Let \( D = \mathbb{R} - \{0, 1\} \) and \( f: D \to D \), \( g: D \to D \) and \( h: D \to D \) be three functions defined by
\[
 f(x) = \frac{1}{x}, \quad g(x) = 1 - x \quad \text{and} \quad h(x) = \frac{1}{1-x}.
\]
If \( j: D \to D \) is such that
\[
 (g \circ j \circ f)(x) = j(x) \quad \text{for all} \quad x \in D,
\]
then which one of the following is \( j(x) \)?

\[ D = \mathbb{R} - \{0, 1\} \text{ defined, } f: D \to D, \ g: D \to D, \ h: D \to D \text{ are all functions} \]
\[
 f(x) = \frac{1}{x}, \quad g(x) = 1 - x \quad \text{and} \quad h(x) = \frac{1}{1-x} \text{ are defined, } j: D \to D \text{ a function such that}
\]
\[
 (g \circ j \circ f)(x) = j(x) \text{ for all } x \in D \text{ is } j(x) \text{?}
\]

Options:

1. \((f \circ g)(x)\)
2. \(f(x)\)
3. \(g(x)\)
4. \((g \circ h)(x)\)
Question Number : 2  Question Id : 1874634002  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The maximum value of the function \( f(x) = \tan\left(x + \frac{2\pi}{3}\right) - \tan\left(x + \frac{\pi}{6}\right) + \cos\left(x + \frac{\pi}{6}\right) \) in \( \left[-\frac{5\pi}{12}, -\frac{\pi}{3}\right] \) is

\[ f(x) = \tan\left(x + \frac{2\pi}{3}\right) - \tan\left(x + \frac{\pi}{6}\right) + \cos\left(x + \frac{\pi}{6}\right) \]

Options :

1. \( \frac{11\sqrt{2}}{6} \)
2. \( \frac{11\sqrt{3}}{6} \)
3. 3
4. 1

Question Number : 3  Question Id : 1874634003  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

\[ 1^2 + \left(1^2 + 2^2\right) + \left(1^2 + 2^2 + 3^2\right) + \ldots + \left(1^2 + 2^2 + \ldots + n^2\right) = \]

Options :

1. \( \frac{n(n+1)(n+2)}{12} \)
2. \( \frac{n(n+1)(2n+1)}{6} \)
3. \( \frac{n(n+1)^2(n+2)}{12} \)
4. \[
\frac{n(n+1)(n+2)(n+3)}{12}
\]

Question Number : 4  Question Id : 1874634004  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

\[
\begin{vmatrix}
 a+b+2c & a & b \\
 2a+b+c & b \\
 c & a+2b+c \\
\end{vmatrix} = 2, \text{ then } a^3 + b^3 + c^3 - 3abc =
\]

\[
\begin{vmatrix}
 a+b+2c & a & b \\
 2a+b+c & b \\
 c & a+2b+c \\
\end{vmatrix} = 2, \text{ so } a^3 + b^3 + c^3 - 3abc =
\]

Options :
1. \(-3ab - 3bc - 3ca\)
2. 0
3. \(-2ab - 2bc - 2ca\)
4. 1

Question Number : 5  Question Id : 1874634005  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
If \( k \) is one of the roots of the equation \( x^2 - 25x + 24 = 0 \) such that \( A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & k \end{bmatrix} \) is a non-singular matrix, then \( A^{-1} = \)

\[
A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & k \end{bmatrix}
\]

Options:

1. \(-\frac{1}{46} \begin{bmatrix} 90 & -94 & 8 \\ -138 & 46 & 0 \\ 2 & 2 & -8 \end{bmatrix}\)

2. \(-\frac{1}{92} \begin{bmatrix} 45 & -47 & 4 \\ -69 & 23 & 0 \\ 1 & 1 & 4 \end{bmatrix}\)

3. \(-\frac{1}{46} \begin{bmatrix} 45 & -47 & 4 \\ -69 & 23 & 0 \\ 1 & 1 & -4 \end{bmatrix}\)

4. \(-\frac{1}{92} \begin{bmatrix} 90 & -94 & 8 \\ -138 & 46 & 0 \\ 2 & 2 & -8 \end{bmatrix}\)
A value of $b$ for which the rank of the matrix \( A = \begin{bmatrix} 1 & 1 & -1 & 0 \\ 4 & 4 & -3 & 1 \\ b & 2 & 2 & 2 \\ 9 & 9 & b & 3 \end{bmatrix} \) is 3, is

Options:
1. \(-2\)
2. \(-4\)
3. \(-6\)
4. \(3\)

If $z = x - iy$ and $z^3 = a + ib$, then \( \frac{x + iy}{a^2 + b^2} = \)

Options:
1. \(-2\)
2. \(-1\)
The equation whose solutions are the non-zero solutions of the equation $z = iz^2$, is

\[ z = iz^2 \begin{align*}
\text{Options:} \\
1. & \quad z^3 + i = 0 \\
2. & \quad z^3 + z + 1 = 0 \\
3. & \quad z^3 - i = 0 \\
4. & \quad z^3 + iz + 1 = 0 
\end{align*} \]

If $x, y \in \mathbb{R}$ and $x^2 + y + 4i$ and $-3 + x^2y$ are conjugates to each other, then $(|x| + |y|)^2 =$

\[ x, y \in \mathbb{R} \quad x^2 + y + 4i \quad \text{and} \quad -3 + x^2y \quad \text{are conjugates to each other. Thus,} \quad (|x| + |y|)^2 = \begin{align*}
\text{Options:} \\
1. & \quad 17 \\
2. & \quad 16 \\
3. & \quad 25 \\
4. & \quad 9 
\end{align*} \]
\[
\sum_{k=1}^{6} \left( \sin \frac{2\pi k}{7} - i \cos \frac{2\pi k}{7} \right) =
\]

Options:
1. \(-1\)
2. 0
3. \(i\)
4. \(-i\)

Question Number : 11  Question Id : 1874634011  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If \(\alpha\) satisfies the equation \(\sqrt{\frac{x}{2x+1}} + \sqrt{\frac{2x+1}{x}} = 2\), then the roots of the equation \(\alpha^2 x^2 + 4\alpha x + 3 = 0\) are

\[
\sqrt{\frac{x}{2x+1}} + \sqrt{\frac{2x+1}{x}} = 2\]

Options:
1. 1, 3
2. \(-1, 1\)
3. 2, \(-3\)
4. 3, 4

Question Number : 12  Question Id : 1874634012  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
Let \( f(x) = x^2 + 2x + 2 \), \( g(x) = -x^2 + 2x - 1 \) and \( a, b \) be the extreme values of \( f(x), g(x) \) respectively. If \( c \) is the extreme value of \( \frac{f(x)}{g(x)} \) (for \( x \neq 1 \)), then \( a + 2b + 5c + 4 = \)

\[
f(x) = x^2 + 2x + 2, \quad g(x) = -x^2 + 2x - 1 \quad \text{where} \quad a, b \quad \text{are the extreme values of} \quad f(x), g(x) \quad \text{respectively.}
\]

\[\text{When} \quad x \neq 1, \quad \frac{f(x)}{g(x)} \quad \text{is maximized,} \quad \text{so} \quad c \quad \text{is the maximum,} \quad a + 2b + 5c + 4 = \]

Options:

1. 2
2. 1
3. 4
4. 3

Question Number : 13  Question Id : 1874634013  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The set of all real numbers satisfying the inequation \( x^2 - |x + 2| + x > 0 \) is

\[x^2 - |x + 2| + x > 0 \quad \text{(where) \quad \text{the quadratic and linear terms cancel out, so the inequality holds for all real numbers.)}\]

Options:

1. \([-2, -\sqrt{2}) \cup (\sqrt{2}, \infty)\)
2. \((-\infty, -2) \cup (2, \infty)\)
3. \((-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)\)
4. \((-\infty, -2) \cup [\sqrt{2}, \infty)\)

Question Number : 14  Question Id : 1874634014  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
If $\alpha$, $\beta$, $\gamma$ are the roots of $x^3 - 6x^2 + 11x - 6 = 0$, then the equation having the roots $\alpha^2 + \beta^2$, $\beta^2 + \gamma^2$ and $\gamma^2 + \alpha^2$ is

$\alpha$, $\beta$, $\gamma \in x^3 - 6x^2 + 11x - 6 = 0 \Rightarrow x^3 - 6x^2 + 11x - 6 = 0 \Rightarrow \alpha^2 + \beta^2, \beta^2 + \gamma^2, \gamma^2 + \alpha^2$

Options :

1. $x^3 - 28x^2 + 245x - 650 = 0$

2. $x^3 - 28x^2 + 245x + 650 = 0$

3. $x^3 + 28x^2 - 245x - 650 = 0$

4. $x^3 + 28x^2 + 245x - 650 = 0$
If the number of elements in the sets $G$ and $A$ are 3 and 4 respectively, then match the items of List I with those of List II.

<table>
<thead>
<tr>
<th>List - I</th>
<th>List - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A)</td>
<td>I) 24</td>
</tr>
<tr>
<td>B)</td>
<td>II) 0</td>
</tr>
<tr>
<td>C)</td>
<td>III) 1728</td>
</tr>
<tr>
<td>D)</td>
<td>IV) 12</td>
</tr>
<tr>
<td></td>
<td>V) 19683</td>
</tr>
</tbody>
</table>

The correct match is

Options:

1. A B C D
   V I III II
2. A B C D
   V III IV II
3. A B C D
   III IV V II
There are 20 straight lines in a plane such that no two of them are parallel and no three of them are concurrent. If their points of intersection are joined, then the number of new line segments formed are

Options:
1. 3420
2. 14535
3. 2907
4. 17955

Let \( a_0, a_1, a_2, \ldots, a_n \in \mathbb{R} \) be in an arithmetic progression and let \( C_0, C_1, C_2, \ldots, C_n \) be the binomial coefficients. Then \( \sum_{k=0}^{n} a_k \cdot C_k = \)

\[ a_0, a_1, a_2, \ldots, a_n \in \mathbb{R} \text{ are in arithmetic progression, } C_0, C_1, C_2, \ldots, C_n \text{ be the binomial coefficients. Then } \sum_{k=0}^{n} a_k \cdot C_k = \]

Options:
1. \( \frac{1}{2} (a_0 + a_n) \)
2. \((a_0 + a_n) \cdot 2^{n-1}\)
3. \((a_0 + a_n)\)
4. 0

Question Number: 18  Question Id: 1874634018  Question Type: MCQ  Option Shuffling: Yes  Display Question Number: Yes  Single Line Question Option: No  Option Orientation: Vertical

If \(x = \frac{3}{10} + \frac{3.7}{10.15} + \frac{3.7.9}{10.15.20} + \ldots\), then \(5x + 8 =\)

\[x = \frac{3}{10} + \frac{3.7}{10.15} + \frac{3.7.9}{10.15.20} + \ldots\] 5. \(5x + 8 =\)

Options:
1. \(\frac{5\sqrt{5}}{3}\)
2. \(\frac{5\sqrt{5}}{\sqrt{3}}\)
3. \(\frac{3\sqrt{3}}{\sqrt{5}}\)
4. \(\frac{25\sqrt{5}}{3\sqrt{3}}\)

Question Number: 19  Question Id: 1874634019  Question Type: MCQ  Option Shuffling: Yes  Display Question Number: Yes  Single Line Question Option: No  Option Orientation: Vertical

