Least count corresponding to the main scale and circular scale of a screw gauge are 0.5 mm and 0.005 mm, respectively. A wire of diameter 2.675 mm is measured with the screw gauge. What would be the reading of divisions on circular scale of the screw gauge, if the zero error of the screw gauge is +0.02 mm?

Options:

6760333241. 31
6760333242. 35
6760333243. 39
6760333244. 61
Question Number : 2 Question Id : 6760331082 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

For the one-dimensional motion described by $x(t) = t - \sin t$

A. $v(t) < 0$ for all $t > 0$
B. $x(t) > 0$ for all $t > 0$
C. $v(t)$ lies in between 0 and 2
D. $a(t) > 0$ for all $t > 0$
E. $a(t)$ lies in between 2 and 3

Choose the correct answer from the options given below:

Options :

- 6760333245. A, D, E only
- 6760333246. B, C only
- 6760333247. B, C, E only
- 6760333248. C, E only

---

Question Number : 3 Question Id : 6760331083 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

A body moving with an initial velocity of 10 $m/s$, maintains a constant acceleration for 20 $s$. If it covers a distance of 88 $m$ in its last second, what is its acceleration?

Options :

- 6760333249. $3 \text{ m/s}^2$
6760333250. $4 \text{ m/s}^2$

6760333251. $2 \text{ m/s}^2$

6760333252. $0.5 \text{ m/s}^2$

Question Number : 4 Question Id : 6760331084 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
A constant power is fed to an object, starting from rest, moving along a straight line. The distance travelled by the body in time $t$ is proportional to -

Options :

6760333253. $\frac{7}{2} t^{1/2}$

6760333254. $\frac{5}{2} t^{1/2}$

6760333255. $\frac{3}{2} t^{1/2}$

6760333256. $\frac{1}{2} t^{1/2}$

Question Number : 5 Question Id : 6760331085 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
A carnot engine working at source temperature 400 K, takes 500 J heat from the source and rejects 300 J to sink. What is the temperature of sink?

Options:
6760333257. 200 K
6760333258. 230 K
6760333259. 220 K
6760333260. 240 K

Question Number: 6 Question Id: 6760331086 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No Correct Marks: 4 Wrong Marks: 1
As shown in the figure, a string of length 'l' holds a small bob of mass 'm' while suspended from a point 'O'. The bob revolves about a vertical line OC passing through the point of suspension on a horizontal circle such that the string always remains inclined to the vertical at an angle 'α'. The angular frequency of revolution will be -

\[ \sqrt{\frac{g}{l \cos \alpha}} \]

Options:

6760333261.

\[ \sqrt{\frac{g}{l \sin \alpha}} \]

6760333262.
A gas has a constant volume filled in a glass bulb and its pressure becomes 71.00 cm and 100 cm of Hg at 0°C and 100°C respectively. The value of pressure at 30°C is -

Options:
- 73 cm of Hg
- 27 cm of Hg
- 79.7 cm of Hg
- 78 cm of Hg
A pulley of mass $m$ and moment of inertia $I$ about its axis is suspended as shown in the diagram. The spring has spring constant ‘$k$’ and the string does not slip over the pulley. Find the extension in the spring under equilibrium condition.

Options:

1. $\frac{2k}{mg}$
2. $\frac{mg}{I}$
3. $\frac{k}{mg}$
4. $\frac{mg}{k}$
5. $\frac{mg}{2k}$
A sinusoidal wave \( f_1(t) = 3 \sin(\omega t) \) is superposed on another periodic wave \( f_2(t) \) which is also oscillating with the same frequency. If the resultant wave is a sinusoidal wave, which is out of phase with \( f_1(t) \) by 53.1°; then the wave \( f_2(t) \) would be -

[Given \( \tan 53.1° = 1.33 \)]

Options:

6760333273. \[ f_2(t) = 3 \sin(\omega t) \]

6760333274. \[ f_2(t) = 4 \sin(\omega t + 53.1°) \]

6760333275. \[ f_2(t) = 3 \cos(\omega t - 53.1°) \]

6760333276. \[ f_2(t) = 4 \cos(\omega t) \]
The diagram shows a scheme of two unequal masses, \( m_1 = 2m \) and \( m_2 = m \) having unequal positive charge on them. They are suspended by two mass-less threads of unequal lengths from a common point such that, during equilibrium, \( m_1 \) and \( m_2 \) are on same horizontal level. Angle between two strings is \( \theta = 45^\circ \) in this position. Electrostatic force of interaction between the masses will be -

