In case the candidates want to submit documents in support of challenge of answer key, they should upload the PDF file.

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<th>Gender</th>
<th>Mobile No</th>
<th>Email ID</th>
<th>Standard</th>
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**B TECH - Mathematics**

- Paper B
- Objective
- Numerical

**B TECH - Chemistry Section A Objective**

- Question Type
- Question ID
- Correct Option(s)
- Option(s) ID for Challenge

**B TECH - Physics Section A**

- Question Type
- Question ID
- Correct Option(s)
- Option(s) ID for Challenge

**B TECH - Physics Section B**

- Question Type
- Question ID
- Correct Option(s)
- Option(s) ID for Challenge
Q.1 Match List I with List II:

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Intrinsic semiconductor</td>
<td>I. Fermi-level near the valence band</td>
</tr>
<tr>
<td>B. n-type semiconductor</td>
<td>II. Fermi-level in the middle of valence and conduction band</td>
</tr>
<tr>
<td>C. p-type semiconductor</td>
<td>III. Fermi-level near the conduction band</td>
</tr>
<tr>
<td>D. Metals</td>
<td>IV. Fermi-level inside the conduction band</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below:

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

Question Type: MCQ
Question ID: 3666942483
Option 1 ID: 3666947821
Option 2 ID: 3666947822
Option 3 ID: 3666947820
Option 4 ID: 3666947819
Status: Answered
Chosen Option: 4
Q.2 The equivalent resistance between A and B of the network shown in figure:

Options
1. \( \frac{11}{3} \, R \)
2. \( 14 \, R \)
3. \( 21 \, R \)
4. \( \frac{8}{3} \, R \)

Q.3 The average kinetic energy of a molecule of the gas is

Options
1. proportional to absolute temperature
2. proportional to volume
3. proportional to pressure
4. dependent on the nature of the gas
Q.4  A child stands on the edge of the cliff 10 m above the ground and throws a stone horizontally with an initial speed of 5 ms\(^{-1}\). Neglecting the air resistance, the speed with which the stone hits the ground will be ____ ms\(^{-1}\) (given, \(g = 10\) ms\(^{-2}\)).

Options  
1. 20  
2. 25  
3. 15  
4. 30

Q.5  A block of mass 5 kg is placed at rest on a table of rough surface. Now, if a force of 30N is applied in the direction parallel to surface of the table, the block slides through a distance of 50 m in an interval of time 10s. Coefficient of kinetic friction is (given, \(g = 10\) ms\(^{-2}\)).

Options  
1. 0.25  
2. 0.60  
3. 0.50  
4. 0.75
Q.6 Find the magnetic field at the point P in figure. The curved portion is a semicircle connected to two long straight wires.

Options
1. \( \frac{\mu_0 i}{2r} \left( 1 + \frac{2}{\pi} \right) \)
2. \( \frac{\mu_0 i}{2r} \left( 1 + \frac{1}{2} \right) \)
3. \( \frac{\mu_0 i}{2r} \left( 1 + \frac{1}{\pi} \right) \)
4. \( \frac{\mu_0 i}{2r} \left( \frac{1}{2} + \frac{1}{2\pi} \right) \)

Status: Answered
Chosen Option: 3

Q.7 The mass of proton, neutron and helium nucleus are respectively 1.0073 \( u \), 1.0087 \( u \) and 4.0015 \( u \). The binding energy of helium nucleus is:

Options 1. 14.2 MeV
2. 56.8 MeV
3. 28.4 MeV
4. 7.1 MeV

Status: Answered
Chosen Option: 3
Q.8 Which of the following frequencies does not belong to FM broadcast.

Options
1. 99 MHz
2. 64 MHz
3. 106 MHz
4. 89 MHz

Q.9 Match List I with List II:

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. AC generator</td>
<td>I. Presence of both L and C</td>
</tr>
<tr>
<td>B. Transformer</td>
<td>II. Electromagnetic Induction</td>
</tr>
<tr>
<td>C. Resonance phenomenon to occur</td>
<td>III. Quality factor</td>
</tr>
<tr>
<td>D. Sharpness of resonance</td>
<td>IV. Mutual Induction</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below:

Options
1. A-II, B-IV, C-I, D-III
2. A-IV, B-II, C-I, D-III
3. A-II, B-I, C-III, D-IV
4. A-IV, B-III, C-I, D-II
Q.10
Let \( \sigma \) be the uniform surface charge density of two infinite thin plane sheets shown in figure. Then the electric fields in three different region \( E_I, E_{II} \) and \( E_{III} \) are:

![Diagram showing two infinite thin plane sheets]

Options
1. \( \vec{E}_I = \frac{\sigma}{2\varepsilon_0} \hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{\sigma}{2\varepsilon_0} \hat{n} \)
2. \( \vec{E}_I = 0, \vec{E}_{II} = \frac{\sigma}{\varepsilon_0} \hat{n}, \vec{E}_{III} = 0 \)
3. \( \vec{E}_I = \frac{2\sigma}{\varepsilon_0} \hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{2\sigma}{\varepsilon_0} \hat{n} \)
4. \( \vec{E}_I = -\frac{\sigma}{\varepsilon_0} \hat{n}, \vec{E}_{II} = 0, \vec{E}_{III} = \frac{\sigma}{\varepsilon_0} \hat{n} \)

Q.11
A proton moving with one tenth of velocity of light has a certain de Broglie wavelength of \( \lambda \). An alpha particle having certain kinetic energy has the same de-Broglie wavelength \( \lambda \). The ratio of kinetic energy of proton and that of alpha particle is:

Options
1. \( 1 : 4 \)
2. \( 2 : 1 \)
3. \( 4 : 1 \)
4. \( 1 : 2 \)
Q.12 Given below are two statements:

**Statement I:** Acceleration due to gravity is different at different places on the surface of earth.

**Statement II:** Acceleration due to gravity increases as we go down below the earth’s surface.

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

1. Both Statement I and Statement II are true
2. Statement I is false but Statement II is true
3. Both Statement I and Statement II are false
4. Statement I is true but Statement II is false

Question Type : MCQ
Question ID : 3666942497
Option 1 ID : 3666947875
Option 2 ID : 3666947878
Option 3 ID : 3666947876
Option 4 ID : 3666947877
Status : Answered
Chosen Option : 2

Q.13 A steel wire with mass per unit length $7.0 \times 10^{-3}$ kg m$^{-1}$ is under tension of 70 N. The speed of transverse waves in the wire will be:

1. $200 \pi$ m/s
2. 50 m/s
3. 100 m/s
4. 10 m/s

Question Type : MCQ
Question ID : 3666942493
Option 1 ID : 3666947862
Option 2 ID : 3666947860
Option 3 ID : 3666947861
Option 4 ID : 3666947859
Status : Answered
Chosen Option : 3
Q.14
Match List I with List II:

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
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<tbody>
<tr>
<td>A. Microwaves</td>
<td>I. Radio active decay of the nucleus</td>
</tr>
<tr>
<td>B. Gamma rays</td>
<td>II. Rapid acceleration and deceleration of</td>
</tr>
<tr>
<td></td>
<td>electron in aerials</td>
</tr>
<tr>
<td>C. Radio waves</td>
<td>III. Inner shell electrons</td>
</tr>
<tr>
<td>D. X-rays</td>
<td>IV. Klystron valve</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below:

Options 1. A-IV, B-I, C-II, D-III
2. A-I, B-II, C-III, D-IV
3. A-I, B-III, C-IV, D-II
4. A-IV, B-III, C-II, D-I

Question Type: MCQ
Question ID: 3666942487
Option 1 ID: 3666947835
Option 2 ID: 3666947836
Option 3 ID: 3666947838
Option 4 ID: 3666947837
Status: Answered
Chosen Option: 3

Q.15
A mercury drop of radius $10^{-3}$ m is broken into 125 equal size droplets. Surface tension of mercury is 0.45 Nm$^{-1}$. The gain in surface energy is:

Options 1. $17.5 \times 10^{-5}$ J
2. $2.26 \times 10^{-5}$ J
3. $28 \times 10^{-5}$ J
4. $5 \times 10^{-5}$ J

Question Type: MCQ
Question ID: 3666942498
Option 1 ID: 3666947882
Option 2 ID: 3666947879
Option 3 ID: 3666947881
Option 4 ID: 366947880
Status: Answered
Chosen Option: 3
Q.16  

`n` polarizing sheets are arranged such that each makes an angle 45° with the preceding sheet. An unpolarized light of intensity I is incident into this arrangement. The output intensity is found to be $I/64$. The value of $n$ will be:

Options
1. 3
2. 4
3. 5
4. 6

Q.17

An object moves with speed $v_1, v_2$ and $v_3$ along a line segment AB, BC and CD respectively as shown in figure. Where AB=BC and AD=3AB, then average speed of the object will be:

Options
1. $\frac{3v_1v_2v_3}{(v_1v_2 + v_2v_3 + v_3v_1)}$
2. $\frac{(v_1 + v_2 + v_3)}{3v_1v_2v_3}$
3. $\frac{v_1v_2v_3}{3(v_1v_2 + v_2v_3 + v_3v_1)}$
4. $\frac{(v_1 + v_2 + v_3)}{3}$
Q.18 \[ (P + \frac{a}{V^2})(V - b) = RT \] represents the equation of state of some gases. Where 
\( P \) is the pressure, \( V \) is the volume, \( T \) is the temperature and \( a, b, R \) are the constants. The physical quantity, which has dimensional formula as that of \( \frac{b^2}{a} \), will be:

Options 1. Bulk modulus
2. Modulus of rigidity
3. Compressibility
4. Energy density

Q.19 If earth has a mass nine times and radius twice to that of a planet P. Then \( \frac{v_e}{3} \sqrt{\frac{1}{9}} \) ms\(^{-1} \) will be the minimum velocity required by a rocket to pull out of gravitational force of P, where \( v_e \) is escape velocity on earth. The value of \( x \) is

Options 1. 1
2. 2
3. 18
4. 3
Q.20
A sample of gas at temperature $T$ is adiabatically expanded to double its volume. The work done by the gas in the process is \( \left( \text{given, } \gamma = \frac{3}{2} \right) \):

Options

1. \( W = \frac{RT}{T} \left[ 2 - \sqrt{2} \right] \)

2. \( W = \frac{TR}{R} \left[ \sqrt{2} - 2 \right] \)

3. \( W = RT \left[ 2 - \sqrt{2} \right] \)

4. \( W = TR \left[ \sqrt{2} - 2 \right] \)

Q.21
A light of energy 12.75 eV is incident on a hydrogen atom in its ground state. The atom absorbs the radiation and reaches to one of its excited states. The angular momentum of the atom in the excited state is \( \frac{\hbar}{\pi} \times 10^{-17} \text{ eVs} \). The value of \( x \) is _________ (use \( \hbar = 4.14 \times 10^{-15} \text{ eVs} \), \( c = 3 \times 10^8 \text{ ms}^{-1} \)).

