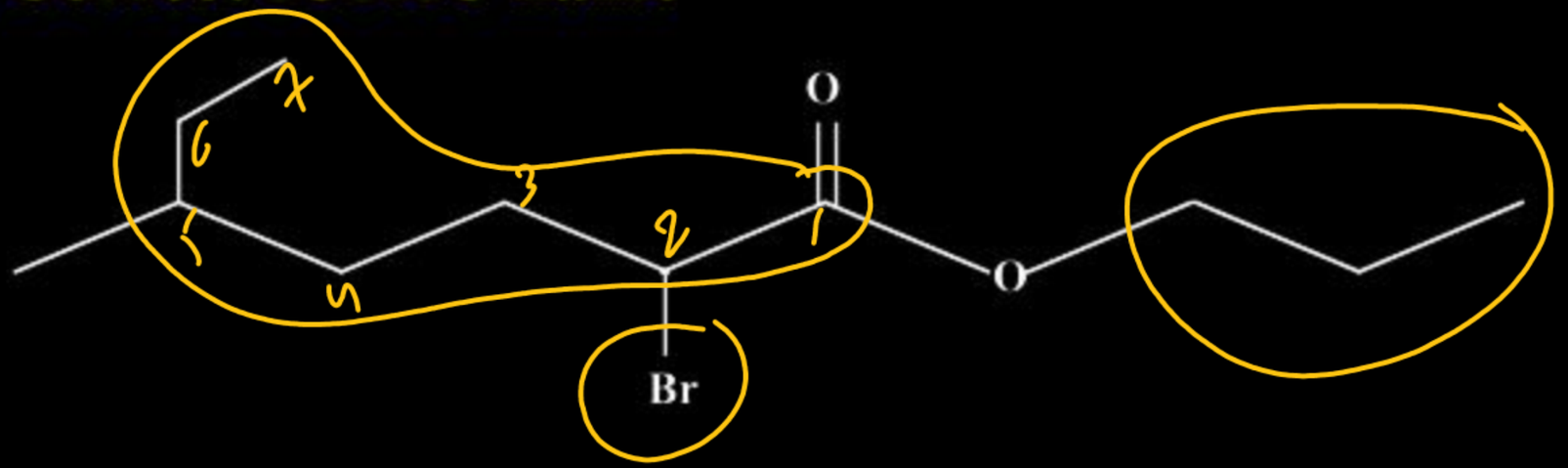
Q) Correct IUPAC name



n-Propyl-2-boromo-
5-methyl heptanoate

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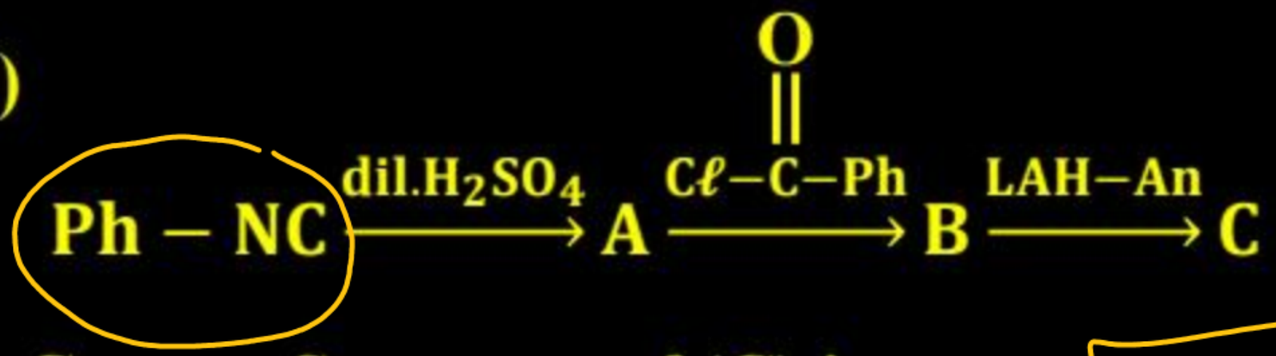
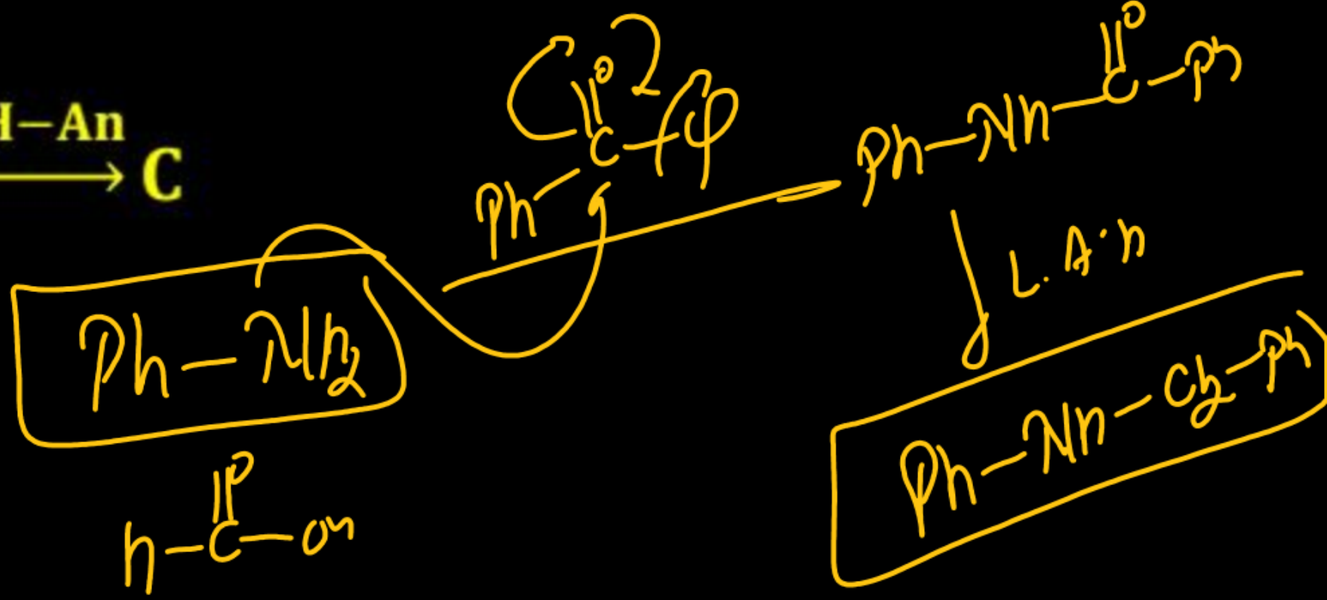
Q)



