National Testing Agency

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B TECH EK

Group Number : 1
Group Id : 8643513
Group Maximum Duration : 0
Group Minimum Duration : 180
Show Attended Group? : No
Edit Attended Group? : No
Break time : 0
Group Marks : 300
Is this Group for Examiner? : No

Physics Section A

Section Id : 86435113
Section Number : 1
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 20
Number of Questions to be attempted : 20
Section Marks : 80
Mark As Answered Required? : Yes
Sub-Section Number : 1
Sub-Section Id : 86435113
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 864351181 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
For an electromagnetic wave travelling in free space, the relation between average energy densities due to electric ($U_e$) and magnetic ($U_m$) fields is:

Options:

\[ U_e = U_m \]
864351541.

\[ U_e \neq U_m \]
864351542.

\[ U_e > U_m \]
864351543.

\[ U_e < U_m \]
864351544.

Question Number: 1 Question Id: 864351181 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No
Correct Marks: 4 Wrong Marks: 1

Question: For an electromagnetic wave travelling in free space, the relation between average energy densities due to electric ($U_e$) and magnetic ($U_m$) fields is:

Options:

\[ U_e = U_m \]
864351541.

\[ U_e \neq U_m \]
864351542.

\[ U_e > U_m \]
864351543.

\[ U_e < U_m \]
864351544.

---

The volume $V$ of an enclosure contains a mixture of three gases, 16 g of oxygen, 28 g of nitrogen and 44 g of carbon dioxide at absolute temperature $T$. Consider $R$ as universal gas constant. The pressure of the mixture of gases is:

Options:

\[ \frac{5}{2} \frac{RT}{V} \]
864351545.
\[ \frac{3RT}{V} \]
864351546.

\[ \frac{4RT}{V} \]
864351547.

\[ \frac{88RT}{V} \]
864351548.

**Question Number : 2  Question Id : 864351182  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No**

**Correct Marks : 4  Wrong Marks : 1**

नई वस्तुहात वेगची तात्पर्य T वर्गात घेतली गेली, 16 g अर्धवर्त्ती 28 g अधिवर्ती वस्तु 44 g अर्धवर्तीत तेंे वेगची माहिती देण्यात. R भागातीन मोजवून तीतून फुटावतीने अंशांचे. त्यावर दासची कारणी:

**Options :**

\[ \frac{5}{2} \frac{RT}{V} \]
864351545.

\[ \frac{3RT}{V} \]
864351546.

\[ \frac{4RT}{V} \]
864351547.

\[ \frac{88RT}{V} \]
864351548.

**Question Number : 3  Question Id : 864351183  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No**

**Correct Marks : 4  Wrong Marks : 1**
For changing the capacitance of a given parallel plate capacitor, a dielectric material of dielectric constant K is used, which has the same area as the plates of the capacitor. The thickness of the dielectric slab is \( \frac{3}{4} d \), where ‘d’ is the separation between the plates of parallel plate capacitor. The new capacitance (\( C' \)) in terms of original capacitance (\( C_0 \)) is given by the following relation:

Options:

- \[ C' = \frac{4K}{K+3} C_0 \]
- \[ C' = \frac{4}{3+K} C_0 \]
- \[ C' = \frac{3+K}{4K} C_0 \]
- \[ C' = \frac{4+K}{3} C_0 \]

Question Number : 3 Question Id : 864351183 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options:

- \[ C' = \frac{4K}{K+3} C_0 \]
- \[ C' = \frac{4}{3+K} C_0 \]
\[ C' = \frac{3 + K}{4K} C_0 \]

\[ C' = \frac{4 + K}{3} C_0 \]

The velocity-displacement graph describing the motion of a bicycle is shown in the figure.

The acceleration-displacement graph of the bicycle’s motion is best described by:

Options:
Question Number : 4 Question Id : 864351184 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

**Options :**
864351553.

864351554.

864351555.

864351556.

Question Number: 5  Question Id: 864351185  Question Type: MCQ Optio  Question Mandatory: No  Correct Marks: 4 Wrong Marks: 1
A block of mass \( m \) slides along a floor while a force of magnitude \( F \) is applied to it at an angle \( \theta \) as shown in figure. The coefficient of kinetic friction is \( \mu_k \). Then, the block’s acceleration ‘\( a \)’ is given by:

\[
\begin{align*}
(g \text{ is acceleration due to gravity})
\end{align*}
\]

Options :

\[
\begin{align*}
- \frac{F}{m} \cos \theta - \mu_k \left( g - \frac{F}{m} \sin \theta \right) \\
\frac{F}{m} \cos \theta + \mu_k \left( g - \frac{F}{m} \sin \theta \right) \\
\frac{F}{m} \cos \theta - \mu_k \left( g + \frac{F}{m} \sin \theta \right) \\
\frac{F}{m} \cos \theta - \mu_k \left( g - \frac{F}{m} \sin \theta \right)
\end{align*}
\]

Question Number : 5 Question Id : 864351185 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[
\begin{align*}
(\text{g is acceleration due to gravity} )
\end{align*}
\]
Options:

\[-\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)\]

864351557.

\[\frac{F}{m}\cos\theta + \mu_K\left(g - \frac{F}{m}\sin\theta\right)\]

864351558.

\[\frac{F}{m}\cos\theta - \mu_K\left(g + \frac{F}{m}\sin\theta\right)\]

864351559.

\[\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)\]

864351560.

Question Number : 6 Question Id : 864351186 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A bar magnet of length 14 cm is placed in the magnetic meridian with its north pole pointing towards the geographic north pole. A neutral point is obtained at a distance of 18 cm from the center of the magnet. If \(B_H = 0.4\) G, the magnetic moment of the magnet is \((1\ G = 10^{-4}\ T)\)

Options:

864351561. \(28.80\ J\ T^{-1}\)

864351562. \(2.880 \times 10^2\ J\ T^{-1}\)

864351563. \(2.880\ J\ T^{-1}\)

864351564. \(2.880 \times 10^3\ J\ T^{-1}\)

Question Number : 6 Question Id : 864351186 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

14 cm

Options:

1.\(14\) cm

2.\(18\) cm

3.\(20\) cm

4.\(24\) cm

(1 G = 10\(^{-4}\) T)
The angle of deviation through a prism is minimum when

(A) Incident ray and emergent ray are symmetric to the prism
(B) The refracted ray inside the prism becomes parallel to its base
(C) Angle of incidence is equal to that of the angle of emergence
(D) When angle of emergence is double the angle of incidence

Choose the correct answer from the options given below:

Options:

864351565. Only statements (A) and (B) are true

864351566. Statements (A), (B) and (C) are true

864351567. Only statement (D) is true

864351568. Statements (B) and (C) are true
An RC circuit as shown in the figure is driven by a AC source generating a square wave. The output wave pattern monitored by CRO would look close to :

Options:

864351569.
Question Number : 8 Question Id : 864351188 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
The voltage waveform observed on an oscilloscope is shown in the diagram. The waveform is an RC circuit waveform. The CRO shows a waveform that is similar to the circuit diagram shown. Which of the following waveforms is correct?

Options:

864351569.

864351570.

864351571.

864351572.
Correct Marks : 4 Wrong Marks : 1
A block of 200 g mass moves with a uniform speed in a horizontal circular groove, with vertical side walls of radius 20 cm. If the block takes 40 s to complete one round, the normal force by the side walls of the groove is:

Options:
864351573. 0.0314 N
864351574. $9.859 \times 10^{-4}$ N
864351575. $6.28 \times 10^{-3}$ N
864351576. $9.859 \times 10^{-2}$ N

Question Number : 9 Question Id : 864351189 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
20 cm ಗಳಿಸುವ ಬಾಲ ಗಡಯಾಗಿ ಗಮನಗಳು ನೆಲೆಸಿದ ಸೂಕ್ಷ್ಮ ವ್ಯಾಪತ್ತಿಯಲ್ಲಿ 200 g ಗಾರಿ ಹೂಡಿದ್ದು ಸ್ತೂಪಿಸಿದ್ದರೆ, ಅಯ್ಯಾದ 40 s ಕ್ರಮದಲ್ಲಿ ಆರು ಬಂದಿಗಳು ಆಗ್ರಹಿಸಿದ್ದರೆ, ಎನ್ನುವಂತೆ ಸೆಂಗಾರು ಭಾಗದಲ್ಲಿ ಎಳೆ ಮಾಡಬೇಕು:

Options:
864351573. 0.0314 N
864351574. $9.859 \times 10^{-4}$ N
864351575. $6.28 \times 10^{-3}$ N
864351576. $9.859 \times 10^{-2}$ N

Question Number : 10 Question Id : 864351190 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
In thermodynamics, heat and work are:

Options:
864351577. Point functions
864351578. Path functions
Intensive thermodynamic state variables

Extensive thermodynamic state variables

**Question Number : 10**  
**Question Id : 864351190**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

**Options :**

864351577.

864351578.

864351579.

864351580.