If \(\frac{x^4}{(x-1)(x-2)(x-3)} = x + k + \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{x-3}\), then \(k + A - B + C =\)

\[\frac{x^4}{(x-1)(x-2)(x-3)} = x + k + \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{x-3}\] 5. \(k + A - B + C =\)
Question Number : 20  Question Id : 1874634020  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes Single Line Question Option : No  Option Orientation : Vertical
\[ \csc 48^\circ + \csc 96^\circ + \csc 192^\circ + \csc 384^\circ = \]

Options :
1. \(-2\)
2. \(-1\)
3. 0
4. \(\frac{\sqrt{3}}{2}\)

Question Number : 21  Question Id : 1874634021  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes Single Line Question Option : No  Option Orientation : Vertical
\[ \sin \frac{\pi}{8} + \sin \frac{2\pi}{8} + \sin \frac{3\pi}{8} + \sin \frac{4\pi}{8} + \sin \frac{5\pi}{8} + \sin \frac{6\pi}{8} + \sin \frac{7\pi}{8} = \]

Options :
1. \(\frac{3}{2}\)
2. 5
3. 2
4. 3
If $x : y : z = \tan \left( \frac{\pi}{15} + \alpha \right) : \tan \left( \frac{\pi}{15} + \beta \right) : \tan \left( \frac{\pi}{15} + \gamma \right)$,

then $\frac{x + y}{z - x} \sin^2 (\gamma - \alpha) + \frac{x + y}{y - z} \sin^2 (\alpha - \beta) + \frac{y + z}{y - z} \sin^2 (\beta - \gamma) = 0.$

$\tan \left( \frac{\pi}{15} + \alpha \right) : \tan \left( \frac{\pi}{15} + \beta \right) : \tan \left( \frac{\pi}{15} + \gamma \right)$

$\frac{x + y}{z - x} \sin^2 (\gamma - \alpha) + \frac{x + y}{y - z} \sin^2 (\alpha - \beta) + \frac{y + z}{y - z} \sin^2 (\beta - \gamma) = 0.$

Options:

1. $\sin^2 \theta$
2. $\cos^2 \theta$
3. 0
4. 1

Let $[x]$ denote the largest integer $\leq x$. If the number of solutions of

$$\sin x \sqrt{4 \cos^2 x} = \frac{2 + x - [x]}{1 - x + [x]}$$

is $k$, then for $x \in \left( \frac{\pi}{4}, \frac{\pi}{3} \right)$, the value of $k \tan^2 x$

$x \in \left[ \frac{\pi}{4}, \frac{\pi}{3} \right]$ యొక్క ప్రత్యేక విశేషాది విధానం

$$\sin x \sqrt{4 \cos^2 x} = \frac{2 + x - [x]}{1 - x + [x]}$$

త్రికోణమితి సమీకరణ ప్రత్యేక $k$ విధానం, $x \in \left( \frac{\pi}{4}, \frac{\pi}{3} \right)$ ప్రదర్శనం
is equal to 1
1 \leq \frac{1}{2}

lies in between \(2^1\) and \(2^3\)
\(2^1 = 2\) and \(2^3 = 8\)

is equal to zero
\(\sin \theta = 0\)

lies in between \(\frac{1}{2^3}\) and \(\frac{1}{2}\)
\(\frac{1}{2^3} = \frac{1}{8}\) and \(\frac{1}{2}\)

Question Number: 24  Question Id: 1874634024  Question Type: MCQ  Option Shuffling: Yes  Display Question Number: Yes  Single Line Question Option: No  Option Orientation: Vertical

If \(\alpha\) and \(\beta\) are the least and the greatest values of \(f(x) = (\sin^{-1} x)^2 + (\cos^{-1} x)^2\) for all \(x \in \mathbb{R}\) respectively, then \(8 (\alpha + \beta) =\)

\(\alpha\) and \(\beta\) are the least and the greatest values of \(f(x) = (\sin^{-1} x)^2 + (\cos^{-1} x)^2\) for all \(x \in \mathbb{R}\)

Option:

1. \(\pi^2\)
2. \(11\pi^2\)
3. \(9\pi^2\)
4. \(25\pi^2\)
Question Number : 25  Question Id : 1874634025  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If \( x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right) \), then \( \log \sec x = \)

\[ x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right) \Rightarrow \text{log sec } x = \]

Options :
1. \( 2 \ \text{Cosec}^{-1} \left( \cot^2 \frac{x}{2} - 1 \right) \)
2. \( 2 \ \text{Cosec}^{-1} \left( \cot^2 \frac{x}{2} + 1 \right) \)
3. \( 2 \ \text{Cot}^{-1} \left( \cosec^2 \frac{x}{2} - 1 \right) \)
4. \( 2 \ \text{Cot}^{-1} \left( \cosec^2 \frac{x}{2} + 1 \right) \)

Question Number : 26  Question Id : 1874634026  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The area (in square units) of \( \triangle ABC \) if \( \angle A = 75^\circ, \angle B = 45^\circ \) and \( a = 2 \left( \sqrt{3} + 1 \right) \) is

\[ \triangle ABC \text{  \  } \angle A = 75^\circ, \angle B = 45^\circ \text{  \  } a = 2 \left( \sqrt{3} + 1 \right) \text{  \  } \text{is} \]

Options :
1. 6
2. \( 2\sqrt{3} \)
3. \( 2 \sqrt{2} \)
4. \( 4 \)
3. \(6 - 2\sqrt{3}\)

4. \(6 + 2\sqrt{3}\)

Question Number : 27  Question Id : 1874634027  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

In a \(\Delta ABC\), if \(3a = b + c\), then \(\cot \frac{B}{2} \cot \frac{C}{2} = \)

\(\Delta ABC \neq \). \(3a = b + c\) అయితే, \(\cot \frac{B}{2} \cot \frac{C}{2} = \)

Options :

1. 1

2. 2

3. \(\frac{1}{3}\)

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

Question Number : 28  Question Id : 1874634028  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

In a \(\Delta ABC\), if \(\frac{2r_2r_3}{r_2 - r_1} = r_3 - r_1\), then \(\frac{r_1(r_2 + r_3)}{\sqrt{r_1r_2 + r_2r_3 + r_3r_1}} = \)

\(\Delta ABC \neq \). \(\frac{2r_2r_3}{r_2 - r_1} = r_3 - r_1\) అయితే, \(\frac{r_1(r_2 + r_3)}{\sqrt{r_1r_2 + r_2r_3 + r_3r_1}} = \)

Options :

\(\frac{a^2 + b^2 + c^2}{\Delta^2}\)

1.
2. \[ b - c \]

3. \[ \frac{1}{2R} \]

4. \[ 2R \]

Question Number : 29  Question Id : 1874634029  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If \( 3\overrightarrow{i} - 2\overrightarrow{j} - \lambda\overrightarrow{k}, 2\overrightarrow{i} + 3\overrightarrow{j} - 4\overrightarrow{k}, -\overrightarrow{i} + \overrightarrow{j} + 2\overrightarrow{k} \) and \( 4\overrightarrow{i} + 5\overrightarrow{j} + \lambda\overrightarrow{k} \) are respectively the position vectors of four coplanar points \( P, Q, R \) and \( S \) then \( \lambda = \)

\[ 3\overrightarrow{i} - 2\overrightarrow{j} - \overrightarrow{k}, 2\overrightarrow{i} + 3\overrightarrow{j} - 4\overrightarrow{k}, -\overrightarrow{i} + \overrightarrow{j} + 2\overrightarrow{k} \) లేకుండా \( 4\overrightarrow{i} + 5\overrightarrow{j} + \lambda\overrightarrow{k} \) అనే చార్మాంట చాలా ప్రాంగణం ఆ ప్రాంభాలు, అది కుంటే \( \lambda = \)

Options :
1. \( \frac{46}{17} \)
2. \( \frac{46}{17} \)
3. \( \frac{146}{17} \)
4. \( \frac{146}{17} \)

Question Number : 30  Question Id : 1874634030  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
If $\overrightarrow{OA} = 2\overrightarrow{i} + 2\overrightarrow{j} + \overrightarrow{k}, \overrightarrow{OB} = 2\overrightarrow{i} + 4\overrightarrow{j} + 4\overrightarrow{k}$ and the length of the internal bisector of $\angle BOA$ of triangle $AOB$ is $k$, then $9k^2 =$

\[ \overrightarrow{OA} = 2\overrightarrow{i} + 2\overrightarrow{j} + \overrightarrow{k}, \overrightarrow{OB} = 2\overrightarrow{i} + 4\overrightarrow{j} + 4\overrightarrow{k} \]  

Options:
1. $\sqrt{225}$
2. 136
3. 712
4. 20

Question Number : 31  Question Id : 1874634031  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If $\overrightarrow{a} + \overrightarrow{x\overrightarrow{b} + y\overrightarrow{c} = 0}, \overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{b} \times \overrightarrow{c} + \overrightarrow{c} \times \overrightarrow{a} = 6(\overrightarrow{b} \times \overrightarrow{c})$, then the locus of the point $(x, y)$ is

\[ \overrightarrow{a} + \overrightarrow{x\overrightarrow{b} + y\overrightarrow{c} = 0}, \overrightarrow{a} \times \overrightarrow{b} + \overrightarrow{b} \times \overrightarrow{c} + \overrightarrow{c} \times \overrightarrow{a} = 6(\overrightarrow{b} \times \overrightarrow{c}) \]  

Options:
1. $x^2 + y^2 = 1$
2. $x + y - 5 = 0$
3. $2x + 6y = 5$
4. $x + y + 6 = 0$

Question Number : 32  Question Id : 1874634032  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
Let \( \mathbf{A} = (\alpha, 1, 2\alpha), \mathbf{B} = (3, 1, 2) \) and \( \mathbf{C} = 4\mathbf{i} - \mathbf{j} + 3\mathbf{k} \). If \( \mathbf{AB} \times \mathbf{C} = 6\mathbf{i} + 9\mathbf{j} - 5\mathbf{k} \), then \( \alpha^2 + \alpha + 5 = \)

\[ \mathbf{A} = (\alpha, 1, 2\alpha), \mathbf{B} = (3, 1, 2) \text{ and } \mathbf{C} = 4\mathbf{i} - \mathbf{j} + 3\mathbf{k} \text{ are coplanar.} \quad \mathbf{AB} \times \mathbf{C} = 6\mathbf{i} + 9\mathbf{j} - 5\mathbf{k} \]

**Options:**

1. 11
2. 7
3. 9
4. 5

The shortest distance between the skew lines \( \mathbf{r} = (6\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}) + t(\mathbf{i} - 2\mathbf{j} + 2\mathbf{k}) \) and \( \mathbf{r} = (-4\mathbf{i} - \mathbf{k}) + s(3\mathbf{i} - 2\mathbf{j} - 2\mathbf{k}) \) is

\[ \mathbf{r} = (6\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}) + t(\mathbf{i} - 2\mathbf{j} + 2\mathbf{k}) \text{ and } \mathbf{r} = (-4\mathbf{i} - \mathbf{k}) + s(3\mathbf{i} - 2\mathbf{j} - 2\mathbf{k}) \]