Correct Structure of (C) is :



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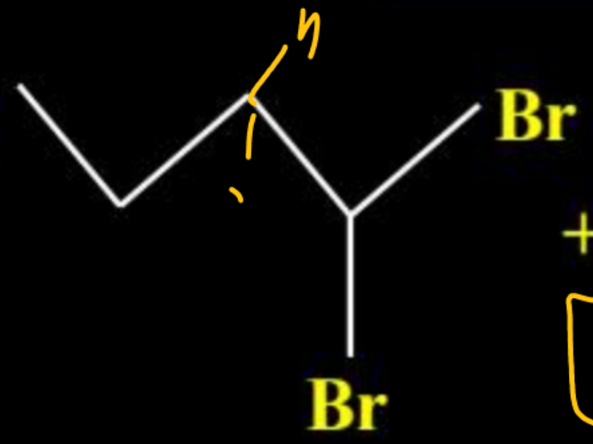
Q) 

$+ 2NaNH_2 \xrightarrow{E^2} (X) \xrightarrow[\text{ii)2-bromo-propane}]{\text{i)}NaNH_2} (Y)$

$2NaNH_2$

$C-C-C\equiv C-H$

$NaNH_2$

$C-C\equiv C$

$C-C-C$

(A) Isopropyl but-1-yne
(B) 2-methyl Hex-2-yne
(C) 5-methyl Hex-2-yne
(D) 2-methyl Hex-3-yne

$C-C-C\equiv C-C-C$

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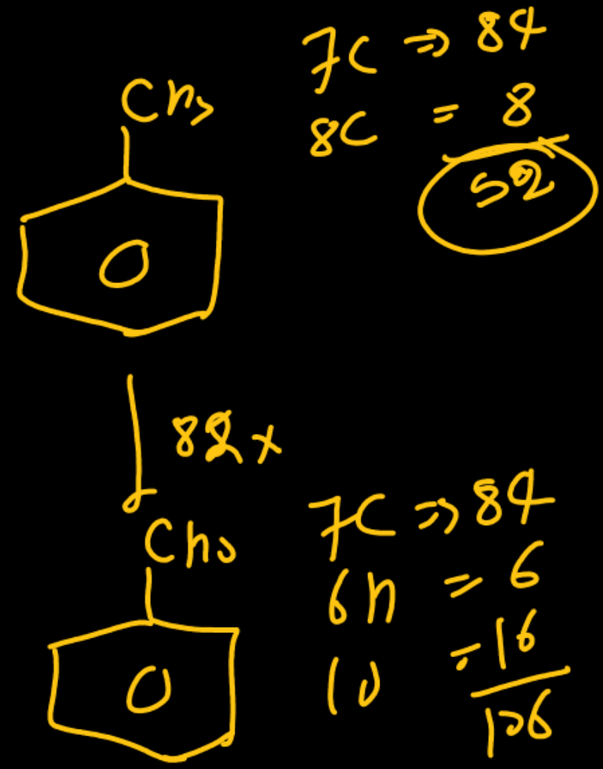
Q) In given Conversion find out mass of benzaldehyde

Toluene (5.8gm) $\xrightarrow{82\%}$ benzaldehyde

$$\left(\frac{5.8}{92}\right) \cdot 82 = \frac{\text{mass (w)}}{106}$$



Ans. (5.42)

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Q) Match list-I with list-II

List-I Reagent (React with glucose)		List-II Product
(1) hydroxylamine	→	(P) glucose oxime
(2) Br_2 in water	→	(Q) gluconic acid
(3) AC_2O (	→	(R) glucose pentaacetate
(4) Con. HNO_3	→	(S) Saccharic acid

