Section: Physics

Q.1. A particle of charge $q$ and mass $m$ is subjected to an electric field $E = E_0(1 - ax^2)$ in the $x$-direction, where $a$ and $E_0$ are constants. Initially the particle was at rest at $x = 0$. Other than the initial position the kinetic energy of the particle becomes zero when the distance of the particle from the origin is:

Options 1. $a$

2. $\sqrt{\frac{2}{a}}$

3. $\sqrt{\frac{3}{a}}$

4. $\sqrt{\frac{4}{a}}$

Question Type: MCQ
Question ID: 40503811241
Option 1 ID: 40503840816
Option 2 ID: 40503840818
Option 3 ID: 40503840819
Option 4 ID: 40503840817
Status: Not Answered
Chosen Option: --
Q.2 A series L-R circuit is connected to a battery of emf V. If the circuit is switched on at t=0, then the time at which the energy stored in the inductor reaches \( \left( \frac{1}{n} \right) \) times of its maximum value, is:

Options
1. \( \frac{L}{R} \ln \left( \frac{\sqrt{n}}{\sqrt{n} - 1} \right) \)
2. \( \frac{L}{R} \ln \left( \frac{\sqrt{n} + 1}{\sqrt{n} - 1} \right) \)
3. \( \frac{L}{R} \ln \left( \frac{\sqrt{n}}{\sqrt{n} + 1} \right) \)
4. \( \frac{L}{R} \ln \left( \frac{\sqrt{n} - 1}{\sqrt{n}} \right) \)

Question Type: MCQ
Question ID: 40503611245
Option 1 ID: 40503640834
Option 2 ID: 40503640833
Option 3 ID: 40503640835
Option 4 ID: 40503640832
Status: Not Answered
Chosen Option: --

Q.3 Consider two uniform discs of the same thickness and different radii \( R_1 = R \) and \( R_2 = \alpha R \) made of the same material. If the ratio of their moments of inertia \( I_1 \) and \( I_2 \), respectively, about their axes is \( I_1 : I_2 = 1 : 16 \) then the value of \( \alpha \) is:

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

Question Type: MCQ
Question ID: 40503611234
Option 1 ID: 40503640788
Option 2 ID: 40503640791
Option 3 ID: 40503640789
Option 4 ID: 40503640790
Status: Not Answered
Chosen Option: --
Q.4 The electric field of a plane electromagnetic wave is given by
\[ \vec{E} = E_0 (\hat{x} + \hat{y}) \sin(kz - \omega t) \]
Its magnetic field will be given by:

Options
1. \( \frac{E_0}{c} (-\hat{x} + \hat{y}) \sin(kz - \omega t) \)
2. \( \frac{E_0}{c} (\hat{x} + \hat{y}) \sin(kz - \omega t) \)
3. \( \frac{E_0}{c} (\hat{x} - \hat{y}) \sin(kz - \omega t) \)
4. \( \frac{E_0}{c} (\hat{x} - \hat{y}) \cos(kz - \omega t) \)

Question Type: MCQ
Question ID: 40503611246
Option 1 ID: 40503640838
Option 2 ID: 40503640836
Option 3 ID: 40503640837
Option 4 ID: 40503640839
Status: Answered
Chosen Option: 3

Q.5 The driver of a bus approaching a big wall notices that the frequency of his bus's horn changes from 420 Hz to 490 Hz when he hears it after it gets reflected from the wall. Find the speed of the bus if speed of the sound is 330 m/s⁻¹.

Options
1. 91 kmh⁻¹
2. 81 kmh⁻¹
3. 61 kmh⁻¹
4. 71 kmh⁻¹

Question Type: MCQ
Question ID: 40503611240
Option 1 ID: 40503640814
Option 2 ID: 40503640813
Option 3 ID: 40503640815
Option 4 ID: 40503640812
Status: Not Answered
Chosen Option: --
Q.6 Find the Binding energy per nucleon for $^{120}_{50}$Sn. Mass of proton $m_p = 1.00783$ U, mass of neutron $m_n = 1.00867$ U and mass of tin nucleus $m_{Sn} = 119.902199$ U. (take $1U = 931$ MeV)

Options:
1. 7.5 MeV
2. 9.0 MeV
3. 8.0 MeV
4. 8.5 MeV

Question Type: MCQ
Question ID: 40503611248
Option 1 ID: 40503640845
Option 2 ID: 40503640847
Option 3 ID: 40503640844
Option 4 ID: 40503640846
Status: Not Answered
Chosen Option: --

Q.7 Identify the operation performed by the circuit given below:

