

MATHEMATICS

SECTION - A

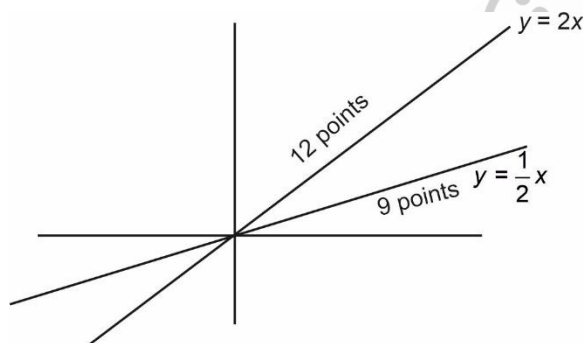
Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer:

1. Line L_1 of slope 2 and line L_2 of slope $\frac{1}{2}$ intersect at the origin O . In the first quadrant, P_1, P_2, \dots, P_{12} are 12 points on line L_1 and Q_1, Q_2, \dots, Q_9 are 9 points on line L_2 . Then the total number of triangles, that can be formed having vertices at three of the 22 points $O, P_1, P_2, \dots, P_{12}, Q_1, Q_2, \dots, Q_9$, is:
- (1) 1080 (2) 1188
(3) 1134 (4) 1026

Answer (3)

Sol. Total triangles



(2 points as $y = \frac{x}{2}$, 1 point on $y = \frac{x}{2}$)

+2(points and $y = \frac{x}{2}$, 1 point on $y = 2x$)

+(1 point on $y = 2x$, 1) point on $y = \frac{x}{2}$ and origin)

$$= {}^9C_2 \cdot {}^{12}C_1 + {}^9C_1 \cdot {}^{12}C_2 + {}^9C_1 \cdot {}^{12}C_1 \cdot 1C_1$$

$$= 1134$$

2. Let the Mean and Variance of five observations $x_1 = 1, x_2 = 3, x_3 = a, x_4 = 7$ and $x_5 = b$, $a > b$, be 5 and 10 respectively. Then the Variance of the observations $n + x_n, n = 1, 2, \dots, 5$ is

- (1) 16.4 (2) 16
(3) 17.4 (4) 17

Answer (2)

Sol. $5 = \frac{1+3+a+7+b}{5}$

$$\Rightarrow a + b = 14$$

$$\frac{1+9+a^2+49-b^2}{5} - (5)^2 = 10$$

$$a^2 + b^2 = 116$$

$$\Rightarrow a = 10, b = 4$$

New digits: 2, 5, 13, 11, 9

$$\text{Var} = \frac{4+26+169+121+81}{5} - 64$$

$$\text{Var} = 16$$

3. Let the equation $x(x+2)(12-k) = 2$ have equal roots. Then the distance of the point $\left(k, \frac{k}{2}\right)$ from the line $3x + 4y + 5 = 0$ is

- (1) $5\sqrt{3}$ (2) 15
(3) $15\sqrt{5}$ (4) 12

Answer (2)

Sol. $x^2 + 2x - \frac{2}{12-k} = 0$

$$D = 0$$

$$4 - 4\left(\frac{-2}{12-k}\right) = 0$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile



Shreyas Lohiya
PSID: 00003389699

100
Percentile



Harsh Jha
PSID: 00014863322

100
Percentile



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024

$$1 + \frac{2}{12-k} = 0$$

$$\Rightarrow k = 14$$

Point (14, 7)

$$\text{Distance} = \left| \frac{3(14) + 4(7) + 5}{5} \right|$$

$$d = 15$$

Option (2) is correct

4. The integral $\int_0^{\pi} \frac{8x dx}{4\cos^2 x + \sin^2 x}$ is equal to

(1) π^2 (2) $\frac{3\pi^2}{2}$

(3) $4\pi^2$ (4) $2\pi^2$

Answer (4)

Sol. $I = \int_0^{\pi} \frac{8x}{4\cos^2 x + \sin^2 x} dx \dots (1)$

$$I = \int_0^{\pi} \frac{8(\pi-x)}{4\cos^2(\pi-x) + \sin^2(\pi-x)} dx$$

$$I = \int_0^{\pi} \frac{8(\pi-x)}{4\cos^2 x + \sin^2 x} dx \dots (2)$$

Adding (1) and (2)

$$2I = 8\pi \int_0^{\pi} \frac{1}{4\cos^2 x + \sin^2 x} dx$$

$$I = 4\pi \times 2 \int_0^{\pi} \frac{\sec^2 x}{4\tan^2 x} dx$$

Put $\tan x = t$

$$\sec^2 x dx = dt$$

$$I = 8\pi \int_0^{\infty} \frac{dt}{4+t^2}$$

$$I = 8\pi \frac{1}{2} \left(\tan^{-1} \frac{t}{2} \right)_0^{\infty}$$

$$I = 4\pi \left(\frac{\pi}{2} \right)$$

$$I = 2\pi^2$$

5. If the domain of the function $f(x) = \log_7(1 - \log_4(x^2 - 9x + 18))$ is $(\alpha, \beta) \cup (\gamma, \delta)$, then $\alpha + \beta + \gamma + \delta$ is equal to

(1) 17 (2) 18

(3) 15 (4) 16

Answer (2)

Sol. $1 - \log_4(x^2 - 9x + 18) > 0$

$$\log_4(x^2 - 9x + 18) < 1$$

$$x^2 - 9x + 18 < 4$$

$$x^2 - 9x + 14 < 0$$

$$x \in (2, 7)$$

$$x^2 - 9x + 18 > 0$$

$$x \in (-\infty, 3) \cup (6, \infty)$$



$$x \in (2, 3) \cup (6, 7)$$

$$\alpha + \beta + \gamma + \delta = 18$$

6. Let $f: R \rightarrow R$ be a function defined by $f(x) = ||x+2| - 2|x||$. If m is the number of points of local minima and n is the number of points of local maxima of f , then $m+n$ is

(1) 3 (2) 2

(3) 4 (4) 5

Answer (1)

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



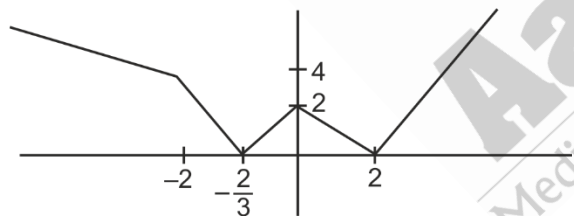
Sol. $f(x) = \begin{cases} |-x-2+2x| & x \leq -2 \\ |x+2+2x| & -2 \leq x \leq 0 \\ |x+2-2x| & x \geq 0 \end{cases}$

$$f(x) = \begin{cases} |-x-2+2x| & x \leq -2 \\ |x+2+2x| & -2 \leq x \leq 0 \\ |x+2-2x| & x \geq 0 \end{cases}$$

$$f(x) = \begin{cases} |x-2| & x \leq -2 \\ |3x+2| & -2 < x \leq 0 \\ |2-x| & x > 0 \end{cases}$$

$$f(x) = \begin{cases} 2-x & x \leq -2 \\ -3x-2 & -2 < x \leq -\frac{2}{3} \\ 3x+2 & -\frac{2}{3} < x \leq 0 \end{cases}$$

$$f(x) = \begin{cases} 2-x & x \leq -2 \\ -3x-2 & -2 < x \leq -\frac{2}{3} \\ 3x+2 & -\frac{2}{3} < x \leq 0 \\ 2-x & 0 < x < 2 \\ x-2 & x \geq 2 \end{cases}$$



No. of maxima = 1

No. of minima = 2

$m = 2$

$n = 1$

$m + n = 3$

7. If the probability that the random variable X takes the value x is given by

$P(X=x) = k(x+1)3^{-x}$, $x = 0, 1, 2, 3, \dots$, where k is a constant, then $P(X \geq 3)$ is equal to

(1) $\frac{4}{9}$

(2) $\frac{7}{27}$

(3) $\frac{1}{9}$

(4) $\frac{8}{27}$

Answer (3)

Sol. $s = \frac{k}{3^0} + \frac{2k}{3} + \frac{3k}{3^2} + \dots$

$$\frac{s}{3} = \frac{k}{3} + \frac{2k}{3^2} + \dots$$

$$s - \frac{s}{3} = k + \frac{k}{3} + \frac{k}{3^2} + \dots$$

$$\frac{2s}{3} = k \left(1 + \frac{1}{3} + \frac{1}{3^2} + \dots \right)$$

$$\frac{2s}{3} = k \times \frac{1}{1 - \frac{1}{3}} = \frac{3k}{2}$$

$$s = \frac{9k}{4} = 1 \quad (\text{Total probability})$$

$$k = \frac{4}{9}$$

$$P(x \geq 3) = 1 - (P(x=0) + P(x=1) + P(x=2))$$

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

$$= 1 - 2k$$

$$= 1 - 2 \times \frac{4}{9}$$

$$= \frac{1}{9}$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile



Shreyas Lohiya
PSID: 00003389699

100
Percentile



Harsh Jha
PSID: 00014863322

100
Percentile



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-1 JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024

8. Each of the angles β and γ that a given line makes with the positive y - and z -axes, respectively, is half of the angle that this line makes with the positive x -axis. Then the sum of all possible values of the angle β is

- (1) π (2) $\frac{3\pi}{4}$
 (3) $\frac{\pi}{2}$ (4) $\frac{3\pi}{2}$

Answer (2)

Sol. $\beta = \gamma = \frac{\alpha}{2}$

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$$

$$\cos^2 2\beta + \cos^2\beta + \cos^2\beta = 1$$

$$(2\cos^2\beta - 1)^2 + (2\cos^2\beta - 1) = 0$$

$$(2\cos^2\beta - 1) [(2\cos^2\beta - 1) + 1] = 0$$

$$\cos^2\beta = \frac{1}{2} \text{ or } \cos^2\beta = 0$$

$$\therefore \beta = \frac{\pi}{4}, \frac{\pi}{2}$$

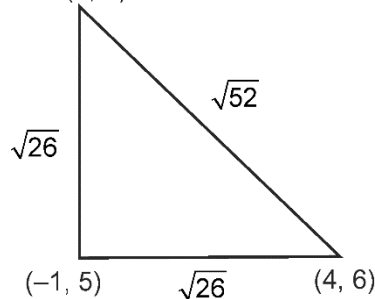
$$\therefore \text{sum} = \frac{\pi}{4} + \frac{\pi}{2} = \frac{3\pi}{4}$$