Given--
Answer : 

Q.22
A charge particle of 2 \( \mu \)C accelerated by a potential difference of 100V enters a region of uniform magnetic field of magnitude 4 mT at right angle to the direction of field. The charge particle completes semicircle of radius 3 cm inside magnetic field. The mass of the charge particle is ________ \( \times 10^{-18} \text{ kg} \).

Given--
Answer : 

Q.23
A certain pressure 'P' is applied to 1 litre of water and 2 litre of a liquid separately. Water gets compressed to 0.01% whereas the liquid gets compressed to 0.03%. The ratio of Bulk modulus of water to that of the liquid is \( \frac{3}{x} \). The value of \( x \) is ________.

Given--
Answer :
Q.24
A solid cylinder is released from rest from the top of an inclined plane of inclination 30° and length 60 cm. If the cylinder rolls without slipping, its speed upon reaching the bottom of the inclined plane is ________ m/s⁻¹.

(Given g = 10 ms⁻²)

Q.25
A small particle moves to position 5\hat{i} - 2\hat{j} + \hat{k} from its initial position 2\hat{i} + 3\hat{j} - 4\hat{k} under the action of force 5\hat{i} + 2\hat{j} + 7\hat{k} N. The value of work done will be ________ J.

Q.26
A series LCR circuit is connected to an ac source of 220V, 50Hz. The circuit contain a resistance R = 100Ω and an inductor of inductive reactance X_L = 79.6Ω. The capacitance of the capacitor needed to maximize the average rate at which energy is supplied will be ________ μF.

Q.27
Two equal positive point charges are separated by a distance 2a. The distance of a point from the centre of the line joining two charges on the equatorial line (perpendicular bisector) at which force experienced by a test charge q₀ becomes maximum is \frac{a}{\sqrt{2}}. The value of x is ________.
Q.28  A thin cylindrical rod of length 10 cm is placed horizontally on the principle axis of a concave mirror of focal length 20 cm. The rod is placed in such a way that mid point of the rod is at 40 cm from the pole of mirror. The length of the image formed by the mirror will be \( \frac{x}{3} \) cm. The value of \( x \) is ________.

Given--
Answer :

Question Type : SA
Question ID : 3666942504
Status : Not Answered

Q.29  In an experiment to find emf of a cell using potentiometer, the length of null point for a cell of emf 1.5 V is found to be 60 cm. If this cell is replaced by another cell of emf \( E \), the length of null point increases by 40 cm. The value of \( E \) is \( \frac{x}{10} \) V. The value of \( x \) is ________.

Given--
Answer :

Question Type : SA
Question ID : 3666942502
Status : Not Answered

Q.30  The amplitude of a particle executing SHM is 3 cm. The displacement at which its kinetic energy will be 25% more than the potential energy is: ________ cm.

Given--
Answer :

Question Type : SA
Question ID : 3666942510
Status : Not Answered

Section : Chemistry Section A
Q.31

Highest oxidation state of Mn is exhibited in Mn$_2$O$_7$. The correct statements about Mn$_2$O$_7$ are:

(A) Mn is tetrahedrally surrounded by oxygen atoms.
(B) Mn is octahedrally surrounded by oxygen atoms.
(C) Contains Mn-O-Mn bridge.
(D) Contains Mn-Mn bond.

Choose the correct answer from the options given below:

Options

1. A and D only
2. B and D only
3. B and C only
4. A and C only

Q.32

A solution of FeCl$_3$ when treated with K$_4$[Fe(CN)$_6$] gives a prussian blue precipitate due to the formation of

Options

1. K[Fe$_2$(CN)$_6$]
2. Fe$_4$[Fe(CN)$_6$]$_3$
3. Fe$_2$[Fe(CN)$_6$]$_2$
4. Fe[Fe(CN)$_6$]

Question Type: MCQ
Question ID: 3666942519
Option 1 ID: 3666947933
Option 2 ID: 3666947936
Option 3 ID: 3666947934
Option 4 ID: 3666947935
Status: Answered
Chosen Option: 4
Q.33

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

**Assertion A:** In an Ellingham diagram, the oxidation of carbon to carbon monoxide shows a negative slope with respect to temperature.

**Reason R:** CO tends to get decomposed at higher temperature.

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

Options

1. **A is correct but R is not correct**

2. **Both A and R are correct but R is NOT the correct explanation of A**

3. **Both A and R are correct and R is the correct explanation of A**

4. **A is not correct but R is correct**

---

Q.34

How can photochemical smog be controlled?

Options

1. By using tall chimneys.

2. By using catalyst.


4. By using catalytic convertors in the automobiles/industry.
Q.35
Which of the following complex will show largest splitting of d-orbitals?

Options
1. \([\text{Fe}(\text{C}_2\text{O}_4)^3]^-\)
2. \([\text{Fe}(\text{NH}_3)_6]^{2+}\)
3. \([\text{FeF}_6]^{3-}\)
4. \([\text{Fe}(\text{CN})_6]^{3-}\)

Question Type : MCQ
Question ID : 3666942520
Option 1 ID : 3666947938
Option 2 ID : 3666947940
Option 3 ID : 3666947937
Option 4 ID : 3666947939
Status : Not Answered
Chosen Option : --

Q.36
Match List I with List II

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Slaked lime</td>
<td>(I) NaOH</td>
</tr>
<tr>
<td>(B) Dead burnt plaster</td>
<td>(II) Ca(NOH)_2</td>
</tr>
<tr>
<td>(C) Caustic soda</td>
<td>(III) Na_2CO_3.10H_2O</td>
</tr>
<tr>
<td>(D) Washing soda</td>
<td>(IV) CaSO_4</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below:

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

Question Type : MCQ
Question ID : 3666942518
Option 1 ID : 3666947930
Option 2 ID : 3666947931
Option 3 ID : 3666947932
Option 4 ID : 3666947929
Status : Answered
Chosen Option : 3
Q.37
But-2-yne is reacted separately with one mole of Hydrogen as shown below:

\[
\text{B} \xrightleftharpoons{\text{Na (liq) NH}_3}{\Delta} \text{CH}_3\text{C}≡\text{C}≡\text{CH}_3 + \text{H}_2 \xrightarrow{\text{Pd/C}} \text{A}
\]

A. A is more soluble than B.
B. The boiling point & melting point of A are higher and lower than B respectively.
C. A is more polar than B because dipole moment of A is zero.
D. Br_2 adds easily to B than A.

Identify the incorrect statements from the options given below:

Options
1. A and B only
2. B and C only
3. B, C & D only
4. A, C & D only

Q.38
Given below are two statements:

**Statement I:** Chlorine can easily combine with oxygen to form oxides; and the product has a tendency to explode.

**Statement II:** Chemical reactivity of an element can be determined by its reaction with oxygen and halogens.

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

Options
1. Statement I is true but Statement II is false
2. Statement I is false but Statement II is true
3. Both the Statements I and II are true
4. Both the Statements I and II are false
Q.39

Match List I with List II

<table>
<thead>
<tr>
<th>List I</th>
<th>Functional group / Class of Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Molisch’s Test</td>
<td>(I) Peptide</td>
</tr>
<tr>
<td>(B) Biuret Test</td>
<td>(II) Carbohydrate</td>
</tr>
<tr>
<td>(C) Carbylamine Test</td>
<td>(III) Primary amine</td>
</tr>
<tr>
<td>(D) Schiffs Test</td>
<td>(IV) Aldehyde</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below:

Options 1. (A) – III, (B) – IV, (C) – I, (D) – II

2. (A) – II, (B) – I, (C) – III, (D) – IV

3. (A) – I, (B) – II, (C) – III, (D) – IV

4. (A) – III, (B) – IV, (C) – II, (D) – I

Q.40

Choose the correct statement(s):

A. Beryllium oxide is purely acidic in nature.

B. Beryllium carbonate is kept in the atmosphere of CO₂.

C. Beryllium sulphate is readily soluble in water.

D. Beryllium shows anomalous behavior.

Choose the correct answer from the options given below:

Options

1. B, C and D only

2. A only

3. A, B and C only

4. A and B only
Q.41

Resonance in carbonate ion (CO$_3^{2-}$) is

\[
\begin{array}{c}
\text{O} \\
\text{C} \\
\text{O} \\
\end{array}
\quad \leftrightarrow 
\begin{array}{c}
\text{O} \\
\text{C} = \text{O} \\
\text{O} \\
\end{array}
\quad \leftrightarrow 
\begin{array}{c}
\text{O} \\
\text{C} \equiv \text{O} \\
\text{O} \\
\end{array}

Which of the following is true?

Options
1. Each structure exists for equal amount of time.
2. CO$_3^{2-}$ has a single structure i.e., resonance hybrid of the above three structures.
3. It is possible to identify each structure individually by some physical or chemical method.
4. All these structures are in dynamic equilibrium with each other.
Q.42

Which of the following are the example of double salt?

A. FeSO₄·(NH₄)₂SO₄·6H₂O
B. CuSO₄·4NH₃·H₂O
C. K₂SO₄·Al₂(SO₄)₃·24H₂O
D. Fe(CN)₂·4KCN

Choose the correct answer

Options

1. B and D only
2. A and C only
3. A, B and D only
4. A and B only
Q.43
Which of the following represents the lattice structure of \( A_{0.95}O \) containing \( A^{2+} \), \( A^{3+} \) and \( O^{2-} \) ions?

\[ \text{Options:} \ A^{2+} \quad A^{3+} \quad O^{2-} \]

A. 

B. 

C. 

Options
1. B only
2. B and C only
3. A and B only
4. A only

Question Type: MCQ
Question ID: 3666942511
Option 1 ID: 3666947902
Option 2 ID: 3666947904
Option 3 ID: 3666947903
Option 4 ID: 3666947901
Status: Not Answered
Chosen Option: --
Q.44

Decreasing order of dehydration of the following alcohols is

a
b
  c
  d

Options

1. b > d > e > a
2. d > b > c > a
3. b > a > d > e
4. a > d > b > e

Question Type : MCQ
Question ID : 3666942527
Option 1 ID : 3666947966
Option 2 ID : 3666947968
Option 3 ID : 3666947967
Option 4 ID : 3666947965
Status : Answered
Chosen Option : 4
Q.45

The correct representation in six-membered pyranose form for the following sugar [X] is

CH\text{O} \\
HO \quad \text{H} \\
HO \quad \text{H} \\
H \quad \text{OH} \\
H \quad \text{OH} \\
H_2\text{COH} \\
Sugar \ [X]

Options

1. 

2. 

3. 

4. 