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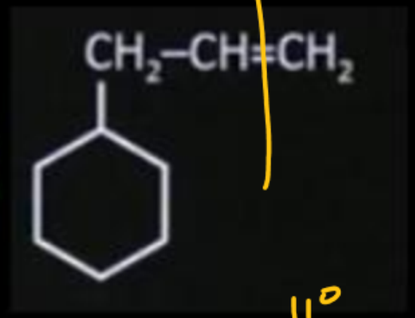
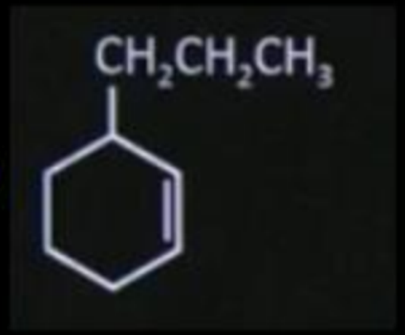
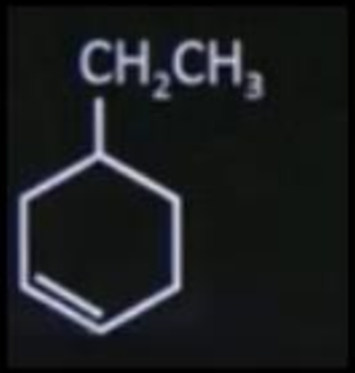
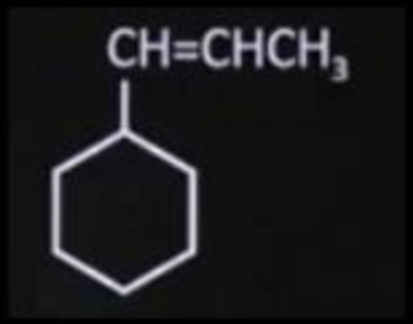
Q) An alkene on reductive ozonolysis gives methanal as one of the products. It's structure is

(A) 

(B) 

(C) 

(D) 

Ans. (A)

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Q) Volume ratio of decimolar NH_4OH and decimolar HCl to give a solution of pH = 9.25 at 25° C is x : 1. Find x. → (2)

pK_b of NH_4OH = 4.75

$$NH_4OH + HCl \rightarrow NH_4Cl + H_2O$$

$0.1 \times x$	0.1×1	—	
$0.1x - 0.1$	—	0.1	

$$pOH = pK_b + \log \frac{(NH_4Cl)}{(NH_4OH)}$$

$$14 - 9.25 = 4.75 + \log \frac{0.1}{(0.1x - 0.1)}$$

$$4.75 = 4.75 + \log \frac{1}{(x-1)}$$

Ans. (2)

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$$\log\left(\frac{1}{x-1}\right) = 0$$

$$\frac{1}{x-1} = 1$$

$$x-1 = 1$$

$$x = 2$$

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Q) Which of following is basic buffer?

(A) $NaOH + CH_3COONa$

(B) $NaOH + Na_2SO_4$

(C) $K_2SO_4 + H_2SO_4$

(D) $NH_4OH + NH_4Cl$

Ans. (D)

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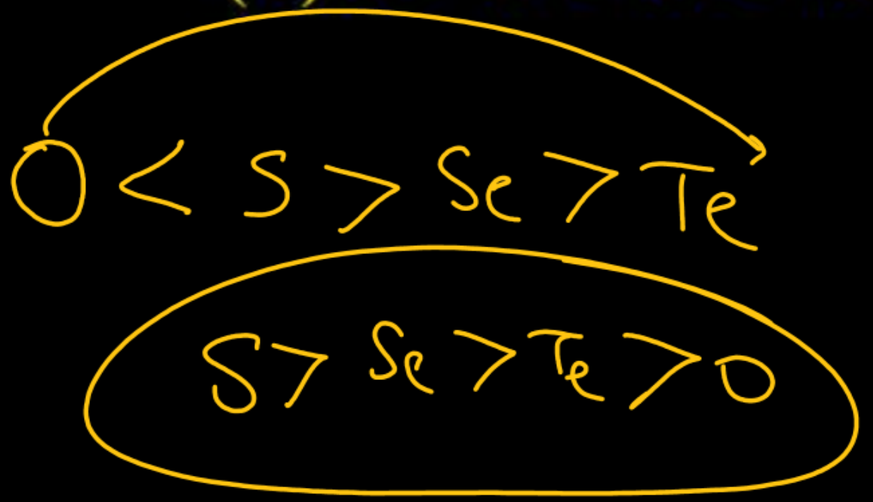
Q) The correct order of electron gain enthalpy (magnitude only) for group 16 elements is

(A) Te > Se > S > O

(B) S > Se > Te > O

(C) O > S > Se > Te

(D) S > O > Se > Te



Ans. (B)

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Q) 100g 98% by weight H_2SO_4 is mixed with 100g 49% by weight H_2SO_4. Mole fraction of H_2SO_4 in solution is

(A) 0.9 (B) 0.1 (C) 0.67 (D) 0.34

$H_2SO_4 \rightarrow 98g + 49 = 147g$ $\quad n = \frac{147}{98} = 1.5$

$H_2O \rightarrow ? + 51 = 53g$ $\quad N = \frac{53}{18} \approx 3$

$$\chi_{H_2SO_4} = \frac{1.5}{1.5+3} = \frac{1.5}{4.5} = \frac{1}{3}$$

Ans. (D)

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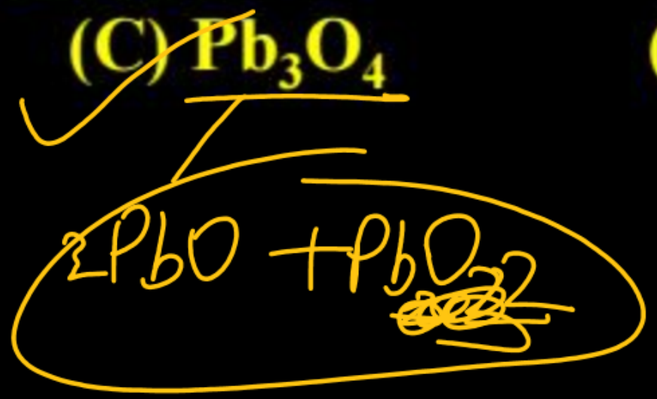
Q) Which of the following is a mixed oxide?