![Diagram of two masses with unequal lengths of threads and angle \( \theta = 45^\circ \)]

Options:

\[ F = \left( \frac{\sqrt{17} - 3}{2} \right) mg \]

6760333277.

\[ F = \left( \sqrt{17} - 3 \right) mg \]

6760333278.

\[ F = mg \]

6760333279.

\[ F = \left( \frac{\sqrt{11} - 3}{2} \right) mg \]

6760333280.
Two conducting spheres of radii 15 cm and 12 cm are charged and joined by a wire. The ratio of electric fields on the surfaces of the first and the second sphere is -

Options:

\[
\frac{4}{5} \\
6760333281
\]

\[
\frac{5}{4} \\
6760333282
\]

\[
\frac{16}{25} \\
6760333283
\]

\[
\frac{64}{125} \\
6760333284
\]
Consider the case of a non-homogeneous solid cylinder of radius R carrying a current ‘I’ such that the current density depends on the radial distance ‘r’ from the axis of the cylinder as \( J = \sigma r \), (\( \sigma \) is constant). The magnetic field at a point ‘P’ at a perpendicular distance \( r(< R) \) from the axis of the cylinder is -

**Options:**

\[ \frac{\mu_0 IR^2}{2\pi r^3} \]

6760333285.

\[ \frac{\mu_0 IR^2}{2\pi R^3} \]

6760333286.

\[ \frac{\mu_0 IR^2}{2\pi R^2} \]

6760333287.

\[ \frac{\mu_0 IR}{2\pi r^2} \]

6760333288.
A current $I$ enters a circular coil of radius $R$, branches into two parts at $A$ and then recombines at $B$ (as shown in figure). The resultant magnetic field at the centre of the coil is -

Options:

1. \( \frac{2}{3} \left( \frac{\mu_0 I}{2R} \right) \)
2. \( \frac{1}{2} \left( \frac{\mu_0 I}{2R} \right) \)
3. \( \frac{\mu_0 I}{2R} \)
4. Zero
20 mA current can pass through a galvanometer of resistance 50 Ω. What resistance in series should be connected through it, so that it is converted into a voltmeter measuring upto 200 Volt?

Options:
6760333293. 0.995 Ω
6760333294. 99.50 Ω
6760333295. 995 Ω
6760333296. 9950 Ω
In the given figure, a ray of light passes through four transparent media with refractive indices \( n_1, n_2, n_3 \) and \( n_4 \). The surfaces of all the media are parallel. If the emergent ray CD is parallel to the incident ray AB, we must have -

Options:

1. \( n_1 = n_2 \)
2. \( n_2 = n_3 \)
3. \( n_3 = n_4 \)
4. \( n_4 = n_1 \)

A beam of light is incident on the surface of a transparent liquid at an angle of 60°. The reflected and refracted lights are found to be perpendicular to each other. The refractive index of transparent liquid is -

Options:

1. \( \sqrt{5} \)
6760333302. $\sqrt{3}$

6760333303. $\sqrt{2}$

6760333304. 1

Question Number : 17 Question Id : 6760331097 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

A compound microscope has a magnification of 30. Assuming that the final image is formed at the least distance of distinct vision (25 cm), find the magnification produced by the objective lens of the microscope. Given focal length of the eye piece is 5 cm.

Options :
6760333305. 4
6760333306. 5
6760333307. 3
6760333308. 2

Question Number : 18 Question Id : 6760331098 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
An amount of $8 \times 10^{20}$ photons per second are emitting from a monochromatic source of light operated at 500W, with 80% efficiency. The wavelength of the light is ________. (Take $h = 6.63 \times 10^{-34}$ Js).

**Options:**
- 6760333309. 460 nm
- 6760333310. 450 nm
- 6760333311. 425 nm
- 6760333312. 398 nm

---

**Question Number : 19 Question Id : 6760331099 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Given below are two statements:

**Statement I :** A two input OR gate and a two input AND gate have similar inputs, but outputs may be same or different.

**Statement II :** An AND gate has inputs A and B. The input B is always low, the state of input A can effect the output.

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

**Options :**
- 6760333313. Both Statement I and Statement II are true.
- 6760333314. Both Statement I and Statement II are false.
Statement I is true but Statement II is false.

Statement I is false but Statement II is true.

In the given figure, a logic circuit has the input waveforms `A' and `B'.

The correct output waveform will be -

Options:

6760333317.