9. If the four distinct points $(4, 6)$, $(-1, 5)$, $(0, 0)$ and $(k, 3k)$ lie on a circle of radius r , then $10k + r^2$ is equal to

- (1) 33 (2) 32
 (3) 34 (4) 35

Answer (4)

Sol. $(0, 0)$



$$2r = \sqrt{52}$$

$$4r^2 = 52$$

$$2r^2 = 26$$

$$r^2 = 13$$

Eqⁿ of circle is

$$x(x-4) + y(y-6) = 0$$

$$k(k-4) + 3k(3k-6) = 0$$

$$k^2 - 4k + 9k^2 - 18k = 0$$

$$10k^2 = 22k$$

$$10k = 22$$

$$\therefore 10k + r^2 = 35$$

10. The sum $1 + \frac{1+3}{2!} + \frac{1+3+5}{3!} + \frac{1+3+5+7}{4!} + \dots$ upto ∞ terms, is equal to

- (1) $6e$ (2) $2e$
 (3) $3e$ (4) $4e$

Answer (2)

Sol. $T_r = \frac{r^2}{r!} = \frac{r}{(r-1)!} = \frac{(r-1)+1}{(r-1)!} = \frac{1}{(r-2)!} + \frac{1}{(r-1)!}$

$$\sum_{r=1}^{\infty} T_r = \sum_{r=1}^{\infty} \frac{1}{(r-2)!} + \frac{1}{(r-1)!} = e + e = 2e$$

11. Let f be a function such that $f(x) + 3f\left(\frac{24}{x}\right) = 4x$,

$x \neq 0$. Then $f(3) + f(8)$ is equal to

- (1) 10 (2) 12
 (3) 13 (4) 11

Answer (4)

Sol. $f(x) + 3f\left(\frac{24}{x}\right) = 4x, x \neq 0 \quad \dots(1)$

replace x by $\frac{24}{x}$

$$f\left(\frac{24}{x}\right) + 3f\left(\frac{24}{\frac{24}{x}}\right) = 4\left(\frac{24}{x}\right) = \frac{96}{x} \quad \dots(2)$$

$$3 \times (2) - (1)$$

$$\Rightarrow 8f(x) = \frac{96.3}{x} - 4x \Rightarrow f(x) = \frac{36}{x} - \frac{x}{2}$$

$$f(3) + f(8) = \left(12 - \frac{3}{2}\right) + \left(\frac{36}{8} - 4\right)$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILES

1000+ 99
PERCENTILES

4000+ 95
PERCENTILES

100
Percentile



Shreyas Lohiya
PSID: 00003389699

100
Percentile



Harsh Jha
PSID: 00014863322

100
Percentile



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
1 AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
1 AIR-34 CRL
JEE (Main)
2024

$$= 8 + \frac{36}{8} - \frac{12}{8} = 11$$

12. The number of solutions of the equation
 $(4 - \sqrt{3})\sin x - 2\sqrt{3}\cos^2 x = -\frac{4}{1 + \sqrt{3}}, x \in \left[-2\pi, \frac{5\pi}{2}\right]$

is

- (1) 6 (2) 4
 (3) 3 (4) 5

Answer (4)

Sol. $(4 - \sqrt{3})\sin x - 2\sqrt{3}\cos^2 x = \frac{-4}{(1 + \sqrt{3})}$

Let $\sin x = t \Rightarrow \cos^2 x = 1 - t^2$

$$(4 - \sqrt{3})t - 2\sqrt{3}(1 - t^2) = \frac{-4}{(1 + \sqrt{3})}$$

$$\Rightarrow 2\sqrt{3}t^2 + (4 - \sqrt{3})t - 2\sqrt{3} + \frac{4}{1 + \sqrt{3}} = 0$$

$$2\sqrt{3}t^2 + (4 - \sqrt{3})t + \frac{(-2\sqrt{3} - 2)}{(1 + \sqrt{3})} = 0$$

$$2\sqrt{3}t^2 + (4 - \sqrt{3})t - 2 = 0$$

$$\Rightarrow t = \frac{(\sqrt{3} - 4) \pm \sqrt{19 - 8\sqrt{3} + 8(2\sqrt{3})}}{4\sqrt{3}}$$

$$t = \frac{(\sqrt{3} - 4) \pm \sqrt{19 + 8\sqrt{3}}}{4\sqrt{3}} = \frac{(\sqrt{3} - 4) \pm (\sqrt{3} + 4)}{4\sqrt{3}} = \left(\frac{2\sqrt{3}}{4\sqrt{3}}\right) \text{ or } \frac{-8}{4\sqrt{3}}$$

$$\Rightarrow \sin x = \frac{1}{2} \text{ or } \frac{-2}{\sqrt{3}} < -1 \Rightarrow \text{only } \sin x = \frac{1}{2}$$

$$\Rightarrow 5 \text{ solutions in } x \in \left[-2\pi, \frac{5\pi}{2}\right]$$

13. The shortest distance between the curves $y^2 = 8x$ and $x^2 + y^2 + 12y + 35 = 0$ is:

- (1) $3\sqrt{2} - 1$ (2) $2\sqrt{3} - 1$
 (3) $2\sqrt{2} - 1$ (4) $\sqrt{2}$

Answer (3)

Sol. Equation of normal: $y = mx - 2am - am^3$ ($a = 2$)
 $y = mx - 4m - 2m^3$

centre of circle: $c(0, -6)$, radius = 1

$$-6 = -4m - 2m^3$$

$$\Rightarrow m = 1$$

$$P(am^2, -2am)$$

$$= P(2, -4)$$

Shortest distance: $CP - r$

$$= \sqrt{4 + 4} - 1$$

$$= 2\sqrt{2} - 1$$

14. Let $A = \{-2, -1, 0, 1, 2, 3\}$. Let R be a relation on A defined by xRy if and only if $y = \max\{x, 1\}$. Let l be the number of elements in R . Let m and n be the minimum number of elements required to be added in R to make it reflexive and symmetric relations, respectively. Then $l + m + n$ is equal to

- (1) 12 (2) 11
 (3) 14 (4) 13

Answer (1)

Sol. $A = \{-2, -1, 0, 1, 2, 3\}$

$$xRy \Leftrightarrow y = \max\{x, 1\}$$

$$\therefore R = \{(-2, 1), (-1, 1), (0, 1), (1, 1), (2, 2), (3, 3)\}$$

$$l = 6$$

Elements to be added to make it reflexive:

$$(-2, -2), (-1, -1), (0, 0)$$

$$\therefore m = 3$$

Elements to be added to make it symmetric:

$$(1, -2), (1, -1), (1, 0)$$

$$\therefore n = 3$$

$$l + m + n = 12$$

15. The distance of the point $(7, 10, 11)$ from the line

$$\frac{x-4}{1} = \frac{y-4}{0} = \frac{z-2}{3} \text{ along the line}$$

$$\frac{x-9}{2} = \frac{y-13}{3} = \frac{z-17}{6} \text{ is}$$

- (1) 16 (2) 18
 (3) 14 (4) 12

Answer (3)

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILES

1000+ 99
PERCENTILES

4000+ 95
PERCENTILES

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-34 CRL
JEE (Main)
2022



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Main)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024

Sol. Equation of line passing through $P(7, 10, 11)$ along the line $\frac{x-9}{2} = \frac{y-13}{3} = \frac{z-17}{6}$ is

$$\frac{x-7}{2} = \frac{y-10}{3} = \frac{z-11}{6} = \lambda$$

Let the point on the line is

$$Q(2\lambda + 7, 3\lambda + 10, 6\lambda + 11)$$

$$Q \text{ lies on line } \frac{x-4}{1} = \frac{y-4}{0} = \frac{z-2}{3}$$

$$3\lambda + 10 = 4 \Rightarrow \lambda = -2$$

$$\therefore Q(3, 4, -1)$$

$$PQ = \sqrt{16 + 36 + 144} = 14$$

16. Consider the lines $x(3\lambda + 1) + y(7\lambda + 2) = 17\lambda + 5$, λ being a parameter, all passing through a point P . One of these lines (say L) is farthest from the origin. If the distance of L from the point $(3, 6)$ is d , then the value of d^2 is

- (1) 10 (2) 20
(3) 15 (4) 30

Answer (2)

Sol. $x(3\lambda + 1) + y(7\lambda + 2) = 17\lambda + 5$

$$(x + 2y - 5) + \lambda(3x + 7y - 17) = 0$$

$$L_1 + \lambda L_2 = 0$$

$\Rightarrow P$ is intersection of L_1 & L_2 i.e. $(1, 2)$

$$y - 2 = m(x - 1)$$

$$mx - y + 2 - m = 0$$

$$\text{Distance from origin} = \left| \frac{2-m}{\sqrt{1+m^2}} \right| = \max$$

$$2y - 4 = -x + 1$$

$$\text{For } m = -\frac{1}{2}$$

$$\therefore L = y - 2 = -\frac{1}{2}(x - 1)$$

$$L: x + 2y - 5 = 0$$

$$\text{Now, } d = \left| \frac{3 + 12 - 5}{\sqrt{5}} \right| = \left| \frac{10}{\sqrt{5}} \right|$$

$$d^2 = \frac{100}{5} = 20$$

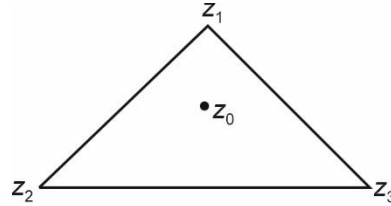
17. If $z_1, z_2, z_3 \in \mathbb{C}$ are the vertices of an equilateral triangle, whose centroid is z_0 , then $\sum_{k=1}^3 (z_k - z_0)^2$ is

equal to

- (1) 0 (2) 1
(3) i (4) $-i$

Answer (1)

Sol.