**Options:**

1. 9
2. \( \frac{40}{7} \)
3. 108
4. 120
If \( \overrightarrow{a} \) makes an acute angle with \( \overrightarrow{b} \), \( \overrightarrow{a} \cdot \overrightarrow{b} = 0 \) and \( \overrightarrow{a} \times \overrightarrow{b} = \overrightarrow{c} \times \overrightarrow{b} \), then \( \overrightarrow{r} = \)

\[ \overrightarrow{b} \times \overrightarrow{a} \]  

Options :

1. \( \overrightarrow{a} \times \overrightarrow{c} - \overrightarrow{b} \)
2. \( \overrightarrow{c} \times \overrightarrow{a} \)
3. \( \overrightarrow{c} - \left( \frac{\overrightarrow{c} \cdot \overrightarrow{a}}{\overrightarrow{b} \cdot \overrightarrow{a}} \right) \overrightarrow{b} \)
4. \( \overrightarrow{c} + \left( \frac{\overrightarrow{c} \cdot \overrightarrow{a}}{\overrightarrow{b} \cdot \overrightarrow{a}} \right) \overrightarrow{b} \)

For a data consisting of 15 observations \( x_i \), \( i = 1, 2, 3, \ldots, 15 \) the following results are obtained:

\[ \sum_{i=1}^{15} x_i = 170; \sum_{i=1}^{15} x_i^2 = 2830. \]  

If one of the observation namely 20 was found wrong and was replaced by its correct value 30, then the corrected variance is

\[ x_i \], \( i = 1, 2, 3, \ldots, 15 \) ఉన్నాంపార్టక పదార్థాలు ఉన్నాం, కమాండం తాపమాటంలో

\[ \sum_{i=1}^{15} x_i = 170; \sum_{i=1}^{15} x_i^2 = 2830. \]  

\( \text{తండ్రియు} \) 20 వింతలు అంటే అతనురాగ గంటలం ఉన్నాం, తండ్రియు లో సంఖ్యలు ఉన్నాం, 30 వింతలు అంటే అతనురాగ గంటలం ఉన్నాం, తండ్రియు లో సంఖ్యలు ఉన్నాం.

Options :

1. 80
2. 78
3. 76
Question Number : 36  Question Id : 1874634036  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The mean deviation about the mean for the following data is

<table>
<thead>
<tr>
<th>Class interval</th>
<th>0-10</th>
<th>10-20</th>
<th>20-30</th>
<th>30-40</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>4</td>
<td>6</td>
<td>16</td>
<td>28</td>
<td>16</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Questions in Telugu:

మిగిలి సాధారణా అత్యంత మయపరంగా నిమిషానికి మయపరు నిమిషానికి

<table>
<thead>
<tr>
<th>Class interval</th>
<th>0-10</th>
<th>10-20</th>
<th>20-30</th>
<th>30-40</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>4</td>
<td>6</td>
<td>16</td>
<td>28</td>
<td>16</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Options:

1. 35
2. 10
3. 15
4. 12

Question Number : 37  Question Id : 1874634037  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
A and B each select one number at random from the distinct numbers 1, 2, 3, ..., n and the probability that the number selected by A is less than the number selected by B is \( \frac{1009}{2019} \). Now, the probability that the number selected by B is the number immediately next to the number selected by A is

\[ \frac{2018}{(2019)^2} \]

\[ \frac{2000}{2019} \]

There are 3 bags A, B and C. Bag A contains 2 white and 3 black balls, bag B contains 4 white and 2 black balls and Bag C contains 3 white and 2 black balls. If a ball is drawn at random from a randomly chosen bag, then the probability that the ball drawn is black, is

A. B. C యొక్క సముదాయ శిరీసు కంతి. కానీ A యొక్క 2 వెండుతుంది మరియు 3 కంతి మారిని, కానీ B యొక్క 4 వెండుతుంది 2 నాస్తుంది మరియు C యొక్క 3 వెండుతుంది 2 కంతి మారిని కంతి. చాలా ప్రామాణికంగా చెందింది ఇందుకు అది అది మరియు A యొక్క కంతి సమానమైని, బుగ్గ కంతి లో ప్రతి కంతి ఫలితం.
Options:

1. \( \frac{2}{3} \)

2. \( \frac{4}{9} \)

3. \( \frac{5}{9} \)

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

Question Number : 39  Question Id : 1874634039  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
The following table shows the probability of selecting the boxes A, B and C and the number of balls of different colours contained in them:

<table>
<thead>
<tr>
<th>Box</th>
<th>Number of balls</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
<td>Green</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

A box is selected at random and a ball is drawn from it. If it is given that the ball drawn is green, then the probability that it has come from box C is

\[ \frac{1}{6} \]

Options:

1. $\frac{1}{13}$
2. $\frac{6}{13}$
3. $\frac{5}{13}$
4. \[ \frac{7}{13} \]

**Question Number : 40  Question Id : 1874634040  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical**

If a random variable \( X \) has the probability distribution given by

\[
P(X = 0) = 3C^3, P(X = 2) = 5C - 10C^2 \quad \text{and} \quad P(X = 4) = 4C - 1,
\]

then the variance of that distribution is

\[ 3C^3, P(X = 2) = 5C - 10C^2 \quad \text{and} \quad P(X = 4) = 4C - 1 \]

Options :

1. \[ \frac{68}{9} \]
2. \[ \frac{22}{9} \]
3. \[ \frac{612}{81} \]
4. \[ \frac{128}{81} \]

**Question Number : 41  Question Id : 1874634041  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical**

A box contains 30 toys of same size in which 10 toys are white and all the remaining toys are blue. A toy is drawn at random from the box and it is replaced in the box after noting down its colour. If 5 toys are drawn in this way, then the probability of getting atmost 2 white toys is

\[ \frac{30}{30}, 10 \]  
\[ \frac{20}{30}, 20 \]  
\[ \frac{10}{30}, 30 \]  
\[ \frac{5}{30}, 30 \]  

Options :
For any value of $\theta$, if the straight lines $x\sin \theta + (1 - \cos \theta) y = a \sin \theta$ and $x\sin \theta - (1 + \cos \theta) y + a \sin \theta = 0$ intersect at $P(\theta)$, then the locus of $P(\theta)$ is a

Options:
1. straight line
2. circle
3. parabola
A line \( L \) has intercepts \( a \) and \( b \) on the coordinate axes. When the axes are rotated through a given angle \( \theta \) keeping the origin fixed, this line \( L \) has the intercepts \( p \) and \( q \). Then

\[
\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2} + \frac{1}{q^2}
\]

Options:

1. \( a^2 + b^2 = p^2 + q^2 \)
2. \( a^2 + p^2 = b^2 + q^2 \)
3. \( \frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2} + \frac{1}{q^2} \)
4. \( \frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2} + \frac{1}{q^2} \)

If \( O \) is the origin and \( A \) and \( B \) are points on the line \( 3x - 4y + 25 = 0 \) such that \( \overline{OA} = \overline{OB} = 13 \), then the area of \( \triangle OAB \) (in sq. units) is

\[
\overline{OA} = \overline{OB} = 13 \quad \text{(given)}
\]

Options:

1. 30
2. 120
Question Number : 45  Question Id : 1874634045  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If \( P(\alpha, \beta) \) be a point on the line \( 3x + y = 0 \) such that the point \( P \) and the point \( Q(1, 1) \) lie on either side of the line \( 3x = 4y + 8 \), then

\[
3x + y = 0 \Rightarrow \exists \text{ a point } P(\alpha, \beta) \text{ such that } x \text{ and } y \text{ are of opposite sign}
\]

Options :

1. \( \alpha > \frac{8}{15}, \beta < -\frac{8}{5} \)
2. \( \alpha < \frac{8}{15}, \beta < -\frac{8}{5} \)
3. \( \alpha > \frac{8}{15}, \beta > -\frac{8}{5} \)
4. \( \alpha < \frac{8}{15}, \beta > -\frac{8}{5} \)

Question Number : 46  Question Id : 1874634046  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

Two vertices of a triangle are \((5, -1)\) and \((-2, 3)\). If the origin is the orthocentre of this triangle, then the coordinates of the third vertex of that triangle are

\[
\text{If } (0, 0) \text{ is the orthocentre, then the coordinates of the third vertex are}
\]

Options :

1. \((4, 7)\)
The distance from the origin to the orthocentre of the triangle formed by the lines $x + y - 1 = 0$ and $6x^2 - 13xy + 5y^2 = 0$ is

Options:

1. $\frac{11\sqrt{2}}{2}$

2. 13

3. 11

4. $\frac{11\sqrt{2}}{24}$
The combined equation of two lines $L$ and $L_1$ is $2x^2 + axy + 3y^2 = 0$ and the combined equation of two lines $L$ and $L_2$ is $2x^2 + bxy - 3y^2 = 0$. If $L_1$ and $L_2$ are perpendicular, then $a^2 + b^2 =$

The power of the point $B(-1, 1)$ with respect to the circle $S = x^2 + y^2 - 2x - 4y + 3 = 0$ is $p$. If the length of the tangent drawn from $B$ to the circle $S = 0$ is $t$, then the point $(2, 3)$ with respect to the circle $S' = 0$ having centre at $(p, p^2)$ and passing through the origin

Options:

1. 26
2. 29
3. 13
4. 85

The combined equation of two lines $L$ and $L_1$ is $2x^2 + axy + 3y^2 = 0$ and the combined equation of two lines $L$ and $L_2$ is $2x^2 + bxy - 3y^2 = 0$. If $L_1$ and $L_2$ are perpendicular, then $a^2 + b^2 =$

The power of the point $B(-1, 1)$ with respect to the circle $S = x^2 + y^2 - 2x - 4y + 3 = 0$ is $p$. If the length of the tangent drawn from $B$ to the circle $S = 0$ is $t$, then the point $(2, 3)$ with respect to the circle $S' = 0$ having centre at $(p, p^2)$ and passing through the origin

Options:

1. lies inside the circle $S' = 0$
2. lies outside the circle $S' = 0$
lies on the circle $S' = 0$

is the centre of the circle $S' = 0$

If tangents are drawn to the circle $x^2 + y^2 = 12$ at the points where it intersects the circle $x^2 + y^2 - 5x + 3y - 2 = 0$, then the coordinates of the point of intersection of those tangents are

$$x^2 + y^2 = 12 \quad \text{and} \quad x^2 + y^2 - 5x + 3y - 2 = 0$$

Options:

1. $\left(-6, \frac{18}{5}\right)$
2. $\left(6, \frac{18}{5}\right)$
3. $\left(-6, -\frac{18}{5}\right)$
4. $\left(6, -\frac{18}{5}\right)$
If the point of intersection of the pair of the transverse common tangents and that of the pair of direct common tangents drawn to the circles \( x^2 + y^2 - 14x + 6y + 33 = 0 \) and \( x^2 + y^2 + 30x - 2y + 1 = 0 \) are \( T \) and \( D \) respectively, then the centre of the circle having \( \overline{TD} \) as diameter is

\[
x^2 + y^2 - 14x + 6y + 33 = 0 \quad \text{and} \quad x^2 + y^2 + 30x - 2y + 1 = 0
\]

**Options:**

1. \( \left( \frac{39}{2}, \frac{-7}{4} \right) \)

2. \( \left( \frac{39}{4}, \frac{7}{2} \right) \)

3. \( \left( \frac{39}{4}, \frac{-7}{2} \right) \)