6760333318.
Physics Section B

Section Id : 67603374
Section Number : 2
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 10
Number of Questions to be attempted : 5
Section Marks : 20
Enable Mark as Answered Mark for Review and Clear Response : Yes
Sub-Section Number : 1
Sub-Section Id : 67603374
Question Shuffling Allowed : Yes

Question Number : 21 Question Id : 6760331101 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The given figure shows a loop-the-loop track having radius 760 cm. A car without engine starts from a platform at a distance ‘$h$’ above the top of the loop and goes around the loop without falling off the track. The minimum value of ‘$h$’ required for a successful looping is ________ cm. (Ignore friction)

A steam engine intakes 80 g steam at 100°C per minute and cools it down to 30°C. The heat energy consumed by the steam engine per minute is ________ Cal. (Latent heat of vaporization of steam = 540 Cal/g)

Question Number : 22 Question Id : 6760331102 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
A steam engine intakes 80 g steam at 100°C per minute and cools it down to 30°C. The heat energy consumed by the steam engine per minute is ________ Cal. (Latent heat of vaporization of steam = 540 Cal/g)
Question Number: 23 Question Id: 6760331103 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
The length of a wire is increased by 20% by stretching. The percentage increase in resistance of wire will be _______.

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

Question Number: 24 Question Id: 6760331104 Question Type: SA
Correct Marks: 4 Wrong Marks: 0
An inductor coil stores 32 J of magnetic field energy and dissipates energy as heat at the rate of 64 W when a current of 8 A is passed through it. When this coil is joined across an ideal battery, the time constant of the circuit is ________ s (second).

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:
A photoelectric metal of work function 1 eV is used for photoelectric effect. When a radiation of wavelength 621 nm is incident on the photometal, the maximum kinetic energy of photoelectrons approximately is ________ (in eV). [Given $hc=1242$ eV-nm]

Two particles having position vectors $\vec{r}_1 = \left(2 \vec{i} + 3 \vec{j}\right) m$ and $\vec{r}_2 = \left(-10 \vec{i} + 3 \vec{j}\right) m$ are moving with velocities $\vec{v}_1 = \left(\vec{i} - 2 \vec{j}\right) m/s$ and $\vec{v}_2 = \left(5 \vec{i} - b \vec{j}\right) m/s$. If they meet after 3 second, the value of $b$ is ________.
Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100

Question Number : 27 Question Id : 6760331107 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
Two rods X and Y of identical dimensions are at temperature 40°C. If X is heated upto 200°C and Y is heated upto T°C, then also the new lengths are the same. If the ratio of the coefficients of linear expansion of X and Y is 8 : 10 then the value of T is ________ K.

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

Question Number : 28 Question Id : 6760331108 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The time period of a satellite of earth is 10 hours. If the separation between the earth and the satellite is increased to 16 times the previous value, the new time period will become ________ minutes.

Response Type : Numeric
A steel bar of mass $16 \times 10^{-3} \text{ kg}$ and density $8 \times 10^3 \text{ kg/m}^3$ is used to make a bar magnet. The magnetic moment of the bar magnet is $4 \text{ A}\cdot\text{m}^2$. The intensity of magnetization of the magnet will be _______ $\times 10^6 \text{ A/m}$.

A ray of monochromatic light is incident on one refracting face of prism of angle $75^\circ$. It passes through the prism and is incident on the other face at the critical angle. If the refractive index of the material of the prism is $\sqrt{2}$, the angle of incidence on the first face of the prism is _______. (degree).
<table>
<thead>
<tr>
<th><strong>Chemistry Section A</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section Id:</strong> 67603375</td>
</tr>
<tr>
<td><strong>Section Number:</strong> 3</td>
</tr>
<tr>
<td><strong>Section type:</strong> Online</td>
</tr>
<tr>
<td><strong>Mandatory or Optional:</strong> Mandatory</td>
</tr>
<tr>
<td><strong>Number of Questions:</strong> 20</td>
</tr>
<tr>
<td><strong>Number of Questions to be attempted:</strong> 20</td>
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<tr>
<td><strong>Section Marks:</strong> 80</td>
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<td><strong>Enable Mark as Answered Mark for Review and Clear Response:</strong> Yes</td>
</tr>
<tr>
<td><strong>Sub-Section Number:</strong> 1</td>
</tr>
<tr>
<td><strong>Sub-Section Id:</strong> 67603375</td>
</tr>
<tr>
<td><strong>Question Shuffling Allowed:</strong> Yes</td>
</tr>
</tbody>
</table>

Question Number: 31  Question Id: 6760331111  Question Type: MCQ  Option Shuffling: Yes  Is Question Mandatory: No  Correct Marks: 4  Wrong Marks: 1
The true value of a result is 5.0g and a student ‘A’ takes two measurements and reports the result as 5.3 and 5.4g. Another student ‘B’ repeats the measurement and reports 4.6 and 4.7g. Pick the statement from below that correctly describes the reports of A and B.