$$z_0 = \frac{z_1 + z_2 + z_3}{3}$$

$$\sum_{k=1}^3 (z_k - z_0)^2 = (z_1 - z_0)^2 + (z_2 - z_0)^2 + (z_3 - z_0)^2$$

Let z_0 is origin $\Rightarrow z_1, z_2, z_3$ lies on a circle

having $|z_0 - z| = R$

$$\therefore z_1 = Re^{2\pi i/3} \quad z_2 = Re^{4\pi i/3} \quad z_3 = Re^{6\pi i/3}$$

$$\Rightarrow z_1^2 + z_2^2 + z_3^2 = R^2 [e^{4\pi i/3} + e^{8\pi i/3} + e^{12\pi i/3}]$$

$$= 0$$

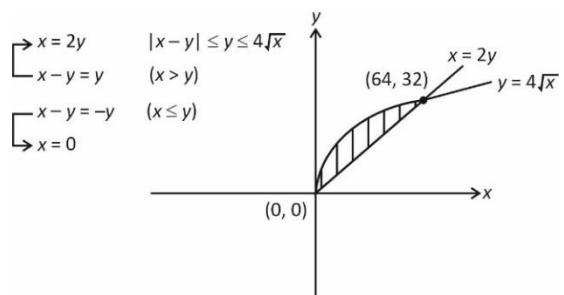
$$\therefore \sum_{k=1}^3 (z_k - z_0)^2 = 0$$

18. The area of the region $\{(x, y) : |x - y| \leq y \leq 4\sqrt{x}\}$ is

- (1) $\frac{512}{3}$ (2) $\frac{1024}{3}$
(3) $\frac{2048}{3}$ (4) 512

Answer (2)

Sol. $|x - y| \leq y \leq 4\sqrt{x}$



THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILES

1000+ 99 PERCENTILES

4000+ 95 PERCENTILES

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



$$\text{Area} = \int_0^{64} \left(4\sqrt{x} - \frac{x}{2} \right) dx$$

$$= \left[\frac{4x^{3/2}}{\frac{3}{2}} - \frac{x^2}{4} \right]_0^{64}$$

19. Let $y = y(x)$ be the solution of the differential equation $\frac{dy}{dx} + 3(\tan^2 x)y + 3y = \sec^2 x$, $y(0) = \frac{1}{3} + e^3$.

Then $y\left(\frac{\pi}{4}\right)$ is equal to

- (1) $\frac{4}{3} + e^3$ (2) $\frac{4}{3}$
(3) $\frac{2}{3}$ (4) $\frac{2}{3} + e^3$

Answer (2)

Sol. $\frac{dy}{dx} + 3(\tan^2 x)y + 3y = \sec^2 x$

$$\Rightarrow \frac{dy}{dx} + 3\sec^2 x y = \sec^2 x$$

$$\text{I.F} = e^{\int 3\sec^2 x dx}$$

$$= e^{3\tan x}$$

$$y \cdot e^{3\tan x} = \int e^{3\tan x} \cdot \sec^2 x dx + c$$

$$y \cdot e^{3\tan x} = \frac{e^{3\tan x}}{3} + c$$

$$\text{Also } f(0) = \frac{1}{3} + e^3$$

$$\Rightarrow \left(\frac{1}{3} + e^3 \right) = \frac{1}{3} + c$$

$$\Rightarrow c = e^3$$

$$\therefore y \cdot e^{3\tan x} = \frac{e^{3\tan x}}{3} + e^3$$

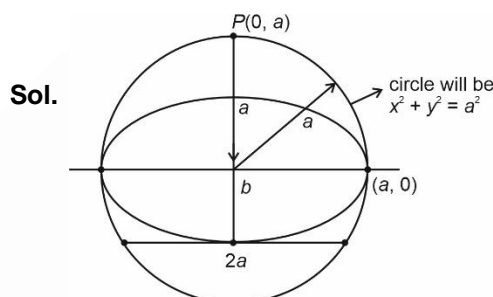
$$\text{Put } x = \frac{\pi}{4}$$

$$ye^3 = \frac{e^3}{3} + e^3 \Rightarrow y = \frac{4}{3}$$

20. Let C be the circle of minimum area enclosing the ellipse $E: \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with eccentricity $\frac{1}{2}$ and foci $(\pm 2, 0)$. Let PQR be a variable triangle, whose vertex P is on the circle C and the side QR of length $2a$ is parallel to the major axis of E and contains the point of intersection of E with the negative y -axis. Then the maximum area of the triangle PQR is:

- (1) $8(2 + \sqrt{3})$ (2) $6(2 + \sqrt{3})$
(3) $6(3 + \sqrt{2})$ (4) $8(3 + \sqrt{2})$

Answer (1)



$$\text{Area} = \frac{1}{2} \times (a + b) \cdot 2a = a(a + b)$$

$$\text{Since, } e = \frac{1}{2} \Rightarrow ae = 2 \Rightarrow a = 4, b = 2\sqrt{3}$$

$$\Rightarrow \text{Area} = 4(4 + 2\sqrt{3}) = 8(2 + \sqrt{3})$$

SECTION - B

Numerical Value Type Questions: This section contains 5 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

21. If the equation of the hyperbola with foci $(4, 2)$ and $(8, 2)$ is $3x^2 - y^2 - \alpha x + \beta y + \gamma = 0$, then $\alpha + \beta + \gamma$ is equal to _____.

Answer (141)

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE TOPPERS

70+ 100 PERCENTILERS

1000+ 99 PERCENTILERS

4000+ 95 PERCENTILERS

100 Percentile in Physics & Maths



Shreyas Lohiya
PSID: 00003389699

100 Percentile in Physics



Harsh Jha
PSID: 00014863322

100 Percentile in Physics & Chemistry



Devya Rustagi
PSID: 00014768785

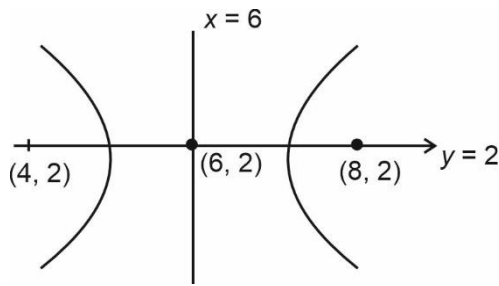
99.99 Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS





$$\text{Given } \frac{(x-6)^2}{a^2} - \frac{(y-2)^2}{b^2} = 1$$

$$\Rightarrow b^2x^2 - a^2y^2 - 12xb^2 + 4ya^2 + 36b^2 - 4a^2 - a^2b^2 = 0$$

$$\text{Comparing } \frac{b^2}{a^2} = 3 \Rightarrow e^2 = 1 + \frac{b^2}{a^2}$$

$$\Rightarrow e^2 = 4$$

$$\Rightarrow \boxed{e=2}$$

$$\text{Similarly, } 2ae = 4$$

$$\Rightarrow a = 1 \Rightarrow b = \sqrt{3}$$

$$\frac{(x-6)^2}{1} - \frac{(y-2)^2}{3} = 1$$

$$\Rightarrow 3x^2 - y^2 - 36x + 4y + 108 - 4 - 3 = 0$$

$$\Rightarrow 3x^2 - y^2 - 36x + 4y + 101 = 0$$

$$\Rightarrow \alpha = 36, \beta = 4, \gamma = 101$$

$$\Rightarrow \alpha + \beta + \gamma = 141$$

22. Let I be the identity matrix of order 3×3 and for the

$$\text{matrix } A = \begin{bmatrix} \lambda & 2 & 3 \\ 4 & 5 & 6 \\ 7 & -1 & 2 \end{bmatrix}, |A| = -1. \text{ Let } B \text{ be the}$$

inverse of the matrix $\text{adj}(A \text{ adj}(A^2))$. Then $|\lambda(B + I)|$ is equal to _____.

Answer (38)

$$\text{Sol. } B = [\text{adj}(A \text{ adj}(A^2))]^{-1}$$

$$\text{Adj}(A^2) = (\text{adj}A)^2 \Rightarrow A \text{ adj}(A^2) = A \text{ adj}(A) \cdot (\text{adj}A) = A(|A|A^{-1})^2 = |A|^2(A^{-1}) = A^{-1}$$

$$\Rightarrow B = (\text{adj}(A^{-1}))^{-1} = (|A^{-1}|A)^{-1} = \frac{A^{-1}}{-1} = -A^{-1}$$

$$\Rightarrow B = -A^{-1}$$

$$|A| = -1 = \begin{vmatrix} \lambda & 2 & 3 \\ 4 & 5 & 6 \\ 7 & -1 & 2 \end{vmatrix} = -1 \Rightarrow \lambda = 3$$

$$|3B + I| = |I - 3A^{-1}| = \frac{|A||I - 3A^{-1}|}{|A|} = \frac{|A - 3I|}{|A|}$$

$$= \frac{|A - 3I|}{-1} = \begin{vmatrix} 0 & 2 & 3 \\ 4 & 2 & 6 \\ 7 & -1 & -1 \end{vmatrix} = 38$$

$$\Rightarrow |3B + I| = 38$$

23. If $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right)^{\frac{1}{x^2}} = p$, then $96 \log_e p$ is equal to _____.

Answer (32)

$$\text{Sol. } \lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right)^{\frac{1}{x^2}} = p$$

$$\therefore \text{Form: } 1^\infty$$

$$\Rightarrow p = e^{\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} - 1 \right) \frac{1}{x^2}}$$

$$= e^{\lim_{x \rightarrow 0} \left(\frac{\tan x - x}{x^3} \right)}$$

$$= e^{\lim_{x \rightarrow 0} \left(\frac{x + \frac{x^3}{3} + \frac{2}{15}x^5 + \dots - x}{x^3} \right)} = e^{\frac{1}{3}}$$

$$\Rightarrow \log_e p = \frac{1}{3}$$

$$\Rightarrow 96 \log_e p = 32$$

24. Let $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = 3\hat{i} - 3\hat{j} + 3\hat{k}$, $\vec{c} = 2\hat{i} - \hat{j} + 2\hat{k}$ and \vec{d} be a vector such that $\vec{b} \times \vec{d} = \vec{c} \times \vec{d}$ and $\vec{a} \cdot \vec{d} = 4$. Then $|\vec{a} \times \vec{d}|^2$ is equal to _____.

Answer (128)

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILES

1000+ 99 PERCENTILES

4000+ 95 PERCENTILES

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-36 CRL
JEE (Main)
2022



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Main)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024

Sol. $\vec{b} \times \vec{d} = \vec{c} \times \vec{d} \Rightarrow (\vec{b} - \vec{c}) \times \vec{d} = 0$

$\Rightarrow (\vec{b} - \vec{c})$ is parallel to \vec{d}

$\Rightarrow \vec{d} = \lambda(\hat{i} - 2\hat{j} + \hat{k})$

$\therefore \vec{a} \cdot \vec{d} = 4$

$\Rightarrow \lambda - 4\lambda + \lambda = 4$

$\Rightarrow \lambda = -2 \Rightarrow \vec{d} = -2\hat{i} + 4\hat{j} - 2\hat{k}$

$\vec{a} \times \vec{d} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 1 \\ -2 & 4 & -2 \end{vmatrix} = -8\hat{i} + 0\hat{j} + 8\hat{k}$

$|\vec{a} \times \vec{d}|^2 = 128$

25. Let $(1 + x + x^2)^{10} = a_0 + a_1x + a_2x^2 + \dots + a_{20}x^{20}$. If $(a_1 + a_3 + a_5 + \dots + a_{19}) - 11a_2 = 121k$, then k is equal to _____.