(A) Fe_2O_3 (B) PbO_2 (C) Pb_3O_4 (D) BaO_2



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Q) Consider the following data :-

$Na(s) + \frac{1}{2}Cl_2(g) \rightarrow NaCl(s)$	$\Delta H^\circ = -411\ kJ/mole^{-1}$
$Na(s) \rightarrow Na(g)$	$\Delta H^\circ = 107\ kJ/mole$
$Cl_2(g) \rightarrow (2Cl(g)$	$\Delta H^\circ = 242\ kJ/\ mole$
$Cl(g) + e^- \rightarrow Cl^-(g)$	$\Delta H^\circ = -355\ kJ/\ mole$
$Na(g) \rightarrow Na^+(g) + e^-$	$\Delta H^\circ = 502\ kJ/\ mole$

Find out lattice energy of NaCl(s).

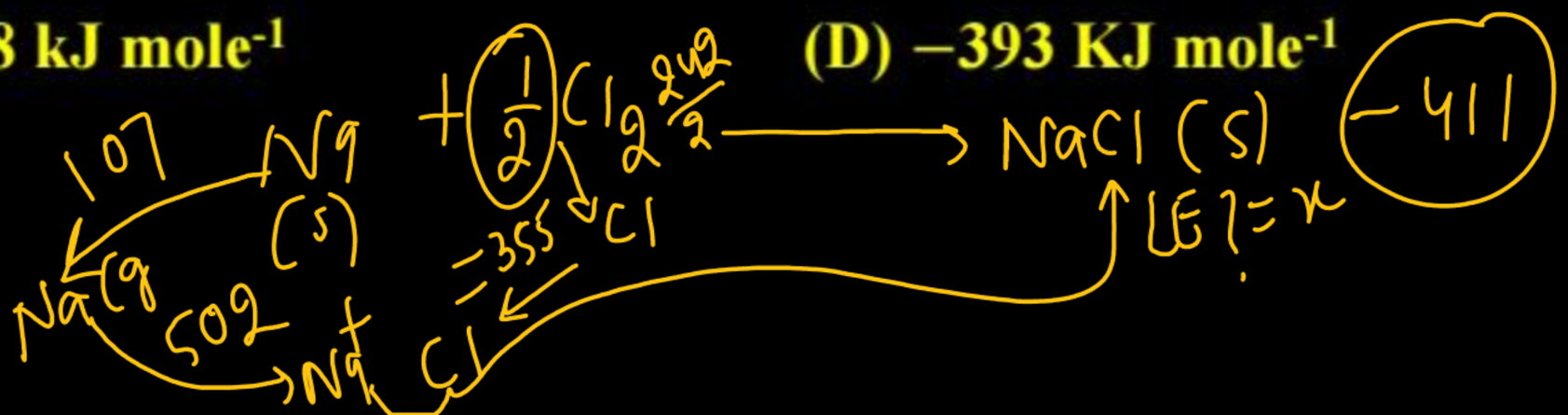
(A) −786 kJ mole^{-1}

(B) −628 KJ mol^{-1}

(C) −428 kJ mole^{-1}

(D) −393 KJ mole^{-1}

$107 + 502 + \frac{242}{2} + (-355) + x \Rightarrow -411$



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Math

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Q) If $a + b + c = 1$ and $a < b < c$, $a, b, c \in R$ and $a^2, 2b^2, c^2$ are in G.P. and a, b, c are in A.P. then find the value of $9(a^2 + b^2 + c^2) = ?$

$2b = a + c$

$b + 2b = 1$

$b = \frac{1}{3}$

$\frac{1}{3} - d, \frac{1}{3}, \frac{1}{3} + d$

$d > 0$

$4b^4 = a^2c^2$

$\frac{4}{81} = \left(\left(\frac{1}{3} - d\right)\left(\frac{1}{3} + d\right)\right)^2$

$\frac{1}{9} - d^2 = \frac{2}{9}, -\frac{2}{9}$

$d^2 = -\frac{1}{9}$ ✗

$d^2 = \frac{3}{9} = \frac{1}{3}$

$d = \frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}$ ✓ ✗

$9\left(\frac{1}{9} + \left(\frac{1}{3} - d\right)^2 + \left(\frac{1}{3} + d\right)^2\right)$

$9\left(\frac{1}{9} + \frac{2}{9} + 2d^2\right)$

$9\left(\frac{3}{9} + \frac{2}{3}\right)$

$9(1) = 9$

Ans. (9)

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Q) Let α, β be the roots of quadratic equation $12x^2 - 20x + 3\lambda = 0$, $\lambda \in z$. If $1/2 \leq |\beta - \alpha| \leq 3/2$ then the sum of all possible valued of λ is _____.