**Options:**

6760333331. Reports of both A and B are both precise and accurate

6760333332. Reports of both A and B are neither precise nor accurate

6760333333. Reports of A and B are both precise but not accurate

6760333334. Reports of A and B are both accurate but not precise.

**Question Number : 32 Question Id : 6760331112 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Given below are two statements:

**Statement I :** In CH₂F₂ molecule ∠FCF is less than 109.5°

**Statement II :** In CH₂F₂ molecule both ∠FCF and ∠HCH are equal

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

**Options :**
Both Statement I and Statement II are correct
Both Statement I and Statement II are incorrect
Statement I is correct but Statement II is incorrect
Statement I is incorrect but Statement II is correct.

The correct order of second ionization enthalpy is

Options:
V > Cr > Mn > Fe
Fe > Mn > Cr > V
Cr > Fe > Mn > V
Fe > Cr > Mn > V

The correct order of second ionization enthalpy is
Ellingham diagram does not predict the

**Options:**

6760333343. reducing ability of a metal

6760333344. rate of a reaction

6760333345. overall free energy of a reaction

6760333346. feasibility of a reaction

---

**Question Number:** 35  **Question Id:** 6760331115  **Question Type:** MCQ  **Option Shuffling:** Yes  **Is Question Mandatory:** No  **Correct Marks:** 4  **Wrong Marks:** 1

Sodium chromate reacts with hydrogen peroxide (H₂O₂) in the presence of dilute sulphuric acid to yield

**Options:**

6760333347. Chromyl chloride

6760333348. Chromium pentoxide

6760333349. Sodium dichromate

6760333350. Chromium sulphate
The percentage of oxides in Portland Cement decreases in the order

Options:

6760333351. CaO > SiO₂ > Al₂O₃ > MgO

6760333352. CaO > Al₂O₃ > MgO > SiO₂

6760333353. SiO₂ > CaO > MgO > Al₂O₃

6760333354. SiO₂ > CaO > Al₂O₃ > MgO

Select from the following, the correct order of reducing property.

Options:

6760333355. H₂S > H₂Se > H₂Te

6760333356. H₂Te > H₂Se > H₂S

6760333357. H₂Te > H₂S > H₂Se

6760333358. H₂Se > H₂S > H₂Te
Question Number : 38  Question Id : 6760331118  Question Type : MCQ
Option Shuffling : Yes  Is Question Mandatory : No
Correct Marks : 4  Wrong Marks : 1
Identify the actinoid which shows +5 oxidation state :

Options :
6760333359. Curium (Atomic no. 96)
6760333360. Thorium (Atomic no. 90)
6760333361. Americium (Atomic no. 95)
6760333362. Fermium (Atomic no. 100)

Question Number : 39  Question Id : 6760331119  Question Type : MCQ
Option Shuffling : Yes  Is Question Mandatory : No
Correct Marks : 4  Wrong Marks : 1
The correct statement for permanganate ion is

Options :
6760333363. It has highly distorted tetrahedral structure.
6760333364. It has two Mn—O double bonds.
6760333365. It can be made by reduction of MnO_4^{2-}.
6760333366. It has three π-bonds.
Question Number : 40 Question Id : 6760331120 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>A. ‘Blue baby’ syndrome</td>
<td>I. Mercury</td>
</tr>
<tr>
<td>B. Eutrophication</td>
<td>II. Cadmium</td>
</tr>
<tr>
<td>C. Minimata disease</td>
<td>III. Nitrate</td>
</tr>
<tr>
<td>D. Itai-Itai disease</td>
<td>IV. Phosphate</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below :

Options :


---

Question Number : 41 Question Id : 6760331121 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1
Given below are two statements:

**Statement I**: Histamine on Lassaigne’s test gives blue colour.

**Statement II**: Pencillin on Lassaigne’s test gives blue colour.

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

**Options**:

6760333371. Both Statement I and Statement II are correct

6760333372. Both Statement I and Statement II are incorrect

6760333373. Statement I is correct but Statement II is incorrect

6760333374. Statement I is incorrect but Statement II is correct.
Find out the correct major product from the following reaction (Me = –CH₃)

Options:

6760333375.