Question Type : MCQ
Question ID : 3666942529
Option 1 ID : 3666947976
Option 2 ID : 3666947973
Option 3 ID : 3666947975
Option 4 ID : 3666947974
Status : Not Answered
Chosen Option : --
Q.46

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

**Assertion A:** Hydrogen is an environment friendly fuel.

**Reason R:** Atomic number of hydrogen is 1 and it is a very light element.

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

1. A is false but R is true
2. Both A and R are true and R is the correct explanation of A
3. A is true but R is false
4. Both A and R are true but R is NOT the correct explanation of A

---

Q.47

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

**Assertion A:** Amongst He, Ne, Ar and Kr: 1g of activated charcoal absorbs more of Kr.

**Reason R:** The critical volume $V_c$ (cm$^3$ mol$^{-1}$) and critical pressure $P_c$ (atm) is highest for Krypton but the compressibility factor at critical point $Z_c$ is lowest for Krypton.

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

1. A is true but R is false
2. Both A and R are true and R is the correct explanation of A
3. A is false but R is true
4. Both A and R are true but R is NOT the correct explanation of A
Q.48  
**Match List I with List II**

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Tranquilizers</td>
<td>(I) Anti blood clotting</td>
</tr>
<tr>
<td>(B) Aspirin</td>
<td>(II) Salvarsan</td>
</tr>
<tr>
<td>(C) Antibiotic</td>
<td>(III) antidepressant drugs</td>
</tr>
<tr>
<td>(D) Antiseptic</td>
<td>(IV) soframicine</td>
</tr>
</tbody>
</table>

Choose the correct answer from the options given below:

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

---

Q.49  
**Identify the incorrect option from the following:**

**Options**

1. ![Chemical Reaction 1](image1.png)
   
   (i) NaOH, 623 K, 300 atm  
   (ii) HCl

2. ![Chemical Reaction 2](image2.png)  
   
   Br + KOH (aICe) → OH + KBr

3. ![Chemical Reaction 3](image3.png)
   
   ![Chemical Reaction 4](image4.png)

4. ![Chemical Reaction 5](image5.png)
   
   Br + KOH (aq) → OH + KBr

---

**Q.48**  
**Q.49**

---

**Question Type:** MCQ  
**Question ID:** 3666942530  
**Option 1 ID:** 3666947978  
**Option 2 ID:** 3666947980  
**Option 3 ID:** 3666947977  
**Option 4 ID:** 3666947979  
**Status:** Answered  
**Chosen Option:** 2

---

**Question Type:** MCQ  
**Question ID:** 3666942525  
**Option 1 ID:** 3666947958  
**Option 2 ID:** 3666947959  
**Option 3 ID:** 3666947960  
**Option 4 ID:** 3666947957  
**Status:** Answered  
**Chosen Option:** 2
Q.50

In the following reaction, ‘A’ is

\[ \text{NH}_2 \ \text{CH}_2\text{OH} \xrightarrow{\text{EtO}} \text{OEt} \rightarrow 'A' \]

Major product

Options

1. 

2. 

3. 

4. 

Q.51

The density of 3 M solution of NaCl is 1.0 g mL\(^{-1}\). Molality of the solution is \( \text{\( x \times 10^{-2}\) m.} \ (\text{Nearest integer}) \).

Given: Molar mass of Na and Cl is 23 and 35.5 g mol\(^{-1}\) respectively.

Given --

Answer:

Question Type: MCQ
Question ID: 3666942526
Option 1 ID: 3666947964
Option 2 ID: 3666947961
Option 3 ID: 3666947962
Option 4 ID: 3666947963
Status: Not Answered

Chosen Option: --

Section: Chemistry Section B

Q.51

The density of 3 M solution of NaCl is 1.0 g mL\(^{-1}\). Molality of the solution is \( \text{\( x \times 10^{-2}\) m.} \ (\text{Nearest integer}) \).

Given: Molar mass of Na and Cl is 23 and 35.5 g mol\(^{-1}\) respectively.

Given --

Answer:

Question Type: SA
Question ID: 3666942531
Status: Not Answered
Q.52
A and B are two substances undergoing radioactive decay in a container.
The half life of A is 15 min and that of B is 5 min. If the initial concentration
of B is 4 times that of A and they both start decaying at the same time, how
much time will it take for the concentration of both of them to be same?

Answer:

Question Type: SA
Question ID: 3666942537
Status: Not Answered

Q.53
Number of isomeric compounds with molecular formula C₆H₁₀O which (i) do
not dissolve in NaOH (ii) do not dissolve in HCl. (iii) do not give orange
precipitate with 2, 4-DNP (iv) on hydrogenation give identical compound with
molecular formula C₆H₁₂O is__________.

Answer:

Question Type: SA
Question ID: 3666942540
Status: Not Answered

Q.54
25 mL of an aqueous solution of KCl was found to require 20 mL of 1 M
AgNO₃ solution when titrated using K₂CrO₄ as an indicator. What is the
depression in freezing point of KCl solution of the given concentration?

Answer:

Given:

Assume
1) 100% ionization and
2) density of the aqueous solution as 1 g mL⁻¹

Question Type: SA
Question ID: 3666942534
Status: Not Answered
Q.55
Given
Answer:

At 25°C, the enthalpy of the following processes are given:

\[ \begin{align*}
\text{H}_2(g) + \text{O}_2(g) & \rightarrow 2\text{OH(g)} \quad \Delta H^\circ = 78 \text{ kJ mol}^{-1} \\
\text{H}_2(g) + \frac{1}{2}\text{O}_2(g) & \rightarrow \text{H}_2\text{O(g)} \quad \Delta H^\circ = -242 \text{ kJ mol}^{-1} \\
\text{H}_2(g) & \rightarrow 2\text{H(g)} \quad \Delta H^\circ = 436 \text{ kJ mol}^{-1} \\
\frac{1}{2}\text{O}_2(g) & \rightarrow \text{O(g)} \quad \Delta H^\circ = 249 \text{ kJ mol}^{-1}
\end{align*} \]

What would be the value of X for the following reaction? ________

(Nearest integer)

\[ \text{H}_2\text{O(g)} \rightarrow \text{H(g)}+\text{OH(g)} \quad \Delta H^\circ = X \text{ kJ mol}^{-1} \]

Q.56
Given:
Answer:

Electrons in a cathode ray tube have been emitted with a velocity of 1000 m s\(^{-1}\). The number of following statements which is/are true about the emitted radiation is ________.