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**Question Number : 11**  
**Question Id : 864351191**  
**Question Type : MCQ**  
**Option Shuffling : Yes**  
**Is Question Mandatory : No**  
**Correct Marks : 4**  
**Wrong Marks : 1**

The maximum and minimum distances of a comet from the Sun are $1.6 \times 10^{12}$ m and $8.0 \times 10^{10}$ m respectively. If the speed of the comet at the nearest point is $6 \times 10^{4}$ m/s, the speed at the farthest point is:

**Options :**

864351581. $1.5 \times 10^{3}$ m/s

864351582. $3.0 \times 10^{3}$ m/s

864351583. $6.0 \times 10^{3}$ m/s

864351584. $4.5 \times 10^{3}$ m/s
Correct Marks : 4 Wrong Marks : 1

The speed of light in free space is 1.6 × 10^{12} m s^{-1} and 8.0 × 10^{10} m s^{-1} in air. The speed of light in water is 6 × 10^{4} m s^{-1}. Which of the following statements is correct?

Options :
864351581. 1.5 × 10^{3} m/s
864351582. 3.0 × 10^{3} m/s
864351583. 6.0 × 10^{3} m/s
864351584. 4.5 × 10^{3} m/s

Question Number : 12 Question Id : 864351192 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Four equal masses, m each are placed at the corners of a square of length (l) as shown in the figure. The moment of inertia of the system about an axis passing through A and parallel to DB would be:

Options :
864351585. 2 m l^{2}
864351586. \sqrt{3} m l^{2}
864351587. 3 m l^{2}
864351588. m l^{2}
Question Number : 12 Question Id : 864351192 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A 25 m long antenna is mounted on an antenna tower. The height of the antenna tower is 75 m. The wavelength (in meter) of the signal transmitted by this antenna would be:

Options :
864351589. 200
864351590. 300
864351591. 400
864351592. 100
Question Number : 13 Question Id : 864351193 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

25 m ಘಟ್ಟದಲ್ಲಿ ಸುರಿಯುತ್ತದೆ. ಸುರಿ ಕೇಂದ್ರ ಉಳಿಯುವ ಫ್ಲೈಬಿಂಗ್ ಮತ್ತು ತಾಯುಸಾತೆ. ಸುರಿ ಕೇಂದ್ರದಿಂದ 75 m ಎತ್ತರದಲ್ಲಿ. ಇದು ಸುರಿಯ ಸುತ್ತದೊಳಗೆ ಸರಿಯೆಳ್ಳುವಂತೆ ನೀಡಬಹುದೆನ್ನು (ಮುಖ್ಯ) :

Options :
864351589. 200
864351590. 300
864351591. 400
864351592. 100

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Question Number : 14 Question Id : 864351194 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The stopping potential in the context of photoelectric effect depends on the following property of incident electromagnetic radiation :

Options :
864351593. Frequency
864351594. Amplitude
864351595. Intensity
864351596. Phase

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Question Number : 14 Question Id : 864351194 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

ಮನುಷ್ಯರು ಶಿಕ್ಷಣಕ್ಕೆ ಸಮರೂಪದಲ್ಲಿ ಶಿಕ್ಷಣಕ್ಕೆ ಸ್ನೇಹಿಸಿದ್ದಾರೆ. ಮನುಷ್ಯರು ಶಿಕ್ಷಣಕ್ಕೆ ಸ್ನೇಹಿಸಿದ್ದಾರೆ. ಸಂಬಂಧದಲ್ಲಿ ಸಂಬಂಧದಲ್ಲಿ ಕೆಲಸ ಕೆಲಸ
ಈಗಿನೆ ಸಂಬಂಧದಲ್ಲಿ ಅದು ಆದಿಯೇ ಮತ್ತು ಕೆಲಸ ಕೆಲಸ ?

Options :
Question Number : 15 Question Id : 864351195 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Time period of a simple pendulum is \( T \) inside a lift when the lift is stationary. If the lift moves upwards with an acceleration \( g/2 \), the time period of pendulum will be :

Options :

\[ \frac{T}{\sqrt{3}} \]

864351597.

\[ \sqrt{3}T \]

864351598.

\[ \sqrt{\frac{3}{2}}T \]

864351599.

\[ \sqrt{\frac{2}{3}}T \]

864351600.
\[ \sqrt{\frac{3}{2}} \ T \]
\[ \sqrt{\frac{2}{3}} \ T \]

864351599.

864351600.

Question Number : 16 Question Id : 864351196 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A plane electromagnetic wave of frequency 500 MHz is travelling in vacuum along \( y \)-direction. At a particular point in space and time, \( \mathbf{B} = 8.0 \times 10^{-8} \ \hat{z} T \). The value of electric field at this point is:
(speed of light = \( 3 \times 10^8 \ \text{ms}^{-1} \))

\( \hat{x}, \hat{y}, \hat{z} \) are unit vectors along \( x, y \) and \( z \) directions.

Options :

864351601. \( -24 \ \hat{x} \ \text{V/m} \)

864351602. \( 2.6 \ \hat{x} \ \text{V/m} \)

864351603. \( 24 \ \hat{x} \ \text{V/m} \)

864351604. \( -2.6 \ \hat{y} \ \text{V/m} \)
A conducting bar of length L is free to slide on two parallel conducting rails as shown in the figure.

Two resistors $R_1$ and $R_2$ are connected across the ends of the rails. There is a uniform magnetic field $\mathbf{B}$ pointing into the page. An external agent pulls the bar to the left at a constant speed $\dot{v}$.

The correct statement about the directions of induced currents $I_1$ and $I_2$ flowing through $R_1$ and $R_2$ respectively is:

Options:
- $I_1$ is in anticlockwise direction and $I_2$ is in clockwise dir.
I₁ is in clockwise direction and I₂ is in anticlockwise direction

Both I₁ and I₂ are in anticlockwise direction

Both I₁ and I₂ are in clockwise direction

Question Number : 17 Question Id : 864351197 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

I₁ is in clockwise direction and I₂ is in anticlockwise direction.

Both I₁ and I₂ are in anticlockwise direction.

Both I₁ and I₂ are in clockwise direction.

Options:

864351605. I₁ is clockwise and I₂ is anticlockwise

864351606. I₁ is clockwise and I₂ is clockwise

864351607. I₁ and I₂ are both clockwise

864351608. I₁ and I₂ are both anticlockwise

Question Number : 18 Question Id : 864351198 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
The pressure acting on a submarine is $3 \times 10^5$ Pa at a certain depth. If the depth is doubled, the percentage increase in the pressure acting on the submarine would be:

(Assume that atmospheric pressure is $1 \times 10^5$ Pa density of water is $10^3$ kg m$^{-3}$, $g = 10$ ms$^{-2}$)

**Options:**

$\frac{5}{200}$

864351609.

$\frac{200}{5}$

864351610.

$\frac{200}{3}$

864351611.

$\frac{3}{200}$

864351612.

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**Question Number : 18 Question Id : 864351198 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The pressure acting on a submarine is $3 \times 10^5$ Pa at a certain depth. If the depth is doubled, the percentage increase in the pressure acting on the submarine would be:

(Assume that atmospheric pressure is $1 \times 10^5$ Pa density of water is $10^3$ kg m$^{-3}$, $g = 10$ ms$^{-2}$)

**Options:**

$\frac{5}{200}$

864351609.

$\frac{200}{5}$

864351610.

$\frac{200}{3}$

864351611.

$\frac{3}{200}$

864351612.

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**Question Number : 19 Question Id : 864351199 Question Type : MCQ Opti**
A conducting wire of length 'l', area of cross-section A and electric resistivity ρ is connected between the terminals of a battery. A potential difference V is developed between its ends, causing an electric current.

If the length of the wire of the same material is doubled and the area of cross-section is halved, the resultant current would be:

Options:

\[ \frac{4VA}{\rho l} \]

864351613.

\[ \frac{1}{4} \frac{\rho l}{VA} \]

864351614.

\[ \frac{1}{4} \frac{VA}{\rho l} \]

864351615.

\[ \frac{3}{4} \frac{VA}{\rho l} \]

864351616.
Question Number : 20 Question Id : 864351200 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
One main scale division of a vernier callipers is ‘a’ cm and \(n^{th}\) division of the vernier scale coincide with \((n-1)^{th}\) division of the main scale. The least count of the callipers in mm is :
Options :
\[
\left(\frac{n-1}{10n}\right)a
\]
864351617.
\[
\frac{10a}{n}
\]
864351618.
\[
\frac{10a}{(n-1)}
\]
864351619.

Question Number : 20 Question Id : 864351200 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\(a\) से मूल स्केल के \(n^{th}\) स्केल का वर्नियर स्केल के \((n-1)^{th}\) स्केल का समान्तर होने पर \(a\) से लें। वर्नियर स्केल के \(n^{th}\) स्केल और \((n-1)^{th}\) स्केल के समान्तर होने पर \(a\) से लें।
Options :
\[
\left(\frac{n-1}{10n}\right)a
\]
864351617.
\[
\frac{10a}{n}
\]
864351618.
\[
\frac{10a}{(n-1)}
\]
864351619.
A sinusoidal voltage of peak value 250 V is applied to a series LCR circuit, in which \( R = 8 \, \Omega \), \( L = 24 \, \text{mH} \) and \( C = 60 \, \mu\text{F} \). The value of power dissipated at resonant condition is \( \times \) kW.