6760333376.

6760333377.
Question Number : 43  Question Id : 6760331123  Question Type : MCQ  Option Shuffling : Yes  Is Question Mandatory : No  Correct Marks : 4  Wrong Marks : 1
Find out the major product of the following reaction

\[ \text{[diagram]} \]

Options :

1. \[6760333379.\]
2. \[6760333380.\]
3. \[6760333381.\]
The correct arrangement of the following compounds in the order of increasing difficulty towards nucleophilic substitution is

Options:

I, II, IV, III

IV, III, I, II

I, II, III, IV
Product [A] obtained in the following transformation is

\[ \text{I, IV, II, III} \]

Options:

6760333387.

6760333388.
Sulphanilic acid on diazotisation and then reaction with N,N–dimethylaniline gives which of the following? Mark if their common name is correctly matched.

Options:

- Orange-II
- Pink-I dye
Question Number : 47  Question Id : 6760331127  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 - Polymer</th>
<th>List II - Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Bakelite</td>
<td>I. Branched chain</td>
</tr>
<tr>
<td>B. HDP</td>
<td>II. Linear</td>
</tr>
<tr>
<td>C. LDP</td>
<td>III. Network</td>
</tr>
<tr>
<td>D. Rayon</td>
<td>IV. Semi-synthetic</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below :

Options :

A → III, B → II, C → I, D → IV
The correct structure of \( \beta \)-D-deoxyribose present in DNA is

Options:

1. ![Structure 1](image1)
2. ![Structure 2](image2)
Match List I with List II:

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Hell-Volhard-Zelinsky reaction</td>
<td>I. Test for primary amines</td>
</tr>
<tr>
<td>B. Hinsberg’s reagent</td>
<td>II. Preparation of $\alpha$-halocarboxylic acids</td>
</tr>
<tr>
<td>C. Isocyanide test</td>
<td>III. Preparation of primary amines</td>
</tr>
<tr>
<td>D. Hoffmann bromamide degradation</td>
<td>IV. Differentiates 1°, 2° and 3° amines.</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below:
Which of the following is the most stable conformer?

Options:

6760333403. \[ A \rightarrow \text{II}, B \rightarrow \text{IV}, C \rightarrow \text{I}, D \rightarrow \text{III} \]

6760333404. \[ A \rightarrow \text{III}, B \rightarrow \text{IV}, C \rightarrow \text{I}, D \rightarrow \text{II} \]

6760333405. \[ A \rightarrow \text{II}, B \rightarrow \text{I}, C \rightarrow \text{IV}, D \rightarrow \text{III} \]

6760333406. \[ A \rightarrow \text{III}, B \rightarrow \text{I}, C \rightarrow \text{II}, D \rightarrow \text{IV} \]
Chemistry Section B

Section Id : 67603376
Section Number : 4
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 10
Number of Questions to be attempted : 5
Section Marks : 20
Enable Mark as Answered Mark for Review and Clear Response : Yes
Sub-Section Number : 1
Sub-Section Id : 67603376
Question Shuffling Allowed : Yes

Question Number : 51 Question Id : 6760331131 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
Assuming H_2 is an ideal gas, consider the quantity “ Pd ”, where ‘P’ is the pressure in atm and ‘d’ is the density in g L⁻¹. For P = 8.21 atm, it is observed that

\[ \left( \frac{\partial (Pd)}{\partial P} \right)_T = 10.0 \text{ g L}^{-1}. \]
The corresponding temperature in K is ______.

(Nearest integer)

[Assume R = 0.0821 L atm mol⁻¹ K⁻¹]
A graph of the uncertainty in position against the inverse of the uncertainty in wavelength of an electron is shown.

The wavelength of the electron in Å is ________ (Nearest integer)

[Assume minimum uncertainty product. Use π = 3.142, Use Δ(g(y)) = | g’(y) | Δy ; where g is an arbitrary function of y.]