integer

$$\frac{1}{2} \leq \frac{\sqrt{D}}{|a|} \leq \frac{3}{2}$$

$$\frac{1}{2} \leq \frac{\sqrt{400 - 4(12)(3\lambda)}}{12} \leq \frac{3}{2}$$

$$6 \leq \sqrt{400 - 144\lambda} \leq 18$$

$$36 \leq 400 - 144\lambda \leq (18)^2$$

$$\frac{19}{36} \leq \lambda \leq \frac{91}{36}$$

$\lambda = 1, 2$

sum = 3

Ans. (3)

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Q) If complex numbers $Z_1, Z_2, \ldots\ldots Z_n$ satisfy the equation $4Z^2 + \bar{Z} = 0$, then $\sum_{i=1}^{n} |Z_i|^2$ is equal to

$z = 0+0i,\ \frac{1}{4}+0i,\ -\frac{1}{8}+\frac{\sqrt{3}}{8}i,\ -\frac{1}{8}-\frac{\sqrt{3}}{8}i$

$|z| = 0, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}$

$|z|^2 = \frac{9}{16}+\frac{1}{16}+\frac{1}{16} = \frac{3}{16}$

(A) $\frac{3}{64}$ (B) $\frac{3}{16}$ (C) $\frac{19}{64}$ (D) $\frac{1}{16}$

Ans. (B)

Let $z = x+iy$ $\Rightarrow$ $4(x+iy)^2 - (x-iy) = 0$

$\Rightarrow$ $4(x^2-y^2) - x + i(8xy+y) = 0 = 0+0i$

$4(x^2-y^2) - x = 0$, $y(8x+1) = 0$

If $y = 0$, $4x^2 - x = 0$, $x = 0, \frac{1}{4}$

If $x = -\frac{1}{8}$, $y = \pm\sqrt{3}/8$

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Q) Area eclosed by $4x^2 + y^2 \leq 8$ and $y^2 \leq 4x$ (in square unit) is

(A) $\left(\pi + \frac{4}{3}\right)$ **sq. unit**

(B) $\left(\pi - \frac{4}{3}\right)$ **sq. unit**

(C) $\left(\pi + \frac{2}{3}\right)$ **sq. unit**

(D) $\left(\pi - \frac{2}{3}\right)$ **sq. unit**

E : $\frac{x^2}{2} + \frac{y^2}{8} = 1$

P : $y^2 = 4x$

Ans. (D)

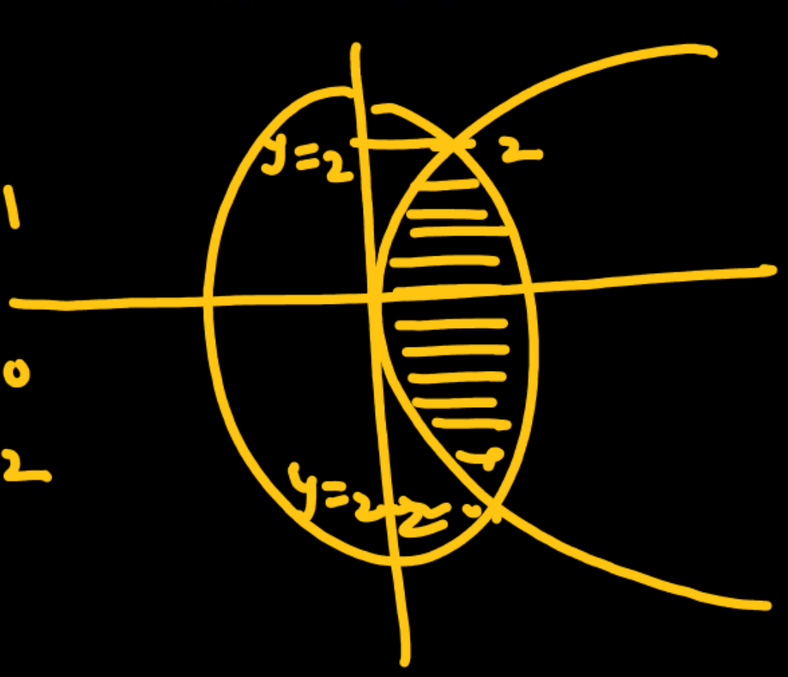
$y^2 = 4x$

$\frac{x^2}{2} + \frac{4x}{8} = 1$

$x^2 + x - 2 = 0$

$x = 1, -2$

$y = \pm 2$



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$\int \sqrt{a^2-x^2}\,dx = \frac{x\sqrt{a^2-x^2}}{2} + \frac{a^2}{2}\sin^{-1}\left(\frac{x}{a}\right)$

Q) Area eclosed by $4x^2 + y^2 \le 8$ and $y^2 \le 4x$ (in square unit) is

(A) $\left(\pi + \frac{4}{3}\right)$ sq. unit

(B) $\left(\pi - \frac{4}{3}\right)$ sq. unit

(C) $\left(\pi + \frac{2}{3}\right)$ sq. unit

(D) $\left(\pi - \frac{2}{3}\right)$ sq. unit

$$A = 2\int_{y=0}^{y=2}\left(\frac{\sqrt{8-y^2}}{2} - \frac{y^2}{4}\right)dy$$

$$= \pi - 2/3$$

Ans. (D)