The value of \( x \) to the nearest integer is ________.

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:
100
Consider a frame that is made up of two thin massless rods AB and AC as shown in the figure. A vertical force $\vec{P}$ of magnitude 100 N is applied at point A of the frame.

Suppose the force is $\vec{P}$ resolved parallel to the arms AB and AC of the frame.

The magnitude of the resolved component along the arm AC is $xN$.

The value of $x$, to the nearest integer, is __________.

[Given: $\sin(35^\circ) = 0.573$, $\cos(35^\circ) = 0.819$
$\sin(110^\circ) = 0.939$, $\cos(110^\circ) = -0.342$]

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:
100
The first three spectral lines of H-atom in the Balmer series are given \( \lambda_1, \lambda_2, \lambda_3 \) considering the Bohr atomic model, the wave lengths of first and third spectral lines \( \left( \frac{\lambda_1}{\lambda_3} \right) \) are related by a factor of approximately \( 'x' \times 10^{-1} \).

The value of x, to the nearest integer, is ________.
The value of power dissipated across the zener diode ($V_z = 15\, \text{V}$) connected in the circuit as shown in the figure is $x \times 10^{-1}$ watt.

The value of $x$, to the nearest integer, is _________.
Question Number : 24 Question Id : 864351204 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

22 V

\[ V_z = 15 \text{ V} \]

\[ R_S = 35 \Omega \]

\[ R_L = 90 \Omega \]

\[ x \times 10^{-1} \text{ मोड़ेळे} \] अधिक.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

100

Question Number : 25 Question Id : 864351205 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
A ball of mass 10 kg moving with a velocity $10\sqrt{3} \text{ m s}^{-1}$ along X-axis, hits another ball of mass 20 kg which is at rest. After collision, the first ball comes to rest and the second one disintegrates into two equal pieces. One of the pieces starts moving along Y-axis at a speed of 10 m/s. The second piece starts moving at a speed of 20 m/s at an angle $\theta$ (degree) with respect to the X-axis.

The configuration of pieces after collision is shown in the figure.

The value of $\theta$ to the nearest integer is \_\_\_\_\_.

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:
100
X-ಅಕ್ಷ 10√3 ms⁻¹ ಸ್ವಲ್ಪ ಹಾಗು 10 kg ಭಾಗವು ಹಿಂಭಾಗವಾಗಿ ವೆಚ್ಚಗೊಂಡಿದ್ದು, 20 kg ಭಾಗವು ಪ್ರತ್ಯೇಕಿಸಿದರೆ, ಎಂದರೆ ಎಂದರೆ X-ಅಕ್ಷ 10 m/s ವೆಚ್ಚಗೊಂಡಿದ್ದು, Y-ಅಕ್ಷ 20 m/s ವೆಚ್ಚಗೊಂಡಿದ್ದು. ಹಾಗೆಗೆ ಹಾಗೆಗೆ X-ಅಕ್ಷಿನಲ್ಲಿ θ (ದಿಂದು) ವೇಗವು ಹಾಗೆಗೆ Y-ಅಕ್ಷಿನಲ್ಲಿ 20 m/s ವೇಗವು ವೇಗವು. ಹಾಗೆ ರೀತಿಯಲ್ಲಿ ಅರ್ಹದ ನಿಜಾಂಗಾ ಇಂದುಂಟು. 

ಭೀರು ಸಂಖ್ಯೆಯನ್ನು θ ನಿಗರಿಸಿ. 

**After Collision**

Response Type : Numeric  
Evaluation Required For SA : Yes  
Show Word Count : Yes  
Answers Type : Equal  
Text Areas : Plain Text  
Possible Answers :  
100

Question Number : 26 Question Id : 864351206 Question Type : SA  
Correct Marks : 4 Wrong Marks : 0
Consider a 20 kg uniform circular disk of radius 0.2 m. It is pin supported at its center and is at rest initially. The disk is acted upon by a constant force $F = 20 \text{ N}$ through a massless string wrapped around its periphery as shown in the figure.

\[ F = 20 \text{ N} \]

Suppose the disk makes $n$ number of revolutions to attain an angular speed of 50 rad $\text{s}^{-1}$.

The value of $n$, to the nearest integer, is \underline{\hspace{2cm}}.

[Given: In one complete revolution, the disk rotates by 6.28 rad]

**Response Type**: Numeric  
**Evaluation Required For SA**: Yes  
**Show Word Count**: Yes  
**Answers Type**: Equal  
**Text Areas**: PlainText  
**Possible Answers**:  
100

**Question Number**: 26  
**Question Id**: 864351206  
**Question Type**: SA  
**Correct Marks**: 4  
**Wrong Marks**: 0
In the logic circuit shown in the figure, if input A and B are 0 to 1 respectively, the output at Y would be ‘x’.

The value of x is __________.
Question Number : 27 Question Id : 864351207 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

In the given figure, the electric current flowing through the 5 kΩ resistor is ‘x’ mA.

The value of x to the nearest integer is ____________.
Question Number: 28 Question Id: 864351208 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

\[ \text{In a series circuit with a 5 kΩ resistor, if the current is } \frac{1}{5} \text{ mA, find } \text{ the voltage.} \]

\[ \text{Response Type: Numeric} \]

Question Number: 29 Question Id: 864351209 Question Type: SA
Correct Marks: 4 Wrong Marks: 0

A fringe width of 6 mm was produced for two slits separated by 1 mm apart. The screen is placed 10 m away. The wavelength of light used is \( x \) nm.

The value of \( x \) to the nearest integer is _________.

Response Type: Numeric
Question Number : 29 Question Id : 864351209 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
1 mm अद्वैतपूर्वक संगत करते हैं 6 mm अद्वैत 10 m से अलग. वर्गस्थलीय रूप से ट्रॉलरकित्रि 'x' mm एकित्र.

त्रॉलरकित्रि 'x' एकित्र __________.
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 30 Question Id : 864351210 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The resistance $R = \frac{V}{I}$, where $V = (50 \pm 2) V$ and $I = (20 \pm 0.2) A$. The percentage error in $R$ is

'x' %.
The value of 'x' to the nearest integer is __________.
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 30 Question Id : 864351210 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
$R = \frac{V}{I}$, जहाँ $V = (50 \pm 2) V$ तथा $I = (20 \pm 0.2) A$. $R$ के विवरण से निकालने 'x' %.

यद्यपि संकलरबन्ध 'x' एकित्र __________.
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100
Chemistry Section A

Section Id : 86435115
Section Number : 3
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 20
Number of Questions to be attempted : 20
Section Marks : 80
Mark As Answered Required? : Yes
Sub-Section Number : 1
Sub-Section Id : 86435115
Question Shuffling Allowed : Yes

Question Number : 31 Question Id : 864351211 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

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

**Assertion A:** The H – O – H bond angle in water molecule is 104.5°.

**Reason R:** The lone pair - lone pair repulsion of electrons is higher than the bond pair - bond pair repulsion.

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

**Options:**

864351631. Both A and R are true, and R is the correct explanation of A

864351632. Both A and R are true, but R is not the correct explanation of A

864351633. A is true but R is false

864351634. A is false but R is true

Question Number : 31 Question Id : 864351211 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Options :
864351631. A ೃ R ೃ ೃ ೃ, ೃ R ೃ A ು ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ ೃ {
 864351632. A ೃ R ೃ ೃ ೃ, ೃ R ೃ A ು ೃ ೃ ೃ ೃ {
 864351633. A ು ು R ೃ {
 864351634. A ು R ು ೃ {

Question Number : 32 Question Id : 864351212 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Match List - I with List - II :

<table>
<thead>
<tr>
<th>List - I</th>
<th>List - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial process</td>
<td>Application</td>
</tr>
<tr>
<td>(a) Haber’s process</td>
<td>(i) HNO₃ synthesis</td>
</tr>
<tr>
<td>(b) Ostwald’s process</td>
<td>(ii) Aluminium extraction</td>
</tr>
<tr>
<td>(c) Contact process</td>
<td>(iii) NH₃ synthesis</td>
</tr>
<tr>
<td>(d) Hall-Heroult process</td>
<td>(iv) H₂SO₄ synthesis</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below :

Options :
864351635. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
864351636. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
864351637. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
864351638. (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
Question Number : 32 Question Id : 864351212 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

<table>
<thead>
<tr>
<th>ರೇಖೆ - I</th>
<th>ರೇಖೆ - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>ಅಗ್ರೋಕ್ಸ್ ಮಟ್ಟಪಟ್ಟೆ</td>
<td>ಸರಣಿ</td>
</tr>
<tr>
<td>(a) ಸ್ಸ್ಸು ಮಟ್ಟಪಟ್ಟೆ</td>
<td>(i) HNO₃ ಸರಣಿ</td>
</tr>
<tr>
<td>(b) ಆನಂದ ಮಟ್ಟಪಟ್ಟೆ</td>
<td>(ii) ಆಂಬಾಕ್ಯಾಮುಕಿ ಸರಣಿ (ವಿಜ್ಞಾನಿ)</td>
</tr>
<tr>
<td>(c) ಇರ್ಯ್ಯು ಮಟ್ಟಪಟ್ಟೆ</td>
<td>(iii) NH₃ ಸರಣಿ</td>
</tr>
<tr>
<td>(d) ಆಸಿ-ಮಸ್ಸಿ ಮಟ್ಟಪಟ್ಟೆ</td>
<td>(iv) H₂SO₄ ಸರಣಿ</td>
</tr>
</tbody>
</table>