Answer (239)

Sol. Let $f(x) = (1 + x + x^2)^{10} = \sum_{r=0}^{20} a_r x^r$

The sum of odd coefficients: $S_{\text{odd}} = a_1 + a_3 + a_5 + \dots + a_{19}$

Subtracting $11a_2$ from above will give the answer

$S_{\text{odd}} = \frac{f(1) - f(-1)}{2}$

$f(1) = (1 + 1 + 1)^{10} = 3^{10}$

$f(-1) = (1 - 1 + 1)^{10} = (1)^{10} = 1$

$S_{\text{odd}} = \sum_{\text{odd } r} a_r = \frac{3^{10} - 1}{2}$

Now for a_2

$1 + x + x^2 = \frac{1 - x^3}{1 - x} \Rightarrow f(x) = \left(\frac{1 - x^3}{1 - x} \right) = \frac{(1 - x^3)^{10}}{(1 - x)^{10}}$

Now use:

$(1 - x^3)^{10} = \sum_{k=0}^{10} (-1)^k \binom{10}{k} x^{3k}$

$(1 - x)^{-10} = \sum_{r=0}^{\infty} \binom{r+9}{9} x^r$

So

$f(x) = \left(\sum_{k=0}^{10} (-1)^k \binom{10}{k} x^{3k} \right) \cdot \left(\sum_{r=0}^{\infty} \binom{r+9}{9} x^r \right)$

Only the term with x^0 from the first sum (i.e., $k = 0$) can contribute to x^2 , since all other $k \geq 1$ gives $x^{3k} \geq x^3$

From $(1 - x^3)^{10}$: the x^0 term is $\binom{10}{0} = 1$

From $(1 - x)^{-10}$: the coefficient of x^2 is

$\binom{2+9}{9} = \binom{11}{9} = 55$

Hence, $a_2 = 1 \cdot 55 = 55$

Now, $S_{\text{odd}} - 11a_2 = \frac{3^{10} - 1}{2} - 11 \cdot 55 = 121k$

$3^{10} = 59049$

So:

$S = \frac{59049 - 1}{2} - 605 = \frac{59048}{2} - 605$

$= 29524 - 605 = 28919$

So:

$121k = 28919 \Rightarrow k = \frac{28919}{121} = 239$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99 PERCENTILERS

4000+ 95 PERCENTILERS

100
Percentile



Shreyas Lohiya
PSID: 00003389699

100
Percentile



Harsh Jha
PSID: 00014863322

100
Percentile



Devya Rustagi
PSID: 00014768785

99.99
Percentile

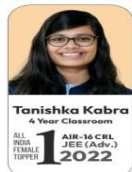


Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
1st AIR
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
1st AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
1st AIR-34 CRL
JEE (Main)
2024

PHYSICS

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answers :

26. A magnetic dipole experiences a torque of $80\sqrt{3}$ N m when placed in uniform magnetic field in such a way that dipole moment makes angle of 60° with magnetic field. The potential energy of the dipole is :

- (1) -80 J (2) $-40\sqrt{3}$ J
(3) -60 J (4) 80 J

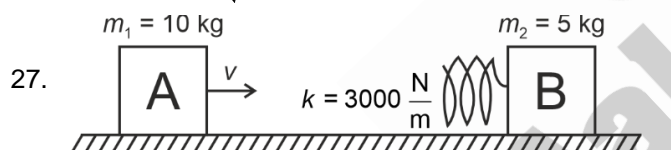
Answer (1)

Sol. $\tau = MB \sin\theta$

$$U = -MB \cos\theta$$

$$\frac{U}{\tau} = -\cot\theta$$

$$U = -80\sqrt{3} \times \frac{1}{\sqrt{3}} = -80$$



Consider two blocks A and B of masses $m_1 = 10$ kg and $m_2 = 5$ kg that are placed on a frictionless table. The block A moves with a constant speed $v = 3$ m/s towards the block B kept at rest. A spring with spring constant $k = 3000$ N/m is attached with the block B as shown in the figure. After the collision, suppose that the blocks A and B, along with the spring in constant compression state, move together, then the compression in the spring is, (Neglect the mass of the spring)

- (1) 0.2 m (2) 0.3 m
(3) 0.4 m (4) 0.1 m

Answer (4)

Sol. COLM

$$10 \times 3 + 50 \times 0 = 15V_C$$

$$V_C = 2 \text{ m/s}$$

COME

$$\frac{1}{2} kx^2 = \left| \frac{1}{2} (m + m) V_C^2 - \frac{1}{2} m v_0^2 \right|$$

$$1500x^2 = \left| \frac{1}{2} \times 15 \times 2^2 - \frac{1}{2} \times 10 \times 3^2 \right|$$

$$1500x^2 = |30 - 45|$$

$$x^2 = \frac{15}{1500}$$

$$x = \frac{1}{10} = 0.1 \text{ m}$$

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

Assertion A : The Bohr model is applicable to hydrogen and hydrogen-like atoms only

Reason R : The formulation of Bohr model does not include repulsive force between electrons.

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

- (1) **A** is true but **R** is false
(2) **A** is false but **R** is true
(3) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**
(4) Both **A** and **R** are true and **R** is the correct explanation of **A**

Answer (4)

Sol. Assertion is correct as a fact, Reason is correct as there are no two electrons for repulsion.

Therefore (4) is most appropriate response

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILES
PHYSICS & MATHS

1000+ 99 PERCENTILES
9 SUBJECTS

4000+ 95 PERCENTILES
9 SUBJECTS

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
1 AIR-16 CRL
JEE (Adv.)
2022

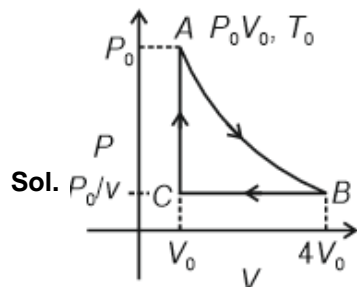


Sanvi Jain
4 Year Classroom
1 AIR-34 CRL
JEE (Main)
2024

29. An ideal gas exists in a state with pressure P_0 , volume V_0 . It is isothermally expanded to 4 times of its initial volume (V_0), then isobarically compressed to its original volume. Finally the system is heated isochorically to bring it to its initial state. The amount of heat exchanged in this process is

- (1) $P_0 V_0 (\ln 2 - 0.25)$ (2) $P_0 V_0 (2 \ln 2 - 0.75)$
(3) $P_0 V_0 (2 \ln 2 - 0.25)$ (4) $P_0 V_0 (\ln 2 - 0.75)$

Answer (2)



$$\Delta Q = \Delta v + \Delta W$$

For cyclic process $\Delta Q = \Delta W$

$$W = W_{AB} + W_{BC} + W_{CA}$$

$$= P_0 V_0 \ln \frac{4V_0}{V_0} + \frac{P_0}{4} (V_0 - 4V_0) + 0$$

$$= P_0 V_0 \ln 4 - \frac{3}{4} P_0 V_0$$

$$= P_0 V_0 (2 \ln 2 - 0.75)$$

30. A particle is projected with velocity u so that its horizontal range is three times the maximum height attained by it. The horizontal range of the projectile

is given as $\frac{nu^2}{25g}$, where value of n is :

(Given, 'g' is the acceleration due to gravity.)

- (1) 18 (2) 6
(3) 12 (4) 24

Answer (4)

Sol. $R = 3H$

$$\frac{u^2 \sin 2\theta}{g} = \frac{3u^2 \sin^2 \theta}{2g}$$

$$2 \sin \theta \cos \theta = \frac{3}{2} \sin \theta \sin \theta$$

$$\frac{4}{3} = \tan \theta$$

$$\theta = 53^\circ$$

$$R = \frac{u^2}{g} \times 2 \times \frac{4}{5} \times \frac{3}{5} = \frac{24}{25} \frac{u^2}{g}$$

31. A monochromatic light of frequency 5×10^{14} Hz travelling through air, is incident on a medium of refractive index '2'. Wavelength of the refracted light will be :

- (1) 400 nm (2) 300 nm
(3) 600 nm (4) 500 nm

Answer (2)

Sol. $v = v\lambda$

As $\mu = 2$ therefore; speed $c \rightarrow \frac{C}{2}$

$$\lambda_r = \frac{C}{2v} = \frac{3 \times 10^8}{2 \times 5 \times 10^{14}} = 3 \times 10^{-8-15} \text{ m}$$

$$= 3 \times 10^{-7} \times 10^9 \text{ nm} = 300 \text{ nm}$$

32. A block of mass 1 kg, moving along x with speed $v_i = 10$ m/s enters a rough region ranging from $x = 0.1$ m to $x = 1.9$ m. The retarding force acting on the block in this range is $F_r = -kx$ N, with $k = 10$ N/m. Then the final speed of the block as it crosses rough region is.