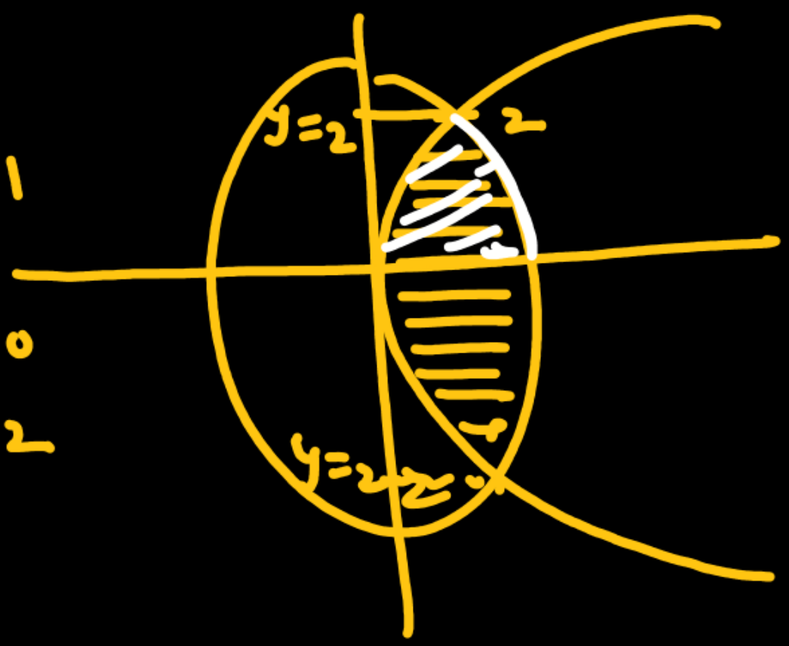
$y^2 = 4x$

$\frac{x^2}{2} + \frac{4x}{8} = 1$

$x^2 + x - 2 = 0$

$x = 1, -2$

$y = \pm 2$



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Q) If $4x^2 + y^2 \leq 52$, $x, y \in I$ then number of ordered pairs (x, y) is

(A) 67 **(B) 77** **(C) 87** **(D) 38**

$E: \quad 4x^2 + y^2 = 52$

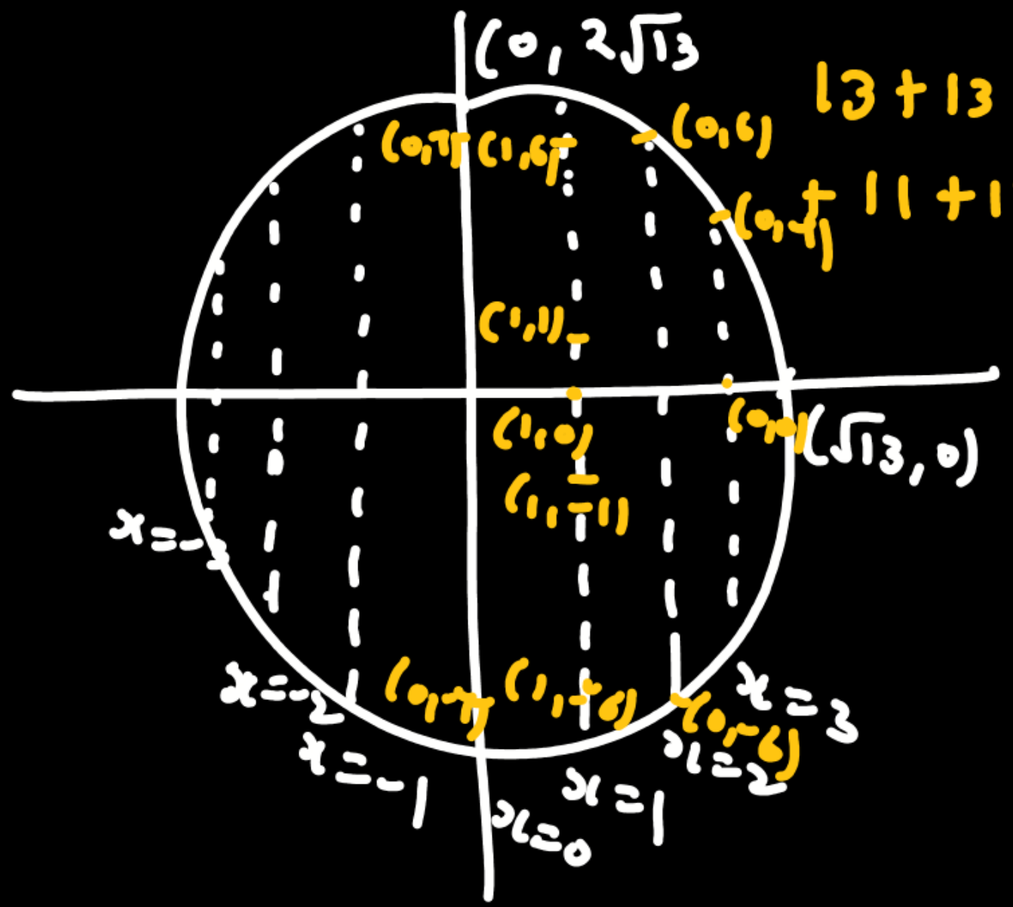
$$\frac{x^2}{13} + \frac{y^2}{52} = 1 \quad (b > a)$$

IF $x = 1, \; y^2 = 48 \Rightarrow y = \pm\sqrt{48}$

$x = 2, \; y^2 = 36 \Rightarrow y = \pm 6$

$x = 3, \; y^2 = 16 \Rightarrow y = \pm 4$

Ans. (B)