೪ನ್ನು ಕೇವಲ ಒಂದು ಪ್ರೇಕ್ಷ್ಪಾಡಿಸಿದ ಮರುಬೌದ್ಧಕರು ನಂಬಿಸಿ ಕುರಿತ ಸಂಖ್ಯೆಯಾದು :

Options :
864351635. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
864351636. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
864351637. (a)-(ii), (b)-(iii). (c)-(iv). (d)-(i)
864351638. (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

Question Number : 33 Question Id : 864351213 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A group 15 element, which is a metal and forms a hydride with strongest reducing power among group 15 hydrides. The element is :

Options :
864351639. Bi

864351640. P

864351641. As

864351642. Sb
Question Number : 33 Question Id : 864351213 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The process that involves the removal of sulphur from the ores is:

Options :

864351639. Refining
864351644. Roasting
864351645. Smelting
864351646. Leaching
Given below are two statements:

Statement I: \( H_2O_2 \) can act as both oxidising and reducing agent in basic medium.

Statement II: In the hydrogen economy, the energy is transmitted in the form of dihydrogen.

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

Options:

864351647. Both statement I and statement II are true

864351648. Both statement I and statement II are false

864351649. Statement I is true but statement II is false

864351650. Statement I is false but statement II is true
Given below are two statements:

Statement I: Both CaCl₂·6H₂O and MgCl₂·8H₂O undergo dehydration on heating.

Statement II: BeO is amphoteric whereas the oxides of other elements in the same group are acidic.

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

Options:

864351651. Both statement I and statement II are true

864351652. Both statement I and statement II are false

864351653. Statement I is true but statement II is false

864351654. Statement I is false but statement II is true

Question Number: 36 Question Id: 864351216 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No
Correct Marks: 4 Wrong Marks: 1
Question Number : 37  Question Id : 864351217  Question Type : MCQ  Option Shuffling : Yes Is Question Mandatory : No  Correct Marks : 4 Wrong Marks : 1

**Match List - I with List - II :**

<table>
<thead>
<tr>
<th>List - I</th>
<th>List - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of oxo acid</td>
<td>Oxidation state of ‘P’</td>
</tr>
<tr>
<td>(a) Hypophosphorous acid</td>
<td>(i) +5</td>
</tr>
<tr>
<td>(b) Orthophosphoric acid</td>
<td>(ii) +4</td>
</tr>
<tr>
<td>(c) Hypophosphoric acid</td>
<td>(iii) +3</td>
</tr>
<tr>
<td>(d) Orthophosphorous acid</td>
<td>(iv) +2</td>
</tr>
<tr>
<td></td>
<td>(v) +1</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below :

**Options :**

864351655. (a)-(v), (b)-(iv), (c)-(ii), (d)-(iii)

864351656. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

864351657. (a)-(iv), (b)-(v), (c)-(ii), (d)-(iii)

864351658. (a)-(v), (b)-(i), (c)-(ii), (d)-(iii)
Question Number : 38  Question Id : 864351218  Question Type : MCQ  Option Shuffling : Yes Is  Question Mandatory : No  Correct Marks : 4 Wrong Marks : 1

Given below are two statement: one is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: Size of Bk\(^{3+}\) ion is less than Np\(^{3+}\) ion.

Reason R: The above is a consequence of the lanthanoid contraction.

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

Options:

(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A
(c) A is true but R is false
A is false but R is true

Question Number : 38 Question Id : 864351218 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options :
864351659.
Aبرج R अस्त्र. ब्रटा R ना A ग्यारात्र भर्स्ति प्रेषिन्य

864351660.
Aبرج R अस्त्र. ब्रटा R ना A ग्यारात्र भर्स्ति प्रेषिन्य

864351661.
Aचार ब्रटा R रच

864351662.
Aतुभन्त ब्रटा R वेषायन

Question Number : 39 Question Id : 864351219 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Given below are two statements :

Statement I : The \( E^0 \) value for \( Ce^{4+}/Ce^{3+} \) is \( +1.74 \) V.

Statement II : Ce is more stable in \( Ce^{4+} \) state than \( Ce^{3+} \) state.

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

Options :
864351663. Both statement I and statement II are correct

864351664. Both statement I and statement II are incorrect

864351665. Statement I is correct but statement II is incorrect

864351666. Statement I is incorrect but statement II is correct
Question Number : 39 Question Id : 864351219 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Options:
- 864351663.
- 864351664.
- 864351665.
- 864351666.

Question Number : 40 Question Id : 864351220 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Options:
- Reducing smog
- Oxidising smog
- Acid rain
- Global warming

Question Number : 40 Question Id : 864351220 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The type of pollution that gets increased during the day time and in the presence of \( \text{O}_3 \) is:
Option 1: Solubility of the compound
Option 2: Mobility or flow of solvent system
Option 3: Length of the column or TLC plate
Option 4: Physical state of the pure compound
Among the following, the aromatic compounds are:

(A) \[ \text{Cyclic structure with a double bond} \]
(B) \[ \text{Cyclic structure without a double bond} \]
(C) \[ \text{Cyclic structure with a negative charge} \]
(D) \[ \text{Cyclic structure with a positive charge} \]

Choose the correct answer from the following options:

Options:
864351675. (A) and (B) only
864351676. (A), (B) and (C) only
864351677. (B), (C) and (D) only
864351678. (B) and (C) only
Which of the following is Lindlar catalyst?

Options:

- Partially deactivated palladised charcoal
- Sodium and liquid NH₃
- Cold dilute solution of KMnO₄
- Zinc chloride and HCl
Question Number : 43 Question Id : 864351223 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which among the following statements is not correct? ?

Options :

- 864351679.
- 864351680.
- 864351681.
- 864351682.

Question Number : 44 Question Id : 864351224 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The products “A” and “B” formed in above reactions are :

Options :

- 864351683.
- 864351684.
Question Number : 44 Question Id : 864351224 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

H₃C OH 20% H₃PO₄ 358 K A
H₃C Cl (CH₃)₃ CO⁻ K⁺ B

ಮೇಲೆ ಕೃತಿಗಳನ್ನು ಸೂಚಿಸಿದ್ದೇ ಒಂದು ವಿಧವಾಂತರೆ "A" ಮತ್ತು "B" ಮೂಲಕವಿ ವಿಧವಾಂತರೆಗಳು :

Options :

864351683.
864351684.
The product “P” in the above reaction is:

Options:
Question Number : 45 Question Id : 864351225 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[
\begin{align*}
\text{O} & \xrightarrow{\text{i) DIBAL-H, } -78^\circ\text{C}} \quad \text{"P"} \\
\text{H}_3\text{O}^+ & \quad (\text{ಸೂಲಿಸುತ್ತಿದ್ದು})
\end{align*}
\]

ಮಾಡಿಕೆ ಸೂಚನೆಯು ಮುಂದಿನ ಗಾತ್ರ "P" ಎಂಬ :

Options :

[Image of a chemical structure]
Question Number : 46  Question Id : 864351226  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1

Assertion A :  Enol form of acetone \([\text{CH}_3\text{COCH}_3]\) exists in < 0.1% quantity. However, the enol form of acetyl acetone \([\text{CH}_3\text{COCH}_2\text{OCCH}_3]\) exists in approximately 15% quantity.

Reason R :  Enol form of acetyl acetone is stabilized by intramolecular hydrogen bonding, which is not possible in enol form of acetone.

Choose the correct statement :

Options :

864351691. Both A and R are true and R is the correct explanation of A

864351692. Both A and R are true but R is not the correct explanation of A

864351693. A is true but R is false
In the above chemical reaction, intermediate “X” and reagent/condition “A” are:

Options:
Question Number : 47 Question Id : 864351227 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
\[
\text{NH}_2 \quad \xrightarrow{\text{NaNO}_2, \text{HCl}} \quad \text{273 - 278 K} \quad \xrightarrow{\text{“X”}} \quad \text{“A”} \quad \text{OH}
\]

The reaction involves substituting "X" with a group (either of the options below) "A" gives:

Options:

1. \( \text{NO}_2 \)
   - \( X \)-
   - \( A \)- \( \text{H}_2\text{O}/\text{NaOH} \)
   - 864351695.

2. \( \text{N}_2\text{Cl}^- \)
   - \( X \)-
   - \( A \)- \( \text{H}_2\text{O}/\Delta \)
   - 864351696.

3. \( \text{N}_2\text{Cl}^- \)
   - \( X \)-
   - \( A \)- \( \text{H}_2\text{O}/\text{NaOH} \)
   - 864351697.