- (1) 6 m/s (2) 10 m/s
(3) 4 m/s (4) 8 m/s

Answer (4)

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE TOPPERS

70+ 100 PERCENTILERS
PHYSICS (JEE 1, 2024)

1000+ 99 PERCENTILERS
& ABOVE

4000+ 95 PERCENTILERS
& ABOVE

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
1 AIR (Adv.)
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
1 AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
1 AIR-34 CRL
JEE (Main)
2024

Sol. $W = \Delta k$ so $|W_f| = \text{loss in KE}$

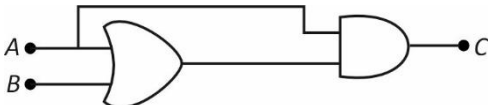
$$\frac{1}{2} k((1.9)^2 - (0.1)^2) = \frac{1}{2} \times 1 \{10^2 - v^2\}$$

$$10 \times 1.8 \times 2 = 100 - v^2$$

$$v^2 = 64$$

$$v = 8 \text{ m/s}$$

33. The truth table corresponding to the circuit given below is :



(1)

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

(2)

A	B	C
0	0	0
0	1	0
1	0	1
1	1	1

(3)

A	B	C
0	0	1
1	0	0
0	1	0
1	1	0

(4)

A	B	C
0	0	0
1	0	0
0	1	0
1	1	1

Answer (2)

Sol. Logic : $C = (A + B)$

$$A = A \cdot A + A \cdot B$$

$$= A + A \cdot B$$

$$= A(1 + B)$$

$$C = A$$

34. Two monochromatic light beams have intensities in the ratio 1 : 9. An interference pattern is obtained by these beams. The ratio of the intensities of maximum to minimum is

(1) 3 : 1

(2) 9 : 1

(3) 8 : 1

(4) 4 : 1

Answer (4)

Sol. $\frac{I_{\max}}{I_{\min}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2} = \frac{(1+3)^2}{(1-3)^2} = \frac{16}{4} = 4$

35. In the resonance experiment, two air columns (closed at one end) of 100 cm and 120 cm long, give 15 beats per second when each one is sounding in the respective fundamental modes. The velocity of sound in the air column is

(1) 370 m/s

(2) 340 m/s

(3) 360 m/s

(4) 335 m/s

Answer (3)

Sol. $f_0 = \frac{v}{4L}$

$$\Delta f = \frac{v}{4} \left\{ \frac{1}{1} - \frac{1}{1.2} \right\}$$

$$\frac{15 \times 4 \times 1.2}{0.2} = v$$

$$360 = v$$

36. Width of one of the two slits in a Young's double slit interference experiment is half of the other slit. The ratio of the maximum to the minimum intensity in the interference pattern is

(1) $(2\sqrt{2} + 1) : (2\sqrt{2} - 1)$ (2) 3 : 1

(3) 9 : 1

(4) $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$

Answer (3)

Sol. Amplitude \propto width

$$\Rightarrow \text{Intensity} \propto \text{width}^2$$

$$I_1 = I, I_2 = 4I; \text{ ratio } \left(\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}} \right)^2$$

$$\text{Ratio} = \left(\frac{1+2}{1-2} \right)^2 = 9$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILES

1000+ 99 PERCENTILES

4000+ 95 PERCENTILES



OUR JEE CHAMPIONS



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

Assertion A : If Oxygen ion (O^{2-}) and Hydrogen ion (H^+) enter normal to the magnetic field with equal momentum, then the path of O^{2-} ion has a smaller curvature than that of H^+ .

Reason R : A proton with same linear momentum as an electron will form a path of smaller radius of curvature on entering a uniform magnetic field perpendicularly.

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

- (1) **A** is true but **R** is false
- (2) Both **A** and **R** are true and **R** is the correct explanation of **A**
- (3) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**
- (4) **A** is false but **R** is true

Answer (1)

Sol. $R = \frac{mv}{qB}$

(A) mv , B are same for O^{2-} & H^+ therefore $R \propto \frac{1}{|q|}$

therefore (A) is correct

(B) $R = \frac{mv}{qB}$; mv , q , B are same both therefore (R)

is incorrect

38. An electric bulb rated as 100W – 220 V is connected to an ac source of rms voltage 220 V. The peak value of current through the bulb is

- (1) 0.64 A
- (2) 0.32 A
- (3) 0.45 A
- (4) 2.2 A

Answer (1)

Sol. $R_B = \frac{V^2}{P} = \frac{220 \times 220}{100} = 484$

$$I_{rms} = \frac{V_{rms}}{R} = \frac{220}{484} = \frac{10}{22} = \frac{5}{11}$$

$$I_0 = \frac{5\sqrt{2}}{11} \approx \frac{7.07}{11} \approx 0.64$$

39. Match the **LIST-I** with **LIST-II**.

	LIST-I		LIST-II
A.	Boltzmann constant	I.	ML^2T^{-1}
B.	Coefficient of viscosity	II.	$MLT^{-3}K^{-1}$
C.	Planck's constant	III.	$ML^2T^{-2}K^{-1}$
D.	Thermal conductivity	IV.	$ML^{-1}T^{-1}$

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

- (1) A – III, B – IV, C – I, D – II
- (2) A – III, B – II, C – I, D – IV
- (3) A – II, B – III, C – IV, D – I
- (4) A – III, B – IV, C – II, D – I

Answer (1)

Sol. $kt = \text{Energy} \Rightarrow k = ML^2T^{-2}K^{-1}$

A \rightarrow III

$$F = 6\pi\eta ru \Rightarrow \eta = \frac{MLT^{-2}}{LLT^{-1}}$$

$$\eta = ML^{-1}T^{-1}$$

B \rightarrow IV

$$E = h\nu = h = ML^2T^{-1}$$

C \rightarrow I

$$H = \frac{kA\Delta T}{l} = k = \frac{ML^2T^{-3}}{LK} = MLT^{-3}K^{-1}$$

D \rightarrow II

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Maths
100
Percentile

Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry
100
Percentile

Harsh Jha
PSID: 00014863322

99.99
Percentile
in Physics
& Chemistry
99.99
Percentile

Devya Rustagi
PSID: 00014768785

99.99
Percentile
in Physics
& Chemistry
99.99
Percentile

Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS

Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020

Tanishka Kabra
4 Year Classroom
1 AIR-16 CRL
JEE (Adv.)
2022

Sanvi Jain
4 Year Classroom
1 AIR-34 CRL
JEE (Main)
2024

40. Using a battery, a 100 pF capacitor is charged to 60 V and then the battery is removed. After that, a second uncharged capacitor is connected to the first capacitor in parallel. If the final voltage across the second capacitor is 20 V, its capacitance is: (in pF)

- (1) 100
(2) 400
(3) 200
(4) 600

Answer (3)

Sol. 

i.e. $Q = 60 \times 100 \text{ pC}$

When new capacitance C' is connected

Then $Q = (C + C')V$

$60 \times 100 = (100 + C') \times 20$

$200 = C'$

41. A particle moves along the x-axis and has its displacement x varying with time t according to the equation:

$x = c_0(t^2 - 2) + c(t - 2)^2$

Where c_0 and c are constants of appropriate dimensions. Then, which of the following statements is correct?

- (1) The acceleration of the particle is $2c_0$
(2) The initial velocity of the particle is $4c$
(3) The acceleration of the particle is $2c$
(4) The acceleration of the particle is $2(c + c_0)$

Answer (4)

Sol. $x = C_0(t^2 - 2) + C(t^2 + 4 - 2t)$

$V = C_0(2t) + C(2t - 2)$

at $t = 0$

$v = -2C$

$a = 2C_0 + 2C$

42. A motor operating on 100 V draws a current of 1 A. If the efficiency of the motor is 91.6%, then the loss of power in units of cal/s is

- (1) 4
(2) 6.2
(3) 8.4
(4) 2

Answer (4)

Sol. $P_0 = 100 \times 1 = 100 \text{ W}$

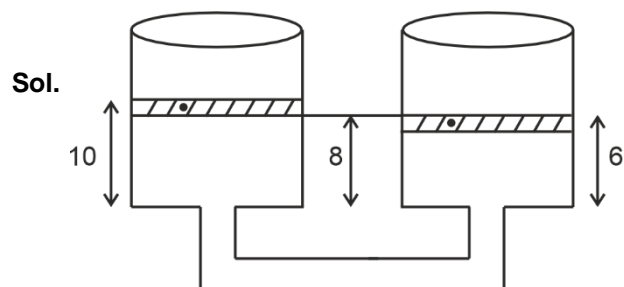
Loss $= (1 - \eta) P_0 = \frac{8.4}{100} \times 100 = 8.4 \text{ J}$

Loss $= \frac{8.4}{4.2} \text{ cal} = 2$

43. Two cylindrical vessels of equal cross sectional area of 2m^2 contain water upto heights 10m and 6m, respectively. If the vessels are connected at their bottom then the work done by the force of gravity is (Density of water is 10^3 kg/m^3 and $g = 10 \text{ m/s}^2$)

- (1) $4 \times 10^4 \text{ J}$
(2) $8 \times 10^4 \text{ J}$
(3) $6 \times 10^4 \text{ J}$
(4) $1 \times 10^5 \text{ J}$

Answer (2)



THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Maths

Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics

Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry

Devya Rustagi
PSID: 00014768785

99.99
Percentile

Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS

Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020

Tanishka Kabra
4 Year Classroom
1 AIR-16 CRL
JEE (Adv.)
2022

Sanvi Jain
4 Year Classroom
1 AIR-34 CRL
JEE (Main)
2024

Effectively shaded portion has descended

$$|w| = \Delta mg \Delta h$$

$$= (\rho 2A)g \times 2$$

$$= 10^3 \times 2 \times 40$$

$$= 8 \times 10^4 \text{ J}$$

44. A solid steel ball of diameter 3.6 mm acquired terminal velocity $2.45 \times 10^{-2} \text{ m/s}$ while falling under gravity through an oil of density 925 kg m^{-3} . Take density of steel as 7825 kg m^{-3} and g as 9.8 m/s^2 . The viscosity of the oil in SI unit is

- (1) 2.18
(2) 1.68
(3) 2.38
(4) 1.99

Answer (2)

Sol. $v = \frac{2}{9} \frac{r^2 g (\sigma - \rho)}{\eta}$

$$\eta = \frac{2}{9} \times \frac{1.8 \times 1.8 \times 10^{-6} \times 10}{2.45 \times 10^{-2}} \{7825 - 925\}$$

$$\approx 2$$

45. Pressure of an ideal gas, contained in a closed vessel, is increased by 0.4% when heated by 1°C .

Its initial temperature must be:

- (1) 25°C
(2) 250°C
(3) 250 K
(4) 2500 K

Answer (3)

Sol. For constant volume

$$\frac{P}{T} = \text{constant}$$

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

$$\frac{0.4}{100} = \frac{1}{T}$$

$$T = \frac{100}{0.4} = 250 \text{ K}$$

SECTION - B

Numerical Value Type Questions: This section contains 5 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

46. Two cells of emfs 1 V and 2 V and internal resistances 2Ω and 1Ω , respectively, are connected in series with an external resistance of 6Ω . The total current in the circuit is I_1 . Now the same two cells in parallel configuration are connected to same external resistance. In this case, the total current drawn is I_2 .