4. \( \left( \frac{39}{2}, \frac{-7}{2} \right) \)

---

If the circles \( x^2 + y^2 + 2\lambda x + 2 = 0 \) and \( x^2 + y^2 + 4y + 2 = 0 \) touch each other, then \( \lambda = \)

\[
x^2 + y^2 + 2\lambda x + 2 = 0 \quad \text{and} \quad x^2 + y^2 + 4y + 2 = 0
\]

**Options:**

1. \( \pm 1 \)

2. \( \pm 2 \)

3. \( \pm 3 \)
4. ± 4

The equation of the circle whose diameter is the common chord of the circles
\[ x^2 + y^2 + 2x + 3y + 1 = 0 \text{ and } x^2 + y^2 + 4x + 3y + 2 = 0 \]
is

\[ x^2 + y^2 + 2x + 3y + 1 = 0 \text{ and } x^2 + y^2 + 4x + 3y + 2 = 0 \]

Options:
1. \( 2x^2 + 2y^2 + x + 3y + 2 = 0 \)
2. \( 2x^2 + 2y^2 + 2x + 6y + 1 = 0 \)
3. \( 2x^2 + 2y^2 + 4x - 3y - 1 = 0 \)
4. \( x^2 + y^2 + 2x + 6y - 2 = 0 \)

Question Number : 54  Question Id : 1874634054  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If the focus of a parabola divides a focal chord of the parabola into segments of lengths 5, 3 units, then the length of the latus rectum of that parabola is

\[ \text{If the focus of a parabola divides a focal chord of the parabola into segments of lengths 5, 3 units, then the length of the latus rectum of that parabola is} \]

Options:
1. \( \frac{15}{4} \)
2. 20
3. \( \frac{25}{2} \)
The angle between the tangents drawn to the parabola $y^2 = 4x$ from the point $(1, 4)$ is

$y^2 = 4x$ పరాభాస్త్రం, $(1, 4)$ పంటకి నుండి నిర్దేశాంశాల వచ్చిని పరిశీలించండి

Options:

1. $\frac{\pi}{4}$
2. $\frac{\pi}{3}$
3. $\frac{2\pi}{5}$
4. $\frac{\pi}{6}$

If the tangent drawn to the parabola $y^2 = 4x$ at $(t^2, 2t)$ is the normal to the ellipse $4x^2 + 5y^2 = 20$ at $(\sqrt{5} \cos \theta, 2 \sin \theta)$, then

$y^2 = 4x$ పరాభాస్త్రం $(t^2, 2t)$ పంటకి నుండి నిర్దేశాంశాలు, $4x^2 + 5y^2 = 20$ ఎలిప్స్ ని విభిరించండి $(\sqrt{5} \cos \theta, 2 \sin \theta)$ పంటకి నుండి నిర్దేశాంశాలు, విభిరించండి

Options:

1. $5t^4 + 4t^2 = 1$
2. $\frac{5}{t^4} + \frac{100}{t^2} = 1$
3. \( t = \sin \theta \)

4. \( \cos \theta = t + 1 \)

**Question Number : 57  Question Id : 1874634057  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical**

If the tangents drawn from a point \( P \) to the ellipse \( 4x^2 + 9y^2 - 24x + 36y = 0 \) are perpendicular, then the locus of \( P \) is

\[ \begin{align*}
4x^2 + 9y^2 - 24x + 36y &= 0 \\
\text{(Equation of the ellipse)}
\end{align*} \]

**Options :**

1. \( x^2 + y^2 - 6x + 4y + 13 = 0 \)

2. \( x^2 + y^2 - 6x + 4y - 13 = 0 \)

3. \( x^2 + y^2 = 26 \)

4. \( x^2 + y^2 + 6x - 4y - 13 = 0 \)

**Question Number : 58  Question Id : 1874634058  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical**

The locus of the midpoints of the chords of the circle \( x^2 + y^2 = 16 \) which are the tangents to the hyperbola \( 9x^2 - 16y^2 = 144 \) is

\[ \begin{align*}
9x^2 - 16y^2 &= 144 \\
\text{(Equation of the hyperbola)}
\end{align*} \]

**Options :**

1. \( 3x^2 - 4y^2 = 16 (x^2 + y^2) \)

2. \( 4x^2 - 3y^2 = 9 (x^2 + y^2) \)
3. \[16x^2 - 9y^2 = (x^2 + y^2)^2\]

4. \[16x^2 - 9y^2 = 4(x^2 + y^2)\]

---

Question Number : 59  Question Id : 1874634059  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

A(3, 2, -1), B(4, 1, 1), C(6, 2, 5) are three points. If D, E, F are three points which divide BC, CA, AB respectively in the same ratio 2:1, then the centroid of ΔDEF is

A(3, 2, -1), B(4, 1, 1), C(6, 2, 5) అంటే రెండింటి వింటికాలు. D, E, F అంటే రెండింటి వింటికాలు

BC, CA, AB ని రెండింటి వింటికాలు విభజించిన అనుస్థానంలో 2:1 అక్షాంశాలు విభజించాలి, తోందు ఆΔDEF చతుర్స్థితి విభజించాలి

Options :

1. \[\left(\frac{13}{3}, \frac{5}{3}, \frac{5}{3}\right)\]

2. (13, 5, 5)

3. (4, 2, 1)

4. \[\left(\frac{11}{3}, \frac{4}{3}, \frac{1}{3}\right)\]

---

Question Number : 60  Question Id : 1874634060  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If A = (1, 8, 4), B = (2, -3, 1), then the direction cosines of a normal to the plane AOB is

A = (1, 8, 4), B = (2, -3, 1) అంటే న్యాయపౌర్తి వింటికాలు నుండి అంతా లేదు

Options :

1. \[\frac{2}{\sqrt{78}}, \frac{5}{\sqrt{78}}, \frac{-7}{\sqrt{78}}\]

2. \[\frac{2\sqrt{10}}{9}, \frac{7\sqrt{10}}{90}, \frac{-19\sqrt{10}}{90}\]
Question Number : 61  Question Id : 1874634061  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If the two lines \[ \frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4} \] and \[ \frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1} \] have a point in common, then \( k = \) 

\[ \frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4} \text{ and } \frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1} \]

Options :
1. \( \frac{2}{9} \)
2. \( \frac{-2}{9} \)
3. \( \frac{9}{2} \)
4. 0

Question Number : 62  Question Id : 1874634062  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

\[ \lim_{x \to 0} \frac{x^2 (\tan 2x - 2 \tan x)^2}{(1 - \cos 2x)^4} = \]

Options :
1. 4
2. 2
Question Number : 63  Question Id : 1874634063  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

\[ \lim_{x \to -\infty} \left( \frac{6x^2 - \cos 3x}{x^2 + 5} - \frac{5x^3 + 3}{\sqrt{x^6 + 2}} \right) = \]

Options :
1. 11
2. 0
3. -1
4. 1

Question Number : 64  Question Id : 1874634064  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The number of discontinuities in \( \mathbb{R} \) for the function \( f(x) = \frac{x - 1}{x^3 + 6x^2 + 11x + 6} \) is

\[ f(x) = \frac{x - 1}{x^3 + 6x^2 + 11x + 6} \]

Options :
1. 3
2. 2
3. 1
4. 0
\[ \frac{d}{dx} \log \left( \sqrt{x + \sqrt{x^2 + a^2}} \right) = \]

Options:
1. \( \frac{1}{\sqrt{x^2 + a^2}} \)
2. \( \frac{1}{2\sqrt{x^2 + a^2}} \)
3. \( \frac{1}{2(x + \sqrt{x^2 + a^2})} \)
4. 

If \( f(x) = \cot^{-1}\left( \frac{x^x - x^{-x}}{2} \right) \), then \( f'(1) = \)

\( f(x) = \cot^{-1}\left( \frac{x^x - x^{-x}}{2} \right) \) என்றால், என்ன \( f'(1) = \)

Options:
1. \(-\log 2\)
2. \( \log 2 \)
3. \( 1 \)
4. \(-1 \)

If \( f(x) = \cot^{-1}\left( \frac{x^x - x^{-x}}{2} \right) \) என்றால், என்ன \( f'(1) = \)
If $a \neq 0$, $x = a(t + \sin t)$ and $y = a(1 - \cos t)$, then
\[
\frac{d^2y}{dx^2} \text{ at } t = \frac{2\pi}{3} \text{ is }
\]

\[
a \neq 0, x = a(t + \sin t) \text{ and } y = a(1 - \cos t) \text{ तब, } t = \frac{2\pi}{3} \text{ तब } \frac{d^2y}{dx^2} =
\]

Options:

1. \(\frac{4}{a}\)
2. \(\frac{1}{4a}\)
3. \(4a\)
4. \(\frac{a}{4}\)

The number of tangents to the curve $y^2 (x-a) = x^2 (x+a) \ (a>0)$ that are parallel to the X-axis is

\[
y^2 (x-a) = x^2 (x+a) \ (a>0) \text{ की वक्र पर X-अक्ष के स्पर्श रेखाओं की संख्या है} \]

Options:

1. infinitely many
2. 0
3. 1
4. 2
If \( f(x) = (2k+1)x - 3 - ke^{-x} + 2e^x \) is monotonically increasing for all \( x \in \mathbb{R} \) then the least value of \( k \) is

\[ \text{Options:} \]
1. 1
2. 0
3. \(-1\)
4. \(-\frac{1}{2}\)

If the function \( f(x) = ax^3 + bx^2 + 11x - 6 \) satisfies the conditions of Rolle's theorem in \([1, 3]\) and \( f'\left(2 + \frac{1}{\sqrt{3}}\right) = 0 \), then \( a + b = \)

\[ \text{Options:} \]
1. -5
2. -3
3. 4
4. 7
For $a > 0$, if the function $f(x) = 2x^3 - 9ax^2 + 12a^2x + 1$ attains its maximum value at $p$ and minimum value at $q$ such that $p^2 = q$, then $a = \frac{1}{2}$.