4. \( \text{NO}_2 \)
   - \( X \)-
   - \( A \)- \( \text{H}_2\text{O}/\Delta \)
   - 864351698.
Which of the following reaction DOES NOT involve Hoffmann bromamide degradation?

**Options:**

864351699.

864351700.

864351701.

864351702.
The functions of antihistamine are:

**Options:**

864351703. Antiallergic and Analgesic

864351704. Analgesic and antacid

864351705. Antacid and antiallergic
Antiallergic and antidepressant

Question Number : 49 Question Id : 864351229 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options :

864351703.

864351704.

864351705.

864351706.

Question Number : 50 Question Id : 864351230 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Which among the following pairs of Vitamins is stored in our body relatively for longer duration?

Options :

864351707. Thiamine and Ascorbic acid

864351708. Vitamin A and Vitamin D

864351709. Thiamine and Vitamin A

864351710. Ascorbic acid and Vitamin D

Question Number : 50 Question Id : 864351230 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

Options :
A 6.50 molal solution of KOH (aq.) has a density of 1.89 g cm$^{-3}$. The molarity of the solution is _________ mol dm$^{-3}$. (Round off to the Nearest Integer).

[Atomic masses : K : 39.0 u; O : 16.0 u; H : 1.0 u]
6.50 g of KOH (aq) occupies 1.89 g cm$^{-3}$Volume of solution = 300 ml. 

How many moles of KOH are there in this solution? 

_________ mol dm$^{-3}$. 

[Note: The atomic weights are: K: 39.0 u; O: 16.0 u; H: 1.0 u] 

**Response Type:** Numeric 

**Evaluation Required For SA:** Yes 

**Show Word Count:** Yes 

**Answers Type:** Equal 

**Text Areas:** PlainText 

**Possible Answers:** 

100

---

**Question Number:** 52 **Question Id:** 864351232 **Question Type:** SA 

**Correct Marks:** 4 **Wrong Marks:** 0 

A certain element crystallises in a bcc lattice of unit cell edge length 27Å. If the same element under the same conditions crystallises in the fcc lattice, the edge length of the unit cell in Å will be ________. (Round off to the Nearest Integer). 

[Assume each lattice point has a single atom] 

[Assume $\sqrt{3} = 1.73, \sqrt{2} = 1.41$] 

**Response Type:** Numeric 

**Evaluation Required For SA:** Yes 

**Show Word Count:** Yes 

**Answers Type:** Equal 

**Text Areas:** PlainText 

**Possible Answers:** 

100

---

**Question Number:** 52 **Question Id:** 864351232 **Question Type:** SA 

**Correct Marks:** 4 **Wrong Marks:** 0 

The volume of crystalline sodium chloride (NaCl) is 30 ml. Its density is 27Å g/cm$^3$. The edge length of the unit cell in Å is ________. (Round off to the Nearest Integer) 

[Note: The atomic weights are: Na: 23 u; Cl: 35.5 u] 

[Assume $\sqrt{3} = 1.73, \sqrt{2} = 1.41$] 

**Response Type:** Numeric 

**Evaluation Required For SA:** Yes 

**Show Word Count:** Yes
When light of wavelength 248 nm falls on a metal of threshold energy 3.0 eV, the de-Broglie wavelength of emitted electrons is \( \text{_________ Å} \). (Round off to the Nearest Integer).

\[
\text{[Use : } \sqrt{3} = 1.73, \ h = 6.63 \times 10^{-34} \ \text{Js} \\
\text{m}_e = 9.1 \times 10^{-31} \ \text{kg} ; \ c = 3.0 \times 10^8 \ \text{ms}^{-1} ; \ 1 \text{eV} = 1.6 \times 10^{-19} \text{J}] 
\]
For the reaction \( A(g) = B(g) \) at 495 K, \( \Delta_r G^\circ = -9.478 \text{ kJ mol}^{-1} \).

If we start the reaction in a closed container at 495 K with 22 millimoles of A, the amount of B in the equilibrium mixture is _________ millimoles. (Round off to the Nearest Integer).

\[ R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}; \ln 10 = 2.303 \]

Question Number : 54 Question Id : 864351234 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\[ A(g) = B(g) \] 495 K \( \Delta_r G^\circ = -9.478 \text{ kJ mol}^{-1} \) 22 millimoles

495 K \( \Delta_r G^\circ \) 22 millimoles

[Given : Molal elevation constant of water \( K_b = 0.5 \text{ K kg mol}^{-1} \) boiling point of pure water = 100°C]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers : 100

For the reaction \( A(g) = B(g) \) at 495 K, \( \Delta_r G^\circ = -9.478 \text{ kJ mol}^{-1} \).

If we start the reaction in a closed container at 495 K with 22 millimoles of A, the amount of B in the equilibrium mixture is _________ millimoles. (Round off to the Nearest Integer).

\[ R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}; \ln 10 = 2.303 \]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers : 100
Question Number : 55 Question Id : 864351235 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

$\text{AB}_2$ is dissolved in $\text{A}^2+ + \text{B}^-$. If the reaction $10 \text{AB}_2 + \text{H}_2 \text{O} \rightarrow 10 \text{A}^2+ + 2 \text{H}^+ + 2 \text{B}^- + 2 \text{H}_2 \text{O}$ is carried out. If the reaction $10 \text{AB}_2 \rightarrow 2 \text{A}^2+ + 4 \text{B}^- + 2 \text{H}_2 \text{O}$ is carried out. 

$\text{K}_\text{b} = 10^{-\text{ }10}$

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 56 Question Id : 864351236 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Two salts $\text{A}_2\text{X}$ and $\text{MX}$ have the same value of solubility product of $4.0 \times 10^{-12}$. The ratio of their molar solubilities i.e. $\frac{S(\text{A}_2\text{X})}{S(\text{MX})}$ = 

(Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 56 Question Id : 864351236 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

$\text{A}_2\text{X}$ and $\text{MX}$ have the same value of solubility product of $4.0 \times 10^{-12}$.

$\frac{S(\text{A}_2\text{X})}{S(\text{MX})}$ = 

(Round off to the Nearest Integer).

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
2 MnO$_4^-$ + b C$_2$O$_4^{2-}$ + c H$^+$ $\rightarrow$ x Mn$^{2+}$ + y CO$_2$ + z H$_2$O

If the above equation is balanced with integer coefficients, the value of c is _________. (Round off to the Nearest Integer).

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

100

The decomposition of formic acid on gold surface follows first order kinetics. If the rate constant at 300 K is $1.0 \times 10^{-3}$ s$^{-1}$ and the activation energy $E_a = 11.488$ kJ mol$^{-1}$, the rate constant at 200 K is __________ $\times 10^{-5}$ s$^{-1}$. (Round off to the Nearest Integer).

(Given: $R = 8.314$ J mol$^{-1}$ K$^{-1}$)

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Question Number : 58 Question Id : 864351238 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The reaction rate constant in the rate law for the reaction A → B is given by $k = 3.0 \times 10^{-3} \text{ s}^{-1}$. The activation energy $E_a = 11.488 \text{ kJ mol}^{-1}$ at 300 K. The reaction rate constant at 200 K is $____ \times 10^{-5} \text{ s}^{-1}$. (Remember $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 59 Question Id : 864351239 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

The equivalents of ethylene diamine required to replace the neutral ligands from the coordination sphere of the trans-complex of CoCl$_3$·4NH$_3$ is ________. (Round off to the Nearest Integer)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 59 Question Id : 864351239 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

CoCl$_3$·4NH$_3$ undergoes reaction to form CoCl$_3$·4Cl$^-$. The ligands are removed from the coordination sphere. Is it possible to regenerate the trans-complex (CoCl$_3$·4NH$_3$) from the reaction? (Remember $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Complete combustion of 750 g of an organic compound provides 420 g of CO₂ and 210 g of H₂O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and __________ respectively. (Round off to the Nearest Integer).