The value of $\left(\frac{I_1}{I_2}\right)$ is $\frac{x}{3}$. The value of x is

Answer (4)

Sol. $I_1 = \frac{\varepsilon_1 + \varepsilon_2}{r_1 + r_2 + R} = \frac{1+2}{2+1+6} = \frac{3}{9} = \frac{1}{3}$

$$I_2 = \frac{\frac{\varepsilon_1}{r_1} + \frac{\varepsilon_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}} = \frac{\frac{1}{2} + \frac{2}{1}}{\frac{1}{2} + \frac{1}{1}} = \frac{5 \times 2 \times 3}{2 \times 3 \times 20} = \frac{1}{4}$$

$$\frac{I_1}{I_2} = \frac{1}{3} \times \frac{4}{1} = \frac{4}{3}$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE TOPPERS

70+ 100 PERCENTILERS

1000+ 99 PERCENTILERS

4000+ 95 PERCENTILERS

100 Percentile in Physics & Maths



Shreyas Lohiya
PSID: 00003389699

100 Percentile in Physics



Harsh Jha
PSID: 00014863322

100 Percentile in Physics & Chemistry



Devya Rustagi
PSID: 00014768785

99.99 Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
1 AIR JEE (Adv.) 2020



Tanishka Kabra
4 Year Classroom
1 AIR-16 CBZ JEE (Adv.) 2022



Sanvi Jain
4 Year Classroom
1 AIR-34 CBZ JEE (Main) 2024

47. An electron in the hydrogen atom initially in the fourth excited state makes a transition to n^{th} energy state by emitting a photon of energy 2.86 eV. The integer value of n will be _____.

Answer (2)

Sol. $E_n = 13.6 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$

$$2.86 = 13.6 \left| -\frac{1}{25} + \frac{1}{n^2} \right|$$

$$\Rightarrow \frac{2.86}{13.6} + \frac{1}{25} = \frac{1}{n^2}$$

$$\frac{1}{n^2} = 0.25$$

$$n^2 = 4$$

$$\Rightarrow \boxed{n = 2}$$

48. A physical quantity C is related to four other quantities

$$p, q, r \text{ and } s \text{ as follows } C = \frac{pq^2}{r^3 \sqrt{s}}.$$

The percentage errors in the measurement of p, q, r and s are 1%, 2%, 3% and 2%, respectively. The percentage error in the measurement of C will be _____ %.

Answer (15)

Sol. $\frac{\Delta C}{C} = \frac{\Delta p}{p} + 2 \frac{\Delta q}{q} + \frac{3\Delta r}{r} + \frac{1}{2} \frac{\Delta s}{s}$

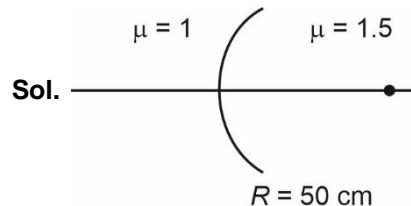
$$\% \text{ error} = 1 + 2 \times 2 + 3 \times 3 + \frac{1}{2} \times 2$$

$$= 1 + 4 + 9 + 1$$

$$= 15$$

49. Light from a point source in air falls on a spherical glass surface (refractive index, $\mu = 1.5$ and radius of curvature = 50 cm). The image is formed at a distance of 200 cm from the glass surface inside the glass. The magnitude of distance of the light source from the glass surface is _____ m.

Answer (4)



$$V = 200 \text{ cm}$$

$$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$$

$$\frac{1.5}{200} - \frac{1}{u} = \frac{1.5 - 1}{50} = \frac{1}{100}$$

$$\frac{1}{u} = \frac{15}{2000} - \frac{1}{100} = \frac{15 - 20}{2000} = \frac{-5}{2000}$$

$$u = -400 \text{ cm} = -4 \text{ m}$$

50. The excess pressure inside a soap bubble A in air is half the excess pressure inside another soap bubble B in air. If the volume of the bubble A is n times the volume of the bubble B , then, the value of n is _____.

Answer (8)

Sol. $\frac{2s}{r_1} = \frac{1}{2} \frac{2s}{r_2}$

$$r_1 = 2r_2$$

$$\text{Ratio} = \frac{\frac{4}{3} \pi r_1^3}{\frac{4}{3} \pi r_2^3} = 8$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS



OUR JEE CHAMPIONS



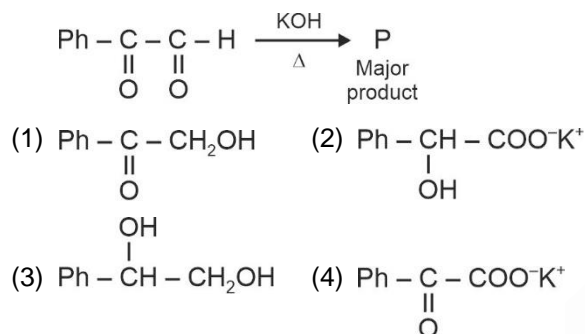
CHEMISTRY

SECTION - A

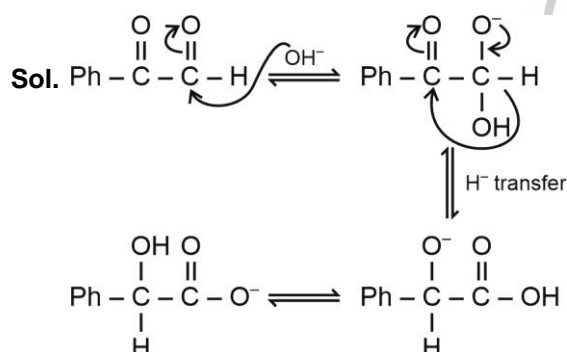
Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer :

51. The major product (P) in the following reaction is



Answer (2)



52. Given below are two statements:

Statement I : Hyperconjugation is not a permanent effect.

Statement II : In general, greater the number of alkyl groups attached to a positively charged C-atom, greater is the hyperconjugation interaction and stabilization of the cation.

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

- (1) Both **Statement I** and **Statement II** are true
- (2) **Statement I** is false but **Statement II** is true
- (3) Both **Statement I** and **Statement II** are false
- (4) **Statement I** is true but **Statement II** is false

Answer (2)

Sol. Hyperconjugation is a permanent effect.

With increase in number of α -H which increases with number of alkyl groups attached to positively charged C, hyperconjugation increases.

53. Identify the diamagnetic octahedral complex ions from below :

- A. $[\text{Mn}(\text{CN})_6]^{3-}$
- B. $[\text{Co}(\text{NH}_3)_6]^{3+}$
- C. $[\text{Fe}(\text{CN})_6]^{4-}$
- D. $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

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

- (1) B and D only
- (2) B and C only
- (3) A and C only
- (4) A and D only

Answer (2)

Sol. $[\text{Mn}(\text{CN})_6]^{3-} : \text{Mn}^{3+} : [\text{Ar}]4s^03d^4 : t_{2g}^4e_g^0$

Octahedral, paramagnetic

$[\text{Co}(\text{NH}_3)_6]^{3+} : \text{Co}^{3+} : [\text{Ar}]4s^03d^6 : t_{2g}^6e_g^0$

Octahedral, diamagnetic

$[\text{Fe}(\text{CN})_6]^{4-} : \text{Fe}^{2+} : [\text{Ar}]4s^03d^6 : t_{2g}^6e_g^0$

Octahedral, diamagnetic

$[\text{Co}(\text{H}_2\text{O})_6]^{3+} : \text{Co}^{3+} : [\text{Ar}]4s^03d^6 : t_{2g}^4e_g^2$

Octahedral, paramagnetic

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024

54. Given below are two statements:

Statement I : When a system containing ice in equilibrium with water (liquid) is heated, heat is absorbed by the system and there is no change in the temperature of the system until whole ice gets melted.

Statement II : At melting point of ice, there is absorption of heat in order to overcome intermolecular forces of attraction within the molecules of water in ice and kinetic energy of molecules is not increased at melting point.

In the light of the above statements choose the **correct** answer from the options given below.

- (1) Both **Statement I** and **Statement II** are true
- (2) **Statement I** is true but **Statement II** is false
- (3) Both **Statement I** and **Statement II** is false
- (4) **Statement I** is false but **Statement II** is true

Answer (1)

Sol. $\text{H}_2\text{O(s)} \rightleftharpoons \text{H}_2\text{O(l)}$

In phase transition, heat provided is used to change solid ice to liquid water at constant temperature, hence there is no change in temperature and kinetic energy.

55. Given below are two statements:

Statement I : Wet cotton clothes made of cellulose based carbohydrate takes comparatively longer time to get dried than wet nylon polymer based clothes.

Statement II : Intermolecular hydrogen bonding with water molecule is more in nylon-based clothes than in the case of cotton clothes.

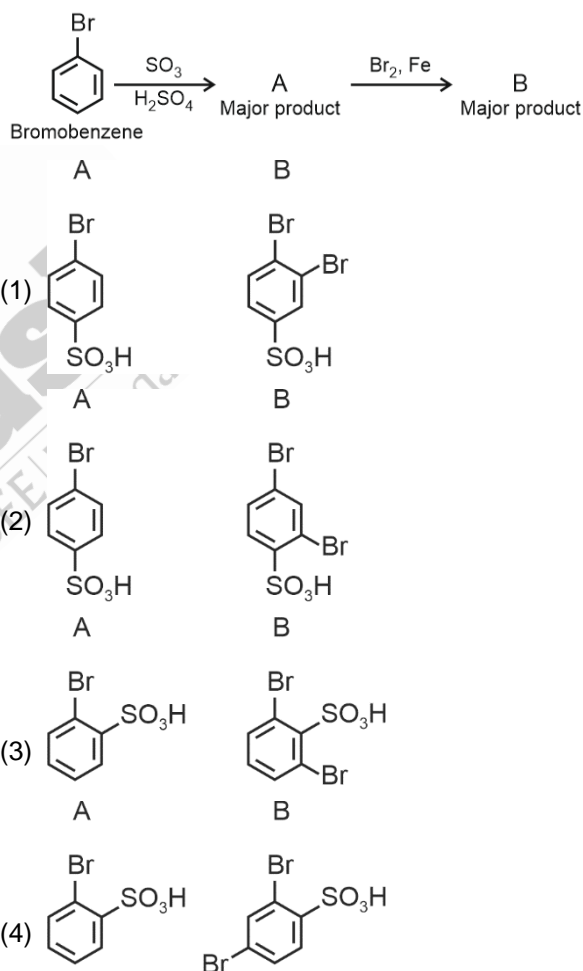
In the light of above statements, choose the **correct** answer from the options given below.

- (1) Both **Statement I** and **Statement II** are false
- (2) **Statement I** is true but **Statement II** is false
- (3) **Statement I** is false but **Statement II** is true
- (4) Both **Statement I** and **Statement II** are true

Answer (2)

Sol. Wet cellulose-based cotton clothes take longer time to dry than wet nylon-based clothes due to more number of H-bonds between cellulose and water molecules. So, Statement-I is correct, Statement-II is incorrect.