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
100
An ideal monoatomic gas traverses the cycle ABCD as shown below in the figure. The work done during the cycle is $xPV$. The value of $x$ is ________. (Nearest integer)

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

The amount of ethyl alcohol ($C_2H_5OH$) that should be added to 1kg of water so that the solution does not freeze at $-4^\circ F$ ($K_f = 1.86 \text{ K kg mol}^{-1}$) in g is ________. (Nearest integer) (Given Atomic mass $C=12.0$, $H=1.0$, $O=16.0$ u)

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
If 1 M solution of acetic acid is diluted $x$ times so that pH of the solution is doubled. The value of $x$ is \( K_a = 1.8 \times 10^{-5} \), \( \text{________} \). \( \text{(Nearest integer)} \)

The logarithm of equilibrium constant \( \log_{10}K \) for the reaction

\[
Pd^{2+\text{(aq)}} + 4Cl^-\text{(aq)} \rightleftharpoons PdCl_4^{2-\text{(aq)}}
\]

is $x \times 10^{-1}$. The value of $x$ is \( \text{________} \). \( \text{(Nearest integer)} \)

[Given emf for the half-cell at 25°C

\[
Pd^{2+\text{(aq)}} + 2e^- \rightarrow Pd(s) \quad E^o = 0.83 \text{V}
\]

\[
PdCl_4^{2-\text{(aq)}} + 2e^- \rightarrow Pd(s) + 4Cl^- \quad E^o = 0.64 \text{V}
\]
The following results have been obtained during the kinetic studies of the reaction.

\[ A + 2B \rightarrow 2C \]

<table>
<thead>
<tr>
<th>Experiment</th>
<th>[A], mol L(^{-1})</th>
<th>[B], mol L(^{-1})</th>
<th>Initial rate of formation of [C], mol L(^{-1}) min(^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.60</td>
<td>0.60</td>
<td>0.20</td>
</tr>
<tr>
<td>2</td>
<td>0.60</td>
<td>1.20</td>
<td>0.80</td>
</tr>
<tr>
<td>3</td>
<td>1.20</td>
<td>0.60</td>
<td>0.40</td>
</tr>
</tbody>
</table>

The order of the reaction with respect to B is _______.

Response Type: Numeric
Evaluation Required For SA: Yes
Show Word Count: Yes
Answers Type: Equal
Question Number : 58 Question Id : 6760331138 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
200 mL of 0.85M acetic acid is shaken with 2g activated charcoal. The final concentration of the solution after adsorption is 0.75M. The mass of acetic acid in grams adsorbed per gram of charcoal is equal to _______×10⁻¹. (Nearest integer) (Given Atomic mass : C=12.0, H=1.0, O=16.0 u)

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

Question Number : 59 Question Id : 6760331139 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The number of ions produced in an aqueous solution from the octahedral complexe with stoichiometry CoCl₃.5H₂O, is ______.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
The strength of 25 volume solution of hydrogen peroxide in percentage is \[ \text{Percentage} = 10^{-1} \times 100 \]. (Nearest integer)
If \( S_1 = \{ x \in \mathbb{R} : x^2 + |x| - 2 = 0 \} \) and \( S_2 = \{ x \in \mathbb{R} : x^2 + x - 2 = 0 \} \), then

Options:

6760333421. \( S_1 \cup S_2 \) has 4 elements.

6760333422. \( S_1 \cup S_2 \) has 2 elements.

6760333423. \( S_1 \cap S_2 \) has 2 elements.

6760333424. \( S_1 \cap S_2 \) has 1 element.

Let \( A = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix} \) and \( B = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix} \).

Then the set \( \{ n \in \mathbb{N} \mid A^n + A^{n+1} + A^{n+2} = B \} \) is
Options:

6760333425. an empty set
6760333426. a finite set
6760333427. a proper infinite subset of \( \mathbb{N} \)
6760333428. equal to \( \mathbb{N} \)

Question Number: 63 Question Id: 6760331143 Question Type: MCQ Option Shuffling: Yes Is Question Mandatory: No
Correct Marks: 4 Wrong Marks: 1
Let \( A \) be a square matrix of order 3 and \( |A| = 3 \).

If \( |\text{Adj}(3 \text{ Adj}(4A))| = 2^m \cdot 3^n \), then the ordered pair \((m, n)\) is equal to.

Options:

6760333429. \((20, 8)\)
6760333430. \((20, 10)\)
6760333431. \((24, 9)\)
6760333432. \((24, 10)\)
Question Number : 64 Question Id : 6760331144 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
For the system of linear equations
\[ \begin{align*}
    x + 3y + 2z &= 7 \\
    x + \lambda y + 3z &= 8 \\
    x - 2y + 7z &= \mu,
\end{align*} \]
which of the following statements is NOT true?