Options:

1. $\frac{1}{2}$
2. $1$
3. $2$
4. $4$

If \( \int \cos x \cdot \cos 2x \cdot \cos 5x \, dx = A \sin 2x + B \sin 4x + C \sin 6x + D \sin 8x + k \) (where $k$ is the arbitrary constant of integration), then $\frac{1}{B} + \frac{1}{C} =$

Options:

1. $\frac{1}{A} - \frac{1}{D}$
2. $\frac{1}{A} + \frac{1}{D}$
3. $1$
Question Number : 73  Question Id : 1874634073  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If \[ \int e^x \left( \frac{x+2}{x+4} \right)^2 \, dx = f(x) + \text{arbitrary constant}, \text{ then } f(x) = \]

\[ \int e^x \left( \frac{x+2}{x+4} \right)^2 \, dx = f(x) + \text{arbitrary constant}, \text{ then } f(x) = \]

Options :
1. \( \frac{xe^x}{x+4} \)
2. \( \frac{e^x}{x+4} \)
3. \( \frac{xe^x}{(x+4)^2} \)
4. \( \frac{e^x}{(x+4)^2} \)

Question Number : 74  Question Id : 1874634074  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

\[ \int \frac{dx}{\sin x + \sin 2x} = \]

Options :
1. \( \frac{1}{2} \log_e |1 + \cos x| + \frac{1}{6} \log_e |1 - \cos x| - \frac{2}{3} \log_e |1 + 2 \cos x| + c \)
2. \( \frac{1}{3} \log_e |1 + \cos x| - \frac{2}{3} \log_e |1 - \cos x| + \frac{1}{2} \log_e |1 + 2 \cos x| + c \)
\[
\frac{1}{2} \log_e |1 + \sin x| - \frac{1}{3} \log_e |1 - \sin x| - \frac{1}{3} \log_e |1 + \cos x| + c
\]

\[
\frac{1}{3} \log_e |1 - \sin x| + \frac{1}{2} \log_e |1 + \cos x| - \frac{2}{3} \log_e |1 - 2 \cos x| + c
\]

Question Number : 75  Question Id : 1874634075  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If \( I_n = \int \frac{\sin nx}{\sin x} \, dx \) for \( n = 1, 2, 3, \ldots \), then \( I_6 = \)

\[
n = 1, 2, 3, \ldots \quad I_n = \int \frac{\sin nx}{\sin x} \, dx, \quad \text{so} \quad I_6 =
\]

Options :

1. \( \frac{3}{5} \sin 3x + \frac{8}{3} \sin^3 x - \sin x + c \)
2. \( \frac{2}{5} \sin 5x - \frac{5}{3} \sin^3 x - 2 \sin x + c \)
3. \( \frac{2}{3} \sin 5x - \frac{8}{3} \sin^3 x + 4 \sin x + c \)
4. \( \frac{2}{5} \sin 5x - \frac{8}{3} \sin^3 x + 4 \sin x + c \)

Question Number : 76  Question Id : 1874634076  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If \( \lim_{n \to \infty} \left[ \left(1 + \frac{1}{n^2}\right) \left(1 + \frac{2^2}{n^2}\right) \ldots \left(1 + \frac{n^2}{n^2}\right) \right]^{\frac{1}{n}} = k \), then \( \log k = \)

\[
\lim_{n \to \infty} \left[ \left(1 + \frac{1}{n^2}\right) \left(1 + \frac{2^2}{n^2}\right) \ldots \left(1 + \frac{n^2}{n^2}\right) \right]^{\frac{1}{n}} = k \quad \text{so} \quad \log k =
\]

Options :
1. \[ \log 4 + \frac{\pi}{2} - 1 \]

2. \[ \log 2 + \frac{\pi}{2} + 1 \]

3. \[ \log 2 + \frac{\pi}{2} - 2 \]

4. \[ \log 2 + \frac{\pi}{2} - 1 \]

Question Number : 77  Question Id : 1874634077  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes
Single Line Question Option : No  Option Orientation : Vertical

\[ \int_0^{\pi/2} \sin^3 x \cos x \, dx \]

Options :

1. \[ \pi \]

2. \[ \frac{\pi}{2} \]

3. \[ \frac{\pi}{4} \]

4. \[ \frac{\pi}{8} \]

Question Number : 78  Question Id : 1874634078  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes
Single Line Question Option : No  Option Orientation : Vertical

The curve \( y = ax^2 + bx \) passes through the point \((1,2)\) and lies above the X-axis for \(0 \leq x \leq 8\). If the area enclosed by this curve, the X-axis and the line \( x = 6 \) is 108 square units, then \( 2b - a = \)

\( y = ax^2 + bx \) వీటి నీడి యుస్తుడు (1.2) తృతు చెందింది, \( 0 \leq x \leq 8 \) కామియమాత్రమే X-అక్షిత వృత్తి
వంటి. \( y \) నీడు, X-అక్షిత, సరిప్పు యుస్తుడు \( x = 6 \) వంటి మార్గాలు పైపాని వాలేందుకు అలాంటే 108 అప్పుడు
వెలుగునందు అందరి, ఆంధ్ర యుస్తుడు \( 2b - a = \)
Question Number : 79  Question Id : 1874634079  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The differential equation of all parabolas whose axes are parallel to Y-axis is

Options :
1. \[ \frac{d^3y}{dx^3} = 0 \]
2. \[ \frac{d^2y}{dx^2} = 0 \]
3. \[ \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0 \]
4. \[ y \frac{d^2y}{dx^2} + \left( \frac{dy}{dx} \right)^2 = 0 \]

Question Number : 80  Question Id : 1874634080  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The solution of the equation \( \frac{dy}{dx} + 2y \tan x = \sin x \) satisfying \( y = 0 \) when \( x = \frac{\pi}{3} \), is

\[ x = \frac{\pi}{3} \]

Options :
\[ y = 2 \sin^2 x + \cos x - 2 \]

1.

\[ y = 2 \sin^2 x - \cos x - 2 \]

2.

\[ y = 2 \cos^2 x - \sin x + 2 \]

3.

\[ y = 2 \cos x - \sin^2 x - 1 \]

4.

**Physics**

Display Number Panel: Yes

Group All Questions: No

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**Question 81**

Question Id: 1874634081

Question Type: MCQ

Option Shuffling: Yes

Display Question Number: Yes

Single Line Question Option: No

Option Orientation: Vertical

Two intervals of time are measured as \( \Delta t_1 = (2.00 \pm 0.02) \) s and \( \Delta t_2 = (4.00 \pm 0.02) \) s. The value of \( \sqrt{\Delta t_1(\Delta t_2)} \) with correct significant figures and error is

\[ \sqrt{(2.00 \pm 0.02)(4.00 \pm 0.02)} \]

**Options:**

1. \( (2.828 \pm 0.01) \) s

2. \( (2.83 \pm 0.01) \) s

3. \( (2.828 \pm 0.0075) \) s

4. \( (2.83 \pm 0.0075) \) s

---

**Question 82**

Question Id: 1874634082

Question Type: MCQ

Option Shuffling: Yes

Display Question Number: Yes

Single Line Question Option: No

Option Orientation: Vertical
The speed of a particle changes from \( \sqrt{5} \text{ ms}^{-1} \) to \( 2\sqrt{5} \text{ ms}^{-1} \) in a time \( t \). If the magnitude of change in its velocity is \( 5 \text{ ms}^{-1} \), the angle between the initial and final velocities of the particle is

Options:
1. \(30^\circ\)
2. \(45^\circ\)
3. \(60^\circ\)
4. \(90^\circ\)

If the maximum height and range of a projectile are 3 m and 4 m respectively then the velocity of the projectile is
(Acceleration due to gravity = \( 10 \text{ ms}^{-2} \))

Options:
1. \(20\sqrt{\frac{6}{5}} \text{ ms}^{-1}\)
2. \(10\sqrt{\frac{3}{2}} \text{ ms}^{-1}\)
3. \(10\sqrt{\frac{2}{3}} \text{ ms}^{-1}\)
A body is projected at an angle other than 90° with the horizontal with some velocity. If the time of ascent of the body is 1 s then the maximum height it can reach is (Acceleration due to gravity = 10 m/s²).

Options:
1. 5 m
2. 10 m
3. 2.5 m
4. 75 m
The position-time $(x-t)$ graph of a moving body of mass 2 kg is shown in the figure. The impulse on the body at $t = 4$ s is

Options:
1. $1.5 \text{ kg m s}^{-1}$
2. $-1.5 \text{ kg m s}^{-1}$
3. $1 \text{ kg m s}^{-1}$
4. $2 \text{ kg m s}^{-1}$
A block of mass ‘m’ is lying on a rough inclined plane having an inclination \( \alpha = \tan^{-1}\left(\frac{1}{5}\right) \).
The inclined plane is moving horizontally with a constant acceleration of \( a = 2 \text{ ms}^{-2} \) as shown in the figure. The minimum value of coefficient of friction so that the block remains stationary with respect to the inclined plane is

(Acceleration due to gravity = 10 \text{ ms}^{-2})

\[ \alpha = \tan^{-1}\left(\frac{1}{5}\right) \]

Options:

1. \( \frac{2}{9} \)
2. \( \frac{5}{12} \)
3. \( \frac{1}{5} \)
4. \( \frac{2}{5} \)
Potential energy of a body of mass 1 kg free to move along X-axis is given by
\[ U(x) = \left( \frac{x^2}{2} - x \right) \text{ J} \]. If the total mechanical energy of the body is 2 J, then the maximum speed of the body is (Assume only conservative force acts on the body)

Options:
1. \( \sqrt{5} \text{ ms}^{-1} \)
2. 5 ms\(^{-1} \)
3. 3.5 ms\(^{-1} \)
4. \( \sqrt{8} \text{ ms}^{-1} \)

A cylindrical well of radius 2.5 m has water up to a height of 14 m from the bottom. If the water level is at a depth of 6 m from the top of the well, then the time taken in minutes to empty the well using a motor of 10 HP is approximately
(Acceleration due to gravity = 10 ms\(^{-2} \))

Options:
1. 30
A fly wheel of mass 1 kg and radius vector \((2\hat{i} + \hat{j} + 2\hat{k})\) m is at rest. When a force \((3\hat{i} + 2\hat{j} - 4\hat{k})N\) acts on it tangentially, it can rotate freely. Then its angular velocity after 4.5 s is

\[\omega = \frac{\sqrt{261}}{9} \text{ rad s}^{-1}\]

Options:

1. \(\frac{2}{9} \sqrt{261} \text{ rad s}^{-1}\)
2. \(\frac{3}{2} \sqrt{261} \text{ rad s}^{-1}\)
3. \(\sqrt{261} \text{ rad s}^{-1}\)
4. \(\frac{5}{9} \sqrt{261} \text{ rad s}^{-1}\)
Three identical spheres each of diameter $2\sqrt{3}$ m are kept on a horizontal surface such that each sphere touches the other two spheres. If one of the spheres is removed, then the shift in the position of the centre of mass of the system is

Options:
1. 12 m
2. 1 m
3. 2 m
4. $\frac{3}{2}$ m

For a particle executing simple harmonic motion, the displacement-time ($x - t$) graph is as shown in the figure. The acceleration of the particle at $t = \frac{4}{3}$ s is

![Graph of x(t) vs t](image-url)
Two masses 90 kg and 160 kg are separated by a distance of 5 m. The magnitude of intensity of the gravitational field at a point which is at a distance 3 m from the 90 kg mass and 4 m from the 160 kg mass is

\[
\left(\text{Universal gravitational constant} = 6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}\right)
\]

Options:

1. \( \frac{-\sqrt{3}}{32} \pi \text{ cm s}^{-2} \)

2. \( \frac{-32}{\sqrt{3}} \pi \text{ cm s}^{-2} \)

3. \( \frac{\sqrt{3}}{32} \pi \text{ cm s}^{-2} \)

4. \( \frac{32}{\sqrt{3}} \pi \text{ cm s}^{-2} \)
The following four wires are made of the same material. If same tension is applied to each, the wire having largest extension is
a) length 0.5 m, diameter 0.5 mm  
b) length 1 m, diameter 1 mm  
c) length 2 m, diameter 2 mm  
d) length 3 m, diameter 3 mm

A liquid drop of density $\rho$ is floating half immersed in a liquid of surface tension $S$ and density $\frac{\rho}{2}$. If the surface tension $S$ of liquid is numerically equal to 10 times of acceleration due to gravity, then the diameter of the drop is

Options:
A block of metal is heated to a temperature much higher than the room temperature and placed in an evacuated cavity. The curve which correctly represents the rate of cooling (T is temperature of the block and t is the time).