A

B

C

Options:
1. NAND
2. OR
3. AND
4. NOT

Question Type: MCQ
Question ID: 40503611249
Option 1 ID: 40503640851
Option 2 ID: 40503640850
Option 3 ID: 40503640849
Option 4 ID: 40503640848
Status: Answered
Chosen Option: 1
A capacitor $C$ is fully charged with voltage $V_0$. After disconnecting the voltage source, it is connected in parallel with another uncharged capacitor of capacitance $\frac{C}{2}$. The energy loss in the process after the charge is distributed between the two capacitors is:

Options:
1. $\frac{1}{2} CV_0^2$
2. $\frac{1}{3} CV_0^2$
3. $\frac{1}{4} CV_0^2$
4. $\frac{1}{6} CV_0^2$
Q.9 In a photoelectric effect experiment, the graph of stopping potential $V$ versus reciprocal of wavelength obtained is shown in the figure. As the intensity of incident radiation is increased:

![Graph showing a straight line with $V$ on y-axis and $1/\lambda$ on x-axis.]

Options:
1. Straight line shifts to right
2. Slope of the straight line gets more steep
3. Straight line shifts to left
4. Graph does not change

Question Type: MCQ
Question ID: 40503511247
Option 1 ID: 40503540842
Option 2 ID: 40503540843
Option 3 ID: 40503540841
Option 4 ID: 40503540840
Status: Answered
Chosen Option: 4
Q.10
A circular coil has moment of inertia 0.8 kg m² around any diameter and is carrying current to produce a magnetic moment of 20 Am². The coil is kept initially in a vertical position and it can rotate freely around a horizontal diameter. When a uniform magnetic field of 4 T is applied along the vertical, it starts rotating around its horizontal diameter. The angular speed the coil acquires after rotating by 60° will be:

Options
1. 10 rad s⁻¹
2. 10 π rad s⁻¹
3. 20 π rad s⁻¹
4. 20 rad s⁻¹
A small ball of mass \( m \) is thrown upward with velocity \( u \) from the ground. The ball experiences a resistive force \( mkv^2 \) where \( v \) is its speed. The maximum height attained by the ball is:

Options:

1. \( \frac{1}{2k} \tan^{-1} \frac{ku^2}{g} \)
2. \( \frac{1}{k} \ln \left( 1 + \frac{ku^2}{2g} \right) \)
3. \( \frac{1}{k} \tan^{-1} \frac{ku^2}{2g} \)
4. \( \frac{1}{2k} \ln \left( 1 + \frac{ku^2}{g} \right) \)

Question Type: MCQ
Question ID: 40503611232
Option 1 ID: 40503640781
Option 2 ID: 40503640783
Option 3 ID: 40503640780
Option 4 ID: 40503640782
Status: Not Answered
Chosen Option: --
Q.12 Two identical cylindrical vessels are kept on the ground and each contain the same liquid of density \( d \). The area of the base of both vessels is \( S \) but the height of liquid in one vessel is \( x_1 \) and in the other, \( x_2 \). When both cylinders are connected through a pipe of negligible volume very close to the bottom, the liquid flows from one vessel to the other until it comes to equilibrium at a new height. The change in energy of the system in the process is:

Options

1. \( gdS \left( x_2^2 + x_1^2 \right) \)
2. \( gdS \left( x_2 + x_1 \right)^2 \)
3. \( \frac{3}{4} \, gdS \left( x_2 - x_1 \right)^2 \)
4. \( \frac{1}{4} \, gdS \left( x_2 - x_1 \right)^2 \)
Q.13 A body is moving in a low circular orbit about a planet of mass M and radius R. The radius of the orbit can be taken to be R itself. Then the ratio of the speed of this body in the orbit to the escape velocity from the planet is:

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

Question Type: MCQ
Question ID: 40503611236
Option 1 ID: 40503640798
Option 2 ID: 40503640799
Option 3 ID: 40503640796
Option 4 ID: 40503640797
Status: Not Answered
Chosen Option: --

Q.14 A cube of metal is subjected to a hydrostatic pressure of 4 GPa. The percentage change in the length of the side of the cube is close to:

(Given bulk modulus of metal, \( B = 8 \times 10^{10} \text{ Pa} \))

Options
1. 5
2. 0.6
3. 20
4. 1.67

Question Type: MCQ
Question ID: 40503611237
Option 1 ID: 40503640803
Option 2 ID: 40503640801
Option 3 ID: 40503640800
Option 4 ID: 40503640802
Status: Not Answered
Chosen Option: --
Q.15 A quantity \( x \) is given by \( (IFv^2/WL^4) \) in terms of moment of inertia \( I \), force \( F \), velocity \( v \), work \( W \) and Length \( L \). The dimensional formula for \( x \) is same as that of:

Options 1. Planck’s constant
2. Force constant
3. Energy density
4. Coefficient of viscosity

Question Type: MCQ
Question ID: 40503811231
Option 1 ID: 40503840779
Option 2 ID: 40503840776
Option 3 ID: 40503840777
Option 4 ID: 40503840778
Status: Not Attempted and Marked For Review
Chosen Option: --