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$-C_1 + C_2 = 0$

$\sum_{n=1}^{25} (2n+1) = 2 \times \frac{25 \times 26}{2} + 25$

Q) Let $P(n) = {}^nC_0 - \frac{{}^nC_1}{2} + \frac{{}^nC_2}{3} - \frac{{}^nC_3}{4} \ldots \frac{(-1)^n\, {}^nC_n}{n+1}$. Find $\sum_{n=1}^{25} \frac{1}{P(2n)}$

$$P(n) = \sum_{r=0}^{n} \frac{(-1)^r\, {}^nC_r}{r+1}$$

$$P(n) = \frac{1}{(n+1)} \sum_{r=0}^{n} (-1)^r \frac{n+1}{r+1} \cdot {}^nC_r$$

$$P(n) = \frac{1}{n+1} \sum_{r=0}^{n} (-1)^r\, {}^{n+1}C_{r+1}$$

$$= \frac{1}{n+1} \left({}^{n+1}C_1 - {}^{n+1}C_2 + - - \right)$$

$$= \frac{-1}{n+1} \left({}^{n+1}C_0 - {}^{n+1}C_1 + {}^{n+1}C_2 + - {}^{n+1}C_{n+1} \right)$$

$$P(2n) = \frac{1}{2n+1}$$

$$= \frac{1}{n+1}$$

Ans. (675)

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Q) Let $f(x) = \min\{\sqrt{2}x, x^2\}$ and $g(x) = |x|[x^2]$

If $x \in (-2, 2)$ then sum of all values of f(x) at those x values where g(x) is non-differentiable ([.] denotes GIF).

(A) $2 - \sqrt{3}$ (B) $1 - \sqrt{3}$ (C) $1 - \sqrt{2}$ (D) $2 - \sqrt{2}$

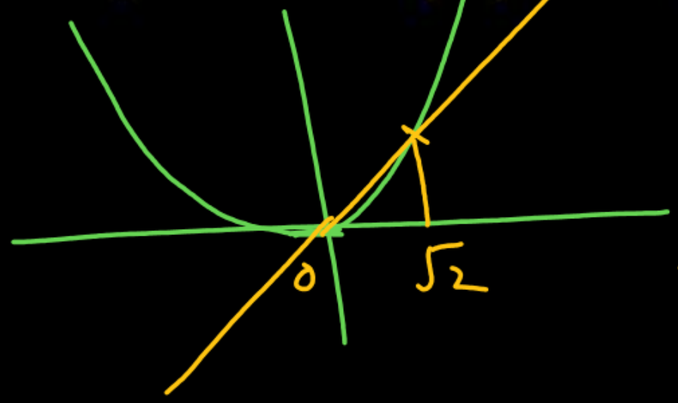
$x = 1, 2, 3$ $x \neq 0$

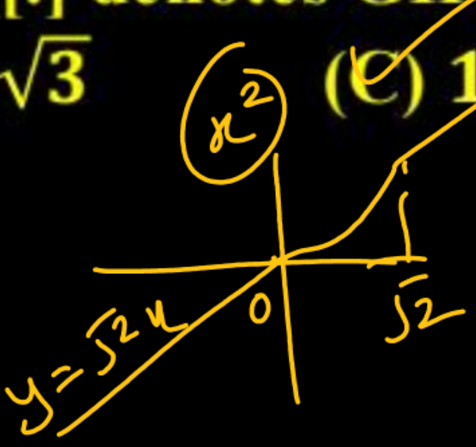
$x = \pm 1, \pm\sqrt{2}, \pm\sqrt{3}$ $x = 0$

$0^+ \to 0$

$-\sqrt{3}, -\sqrt{2}, -1, 1, \sqrt{2}, \sqrt{3}$

$-\sqrt{6} - 2 - \sqrt{2} + 1 + 2 + \sqrt{6}$





Ans. (C)

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Q) Let $s = \{z \in C: 4z^2 + \bar{z} = 0\}$ Then $16\sum_{z\in s} |z|^2$ is equal to

$4(x^2 - y^2 + 2xyi) + (x - iy) = 0$

$4x^2 - 4y^2 + x = 0$ & $8xy - y = 0$

$y(8x - 1) = 0$

$y = 0$	$x = 0$	$-\frac{1}{4}$
$x = \frac{1}{8}$	$y = \frac{\sqrt{3}}{8}$	$y = -\frac{\sqrt{3}}{8}$

Ans. (03)

4 O·P·

$0 + \frac{1}{16} + \frac{1}{16} + \frac{1}{16}$

$= \frac{3}{16}$

$\Rightarrow$ Ans: 3

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Q) $x - ny + z = 6$
$x - (n-2)y + (n+1)z = 8$
$(n-1)y + z = 1$

$\Delta \neq 0$ ⓝ

$\neq \begin{vmatrix} -n & 1 & \\ 1 & -(n-2) & n+1 \\ 0 & n-1 & 1 \end{vmatrix}$

$P\{1, \cancel{2}, 3, 4, 5, 6\} = \frac{k}{6}$ ⓝ

$\frac{\text{fav}}{\text{Total}} = \frac{5}{6}$

Let n = number on the dies when rolled randomly then P (that system equation has unique solution) = $\frac{k}{6}$, then sum of value of k and all possible value of n is

(A) 22 (B) 24 (C) 20 (D) 21

Ans. (B)