750 ಗಾಂಟಿ ಆಧಾರವಾಗಿ ಸಮಗ್ರತೆಯ ಮೂಲಸ್ವರೂಪ ಉಭ್ಯವು 420 ಗಾಂಟಿ CO₂ ಮತ್ತು 210 ಗಾಂಟಿ H₂O ಇದ್ದು ಉತ್ತಮವಾಗಿದೆ. ಆಧಾರವಾಗಿ ಸಮಗ್ರತೆಯ ಇತರಾಂಶಗಳ ಹೊರಹೊರಬಿದ್ದು ಮೂಲಸ್ವರೂಪ ಉಭ್ಯ ಬೇಟ್ಟಮೂಲಕ ಹೌಸದಲ್ಲಿ 15.3 ವಿಭಿನ್ನ __________ ವೇಳೆ. (ಮೊದಲೇ ಮಟ್ಟಾಂಶ)

**Mathematics Section A**

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Let \( A = \begin{bmatrix} i & -i \\ -i & i \end{bmatrix} \), \( i = \sqrt{-1} \). Then, the system of linear equations \( \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 64 \end{bmatrix} \) has:

Options:

864351721. No solution

864351722. A unique solution

864351723. Infinitely many solutions

864351724. Exactly two solutions

Let \( i = \sqrt{-1} \) अरुण \( A = \begin{bmatrix} i & -i \\ -i & i \end{bmatrix} \), अतः \( A^8 \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 64 \end{bmatrix} \) मानने भीरू संस्करणें गरीबाचे:

Options:

864351721. भीरू संस्करणें

864351722. भीरू भीरू (भीरू) संस्करणें

864351723. भीरू संस्करणें

864351724. भीरू संस्करणें
Let the functions \( f : \mathbb{R} \to \mathbb{R} \) and \( g : \mathbb{R} \to \mathbb{R} \) be defined as:

\[
f(x) = \begin{cases} 
x + 2, & x < 0 \\
x^2, & x \geq 0
\end{cases}
\quad \text{and} \quad
g(x) = \begin{cases} 
x^3, & x < 1 \\
3x - 2, & x \geq 1
\end{cases}
\]

Then, the number of points in \( \mathbb{R} \) where \((fog)(x)\) is NOT differentiable is equal to:

**Options:**

- 864351725. 0
- 864351726. 1
- 864351727. 2
- 864351728. 3

---

**Question Number : 62**

**Question Id : 864351242**

**Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

\( f : \mathbb{R} \to \mathbb{R} \) and \( g : \mathbb{R} \to \mathbb{R} \) are defined as:

\[
f(x) = \begin{cases} 
x + 2, & x < 0 \\
x^2, & x \geq 0
\end{cases}
\quad \text{and} \quad
g(x) = \begin{cases} 
x^3, & x < 1 \\
3x - 2, & x \geq 1
\end{cases}
\]

\( f(x) \) and \( g(x) \) are defined on \( \mathbb{R} \). How many points in \( \mathbb{R} \) are NOT differentiable?

**Options :**

- 864351725. 0
- 864351726. 1
- 864351727. 2
- 864351728. 3

---

**Question Number : 63**

**Question Id : 864351243**

**Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**
Let \( P \) be a plane \( lx + my + nz = 0 \) containing the line, \( \frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3} \). If plane \( P \) divides the line segment \( AB \) joining points \( A(-3, -6, 1) \) and \( B(2, 4, -3) \) in ratio \( k : 1 \) then the value of \( k \) is equal to:

**Options:**

- 864351729. 2
- 864351730. 1.5
- 864351731. 3
- 864351732. 4

---

**Question Number:** 63  
**Question Id:** 864351243  
**Question Type:** MCQ  
**Option Shuffling:** Yes  
**Is Question Mandatory:** No  
**Correct Marks:** 4  
**Wrong Marks:** 1

\[ P \text{ is a plane containing the line } \frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3} \]  
\[ \text{The line segment } AB \text{ is divided by plane } P \text{ in the ratio } k : 1 \]  
**Options:**

- 864351729. 2
- 864351730. 1.5
- 864351731. 3
- 864351732. 4

---

**Question Number:** 64  
**Question Id:** 864351244  
**Question Type:** MCQ  
**Option Shuffling:** Yes  
**Is Question Mandatory:** No  
**Correct Marks:** 4  
**Wrong Marks:** 1

If \( a > 0 \), the feet of perpendiculars from the points \( A(a, -2a, 3) \) and \( B(0, 4, 5) \) on the plane \( lx + my + nz = 0 \) are points \( C(0, -a, -1) \) and \( D \) respectively, then the length of line segment \( CD \) is equal to:

**Options:**
Question Number : 64 Question Id : 864351244 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
\[ a > 0 \text{ and } \sqrt{a^2 - 4c} = \sqrt{2} + 1 \text{ exists } \] 
\[ \text{Let } D \text{ and } \text{otherwise } A(a, -2a, 3) \text{ and } B(0, 4, 5) \]
\[ \text{Consider } l \cos + m \cos + n \cos = 0 \text{ and } \pi = \text{otherwise } . \]

Options :
864351733. \[ \sqrt{a^2} \]
864351734. \[ \sqrt{a^2 + 1} \]
864351735. \[ \sqrt{41} \]
864351736. \[ \sqrt{55} \]

Question Number : 65 Question Id : 864351245 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Consider three observations \( a, b \) and \( c \) such that \( b = a + c \). If the standard deviation of \( a + 2, b + 2, c + 2 \) is \( d \), then which of the following is true ?

Options :
864351737. \[ b^2 = 3(a^2 + c^2) - 9d^2 \]
864351738. \[ b^2 = 3(a^2 + c^2) + 9d^2 \]
864351739. \[ b^2 = a^2 + c^2 + 3d^2 \]
b^2 = 3(a^2 + c^2 + d^2)

Question Number : 65 Question Id : 864351245 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

b = a + c \text{ का समीकरण } a, b \text{ से संबंधित } c \text{ तथा } d \text{ तथा } (SD) \text{ हो } d \text{ के समुच्चय } \text{ को प्रदर्शित किया जाता है?}

Options :
864351737. \quad b^2 = 3(a^2 + c^2) - 9d^2

864351738. \quad b^2 = 3(a^2 + c^2) + 9d^2

864351739. \quad b^2 = a^2 + c^2 + 3d^2

864351740. \quad b^2 = 3(a^2 + c^2 + d^2)

Question Number : 66 Question Id : 864351246 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let the position vectors of two points P and Q be \(3\hat{i} - \hat{j} + 2\hat{k}\) and \(\hat{i} + 2\hat{j} - 4\hat{k}\), respectively. Let R and S be two points such that the direction ratios of lines PR and QS are (4, -1, 2) and (-2, 1, -2), respectively. Let lines PR and QS intersect at T. If the vector \(\overrightarrow{TA}\) is perpendicular to both \(\overrightarrow{PR}\) and \(\overrightarrow{QS}\) and the length of vector \(\overrightarrow{TA}\) is \(\sqrt{5}\) units, then the modulus of a position vector of A is :

Options :
864351741. \quad \sqrt{5}

864351742. \quad \sqrt{171}

864351743. \quad \sqrt{227}
Question Number : 66 Question Id : 864351246 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[ 3\hat{i} - \hat{j} + 2\hat{k} \text{ and } \hat{i} + 2\hat{j} - 4\hat{k} \text{ are space vectors. Let } P \text{ be } \hat{Q} \text{ and } \text{ the } S \text{ is a point such that } PR \text{ and } QS \text{ are } 4 \text{ and } (4, -1, 2) \text{ and } (-2, 1, -2) \text{ respectively. Then } \text{ the vector } TR \text{ is equal to } \sqrt{5} \text{. The } TA \text{ is equal to } \sqrt{5} \text{. Which of the following is correct?}

Options :

864351741. \sqrt{5}

864351742. \sqrt{171}

864351743. \sqrt{227}

864351744. \sqrt{482}

Question Number : 67 Question Id : 864351247 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let a vector \( \alpha \hat{i} + \beta \hat{j} \) be obtained by rotating the vector \( \sqrt{3} \hat{i} + \hat{j} \) by an angle 45° about the origin in counterclockwise direction in the first quadrant. Then the area of triangle having vertices \((\alpha, \beta), (0, \beta)\) and \((0, 0)\) is equal to :

Options :

\[ \frac{1}{2} \]

864351745. \[ \frac{1}{2} \]

864351746. 1
Question Number : 67 Question Id : 864351247 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\[ \sqrt{3} \hat{i} + \hat{j} \] छोटे मार्गसर्थ क्रमांक 45° सीयणुकी लगते हैं अतः क्रमांक जो क्रमशः है: 

\[ \alpha \hat{i} + \beta \hat{j} \] के समान होगा. यदि \( (\alpha, \beta), (0, 0) \) को प्राप्त \( (0, 0) \) तो \( \alpha = \beta = 0 \) है।

Options :

\[ \frac{1}{2} \]

864351745.

864351746. 1

864351747. \( 2\sqrt{2} \)

864351748. \( \frac{1}{\sqrt{2}} \)

Question Number : 68 Question Id : 864351248 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The number of roots of the equation, 

\[ (81)^{\sin^2 x} + (81)^{\cos^2 x} = 30 \]

in the interval \([0, \pi]\) is equal to :

Options :

864351749. 2

864351750. 3
Question Number : 68 Question Id : 864351248 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30\] gives \(x\) in \([0, \pi]\)

Options :
864351749. 2
864351750. 3
864351751. 4
864351752. 8

Question Number : 69 Question Id : 864351249 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

A pack of cards has one card missing. Two cards are drawn randomly and are found to be spades. The probability that the missing card is not a spade, is :

Options :
\[
\frac{22}{425}
\]
864351753.
\[
\frac{52}{867}
\]
864351754.
\[
\frac{39}{50}
\]
864351755.
\[
\frac{3}{4}
\]
864351756.
Question Number : 69 Question Id : 864351249 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The range of a ∈ R for which the function

\[ f(x) = (4a - 3)(x + \log_e 5) + 2(a - 7) \cot \left( \frac{x}{2} \right) \sin^2 \left( \frac{x}{2} \right), \quad x \neq 2n\pi, \ n \in \mathbb{N} \]

has critical points, is:

Options :

864351757. \([1, \infty)\]

864351758. \((-\infty, -1]\)

864351759. \([-\frac{4}{3}, 2]\)

864351760. \((-3, 1)\)
Question Number : 70 Question Id : 864351250 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
\[ x \neq 2n\pi, \text{neN} \quad \text{where} \quad f(x) = (4a - 3)(x + \log_e 5) + 2(a - 7)\cot\left(\frac{x}{2}\right)\sin^2\left(\frac{x}{2}\right) \quad \text{is} \quad \text{an} \quad \text{even} \quad \text{function}. \quad \text{If} \quad a \in \mathbb{R} \quad \text{then} \quad \text{the} \quad \text{value} \quad \text{is} \quad \text{odd}.