Options :
6760333433. The system has infinitely many solutions if \( \lambda = 2 \) and \( \mu = 12 \).
6760333434. The system has no solution if \( \lambda = 2 \) and \( \mu \neq 12 \).
6760333435. The system has a unique solution if \( \lambda \neq 2 \) and \( \mu = 12 \).
6760333436. The system has no solution if \( \lambda \neq 2 \) and \( \mu \neq 12 \).

Question Number : 65 Question Id : 6760331145 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The value of the limit:
\[ \lim_{x \to 4} \frac{2^x + 2^{5-x} - 17}{8 - 2^{3/4}} \] is equal to

Options :
6760333437. \( e^{7/3} \)
Suppose that the function
\[ f(x) = \begin{cases} 
  x^2 - [x] + 2a; & x < -1 \\
  4x + 5 - b; & -1 \leq x < 2 \\
  3x^2 + 6[x] - 2a; & x \geq 2 
\end{cases} \]
is continuous on (−2, 3) for some values of $a$ and $b$ where $[x]$ denotes the greatest integer function. Then the value of $8ab$ is

Options:

135

−117

−104

99
Question Number : 67 Question Id : 6760331147 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
The sum of the intercepts on the coordinate axes made by the tangent at any point on the curve, \( \sqrt{x} + \sqrt{y} = 3 \) is

Options :

6760333445.
6760333446.
6760333447.
6760333448.

Question Number : 68 Question Id : 6760331148 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
A plane passes through the points A(1, 2, 3), B(3, 5, 2) and C(2, 1, 5). If P(a, b, c) be a point such that \( a(b + c) = bc \), then the acute angle which the line OP (O is the origin and \( P \neq O \)) makes with the plane is

Options :

\[ \frac{\pi}{4} \]
6760333449.
\[
\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)
\]

6760333450.

\[
\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)
\]

6760333451.

\[
\frac{\pi}{6}
\]

6760333452.

**Question**: 69  **Question Id**: 6760331149  **Question Type**: MCQ  **Option Shuffling**: Yes  **Is Question Mandatory**: No  **Correct Marks**: 4  **Wrong Marks**: 1

If \[
\int \frac{4x+13}{\sqrt{x^2+5x+6}} \, dx = A\sqrt{x^2+5x+6} + B\log_e\left|x + \frac{5}{2}\right| + \sqrt{x^2+5x+6} + C
\]

(C is a constant of integration), then the ordered pair \((A, B)\) is equal to

**Options**:

6760333453. \((3, 4)\)

6760333454. \(\left(\frac{4}{2}, 3\right)\)

6760333455. \((2, 3)\)
6760333456. \((4, 3)\)

Question Number : 70 Question Id : 67603331150 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

\[ \int_1^2 \left[ x^2 - 1 \right] + \left[ x^2 + 1 \right] \, dx \] is equal to \( [t] \) denotes the greatest integer \( \leq t \)

Options :

\[ \frac{14}{3} \]

\[ 5 - \sqrt{2} - \sqrt{3} \]

\[ 1 \]

\[ 10 - 2\sqrt{2} - 2\sqrt{3} \]

Question Number : 71 Question Id : 67603331151 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
If \( x = x(y) \) is the solution of the differential equation,

\[ 2 \cdot \sqrt{\sin x + \tan^{-1} y} \cdot \frac{dy}{dx} = \left( \cos x + \frac{1 + y^2}{1 + y^2} \frac{dy}{dx} \right) \] satisfying \( x(0) = 0 \) and \( x(1) = b \), then
The sum of the values of ‘$a$’ for which circles of radius $\frac{\sqrt{5}}{3}$, touch the straight lines, $x - 2y - a = 0$ and $3x - 6y + 7 = 0$, is

Options:

6760333461. $\frac{14}{3}$

6760333462. $\frac{-20}{3}$

6760333463. $\frac{10}{3}$
If the line $\alpha x + \beta y = 1$ touches the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then the locus of the point $(\alpha, \beta)$ is

Options:

\[
a^2x^2 - b^2y^2 = 1
\]

\[
b^2x^2 - a^2y^2 = 1
\]

\[
a^2x^2 + b^2y^2 = 1
\]

\[
b^2x^2 + a^2y^2 = 1
\]
If the tangents at the points \((2, y)\) on the ellipse, \(\frac{x^2}{16} + \frac{y^2}{4} = 1\) meet the tangent at \((4, y_1)\) on it at the points A and B, then the length of the line segment AB is

Options:

\[
2\sqrt{3}
\]

6760333473.