Options:

1. \[ T = \frac{20}{\sqrt{\rho}} \]
2. \[ T = \frac{80}{\sqrt{\rho}} \]
3. \[ T = \frac{60}{\sqrt{\rho}} \]
4. \[ T = \frac{40}{\sqrt{\rho}} \]
A solid copper sphere of density \( \rho \), specific heat capacity \( C \) and radius \( r \) is initially at 200 K. It is suspended inside a chamber whose walls are at 0 K. The time required (in \( \mu s \)) for the temperature of the sphere to drop to 100 K is

(\( \sigma \) is Stefan’s constant and all the quantities are in SI units)

\[
\rho = \text{mass density of copper} \quad C = \text{specific heat capacity of copper} \quad r = \text{radius of the sphere} \quad T_0 = 200 \text{ K} \quad T = 100 \text{ K}
\]

The time \( t \) required for the temperature to drop from 200 K to 100 K can be calculated using the Stefan-Boltzmann law and the heat transfer equation. The correct expression for the time is:

\[
\frac{48r \rho C}{\sigma}
\]

Options:

1. \( \frac{1}{48} \frac{r \rho C}{\sigma} \)
2. \( \frac{27r \rho C}{7 \sigma} \)
3. \( \frac{7r \rho C}{27 \sigma} \)
4. \( \frac{r \rho C}{\sigma} \)
Match the temperatures of the source and sink ($T_1$ and $T_2$ respectively) of a Carnot heat engine given in List-I with the corresponding efficiencies given in List-II.

<table>
<thead>
<tr>
<th>List-I</th>
<th>List-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) $T_1 = 500$ K, $T_2 = 300$ K</td>
<td>I) 0.2</td>
</tr>
<tr>
<td>B) $T_1 = 500$ K, $T_2 = 350$ K</td>
<td>II) 0.3</td>
</tr>
<tr>
<td>C) $T_1 = 800$ K, $T_2 = 400$ K</td>
<td>III) 0.4</td>
</tr>
<tr>
<td>D) $T_1 = 450$ K, $T_2 = 360$ K</td>
<td>IV) 0.5</td>
</tr>
</tbody>
</table>

The correct answer is

Options:

1. A B C D
   III  IV  II  I

2. A B C D
   IV  III  II  I

3. A B C D
   III  I  IV  II

4. A B C D
   III  II  IV  I
A hammer of mass 200 kg strikes a steel block of mass 200 g with a velocity 8 ms\(^{-1}\). If 23% of the energy is utilized to heat the steel block, the rise in temperature of the block is (specific heat capacity of steel = 460 J kg\(^{-1}\) K\(^{-1}\))

200 kg సంహరించాడు ఎందుకు 8 ms\(^{-1}\) సంముఖంగా 200 g సంహరించాడు ఎందుకు విచెత్తాడు. 23% చాలా చాలా విచెత్తా విచెత్తా విచెత్తా, అందువల్ల విచెత్తా విచెత్తా (సంహరించాడు సంహరించాడు = 460 J kg\(^{-1}\) K\(^{-1}\))

Options :
1. 8 °C
2. 16 °C
3. 12 °C
4. 24 °C

At a temperature of 314 K and a pressure of 100 kPa, the speed of sound in a gas is 1380 ms\(^{-1}\). The radius of each gas molecule is 0.5 Å. The frequency of sound at which the wavelength of sound wave in the gas becomes equal to the mean free path of the gas molecules is (Boltzmann Constant = 1.38 × 10\(^{-23}\) JK\(^{-1}\))

314 K సంహరించాడు మందం 100 kPa చాలా చాలా కారంప మందం 1380 ms\(^{-1}\) లేదు. సంహరించాడు 0.5 Å చాలా చాలా చాలా చాలా. సంహరించాడు విచెత్తా విచెత్తా విచెత్తా విచెత్తా విచెత్తా (సంహరించాడు సంహరించాడు = 1.38 × 10\(^{-23}\) JK\(^{-1}\))

Options :
1. 1000 MHz
2. 1000√2 MHz
\[ \frac{1000}{\sqrt{2}} \text{ MHz} \]

4. 500 MHz

**Question Number : 100  Question Id : 1874634100  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical**

At a temperature of 27 °C, two identical organ pipes produce notes of frequency 140 Hz. If the temperature of one pipe is raised to 57.75 °C, the number of beats produced per second is

**Options :**
1. 7
2. 5
3. 3
4. 9

**Question Number : 101  Question Id : 1874634101  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical**
A source of sound ‘S’ in the form of a block kept on a smooth horizontal surface is connected to a spring, as shown in the figure. If the spring oscillates with an amplitude of 50 cm along horizontal between the wall and the observer O, the maximum frequency heard by the observer is 12.5% more than the minimum frequency heard by him. If the mass of the source of sound is 100 g, the force constant of the spring is

(Speed of sound in air is 340 ms⁻¹)

Options:

1. 40 N m⁻¹
2. 80 N m⁻¹
3. 160 N m⁻¹
4. 320 N m⁻¹
A girl of height 150 cm with her eye level at 140 cm stands in front of a plane mirror of height 75 cm fixed to a wall. The lower edge of the mirror is at a height of 85 cm above her feet level. The height of her image the girl can see in the mirror is

Options:
1. 130 cm
2. 140 cm
3. 120 cm
4. 150 cm
Unpolarised light from air incidents on the surface of a transparent medium of refractive index 1.414 such that the reflected light is completely polarised. Match the angles given in List - I with the corresponding values given in List - II.

<table>
<thead>
<tr>
<th>List - I</th>
<th>List - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Angle of reflection</td>
<td>I) (2\sin^{-1}\left(\frac{2}{\sqrt{3}}\right))</td>
</tr>
<tr>
<td>B) Angle of refraction</td>
<td>II) (\sin^{-1}\left(\frac{2}{\sqrt{3}}\right) - \sin^{-1}\left(\frac{1}{\sqrt{3}}\right))</td>
</tr>
<tr>
<td>C) Angle between incident and completely polarised rays</td>
<td>III) (\sin^{-1}\left(\frac{1}{\sqrt{3}}\right))</td>
</tr>
<tr>
<td>D) Angle of deviation of the incident ray</td>
<td>IV) (\cos^{-1}\left(\frac{1}{\sqrt{3}}\right))</td>
</tr>
</tbody>
</table>

The correct answer is

Options:

1. II III I IV
2. A B C D
3. IV I III II
The electric field intensity at a point on the axis of an electric dipole in air is 4 NC⁻¹. Then the electric field intensity at a point on the equatorial line which is at a distance equal to twice the distance on the axial line and if the dipole is in a medium of dielectric constant 4 is

Options:

1. 1 NC⁻¹
2. \( \frac{1}{8} \) NC⁻¹
3. 16 NC⁻¹
4. \( \frac{1}{16} \) NC⁻¹
Two small spheres of each charge \(q\), mass \(m\) and material density \(d\) are suspended from a fixed point with the help of inextensible light thread. When the spheres are in air, the angle between the threads is 90°. When the spheres are suspended in a liquid of density \(\frac{2}{3}d\), the angle between the threads is 60°. The value of dielectric constant of the liquid is

\[k = \frac{\Delta \mu}{\varepsilon_0}
\]

where \(\Delta \mu\) is the change in the permeability of the material due to the presence of the liquid.

Options:
1. \(6\sqrt{3}\)
2. \(2\sqrt{5}\)
3. \(5\sqrt{3}\)
4. \(7\sqrt{2}\)

The potential difference \((V_A - V_B)\) in the arrangement shown in figure is

\[V_A - V_B = \frac{q}{\varepsilon_0} \frac{r^2}{d}
\]

where \(q\) is the charge on the spheres, \(r\) is the distance between the spheres, and \(d\) is the dielectric constant of the liquid.

Options:
1. \(5.4 \times 10^5\) V
2. \(2.7 \times 10^5\) V
In a parallel plate capacitor the separation between plates is \(3x\). This separation is filled by two layers of dielectrics, in which one layer has thickness \(x\) and dielectric constant 3 K, the other layer is of thickness 2\(x\) and dielectric constant 5 K. If the plates of the capacitor are connected to a battery, then the ratio of potential difference across the dielectric layers is

\[
\frac{V_1}{V_2} = \frac{3x}{2x} \times \frac{3}{5} = \frac{3}{2} \times \frac{3}{5} = \frac{9}{10}
\]

Options:

1. \(\frac{1}{2}\)
2. \(\frac{4}{3}\)
3. \(\frac{3}{5}\)
4. \(\frac{5}{6}\)
Assertion (A): When a wire of aluminium and another wire of silicon are heated from room temperature to 80 °C, the conductivity of aluminium increases and that of silicon decreases.

Reason (R): Aluminium has positive temperature coefficient of resistivity and silicon has negative temperature coefficient of resistivity.

Options:
1. Both (A) and (R) are correct and (R) is the correct explanation of (A)
2. Both (A) and (R) are correct but (R) is not the correct explanation of (A)
3. (A) is correct but (R) is not correct
4. (A) is not correct but (R) is correct
The walls of a closed cubical box of edge 60 cm are made of material of thickness 1 mm and thermal conductivity $4 \times 10^{-4}$ cal s$^{-1}$ cm$^{-1}$ °C$^{-1}$. The interior of the box is maintained 1000 °C above the outside temperature by a heater placed inside the box and connected across 400 V DC supply. The resistance of the heater is

Options:

1. 4.41 Ω
2. 44.1 Ω
3. 0.441 Ω
4. 441 Ω

A galvanometer of resistance ‘G’ Ω, is shunted by a resistance ‘S’ Ω. To keep the main current in the circuit unchanged, the resistance to be connected in series with the galvanometer is

Options:

1. $\frac{G^2}{S+G}$
2. $\frac{S}{S+G}$
3. $\frac{S^2}{S+G}$
Question Number : 111  Question Id : 1874634111  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

A proton and an α-particle are simultaneously projected in opposite directions into a region of uniform magnetic field of 2 mT perpendicular to the direction of the field. After some time it is found that the velocity of proton has changed in direction by 90°. Then at this time, the angle between the velocity vectors of proton and α-particle is

\[ \frac{2 \text{ mT}}{S + G} \]

Options :
1. 60°
2. 90°
3. 45°
4. 180°

Question Number : 112  Question Id : 1874634112  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

A bar magnet placed in a uniform magnetic field making an angle \( \theta \) with the field experiences a torque. If the angle made by the magnet with the field is doubled, the torque experienced by the magnet increases by 41.4%. The initial angle made by the magnet with the magnetic field is

Options :
1. 60°
A metal rod AB of length 50 cm is moving at a velocity 8 ms\(^{-1}\) in a magnetic field of 2 T. If the field is at 60° with the plane of motion as shown in figure, then the potentials \(V_A\) and \(V_B\) are related by

\[50 \text{ cm అతినించిన అనే పొందిన AB, 8 \text{ ms}^{-1} విచిత్రం 2 \text{T పరిమాణం ఉంటే} \text{ అంతిమం కావచ్చు.} \]
\[60° చేపోతె విద్యుతు వైపు యొక్క సమశీతోత్తు కొని, \text{ } V_A \text{ అందించి} V_B \text{ అందించి} \text{ అంతిమం కావచ్చు.} \]

**Options:**

1. \(V_A - V_B = 8 \text{ V}\)
2. \(V_A - V_B = 4 \text{ V}\)
3. \(V_B - V_A = 8 \text{ V}\)
4. \(V_B - V_A = 4 \text{ V}\)
In the given electrical circuit, if the switch S is closed then the maximum energy stored in
the inductor is

Options:
1. 3 J
2. 9 J
3. 12 J
4. 6 J
Which of the following is/are the property/properties of a monochromatic electromagnetic wave propagating in free space?

a) Electric and magnetic fields will have a phase difference $\frac{\pi}{2}$.

b) The energy of the wave is distributed equally between electric and magnetic fields.

c) The pressure exerted by the wave is the product of its speed and energy density.

d) The speed of the wave is equal to the ratio of magnetic field to the electric field.