$n^2 - n - 2 \neq 0$

$(n-2)(n+1) \neq 0$

$n \neq 2, -1$ ✗

$k = 5$

$\sum n = 1+3+4+5+6 = 19$

24

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Q) If P $(10, 2\sqrt{15})$ lies on hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and length of latus rectum = 8, then the square of area of ΔPS_1S_2 is [where S_1 & S_2 are the focii of the hyperbola]

(A) 2700 (B) 1750 (C) 2400 (D) 3600

Ans. (A)

$\frac{100}{a^2} - \frac{60}{b^2} = 1$ — ①

$LR = 8 \Rightarrow \frac{b^2}{a} = 4$

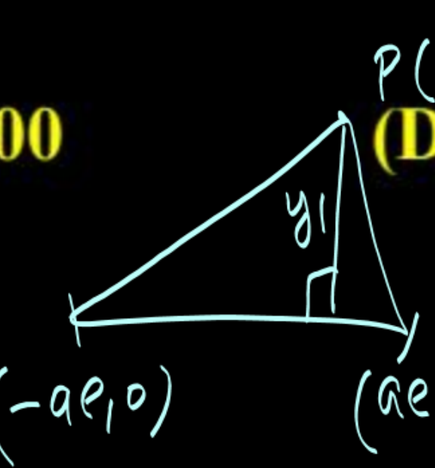
$b^2 = 4a$ — ②

① & ②

$a^2 = 25$ ✓

$b^2 = 20$

$e^2 = \frac{45}{25}$ ✓



$\Delta^2 = \left(\frac{1}{2} \times 2ae \times y_1\right)^2$

$= a^2e^2(2\sqrt{15})^2 = 2700$

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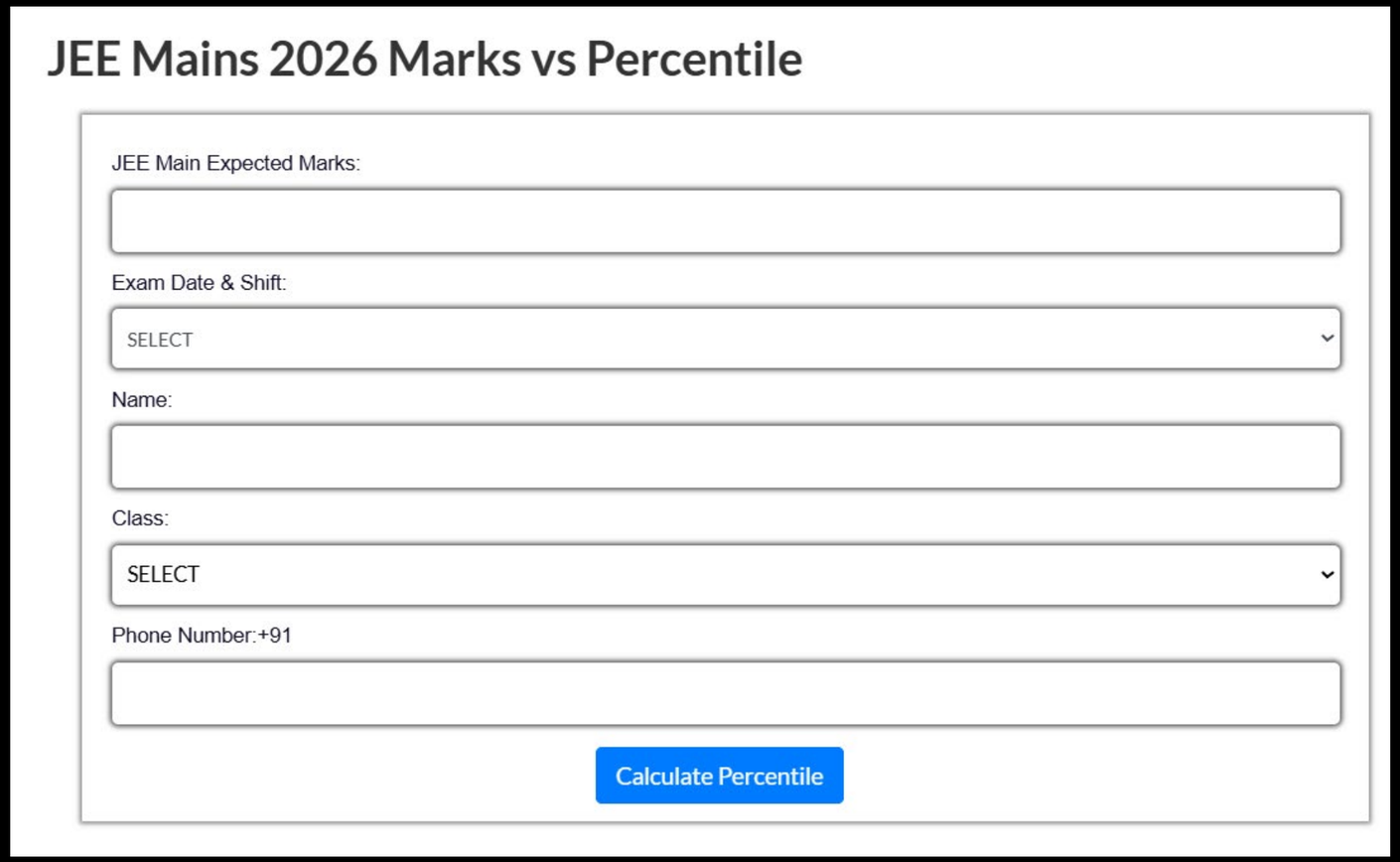

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