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

6760333474.

\[
\frac{4\sqrt{3}}{3}
\]

6760333475.

\[
4\sqrt{3}
\]

6760333476.

---

The distance of the origin from the point of intersection of the line, \(\frac{x}{2} = \frac{y+1}{3} = \frac{z-1}{-1}\) and the plane, \(2x + y + 6z + 1 = 0\) is

Options:

\[
4\sqrt{6}
\]

6760333477.
Question Number : 76 Question Id : 6760331156 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The plane which is parallel to \( \vec{r} \cdot (\hat{i} + 2\hat{j} + 3\hat{k}) = 6 \) and passes through (1, 2, 3), also passes through the point

Options :
6760333481. (2, 6, 1)
6760333482. (2, 6, 0)
6760333483. (3, 6, -1)
6760333484. (3, 5, 1)

Question Number : 77 Question Id : 6760331157 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1
If $\sum_{i=1}^{16} a_i - 6 = 8$ and $\sum_{i=1}^{16} (a_i - 6)^2 = 40$, then the standard deviation of $a_1, a_2, \ldots, a_{16}$ is

Options:
\[ \frac{2}{3}, \frac{3}{2}, \frac{5}{2}, \frac{2}{5} \]
A vertical pole consists of two portions, the lower being \( \frac{1}{3} \) rd of the whole. If the upper portion subtends an angle \( \tan^{-1}\left(\frac{1}{2}\right) \) at a point on a horizontal plane drawn through the foot of the pole and at a distance 40 m from it, then the height (in m) of the pole can be

Options:

6760333493. 36
6760333494. 35
6760333495. 40
6760333496. 60
If $\Box, \Diamond \in \{\land, \lor\}$ such that $(\neg q \land p) \Box (q \Diamond \neg p)$ is a tautology, then

Options:

6760333497. $\Box = \land$ and $\Diamond = \land$

6760333498. $\Box = \land$ and $\Diamond = \lor$

6760333499. $\Box = \lor$ and $\Diamond = \land$

6760333500. $\Box = \lor$ and $\Diamond = \lor$
Question Number : 81 Question Id : 6760331161 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
If \( x^2 - x + 1 = 0 \), then the value of \( \sum_{n=1}^{5} \left( x^n + \frac{1}{x^n} \right)^2 \) is \( \square \).

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 : 6760331162 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
The sum of modulus of all non-real roots of the equation, 
\( (x^2 + 4x + 6) (2x^2 + 8x + 14) = 12 \) is equal to \( \square \).

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 : 6760331163 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
If the number of permutations of the word “STATISTICS” in which all ‘S’ do not come together, is \((56)^2k\), then ‘\(k\)’ is equal to _______.

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

The remainder when \((2020)^{2022}\) is divided by 337 is _______.

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

Let \(n \geq 1\) be an odd integer and \(S_n = n^3 - (n - 1)^3 + (n - 2)^3 - \ldots + (-1)^{n-1} 1^3\).

If \(S_{199} - 4S_{99} = 10^6 \lambda\), then the value of \(\lambda\) is _______.
Let \( f(x) = x + 1 \) and \( g \) be maps on \( \mathbb{R} \) and \( h(n) = (g \circ f)(n+1) - (g \circ f)(n), \ n \in \mathbb{N}. \n\)

Further, \( h(1), h(2), h(3), h(4), \ldots \), is an A.P. and \( h(25) = 53, \ h(101) = 205. \n\)

If \( g(48) - g(2) = 100k \), then ‘\( k \)’ is equal to \( \square \).

If the area of the region enclosed by the curve \( y = x^2 \) and the line \( y = ax \) is 36 sq. units, then \( |a| \) is equal to \( \square \).
Question Number : 88 Question Id : 6760331168 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
If the area of \( \triangle ABC \) with vertices \( A(0, 1) \), \( B(2, 3) \) and \( C(4, b) \) is 6 sq. units, then the positive value of \( b \) is ________.

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 : 6760331169 Question Type : SA
Correct Marks : 4 Wrong Marks : 0
If \( f(x) \) be a differentiable function such that \( f(9) = 9 \) and \( f'(9) = 4 \), then \( \lim_{{x \to 9}} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3} \)
is ________.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
The number of solutions of the equation $x^2 = \cot x$ in $[0, 2\pi]$ is \[\square\].