\( h = 6 \times 10^{-34} \text{ J s, } m_e = 9 \times 10^{-31} \text{ kg.} \)

(A) The deBroglie wavelength of the electron emitted is 696.67 nm.

(B) The characteristic of electrons emitted depend upon the material of the electrodes of the cathode ray tube.

(C) The cathode rays start from cathode and move towards anode.

(D) The nature of the emitted electrons depends on the nature of the gas present in cathode ray tube.

Q.57
Given:
Answer:

The total number of chiral compound/s from the following is ________.

\[ \begin{align*}
\textbf{Ph} & \quad \begin{array}{c}
\text{COOH,} \\
\text{COOH,} \\
\text{COOH,}
\end{array} & \quad \begin{array}{c}
\text{OH,} \\
\text{OH,} \\
\text{OH,}
\end{array} & \quad \begin{array}{c}
\text{Cl} \\
\text{Cl} \\
\text{Cl}
\end{array}
\end{align*} \]
Q.58
Sum of oxidation states of bromine in bromic acid and perbromic acid is ____________.

Given --
Answer :

Q.59
(i) \( X(g) \rightleftharpoons Y(g) + Z(g) \) \( K_{p1} = 3 \)
(ii) \( A(g) \rightleftharpoons 2B(g) \) \( K_{p2} = 1 \)

If the degree of dissociation and initial concentration of both the reactants \( X(g) \) and \( A(g) \) are equal, then the ratio of the total pressure at equilibrium \( \frac{p_1}{p_2} \) is equal to \( x:1 \). The value of \( x \) is ____________ (Nearest integer)

Given --
Answer :

Q.60
At what pH, given half cell \( \text{MnO}_4^- (0.1 \text{ M}) \mid \text{Mn}^{2+} (0.001 \text{ M}) \) will have electrode potential of 1.282 V? ____________ (Nearest Integer)

Given \( E^{\circ}_{\text{MnO}_4^-/\text{Mn}^{2+}} = 1.54 \text{V} \), \( \frac{2.303RT}{F} = 0.059 \text{V} \)

Given --
Answer :

Section: Mathematics Section A
Q.61
Let $S$ be the set of all solutions of the equation $\cos^{-1}(2x) - 2\cos^{-1}(\sqrt{1-x^2}) = \pi$, $x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$. Then $\sum_{x \in S} 2\sin^{-1}(x^2 - 1)$ is equal to

Options
1. $\frac{-2\pi}{3}$
2. $\pi - 2\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$
3. $0$
4. $\pi - \sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$

Q.62
If $y = y(x)$ is the solution curve of the differential equation

$$\frac{dy}{dx} + y\tan x = x\sec x, \quad 0 \leq x \leq \frac{\pi}{3}, \quad y(0) = 1,$$

then $y\left(\frac{\pi}{6}\right)$ is equal to

Options
1. $\frac{\pi}{12} - \frac{\sqrt{3}}{2} \log_e\left(\frac{2}{e^{\sqrt{3}}\sqrt{3}}\right)$
2. $\frac{\pi}{12} - \frac{\sqrt{3}}{2} \log_e\left(\frac{2\sqrt{3}}{e}\right)$
3. $\frac{\pi}{12} + \frac{\sqrt{3}}{2} \log_e\left(\frac{2}{e^{\sqrt{3}}\sqrt{3}}\right)$
4. $\frac{\pi}{12} + \frac{\sqrt{3}}{2} \log_e\left(\frac{2\sqrt{3}}{e}\right)$
Q.63  
The sum to 10 terms of the series  
\[ \frac{1}{1+1^2+1^4} + \frac{2}{1+2^2+2^4} + \frac{3}{1+3^2+3^4} + \ldots \text{ is} \]

Options  
1. \( \frac{55}{111} \)  
2. \( \frac{58}{111} \)  
3. \( \frac{59}{111} \)  
4. \( \frac{56}{111} \)

Q.64  
The value of  
\[ \frac{1}{1!50!} + \frac{1}{3!48!} + \frac{1}{5!46!} + \ldots + \frac{1}{49!2!} + \frac{1}{51!1!} \text{ is} \]

Options  
1. \( \frac{2^{51}}{50!} \)  
2. \( \frac{2^{51}}{51!} \)  
3. \( \frac{2^{50}}{51!} \)  
4. \( \frac{2^{50}}{50!} \)
Q.65

If the orthocentre of the triangle, whose vertices are (1, 2), (2, 3) and (3, 1) is 
\((\alpha, \beta)\), then the quadratic equation whose roots are \(\alpha + 4\beta\) and \(4\alpha + \beta\), is 

Options 
1. \(x^2 - 20x + 99 = 0\) 
2. \(x^2 - 22x + 120 = 0\) 
3. \(x^2 - 18x + 80 = 0\) 
4. \(x^2 - 19x + 90 = 0\)

Q.66

The negation of the expression \(q \lor (\sim q) \land p\) is equivalent to 

Options 
1. \((\sim p) \lor q\) 
2. \((\sim p) \land (\sim q)\) 
3. \((\sim p) \lor (\sim q)\) 
4. \(p \land (\sim q)\)

Q.67

Let \(f(x) = 2x + \tan^{-1}x\) and \(g(x) = \log_e(\sqrt{1 + x^2} + x), x \in [0, 3]\). 