Options :
864351757. \quad [1, \infty)
864351758. \quad (-\infty, -1]
864351759. \quad \left[-\frac{4}{3}, 2\right]
864351760. \quad (-3, 1)

Question Number : 71 Question Id : 864351251 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
If \( n \) is the number of irrational terms in the expansion of \( \left(3^{\frac{3}{4}} + 5^{\frac{1}{8}}\right)^{60} \), then \( (n - 1) \) is divisible by:

Options :
864351761. \quad 30
864351762. \quad 8
864351763. \quad 26
864351764. \quad 7
Let \([x]\) denote greatest integer less than or equal to \(x\). If for \(n \in \mathbb{N}\),

\[(1 - x + x^3)^n = \sum_{j=0}^{3n} a_j x^j, \text{ then}

\[
\sum_{j=0}^{\left\lfloor \frac{3n}{2} \right\rfloor} a_{2j} + 4 \sum_{j=0}^{\left\lfloor \frac{3n-1}{2} \right\rfloor} a_{2j+1}
\]

is equal to:

Options:

864351765. \(2^{n-1}\)

864351766. \(n\)

864351767. \(2\)

864351768. \(1\)
\[ \lfloor x \rfloor \text{ எண்ணிலை எண்ணிலை மேற்குத்திருக்கும் } \leq x \text{ எண்ணிலை } n \in \mathbb{N} \text{ எண்கள்} \]

\[
(1 - x + x^3)^n = \sum_{j=0}^{3n} a_j x^j, \text{ என்று}
\]

\[
\frac{\binom{3n}{2}}{2} a_{2j} + 4 \frac{\binom{3n-1}{2}}{2} a_{2j+1} =
\]

Options:
864351765. \[2^{n-1}\]
864351766. \[n\]
864351767. \[2\]
864351768. \[1\]

Question Number : 73 Question Id : 864351253 Question Type : MCQ Option Shuffling : Yes Is
Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Which of the following Boolean expression is a tautology?

Options:
864351769. \[(p \land q) \lor (p \lor q)\]
864351770. \[(p \land q) \lor (p \rightarrow q)\]
864351771. \[(p \land q) \land (p \rightarrow q)\]
864351772. \[(p \land q) \rightarrow (p \rightarrow q)\]
Options:

864351769. \((p \land q) \lor (p \lor q)\)

864351770. \((p \land q) \lor (p \rightarrow q)\)

864351771. \((p \land q) \land (p \rightarrow q)\)

864351772. \((p \land q) \rightarrow (p \rightarrow q)\)

Question Number: 74 Question Id: 864351254 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No Correct Marks: 4 Wrong Marks: 1

Let \(S_k = \sum_{r=1}^{k} \tan^{-1} \left( \frac{6^r}{2^{2r+1} + 3^{2r+1}} \right)\). Then \(\lim_{k \to \infty} S_k\) is equal to:

Options:

864351773. \(\frac{\pi}{2}\)

864351774. \(\cot^{-1} \left( \frac{3}{2} \right)\)

864351775. \(\tan^{-1} \left( \frac{3}{2} \right)\)

864351776. \(\tan^{-1} (3)\)

Question Number: 74 Question Id: 864351254 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No Correct Marks: 4 Wrong Marks: 1

\[S_k = \sum_{r=1}^{k} \tan^{-1} \left( \frac{6^r}{2^{2r+1} + 3^{2r+1}} \right)\] \(\Rightarrow \lim_{k \to \infty} S_k = \)

Options:

864351773. \(\frac{\pi}{2}\)
\[
\cot^{-1} \left( \frac{3}{2} \right)
\]

864351774.

\[
\tan^{-1} \left( \frac{3}{2} \right)
\]

864351775.

\[
\tan^{-1} \left( 3 \right)
\]

864351776.

**Question Number : 75 Question Id : 864351255 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The number of elements in the set \( \{x \in \mathbb{R} : |x - 3| |x + 4| = 6 \} \) is equal to:

**Options :**

864351777. 1

864351778. 2

864351779. 3

864351780. 4

**Question Number : 75 Question Id : 864351255 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

\( \{x \in \mathbb{R} : |x - 3| |x + 4| = 6 \} \) के क्षेत्र में संयोजित भागों की संख्या है:

**Options :**

864351777. 1

864351778. 2

864351779. 3

864351780. 4

**Question Number : 76 Question Id : 864351256 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**
Correct Marks : 4 Wrong Marks : 1

If \( x \in \left( 0, \frac{\pi}{2} \right) \), \( \log_{10}\sin x + \log_{10}\cos x = -1 \) and \( \log_{10}(\sin x + \cos x) = \frac{1}{2} (\log_{10} n - 1) \), \( n > 0 \),
then the value of \( n \) is equal to:

Options:
864351781. 9
864351782. 12
864351783. 16
864351784. 20

---

Question Number : 76 Question Id : 864351256 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\( x \in \left( 0, \frac{\pi}{2} \right) \) \( \Rightarrow \log_{10}\sin x + \log_{10}\cos x = -1 \) and \( \log_{10}(\sin x + \cos x) = \frac{1}{2} (\log_{10} n - 1) \), \( n > 0 \)

\( \text{value of } n \) is equal to:

Options:
864351781. 9
864351782. 12
864351783. 16
864351784. 20

---

Question Number : 77 Question Id : 864351257 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If \( y = y(x) \) is the solution of the differential equation, \( \frac{dy}{dx} + 2y \tan x = \sin x \), \( y \left( \frac{\pi}{3} \right) = 0 \), then
the maximum value of the function \( y(x) \) over \( R \) is equal to:

Options:
Question Number : 77 Question Id : 864351257 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[ y = y(x) \frac{dy}{dx} + 2y \tan x = \sin x \] 

\[ y\left(\frac{\pi}{3}\right) = 0 \text{ option. Hence, } R \text{ र } L \text{ र } \text{ एक } y(x) \text{ र } \text{ कोण } \text{ दिनित्त } : \]

Options :

864351785. 8

\[ \frac{1}{2} \]

864351786.

\[ -\frac{15}{4} \]

864351787.

\[ \frac{1}{8} \]

864351788.

Question Number : 78 Question Id : 864351258 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

The locus of the midpoints of the chord of the circle, \( x^2 + y^2 = 25 \) which is tangent to the hyperbola, \( \frac{x^2}{9} - \frac{y^2}{16} = 1 \) is :

Options :
Question Number : 78 Question Id : 864351258 Question Type : MCQ Option Shuffling : Yes Is Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[
\frac{x^2}{9} - \frac{y^2}{16} = 1 \quad \text{संख्यात्मक क्वाड्रेटिक सर्ववैधकता ने } \quad x^2 + y^2 = 25 \quad \text{देने} \quad a \quad \text{यस्य विचारण हरे होते}
\]

निम्नलिखित विकल्प:

Options:

864351789. \( (x^2 + y^2)^2 - 9x^2 + 144y^2 = 0 \)

864351790. \( (x^2 + y^2)^2 - 9x^2 - 16y^2 = 0 \)

864351791. \( (x^2 + y^2)^2 - 9x^2 + 16y^2 = 0 \)

864351792. \( (x^2 + y^2)^2 - 16x^2 + 9y^2 = 0 \)

Question Number : 79 Question Id : 864351259 Question Type : MCQ Option Shuffling : Yes Is Mandatory : No
Correct Marks : 4 Wrong Marks : 1

If the three normals drawn to the parabola, \( y^2 = 2x \) pass through the point \( (a, 0) \) \( a \neq 0 \), then ‘a’ must be greater than:

Options:

864351793. \( 1 \)

864351794. \( -1 \)
Question Number : 79 Question Id : 864351259 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

\[ y^2 = 2x \]  

Let \( y = \pm \sqrt{2x} \). The point \( (a, 0) \), \( a \neq 0 \), does not lie inside the region \( y \geq 0 \) for some \( 'a' > 0 \)

Options :

864351793.  1

864351794.  -1

864351795.  \( \frac{1}{2} \)

864351796.  - \( \frac{1}{2} \)

---

Question Number : 80 Question Id : 864351260 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Let a complex number \( z \), \( |z| \neq 1 \), satisfy \( \log \frac{1}{\sqrt{2}} \left( \frac{|z| + 11}{(|z| - 1)^2} \right) \leq 2 \). Then, the largest value of \( |z| \) is equal to ________.