1. (a) and (c)

2. Only (b)

3. (b) and (c)

4. Only (d)
The maximum kinetic energy of a photoelectron liberated from the surface of lithium with work function 2.35 eV by electromagnetic radiation whose electric component varies with time as \( E = a \left[ 1 + \cos(2\pi f_1 t) \right] \cos 2\pi f_2 t \) (where ‘\( a \)’ is a constant) is

\[ f_1 = 3.6 \times 10^{15} \text{ Hz}, \quad f_2 = 1.2 \times 10^{15} \text{ Hz} \] and Plank’s constant = \( 6.6 \times 10^{-34} \text{ J-s} \)

\[ 2.35 \text{ eV} = \text{శాస్త్రంలో అంటారును అర్థం చేయుండాయి} E = a \left[ 1 + \cos(2\pi f_1 t) \right] \cos 2\pi f_2 t \]

(సంఖ్యాభింపు లో ప్రత్యేక విషయం కాదు కావాలి ఉండాలి) అంటే సంఖ్యాభింపు లేదా అత్యధిక సమాధానాలు కావాలి మరియు సంఖ్యాభింపు లేదా అత్యధిక సమాధానాలు కావాలి

\[ f_1 = 3.6 \times 10^{15} \text{ Hz}, \quad f_2 = 1.2 \times 10^{15} \text{ Hz} \] మంటు ప్రత్యేక విషయం లేదా అత్యధిక సమాధానాలు

**Options:**
1. 2.64 eV
2. 7.55 eV
3. 12.52 eV
4. 17.45 eV

---

Magnetic moment due to the motion of the electron in \( n \text{th} \) energy state of hydrogen atom is proportional to ______

అంటారు నాటికి ప్రత్యేక విషయం లేదా అత్యధిక సమాధానాలు

**Options:**
1. \( n^{-2} \)
2. \( n \)
3. \( n^2 \)
4. \( n^3 \)
The rate of disintegration of a radioactive sample is ‘R’ and the number of atoms present at any time ‘t’ is ‘N’. When \( \frac{R}{N} \) is taken along Y-axis and ‘t’ is taken along X-axis, the correct graph is

Options:

1. 

2. 

3. 

4.
For an LED to emit light in visible region of electromagnetic spectrum, it can have energy band gap in the range of

\[(\text{Plank's constant } = 6.6 \times 10^{-34} \text{ J-s and speed of light } = 3 \times 10^8 \text{ ms}^{-1} \text{ in vacuum})\]

Options:
1. 0.1 eV to 0.4 eV
2. 0.9 eV to 1.6 eV
3. 1.7 eV to 3.1 eV
4. 0.5 eV to 0.8 eV

A transmitting antenna of height 20 m and the receiving antenna of height ‘h’ are separated by a distance of 40 km for satisfactory communication in line of sight mode. Then the value of ‘h’ is

\[(\text{Given Radius of earth is 6400 km})\]

Options:
1. 40 m
The energies of an electron in first orbit of $\text{He}^+$ and in third orbit of $\text{Li}^{2+}$ in J are respectively

$\text{He}^+$ లోని ఎనంటి హణనం, $\text{Li}^{2+}$ లో మూడవ హణనం ఎందుకంటే జంతువు జంతువు

Options:
1. $-8.72 \times 10^{-18}, -2.18 \times 10^{-18}$
2. $-8.72 \times 10^{-18}, -1.96 \times 10^{-17}$
3. $-1.96 \times 10^{-17}, -2.18 \times 10^{-18}$
4. $-8.72 \times 10^{-17}, -1.96 \times 10^{-17}$

How many orbital(s) is/are possible with $n = 3$, $l = 1$, and $m_l = -1$ value?

$n = 3$, $l = 1$ విభాగము $m_l = -1$ విభాగము ఎందుకంటే జంతువు జంతువు?

Options:
1. 2
If four elements with atomic numbers $Z - 2$, $Z - 1$, $Z$, and $Z + 1$ are forming isoelectronic ions, the atomic number of the ion having largest size is

$Z - 2$, $Z - 1$, $Z + 1$ నిస్సారంలో విస్తృతంగా నిలిచాలని నాణ్యం సంచలన రూపాలు విస్తృతం

Options:
1. $Z - 2$
2. $Z - 1$
3. $Z$
4. $Z + 1$

Identify the molecule in which the arrangement of electron pairs around the central atom is octahedral and shape is not octahedral

సరసరి ప్రారంభంలో రుణలు వాతావరణం సరిసరి సరసరి సరిసరి

Options:
1. $\text{SF}_6$
2. $\text{XeF}_6$
3. $\text{BrF}_5$
The wave functions of 1s orbitals of two hydrogen atoms are $\psi_A$ and $\psi_B$. $\psi_A$ and $\psi_B$ are linearly combined to form two molecular orbitals ($\sigma$ and $\sigma^*$). Which of the following statements are correct?

I) $\sigma^*$ is equal to $(\psi_A - \psi_B)$
II) In $\sigma$ orbital, one nodal plane is present in between two nuclei
III) The energy of $\sigma$ orbital is lower than the energy of $\sigma^*$ orbital

Options:
1. I, II, III
2. I, II only
3. II, III only
4. I, III only

Question Number : 126  Question Id : 1874634126  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
The variation of vapour pressure (b) as a function of temperature (a) is studied for C₂H₅OC₂H₅, CCl₄ and H₂O at 760 mm Hg and is shown in the figure below. The boiling temperatures of C₂H₅OC₂H₅, CCl₄ and H₂O are 308, 350 and 373 K respectively. Curves A, B, C respectively correspond to

760 mm Hg కుడి, C₂H₅OC₂H₅, CCl₄ రెండవ H₂O అంశాన్ని (b) మరియు (a) కానికి చుండుతూ చలిస్తుంది. C₂H₅OC₂H₅, CCl₄ రెండవ H₂O అంశాన్ని చలిస్తుంది చలిస్తుంది 308, 350, 373 K. ఆంగ్లంలో A, B, C నే సేకరించారు ఉంది.

Options:
1. H₂O, C₂H₅OC₂H₅, CCl₄
2. C₂H₅OC₂H₅, CCl₄, H₂O
3. CCl₄, C₂H₅OC₂H₅, H₂O
4. CCl₄, H₂O, C₂H₅OC₂H₅
30.0 mL of the given HCl solution requires 20.0 mL of 0.1 M sodium carbonate solution for complete neutralisation. What is the volume of this HCl solution required to neutralise 30.0 mL of 0.2 M NaOH solution?

Options :
1. 25 mL
2. 50 mL
3. 90 mL
4. 45 mL

The heat required to rise the temperature of 54 g of aluminium from 40 °C to 60 °C in J is (molar heat capacity of aluminium in this temperature range is 24 J mol⁻¹ K⁻¹; atomic weight of Al is 27)

54 g అంటరోమనోస్సం కాలుపించడం పై 40 °C నుండి 60 °C వరకు సాధనం కలుగుతుంది జంటం J ఈ (అంటరోమనోస్సం మేయ కాలుపించడం వరకు జంటం 24 J mol⁻¹ K⁻¹, Al కొండం 27)

Options :
1. 480
2. 800
3. 960
4. 1280
The equilibrium constant at 850 K for the reaction
\[ \text{N}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{NO}(g) \] is 0.5625. The equilibrium concentration of \( \text{NO}(g) \) is \( 3.0 \times 10^{-3} \) M.
If the equilibrium concentrations of \( \text{N}_2(g) \) and \( \text{O}_2(g) \) are equal, the concentration of \( \text{N}_2(g) \) in M is
\[ \frac{850 \text{ K}}{\text{N}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{NO}(g)} \]
\[ \text{K} = 0.5625, \text{NO}(g) \text{ is } 3.0 \times 10^{-3} \text{ M.} \]
\[ \text{Since } \text{N}_2(g) \text{ and } \text{O}_2(g) \text{ are equal, } \text{N}_2(g) \text{ in M is} \]

Options:
1. \( 4.0 \times 10^{-3} \)
2. \( 4.0 \times 10^{-2} \)
3. \( 1.6 \times 10^{-3} \)
4. \( 3.0 \times 10^{-3} \)

---

The solubility product of a sparingly soluble salt \( \text{A}_2\text{B} \) is \( 3.2 \times 10^{-11} \). Its solubility in mol L\(^{-1} \) is
\[ \text{A}_2\text{B} \text{ deba avaram pakka vellam} \text{ K beetle chala haddu} \text{ vinnam} \]
\[ \text{3.2} \times 10^{-11} \text{ vinnam} \]

Options:
1. \( 4 \times 10^{-4} \)
2. \( 2 \times 10^{-4} \)
3. \( 6 \times 10^{-4} \)
4. \( 3 \times 10^{-4} \)
What is the volume (in mL) of 20 vol H₂O₂ required to completely react with 500 mL of 0.02 M acidified KMnO₄ solution?

500 mL o 0.02 M KMnO₄ కు కలిగి 20 vol H₂O₂ పండిచేసి 20 vol H₂O₂ ఉపయోగించడానికి (mL లో) ఎంత?

Options :
1. 14.0
2. 7.0
3. 28.0
4. 42.0

KO₂ reacts with water to form A. B and C. B forms C when it reacts with iodine in basic medium. What are B and C respectively?

KO₂ సంపర్తి లో అనుమోదించి అయితే A. B మరియు C రూపాలు ఉన్నాయి. ఇది యీడు పర్యాయం B ఇదితో కలిగి C రూపాలు ఉన్నాయి. B రూపాలు C ను యీడు పరిపాలించి ఉంటాయి?

Options :
1. KOH, H₂O₂
2. K₂O₂, H₂O₂
3. KOH, O₂
4. H₂O₂, O₂

Question Number : 132  Question Id : 1874634132  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

Question Number : 133  Question Id : 1874634133  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical
Identify the correct statements from the following:

I) Ga₂O₃ is an amphoteric oxide.
II) The dimer of aluminium chloride has three Al-Cl-Al bridge bonds.
III) Boron is very hard refractory solid of high melting temperature.

Options:

1. I, II only
2. I, III only
3. II, III only
4. I, II, III

Which one of the following methods is used to prepare carbon monoxide on commercial scale?

Options:

1. dehydration of formic acid with conc. H₂SO₄
2. direct oxidation of C in limited supply of oxygen
passing steam over hot coke

heating lime stone

3.

4.

Question Number : 135  Question Id : 1874634135  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

Match the following.