Then 

Options 
1. \(\min f'(x) = 1 + \max g'(x)\) 
2. there exists \(\hat{x} \in [0, 3]\) such that \(f'(\hat{x}) < g'(\hat{x})\) 
3. \(\max f(x) > \max g(x)\) 
4. there exist \(0 < x_1 < x_2 < 3\) such that \(f(x) < g(x), \forall x \in (x_1, x_2)\)
Q.68

The area enclosed by the closed curve C given by the differential equation
\[ \frac{dy}{dx} + \frac{x+a}{y-2} = 0, \quad y(1) = 0 \text{ is } 4\pi. \]

Let P and Q be the points of intersection of the curve C and the y-axis. If normals at P and Q on the curve C intersect x-axis at points R and S respectively, then the length of the line segment RS is

Options

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

2. 2

3. \( \frac{4\sqrt{3}}{3} \)

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

Q.69

Let \( S = \{ x : x \in \mathbb{R} \text{ and } (\sqrt{3} + \sqrt{2})^{x^2-4} + (\sqrt{3} - \sqrt{2})^{x^2-4} = 10 \} \).

Then \( n(S) \) is equal to

Options

1. 0

2. 6

3. 2

4. 4
Q.70 Let the image of the point \( P(2, -1, 3) \) in the plane \( x + 2y - z = 0 \) be \( Q \). Then the distance of the plane \( 3x + 2y + z + 29 = 0 \) from the point \( Q \) is

Options
1. \( \frac{22\sqrt{2}}{7} \)
2. \( 3\sqrt{14} \)
3. \( \frac{24\sqrt{2}}{7} \)
4. \( 2\sqrt{14} \)

Question Type : MCQ
Question ID : 3666942555
Option 1 ID : 3666948047
Option 2 ID : 3666948049
Option 3 ID : 3666948048
Option 4 ID : 3666948050
Status : Answered
Chosen Option : 1

Q.71 \( \lim_{n \to \infty} \left[ \frac{1}{1+n} + \frac{1}{2+n} + \frac{1}{3+n} + \ldots + \frac{1}{2n} \right] \) is equal to

Options
1. \( \log_e \left( \frac{3}{2} \right) \)
2. \( \log_e 2 \)
3. \( \log_e \left( \frac{2}{3} \right) \)
4. \( 0 \)

Question Type : MCQ
Question ID : 3666942550
Option 1 ID : 3666948029
Option 2 ID : 3666948030
Option 3 ID : 3666948028
Option 4 ID : 3666948027
Status : Answered
Chosen Option : 3
Q.72

Let \( f(x) = \begin{vmatrix} 1 + \sin^2 x & \cos^2 x & \sin 2x \\ \sin^2 x & 1 + \cos^2 x & \sin 2x \\ \sin^2 x & \cos^2 x & 1 + \sin 2x \end{vmatrix} \), \( x \in \left[ \frac{\pi}{6}, \frac{\pi}{3} \right] \). If \( \alpha \) and \( \beta \) respectively are the maximum and the minimum values of \( f \), then

**Options**

1. \( \alpha^2 + \beta^2 = \frac{9}{2} \)
2. \( \alpha^2 - \beta^2 = 4\sqrt{3} \)
3. \( \beta^2 + 2\sqrt{\alpha} = \frac{19}{4} \)
4. \( \beta^2 - 2\sqrt{\alpha} = \frac{19}{4} \)

---

Q.73

The combined equation of the two lines \( ax + by + c = 0 \) and \( a'x + b'y + c' = 0 \) can be written as \((a + b + c)(a'x + b'y + c') = 0\).

The equation of the angle bisectors of the lines represented by the equation 
\[ 2x^2 + xy - 3y^2 = 0 \]
is

**Options**

1. \( x^2 - y^2 - 10xy = 0 \)
2. \( 3x^2 + xy - 2y^2 = 0 \)
3. \( 3x^2 + 5xy + 2y^2 = 0 \)
4. \( x^2 - y^2 + 10xy = 0 \)
Q.74 Let $R$ be a relation on $\mathbb{R}$, given by

$$R = \{(a, b) : 3a - 3b + \sqrt{7} \text{ is an irrational number} \}.$$ 

Then $R$ is

- reflexive and transitive but not symmetric
- an equivalence relation
- reflexive but neither symmetric nor transitive
- reflexive and symmetric but not transitive

---

Q.75 The mean and variance of 5 observations are 5 and 8 respectively. If 3 observations are 1, 3, 5, then the sum of cubes of the remaining two observations is

- 1456
- 1072
- 1216
- 1792

---

Q.76 In a binomial distribution $B(n, p)$, the sum and the product of the mean and the variance are 5 and 6 respectively, then $6(n + p - q)$ is equal to

- 50
- 51
- 52
- 53

---

Question Type: MCQ
Question ID: 3666942541
Option 1 ID: 3666947993
Option 2 ID: 3666947994
Option 3 ID: 3666947991
Option 4 ID: 3666947992
Status: Answered
Chosen Option: 2

Question Type: MCQ
Question ID: 3666942558
Option 1 ID: 3666948060
Option 2 ID: 3666948062
Option 3 ID: 3666948061
Option 4 ID: 3666948059
Status: Not Answered
Chosen Option: --