Options :

864351797.  5

864351798.  6

864351799.  7
Question Number : 80 Question Id : 864351260 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\[ |z| \neq 1 \Rightarrow \log_\frac{1}{\sqrt{2}} \left( \frac{|z| + 11}{(|z| - 1)^2} \right) \leq 2 \Rightarrow \text{Surely incorrect. Answer is } |z| \neq 1 \Rightarrow \text{Surely incorrect. Answer is } |z| \neq 1 \]

Options:
864351797. 5
864351798. 6
864351799. 7
864351800. 8

Mathematics Section B

Section Id : 86435118
Section Number : 6
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 10
Number of Questions to be attempted : 5
Section Marks : 20
Mark As Answered Required? : Yes
Sub-Section Number : 1
Sub-Section Id : 86435118
Question Shuffling Allowed : Yes

Question Number : 81 Question Id : 864351261 Question Type : SA Correct Marks : 4 Wrong Marks : 0
Let $z$ and $w$ be two complex numbers such that $w = z \overline{z} - 2z + 2, \quad \frac{|z + i|}{|z - 3i|} = 1$ and $\text{Re}(w)$ has minimum value. Then, the minimum value of $n \in \mathbb{N}$ for which $w^n$ is real, is equal to _______.

**Response Type:** Numeric  
**Evaluation Required For SA:** Yes  
**Show Word Count:** Yes  
**Answers Type:** Equal  
**Text Areas:** PlainText  
**Possible Answers:**  
100

**Question Number:** 81  
**Question Id:** 864351261  
**Question Type:** SA  
**Correct Marks:** 4  
**Wrong Marks:** 0  

$$w = z \overline{z} - 2z + 2, \quad \frac{|z + i|}{|z - 3i|} = 1$$

$\text{Re}(w)$ has minimum value. Then, the minimum value of $n \in \mathbb{N}$ for which $w^n$ is real, is equal to _______.

**Response Type:** Numeric  
**Evaluation Required For SA:** Yes  
**Show Word Count:** Yes  
**Answers Type:** Equal  
**Text Areas:** PlainText  
**Possible Answers:**  
100

**Question Number:** 82  
**Question Id:** 864351262  
**Question Type:** SA  
**Correct Marks:** 4  
**Wrong Marks:** 0  

Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function such that $f(x) + f(x+1) = 2$, for all $x \in \mathbb{R}$. If $I_1 = \int_{0}^{8} f(x) \, dx$ and $I_2 = \int_{-1}^{3} f(x) \, dx$, then the value of $I_1 + 2I_2$ is equal to _______.

**Response Type:** Numeric  
**Evaluation Required For SA:** Yes  
**Show Word Count:** Yes  
**Answers Type:** Equal  
**Text Areas:** PlainText  
**Possible Answers:**
Question Number : 82 Question Id : 864351262 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\[ f: \mathbb{R} \to \mathbb{R} \text{ such that } f(x) + f(x+1) = 2, \forall x \in \mathbb{R} \text{ exists.}
\text{ Therefore } I_1 = \int_{0}^{8} f(x) \, dx \text{ is equal to } \text{__________}.
\]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

100

Question Number : 83 Question Id : 864351263 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

If the normal to the curve \[ y(x) = \int_{0}^{x} (2t^2 - 15t + 10) \, dt \] at a point \((a, b)\) is parallel to the line \[ x + 3y = -5, \ a > 1, \] then the value of \(|a + 6b|\) is equal to \text{__________}.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :

100

Question Number : 83 Question Id : 864351263 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\[ a > 1 \text{ and } (a, b) \text{ is a point on the curve, } y(x) = \int_{0}^{x} (2t^2 - 15t + 10) \, dt \text{ satisfies the condition } x + 3y = -5 \text{ and } x + 3y \text{ is equal to } \text{__________}, \]

|a + 6b| = \text{__________}.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
If \( \lim_{x \to 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2 \), then \( a + b + c \) is equal to _________.

Consider an arithmetic series and a geometric series having four initial terms from the set \{11, 8, 21, 16, 26, 32, 4\}. If the last terms of these series are the maximum possible four digit numbers, then the number of common terms in these two series is equal to _________.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100
Let \( P = \begin{bmatrix} -30 & 20 & 56 \\ 90 & 140 & 112 \\ 120 & 60 & 14 \end{bmatrix} \) and \( A = \begin{bmatrix} 2 & 7 & \omega^2 \\ -1 & -\omega & 1 \\ 0 & -\omega & -\omega + 1 \end{bmatrix} \) where \( \omega = \frac{-1 + i\sqrt{3}}{2} \), and \( I_3 \) be the identity matrix of order 3. If the determinant of the matrix \( (P^{-1}AP-I_3)^2 \) is \( \alpha \omega^2 \), then the value of \( \alpha \) is equal to ________.
\[
\omega = \frac{-1 + i\sqrt{3}}{2}
\]

\[
P = \begin{bmatrix}
-30 & 20 & 56 \\
90 & 140 & 112 \\
120 & 60 & 14
\end{bmatrix}
\]

\[
A = \begin{bmatrix}
2 & 7 & \omega^2 \\
-1 & -\omega & 1 \\
0 & -\omega & -\omega + 1
\end{bmatrix}
\]

3 ຕັ້ງສ່ວນ ຍ້ອຍ້າຍ ການຄັ້ງທັງໝັ່ນ. \((P^{-1}AP-I_3)^2\\) ເກດ່ອງ ຈັດຕັ້ງ ມອີນ ພັນ \(\omega^2\\) ບໍລິການ 


Responses Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 87 Question Id : 864351267 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

Let \(f : (0, 2) \to \mathbb{R}\\) be defined as \(f(x) = \log_2 \left(1 + \tan\left(\frac{\pi x}{4}\right)\right)\\). Then,

\[
\lim_{n \to \infty} \frac{2}{n} \left(f\left(\frac{1}{n}\right) + f\left(\frac{2}{n}\right) + \ldots + f(1)\right)
\]

de ໃ່ການ ລາວຫາກ ອັດຕັ້ງ 

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 87 Question Id : 864351267 Question Type : SA
Correct Marks : 4 Wrong Marks : 0

\(f : (0, 2) \to \mathbb{R}\\) ບໍລິການ ພັນ \(f(x) = \log_2 \left(1 + \tan\left(\frac{\pi x}{4}\right)\right)\\) ເກດ່ອງ ຝາກອັດ,

\[
\lim_{n \to \infty} \frac{2}{n} \left(f\left(\frac{1}{n}\right) + f\left(\frac{2}{n}\right) + \ldots + f(1)\right)
\]

ເອັດຕັ້ງ 

Response Type : Numeric
Question Number : 88 Question Id : 864351268 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The total number of $3 \times 3$ matrices $A$ having entries from the set $\{0, 1, 2, 3\}$ such that the sum of all the diagonal entries of $AA^T$ is 9, is equal to _______.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 88 Question Id : 864351268 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
$\{0, 1, 2, 3\}$ ಅವೆಗೆ $3 \times 3$ ತೃತೀಯ ಅಂಶಗಳು $A$ ಮತ್ತು $AA^T$ ಸಂಬಂಧವಿರುವ ಮಟ್ಟಾಯಿತು $9$ ಎಂಬುದು. $3 \times 3$ ತೃತೀಯ ಅಂಶಗಳು $A$ ಪ್ರತಿಯೊಂದು ಸಮತಳತು ಮನೆಯ _______.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 89 Question Id : 864351269 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
Let ABCD be a square of side of unit length. Let a circle $C_1$ centered at A with unit radius is drawn. Another circle $C_2$ which touches $C_1$ and the lines AD and AB are tangent to it, is also drawn. Let a tangent line from the point C to the circle $C_2$ meet the side AB at E. If the length of EB is $\alpha + \sqrt{3} \beta$, where $\alpha, \beta$ are integers, then $\alpha + \beta$ is equal to _______.

Response Type : Numeric
Evaluation Required For SA : Yes
ABCD is a regular quadrilateral. A is on AD, B is on BC, C is on CD, and D is on DA. AD = AB = BC = CD = \alpha, \alpha = \sqrt{3} \beta, \alpha, \beta are the same. Therefore, \alpha + \beta = \underline{100}.

Let the curve \( y = y(x) \) be the solution of the differential equation, \( \frac{dy}{dx} = 2(x + 1) \). If the numerical value of area bounded by the curve \( y = y(x) \) and x-axis is \( \frac{4\sqrt{8}}{3} \), then the value of \( y(1) \) is equal to \underline{100}.

100

100
\[
\frac{dy}{dx} = 2(x + 1) \text{ लось अधिक नमूने करत्ते } y = y(x) \text{ लось नूआ नमूने सर्जनमुक्ती.} \text{ तरीखा होते}
\]
\[
y = y(x) \text{ अनुक्रम } x-अक्षकर अनुक्रमन अनुक्रमन सुरुहुत चूँकळे } \frac{4\sqrt{8}}{3} \text{ लось स्थान दिशेरदानी } y(1) \text{ हे चे } \_\_\_\_\_\_.
\]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100