<table>
<thead>
<tr>
<th>List - I</th>
<th>List - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Insecticide</td>
<td>I) COD</td>
</tr>
<tr>
<td>B) ( \text{K}_2\text{Cr}_2\text{O}_7 ) / 50% ( \text{H}_2\text{SO}_4 )</td>
<td>II) PAN</td>
</tr>
<tr>
<td>C) Bleaching of cloths and paper</td>
<td>III) ( \text{Na}_3\text{AsO}_3 )</td>
</tr>
<tr>
<td>D) Eye Irritant</td>
<td>IV) BOD</td>
</tr>
<tr>
<td></td>
<td>V) ( \text{H}_2\text{O}_2 )</td>
</tr>
</tbody>
</table>

The correct answer is

Options :

A B C D

III IV V II
For which of the following, Kjeldahl’s method is not used for the estimation of nitrogen?

<table>
<thead>
<tr>
<th>Aniline</th>
<th>Azobenzene</th>
<th>Nitrobenzene</th>
<th>Pyridine</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I)</td>
<td>(II)</td>
<td>(III)</td>
<td>(IV)</td>
</tr>
</tbody>
</table>

Options:
1. II, III, IV
2. II, III only
3. III, IV only
4. I, III, IV

Identify the compound, which has maximum number of no bond resonance structures.

Options:
Which of the following statements are correct?

I) In nitration mixture nitric acid participates as an acid

II) σ complex is the intermediate substance in electrophilic substitution of benzene

III) Benzene on Friedel-Crafts alkylation with n-propyl chloride gives isopropyl benzene

Options:

1. I, II only

2. II, III only

3. I, III only
4. I, II, III

Question Number : 139  Question Id : 1874634139  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

Which one of the following functional groups is not meta directing?

Options :
1. –COOH
2. –NO₂
3. –CHO
4. –OCH₃

Question Number : 140  Question Id : 1874634140  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

If the radius of an atom of an element which forms a body centered cubic unit cell is 173.2 pm, the volume of unit cell in cm³ is

Options :
1. \(3.12 \times 10^{-23}\)
2. \(6.4 \times 10^{-24}\)
3. \(3.2 \times 10^{-24}\)
4. \(2.13 \times 10^{-23}\)
A solution is prepared by dissolving 10 g of a non-volatile solute (molar mass, ‘M’ g mol\(^{-1}\)) in 360 g of water. What is the molar mass in g mol\(^{-1}\) of solute if the relative lowering of vapour pressure of solution is \(5 \times 10^{-3}\)?

\[10 \text{ g } \text{solution} \quad \text{(molar mass ‘M’ g mol}^{-1}\text{) } \quad \text{to } \quad \text{360 g water} \quad \text{results in} \quad \text{relative lowering of vapour pressure } \text{5 } \times \text{10}^{-3}\text{.}\]

**Options:**
1. 199
2. 99.5
3. 299
4. 149.5

---

\[\text{Question Number : 142  Question Id : 1874634142  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical}\]

\(x\) g of MgSO\(_4\) \((i = 1.8)\) is in 2.5 L of solution has an osmotic pressure of 2.463 atm. at 27 \(^{\circ}\)C. What is the value of \(x\) in g?

\[27 \text{ }^{\circ}\text{C } \text{ }	ext{2.5 g MgSO}_4 (i = 1.8) \text{ 2.5 L solution has an osmotic pressure of 2.463 atm.}\]

**Options:**
1. 33.2
2. 6.6
3. 5.3
4. 16.6

---

\[\text{Question Number : 143  Question Id : 1874634143  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical}\]
The electrode potentials for
\[ M^{2+}(aq) + e^- \rightarrow M^+(aq) \]
\[ M^+(aq) + e^- \rightarrow M(s) \]
are +0.15 V and +0.50 V respectively. The value of \( E_{M^{2+}/M}^0 \) will be

\[ M^{2+}(\omega) + e^- \rightarrow M^+(\omega) \]
\[ M^+(\omega) + e^- \rightarrow M(\omega) \]

The phase potentials are +0.15 V and +0.50 V respectively. Hence, \( E_{M^{2+}/M}^0 \) will be

Options:
1. 0.150 V
2. 0.300 V
3. 0.325 V
4. 0.650 V

The half life periods of a first order reaction at 300 K and 400 K are 50 s and 10 s respectively. The activation energy of the reaction in kJ mol\(^{-1}\) is \( \log 5 = 0.70 \)

Options:
1. 4.0
2. 8.0
3. 16.10
Which one of the following statements is correct for adsorption of solutes on solids in solutions?

Options:
1. The extent of adsorption increases with an increase in temperature.
2. The extent of adsorption decreases with an increase of surface area of the adsorbate.
3. The extent of adsorption decreases with an increase in temperature.
4. The extent of adsorption does not depend on the amount of the solute in solution.

Identify the metal which is not common to German Silver and Brass.

Options:
1. Cu
2. Zn
3. Fe
Which of the following reactions are correct with respect to the formation of products?

I) \[2\text{NaOH} + \text{SO}_2 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\]

II) \[2\text{XeF}_4 + 3\text{O}_2\text{F}_2 \xrightarrow{\text{143K}} 2\text{XeO}_3 + 7\text{F}_2\]

III) \[\text{PCl}_5 + 4\text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_4 + 5\text{HCl}\]

IV) \[2\text{NaNO}_2 + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{NO} + \text{NO}_2 + \text{H}_2\text{O}\]

Options:
1. II, IV
2. III, IV
3. I, III
4. II, III

Chlorine oxidises sulphur dioxide in the presence of water to give an oxyacid A. Chlorine also oxidises iodine in the presence of water to give an oxyacid B. The oxidation states of S and I in A and B are respectively

A \(\text{H}_3\text{SO}_4\) and B \(\text{H}_5\text{I}_2\text{O}_5\). The oxidation states of S are +4 and I are +5.

Options:
1. +4, +5
White phosphorous is heated with concentrated NaOH in CO₂ atmosphere to form a gas A and compound B. When A is bubbled into aqueous CuSO₄ solution copper phosphide and C are formed. B and C are respectively

Options:

1. PH₃, H₂SO₄
2. NaH₂PO₄, H₂SO₄
3. NaHPO₃, CuS
4. NaH₂PO₂, Cu₂S

Which of the following set of elements do not possess f-electrons?

Options:

1. La, U, Lr
2. La, Th, Lr
3. La, Ac, Th
4. Ce, Ac, Th

Question Number : 151  Question Id : 1874634151  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

The $\Delta_0$ of a coordination complex of a metal ion (3d$^1$) is 1000 kJ mol$^{-1}$. If the energy of t$_{2g}$ orbitals is $-400$ kJ mol$^{-1}$, the energy (in kJ mol$^{-1}$) of e$_g$ orbitals is

\[ -400 \text{ kJ mol}^{-1} \text{ for t}_{2g}, \]  
\[ \text{e}_g \text{ orbitals} \]  
\[ \text{kJ mol}^{-1} \text{ for e}_g \]  
\[ \text{what?} \]

Options:
1. $-600$
2. $600$
3. $1000$
4. $400$

---

Question Number : 152  Question Id : 1874634152  Question Type : MCQ  Option Shuffling : Yes  Display Question Number : Yes  Single Line Question Option : No  Option Orientation : Vertical

How many of the following polymers given, come under the category of condensation polymers?
Bakelite, Teflon, Nylon 6, Dacron, Polysoprene, Melamine, Neoprene

\[ \text{Bakelite, Teflon, Nylon 6, Dacron, Polysoprene, Melamine, Neoprene?} \]

Options:
1. 4
2. 3
3. 5
4. 6
Identify the correct set from the following.

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Source</th>
<th>deficiency disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_6</td>
<td>Milk</td>
<td>convulsions</td>
</tr>
<tr>
<td>K</td>
<td>Leaf vegetables</td>
<td>anaemia</td>
</tr>
<tr>
<td>C</td>
<td>Fish</td>
<td>scurvy</td>
</tr>
<tr>
<td>D</td>
<td>Citrus fruits</td>
<td>rickets</td>
</tr>
</tbody>
</table>
Which one of the following contains –As = As– in its structure?

Which one of the following contains –As = As– in its structure?

Options :

1. Ranitidine

2. Saccharin

3. Salvarsan

4. Seldane

What are X and Y in the following reaction sequence?

What are X and Y in the following reaction sequence?

\[
\begin{align*}
\text{H}_3\text{C} & \quad \text{Br} \quad \text{KCN} \quad \text{S}_2\text{N}\text{O}_2 \\
\text{H} & \quad \text{C}_2\text{H}_5 \\
& \quad \text{H}_3\text{O}^+ \\
\text{H}_3\text{C} & \quad \text{CN} \quad \text{HO}_2\text{C} \quad \text{CH}_3 \\
\text{H} & \quad \text{C}_2\text{H}_5
\end{align*}
\]

Options :

1. X

2. Y
Which of the following sets is in the correct order regarding the property mentioned against them?

<table>
<thead>
<tr>
<th>Sets</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>I) NCCH₂ COOH &gt; F CH₂ COOH &gt; H₃CCH₂ COOH</td>
<td>acidity</td>
</tr>
<tr>
<td>II) CH₃CH₂CHO &gt; PhCOCH₃ &gt; PhCHO</td>
<td>reactivity</td>
</tr>
<tr>
<td>III) H₃COCH₂CH₃ &lt; H₃CCH₂CHO &lt; H₃CCH₂CH₂OH</td>
<td>boiling points</td>
</tr>
</tbody>
</table>

Options:
Identify the products (X, Y) and reaction mechanism (Z) of the following reaction?

\[ \text{Reaction: } \text{HI} \xrightarrow{\Delta} X + Y \]

Options:

1. X: \[ \text{OH} \]  
   Y: \[ \text{I} \]  
   Z: \[ S_{N1} \]

2. X: \[ \text{OH} \]  
   Y: \[ \text{I} \]  
   Z: \[ S_{N2} \]

3. X: \[ \text{I} \]  
   Y: \[ \text{OH} \]  
   Z: \[ S_{N1} \]
4.

What are the products formed when an aldehyde (RCHO) is reacted with Tollens reagent?

Options:
1. Ag, H₂O, RCHO, NH₃
2. Ag, H₂O, RCOO⁻, H₂
3. Ag, H₂O, RCOO⁻, NH₃
4. Ag₂O, H₂O, RCOO⁻, NH₃

The following species are involved in the formation of an ester from a carboxylic acid in the presence of acid. The correct sequence of formation of these species is

Options:
Identify the reagents $(X, Y, Z)$ used in the conversion of 3-methylaniline to 3-nitrotoluene.

$$3-\text{ méthylamine} \quad 3-\text{amino} \quad \text{ammoniakalni} \quad \text{salts} \quad (X, Y, Z)$$

Options:

1. $X$: $\text{NaNO}_2$, $\text{HCl}$
   $Y$: $\text{HBF}_4$
   $Z$: $\text{NaNO}_2$, $\text{Cu}$, $\Delta$

2. $X$: $\text{NaNO}_3$, $\text{HCl}$
   $Y$: $\text{HF}$
   $Z$: $\text{NaNO}_3$, $\text{Cu}$, $\Delta$

3. $X$: $\text{NaNO}_2$, $\text{HCl}$
   $Y$: $\text{C}_2\text{H}_3\text{OH}$
   $Z$: $\text{NaNO}_3$, $\Delta$

4. $X$: $\text{NaNO}_3$, $\text{HCl}$
   $Y$: $\text{NaOH}$
   $Z$: $\text{C}_6\text{H}_5\text{NO}_2$