Question Type: MCQ
Question ID: 3666942545
Option 1 ID: 3666948007
Option 2 ID: 3666948008
Option 3 ID: 3666948009
Option 4 ID: 3666948010
Status: Not Answered
Chosen Option: --
Q.77
The shortest distance between the lines
\[ \frac{x-5}{1} = \frac{y-2}{2} = \frac{z-4}{-3} \quad \text{and} \quad \frac{x-3}{1} = \frac{y+5}{4} = \frac{z-1}{-5} \]
is

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

Q.78
Let \( S \) denote the set of all real values of \( \lambda \) such that the system of equations
\[
\lambda x + y + z = 1 \\
x + \lambda y + z = 1 \\
x + y + \lambda z = 1
\]
is inconsistent, then \( \sum_{\lambda \in S} (|\lambda|^2 + |\lambda|) \) is equal to

Options
1. 12
2. 6
3. 4
4. 2
Q.79  
For a triangle \(ABC\), the value of \(\cos 2A + \cos 2B + \cos 2C\) is least. If its inradius is 3 and incentre is \(M\), then which of the following is NOT correct?

Options
1. \(\sin 2A + \sin 2B + \sin 2C = \sin A + \sin B + \sin C\)
2. perimeter of \(\Delta ABC\) is \(18\sqrt{3}\)
3. \(\overrightarrow{MA} \cdot \overrightarrow{MB} = -18\)
4. area of \(\Delta ABC\) is \(\frac{27\sqrt{3}}{2}\)

Question Type: MCQ  
Question ID: 3666942557  
Option 1 ID: 3666948058  
Option 2 ID: 3666948057  
Option 3 ID: 3666948056  
Option 4 ID: 3666948055  
Status: Not Answered  
Chosen Option: --

Q.80  
If the center and radius of the circle \(|\frac{z - 2}{z - 3}| = 2\) are respectively \((\alpha, \beta)\) and \(\gamma\), then \(3(\alpha + \beta + \gamma)\) is equal to

Options
1. 9
2. 10
3. 11
4. 12

Question Type: MCQ  
Question ID: 3666942542  
Option 1 ID: 3666947998  
Option 2 ID: 3666947995  
Option 3 ID: 3666947997  
Option 4 ID: 3666947996  
Status: Not Answered  
Chosen Option: --

Section: Mathematics Section B

Q.81  
The number of words, with or without meaning, that can be formed using all the letters of the word ASSASSINATION so that the vowels occur together, is ______.

Given: --  
Answer: --

Question Type: SA  
Question ID: 3666942562  
Status: Not Answered
Q.82  Let $\vec{v} = ai + 2j - 3k$, $\vec{u} = 2ai + j - k$ and $\vec{w}$ be a vector such that $|\vec{u}| = a > 0$. If the minimum value of the scalar triple product $[\vec{u} \vec{v} \vec{w}]$ is $-\alpha \sqrt{3401}$, and $|\vec{u} \cdot \vec{w}| = \frac{m}{n}$ where $m$ and $n$ are coprime natural numbers, then $m+n$ is equal to ________.

Given-- Answer :

---

Q.83  If $f(x) = x^2 + g'(1)x + g''(2)$ and $g(x) = f(1)x^2 + xf''(x) + f''(x)$, then the value of $f(4) - g(4)$ is equal to ________.

Given-- Answer :

---

Q.84  If \[ \int_0^1 (x^m + x^n + x^7)(2x^4 + 3x^7 + 6)^{3/7} \, dx = \frac{1}{11} \theta^{m/n} \] where $l, m, n \in \mathbb{N}$, $m$ and $n$ are coprime then $l + m + n$ is equal to ________.

Given-- Answer :

---

Q.85  Let $a_1, a_2, a_3, ..., a_n$ be an A.P. If the sum of its first four terms is 50 and the sum of its last four terms is 170, then the product of its middle two terms is ________.

Given-- Answer :

---

Q.86  The remainder, when $19^{200} + 23^{200}$ is divided by 49, is ________.

Given-- Answer :

---
<table>
<thead>
<tr>
<th>Question</th>
<th>Given</th>
<th>Answer</th>
<th>Question Type</th>
<th>Question ID</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.87</td>
<td>Let ( A ) be the area bounded by the curve ( y =</td>
<td>x - 3</td>
<td>), the ( x )-axis and the ordinates ( x = -1 ) and ( x = 2 ). Then ( 12 , A ) is equal to ________</td>
<td></td>
<td>SA</td>
</tr>
<tr>
<td>Q.88</td>
<td>( A(2, 6, 2), B(-4, 0, \lambda), C(2, 3, -1) ) and ( D(4, 5, 0),</td>
<td>(</td>
<td>\lambda</td>
<td>\leq 5 ) are the vertices of a quadrilateral ( ABCD ). If its area is 18 square units, then ( 5 - 6 , A ) is equal to ________</td>
<td></td>
</tr>
<tr>
<td>Q.89</td>
<td>The number of 3-digit numbers, that are divisible by either 2 or 3 but not divisible by 7, is ________.</td>
<td></td>
<td>SA</td>
<td>3666942563</td>
<td>Not Answered</td>
</tr>
<tr>
<td>Q.90</td>
<td>Let ( f : \mathbb{R} \rightarrow \mathbb{R} ) be a differentiable function such that ( f'(x) + f(x) = \int_{0}^{x} f(t) , dt ). If ( f(0) = e^{-2} ), then ( 2f(0) - f(2) ) is equal to ________</td>
<td></td>
<td>SA</td>
<td>3666942568</td>
<td>Not Answered</td>
</tr>
</tbody>
</table>