56. In the following series of reactions identify the major products A & B respectively



Answer (1)

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry



Harsh Jha
PSID: 00014863322

99.99
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

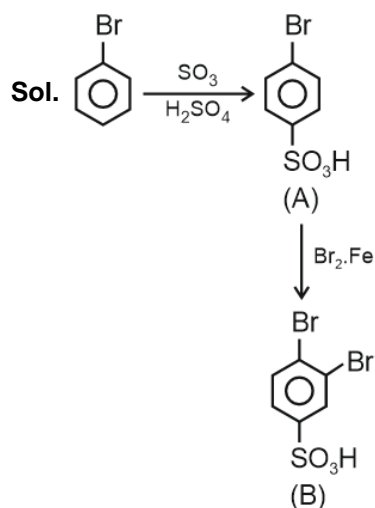
99.99
Percentile
in Physics
& Maths



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS





57. Given below are two statements:

Statement I: CrO_3 is a stronger oxidizing agent than MoO_3

Statement II: Cr(VI) is more stable than Mo(VI)

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

- (1) Statement I is true but Statement II is false
- (2) Statement I is false but Statement II is true
- (3) Both Statement I and Statement II are false
- (4) Both Statement I and Statement II are true

Answer (1)

Sol. Oxidising strength : $\text{CrO}_3 > \text{MoO}_3$

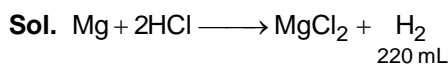
Stability : $\text{Cr}^{6+} < \text{Mo}^{6+}$

58. Mass of magnesium required to produce 220 mL of hydrogen gas at STP on reaction with excess of dil. HCl is

Given: Molar mass of Mg is 24 g mol^{-1} .

- (1) 235.7 g
- (2) 0.24 mg
- (3) 2.444 g
- (4) 236 mg

Answer (4)



$$\text{Moles of } \text{H}_2 = \frac{220}{22400} \text{ moles}$$

$$\text{Mass of Mg} = \frac{220}{22400} \times 24 = 0.236 \text{ g} = 236 \text{ mg}$$

59. Compounds that should not be used as primary standards in titrimetric analysis are :

- A. $\text{Na}_2\text{Cr}_2\text{O}_7$
- B. Oxalic acid
- C. NaOH
- D. $\text{FeSO}_4 \cdot 6\text{H}_2\text{O}$
- E. Sodium tetraborate

Choose the **most appropriate** answer from the options given below:

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

Answer (2)

Sol. Compounds like NaOH, $\text{FeSO}_4 \cdot 6\text{H}_2\text{O}$, $\text{Na}_2\text{Cr}_2\text{O}_7$ are not suitable as primary standards in titrimetric analysis because they are hygroscopic, unstable or difficult to obtain in a pure state.

60. Consider the following statements related to temperature dependence of rate constants.

Identify the correct statements.

- A. The Arrhenius equation holds true only for an elementary homogenous reaction.
- B. The unit of A is same as that of k in Arrhenius equation.
- C. At a given temperature, a low activation energy means a fast reaction.
- D. A and E_a as used in Arrhenius equation depend on temperature.
- E. When $E_a \gg RT$, A and E_a become interdependent.

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-36 (Adv.)
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
AIR-16 CBZ
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CBZ
JEE (Main)
2024

Choose the correct answer from the options given below.

- (1) B and C only (2) B, D and E only
(3) A and B only (4) A, C and D only

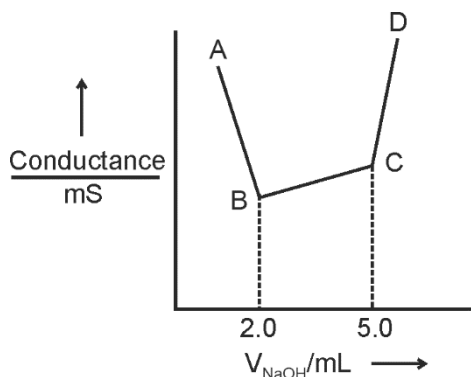
Answer (1)

Sol. $k = Ae^{-E_a/RT}$

If $E_a \downarrow : k \uparrow$

k and A has same units.

61. 40 mL of a mixture of CH_3COOH and HCl (aqueous solution) is titrated against 0.1 M NaOH solution conductometrically. Which of the following statement is **correct**?



- (1) The concentration of HCl in the original mixture is 0.005 M
(2) Point 'C' indicates the complete neutralisation of HCl
(3) CH_3COOH is neutralised first followed by neutralisation of HCl
(4) The concentration of CH_3COOH in the original mixture is 0.005 M

Answer (1)

Sol. $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$

$\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

At first NaOH reacts with HCl , replacing fast moving H^+ ions by slow moving Na^+ ions, hence conductivity decreases.

At point B, eq. of HCl = eq. of NaOH

$$\text{Hence, } [\text{HCl}] = \frac{2 \times 0.1}{42} = 0.005 \text{ M}$$

62. In Dumas' method for estimation of nitrogen 0.4 g of an organic compound gave 60 mL of nitrogen collected at 300 K temperature and 715 mm Hg pressure. The percentage composition of nitrogen in the compound is

(Given : Aqueous tension at 300 K = 15 mm Hg)

- (1) 7.85% (2) 20.95%
(3) 17.46% (4) 15.71%

Answer (4)

Sol. $P_{\text{N}_2} = 715 - 15 = 700 \text{ mm Hg}$

$$n_{\text{N}_2} = \frac{PV}{RT} = \frac{700 \times 60}{760 \times 1000 \times 0.0821 \times 300}$$

$$n_{\text{N}_2} = 2.24 \times 10^{-3}$$

$$\% \text{N}_2 = \frac{2.24 \times 10^{-3} \times 28}{0.4} \times 100$$

$$= 15.71\%$$

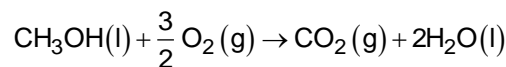
63. The standard cell potential (E_{cell}^\ominus) of a fuel cell based on the oxidation of methanol in air that has been used to power television relay station is measured as 1.21 V. The standard half cell reduction potential for O_2 ($E_{\text{O}_2/\text{H}_2\text{O}}^\ominus$) is 1.229 V.

Choose the correct statement :

- (1) The standard half cell reduction potential for the reduction of CO_2 ($E_{\text{CO}_2/\text{CH}_3\text{OH}}^\ominus$) is 19 mV
(2) Reduction of methanol takes place at the cathode
(3) Reactants are fed at one go to each electrode
(4) Oxygen is formed at the anode

Answer (1)

Sol. Fuel cell reaction



Here O_2 reduces to H_2O and CH_3OH oxidises to CO_2 .

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Maths



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry



Harsh Jha
PSID: 00014863322

100
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-3 (Adv.)
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024

Hence,

$$E_{\text{cell}}^{\circ} = E_{\text{O}_2/\text{H}_2\text{O}}^{\circ} - E_{\text{CO}_2/\text{CH}_3\text{OH}}^{\circ}$$

$$1.21 = 1.229 - E_{\text{CO}_2/\text{CH}_3\text{OH}}^{\circ}$$

$$E_{\text{CO}_2/\text{CH}_3\text{OH}}^{\circ} = 0.019 \text{ V}$$

64. The correct orders among the following are

Atomic radius : B < Al < Ga < In < Tl

Electronegativity : Al < Ga < In < Tl < B

Density : Tl < In < Ga < Al < B

1st Ionisation energy : In < Al < Ga < Tl < B

Choose the correct answer from the options given below :

- (1) C and D only (2) A and B only
(3) B and D only (4) A and C only

Answer (3)

Sol. EN : B > Tl > In > Ga > Al

(2.0) (1.8) (1.7) (1.6) (1.5)

IE₁ : B > Tl > Ga > Al > In

(801) (589) (579) (577) (558) (in kJ/mol)

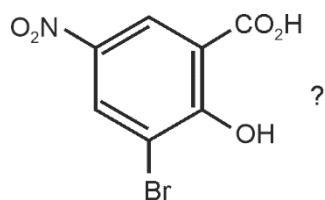
Density : Tl > In > Ga > Al > B

(11.85) (7.31) (5.9) (2.7) (2.35) (in g/ml)

Atomic radius: B < Ga < Al < In < Tl

(85) (135) (143) (167) (170) (in pm)

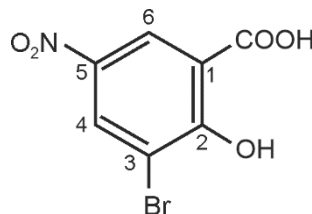
65. What is the correct IUPAC name of



- (1) 3-Bromo-4-hydroxy-1-nitrobenzoic acid
(2) 3-Bromo-2-hydroxy-5-nitrobenzoic acid
(3) 2-Hydroxy-3-bromo-5-nitrobenzoic acid
(4) 5-Nitro-3-bromo-2-hydroxybenzoic acid

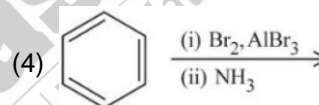
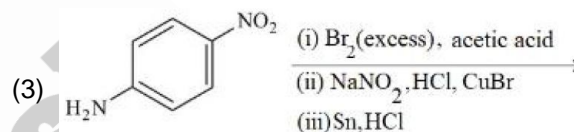
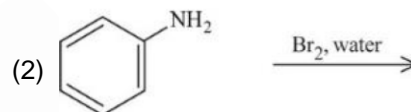
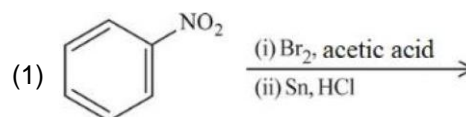
Answer (2)

Sol.



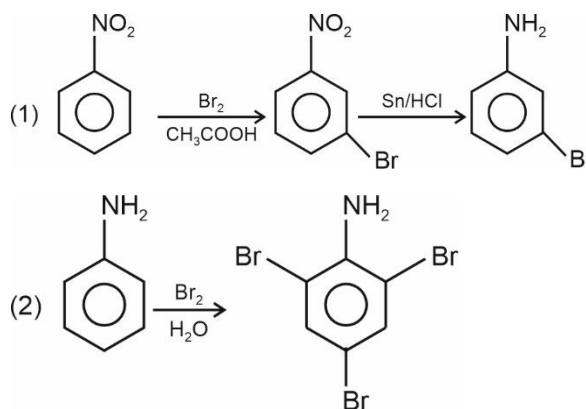
3-Bromo-2-hydroxy-5-nitrobenzoic acid

66. The sequence from the following that would result in giving predominantly 3, 4, 5-Tribromoaniline is



Answer (3)

Sol.



THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in Physics
& Math



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in Physics
& Chemistry



Harsh Jha
PSID: 00014863322

99.99
Percentile
in Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile
in Physics
& Chemistry



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



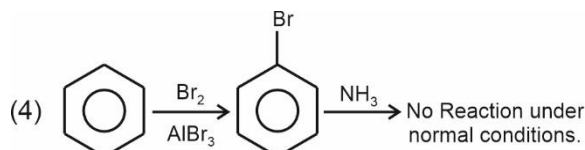
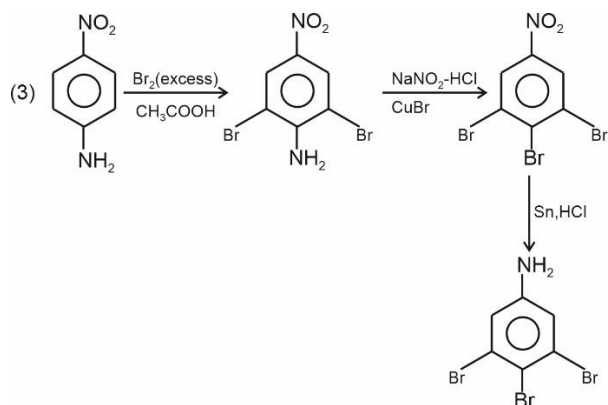
Chirag Falor
4 Year Classroom
AIR-36 CRL
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024



67. Fast soluble vitamins are:

- (A) Vitamin B₁ (B) Vitamin C
(C) Vitamin E (D) Vitamin B₁₂
(E) Vitamin K

Choose the correct answer from the options given below:

- (1) A and B only (2) C and D only
(3) B and C only (4) C and E only

Answer (4)

Sol. Fat soluble vitamins are : A, D, E and K.

68. Match the List-I with List-II.

	List-I (Family)		List-II (Symbol of Element)
A.	Pnictogen (group 15)	I.	Ts
B.	Chalcogen	II.	Og
C.	Halogen	III.	Lv
D.	Noble gas	IV.	Mc

Choose the correct answer from the options given below.

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

Answer (1)

Sol.

A.	Pnictogen (group 15)	IV.	Mc
B.	Chalcogen	III.	Lv
C.	Halogen	I.	Ts
D.	Noble gas	II.	Og

69. 10 mL of 2 M NaOH solution is added to 20 mL of 1 M HCl solution kept in a beaker. Now, 10 mL of this mixture is poured into a volumetric flask of 100 mL containing 2 moles of HCl and made the volume upto the mark with distilled water. The solution in this flask.

- (1) 10 M HCl solution
(2) 20 M HCl solution
(3) Neutral solution
(4) 0.2 M NaCl solution

Answer (2)

Sol. 10 mL of 2 M NaOH reacts with 20 mL of 1 M HCl to give completely neutralised 30 mL of NaCl (20 mmole) solution.

10 mL of this solution has $\frac{20}{30} \times 10 = \frac{20}{3}$ mmol of NaCl

In Final 100 mL solution :

$$[\text{HCl}] = \frac{2}{100} \times 1000 = 20\text{M}$$

$$[\text{NaCl}] = \frac{20}{3 \times 100} = \frac{1}{15}\text{M}$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS

1000+ 99
PERCENTILERS

4000+ 95
PERCENTILERS

100
Percentile
in
Physics
& Math



Shreyas Lohiya
PSID: 00003389699

100
Percentile
in
Physics
& Chemistry



Harsh Jha
PSID: 00014863322

100
Percentile
in
Physics
& Chemistry



Devya Rustagi
PSID: 00014768785

99.99
Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
AIR-16 CRL
JEE (Adv.)
2022



Sanvi Jain
4 Year Classroom
AIR-34 CRL
JEE (Main)
2024

70. For electrons in '2s' and '2p' orbitals, the orbital angular momentum values, respectively are

- (1) 0 and $\sqrt{2} \frac{h}{2\pi}$ (2) 0 and $\sqrt{6} \frac{h}{2\pi}$
(3) $\sqrt{2} \frac{h}{2\pi}$ and 0 (4) $\frac{h}{2\pi}$ and $\sqrt{2} \frac{h}{2\pi}$

Answer (1)

Sol. Orbital angular momentum = $\frac{h}{2\pi} \sqrt{l(l+1)}$

For 2s;

$$l = 0$$

Orbital angular momentum = 0

For 2p;

$$l = 1 \Rightarrow \frac{h}{2\pi} \sqrt{l(l+1)} = \frac{\sqrt{2}h}{2\pi} = \frac{h}{(\sqrt{2})\pi}$$

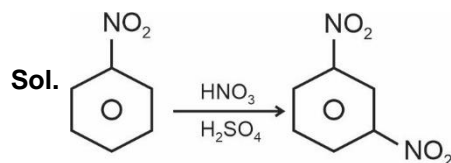
SECTION - B

Numerical Value Type Questions: This section contains 5 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

71. X g of nitrobenzene on nitration gave 4.2 g of m-dinitrobenzene. X = _____ g. (nearest integer)

[Given: molar mass (in g mol⁻¹) C: 12, H: 1, O: 16, N: 14]

Answer (3)



$$\frac{X}{123} = \frac{4.2}{168}$$

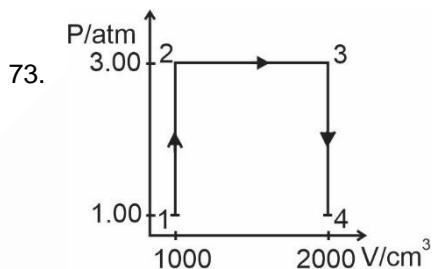
$$X = 3.075 \text{ g}$$

72. A sample of n-octane (1.14 g) was completely burnt in excess of oxygen in a bomb calorimeter, whose heat capacity is 5 kJ K⁻¹. As a result of combustion reaction, the temperature of the calorimeter is increased by 5 K. The magnitude of the heat of combustion of octane at constant volume is _____ kJ mol⁻¹ (nearest integer).

Answer (2500)

Sol. $Q = C\Delta T = 5 \times 5 = 25 \text{ kJ}$

$$Q_v = \frac{25}{1.14} \times 114 = 2500 \text{ kJ mol}^{-1}$$



A perfect gas (0.1 mol) having $\bar{C}_v = 1.50R$ (independent of temperature) undergoes the above transformation from point 1 to point 4. If each step is reversible, the total work done (w) while going from point 1 to point 4 is (–) _____ J (nearest integer)

[Given: $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$]

Answer (304)

Sol. $|w| = \text{area under the curve}$

$$|w| = 3 \times (2000 - 1000)$$

$$= 3000 \text{ mL atm}$$

$$= 3 \text{ L atm}$$

$$|w| = 3 \times 101.3 \text{ J}$$

$$= 303.9 \text{ J}$$

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE TOPPERS

70+ 100 PERCENTILERS (PHYSICS & CHEMISTRY)

1000+ 99 PERCENTILERS & ABOVE

4000+ 95 PERCENTILERS & ABOVE

100 Percentile in Physics & Chemistry



Shreyas Lohiya
PSID: 00003389699

100 Percentile in Physics & Chemistry



Harsh Jha
PSID: 00014863322

100 Percentile in Physics & Chemistry



Devya Rustagi
PSID: 00014768785

99.99 Percentile



Amogh Bansal
PSID: 00014769016

OUR JEE CHAMPIONS



Chirag Falor
4 Year Classroom
1 AIR JEE (Adv.) 2020



Tanishka Kabra
4 Year Classroom
1 AIR-16 CRL JEE (Adv.) 2022

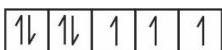


Sanvi Jain
4 Year Classroom
1 AIR-34 CRL JEE (Main) 2024

74. Among, Sc, Mn, Co and Cu, identify the element with highest enthalpy of atomisation. The spin only magnetic moment value of that element in its +2 oxidation state is _____ BM (in nearest integer).

Answer (4)

Sol. Enthalpy of atomisation of : Sc = 326 kJ/mol, Mn = 281 kJ/mol, Co = 425 kJ/mol, Cu = 338 kJ/mol

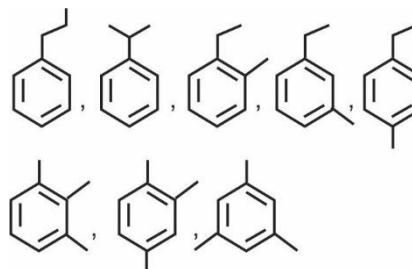
$\text{Co}^{2+} : [\text{Ar}] 4s_0 3d^7 :$ 

$$\mu = \sqrt{3(3+2)} = \sqrt{15} = 3.87$$

75. The total number of structural isomers possible for the substituted benzene derivatives with the molecular formula C_9H_{12} is _____.

Answer (8)

Sol. Degree of unsaturation = $\frac{2 \times 9 + 2 - 12}{2} = 4$




Aakash
 Medical | IIT-JEE | Foundations

THE LEGACY OF SUCCESS CONTINUES

JEE Main (Session-1) 2025

4 STATE
TOPPERS

70+ 100
PERCENTILERS
IN PHYSICS

1000+ 99
PERCENTILERS
IN CHEMISTRY

4000+ 95
PERCENTILERS
IN MATHS

100
Percentile
in Physics
& Maths
100
Percentile


Shreyas Lohiya
 PSID: 00003389699

100
Percentile
in Physics
& Chemistry
100
Percentile


Harsh Jha
 PSID: 00014863322

100
Percentile
in Physics
& Chemistry
99.99
Percentile


Devya Rustagi
 PSID: 00014768785

99.99
Percentile
in Physics
& Maths
99.99
Percentile


Amogh Bansal
 PSID: 00014769016

OUR JEE CHAMPIONS


Chirag Falor
 4 Year Classroom
1 AIR
 JEE (Adv.)
 2020


Tanishka Kabra
 4 Year Classroom
1 AIR-16 CRL
 JEE (Adv.)
 2022


Sanvi Jain
 4 Year Classroom
1 AIR-34 CRL
 JEE (Main)
 2024