Q.16 For a uniform rectangular sheet shown in the figure, the ratio of moments of inertia about the axes perpendicular to the sheet and passing through \( O \) (the centre of mass) and \( O' \) (corner point) is:

Options 1. 2/3
2. 1/4
3. 1/8
4. 1/2

Question Type: MCQ
Question ID: 40503811235
Option 1 ID: 40503840792
Option 2 ID: 40503840794
Option 3 ID: 40503840795
Option 4 ID: 40503840793
Status: Not Answered
Chosen Option: --
Q.17

Match the thermodynamic processes taking place in a system with the correct conditions. In the table: \( \Delta Q \) is the heat supplied, \( \Delta W \) is the work done and \( \Delta U \) is change in internal energy of the system.

<table>
<thead>
<tr>
<th>Process</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I) Adiabatic (A)</td>
<td>( \Delta W = 0 )</td>
</tr>
<tr>
<td>(II) Isothermal (B)</td>
<td>( \Delta Q = \Delta W = 0 )</td>
</tr>
<tr>
<td>(III) Isochoric (C)</td>
<td>( \Delta U = 0, \Delta W \neq 0, \Delta Q = 0 )</td>
</tr>
<tr>
<td>(IV) Isobaric (D)</td>
<td>( \Delta U = 0 )</td>
</tr>
</tbody>
</table>

Options 1.
1. (I) - (A), (II) - (B), (III) - (D), (IV) - (D)
2. (I) - (B), (II) - (A), (III) - (D), (IV) - (C)
3. (I) - (A), (II) - (A), (III) - (B), (IV) - (C)
4. (I) - (B), (II) - (D), (III) - (A), (IV) - (C)
Q.18
The value of current $i_1$ flowing from A to C in the circuit diagram is:

Options:
1. 2 A
2. 4 A
3. 1 A
4. 5 A

Question Type: MCQ
Question ID: 40503811250
Option 1 ID: 40503840653
Option 2 ID: 40503840654
Option 3 ID: 40503840652
Option 4 ID: 40503840655
Status: Not Attempted and Marked For Review
Chosen Option: --
Q. 19
A person pushes a box on a rough horizontal platform surface. He applies a force of 200 N over a distance of 15 m. Thereafter, he gets progressively tired and his applied force reduces linearly with distance to 100 N. The total distance through which the box has been moved is 30 m. What is the work done by the person during the total movement of the box?

Options 1. 3280 J
2. 2780 J
3. 5690 J
4. 5250 J

Q. 20
A paramagnetic sample shows a net magnetisation of 6 A/m when it is placed in an external magnetic field of 0.4 T at a temperature of 4 K. When the sample is placed in an external magnetic field of 0.3 T at a temperature of 24 K, then the magnetisation will be:

Options 1. 1 A/m
2. 4 A/m
3. 2.25 A/m
4. 0.75 A/m
Q.21 The speed verses time graph for a particle is shown in the figure. The distance travelled (in m) by the particle during the time interval \( t=0 \) to \( t=5 \) s will be

\[ u \text{ (ms}^{-1}\text{)} \]

\[ 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad \text{time (s)} \]

Given 40
Answer:

Question Type: SA
Question ID: 40503511251
Status: Answered

Q.22

Four resistances 40 \( \Omega \), 60 \( \Omega \), 90 \( \Omega \) and 110 \( \Omega \) make the arms of a quadrilateral ABCD. Across AC is a battery of emf 40 V and internal resistance negligible. The potential difference across BD in V is

Given --
Answer:

Question Type: SA
Question ID: 40503511253
Status: Not Attempted and Marked For Review
Q.23 The distance between an object and a screen is 100 cm. A lens can produce real image of the object on the screen for two different positions between the screen and the object. The distance between these two positions is 40 cm. If the power of the lens is close to \( \left( \frac{N}{100} \right) \) D where \( N \) is an integer, the value of \( N \) is _________.

Given -- Answer :

Q.24 The change in the magnitude of the volume of an ideal gas when a small additional pressure \( \Delta P \) is applied at a constant temperature, is the same as the change when the temperature is reduced by a small quantity \( \Delta T \) at constant pressure. The initial temperature and pressure of the gas were 300 K and 2 atm. respectively. If \( |\Delta T| = C|\Delta P| \) then value of \( C \) in (K/atm.) is _________.

Given 150 Answer :

Q.25 Orange light of wavelength \( 6000 \times 10^{-10} \) m illuminates a single slit of width \( 0.6 \times 10^{-4} \) m. The maximum possible number of diffraction minima produced on both sides of the central maximum is _________.

Given 2 Answer :
Section: Chemistry

Q.1 The reaction in which the hybridisation of the underlined atom is affected is:

Options
1. $\text{H}_3\text{PO}_2$ $\xrightarrow{\text{Disproportionation}}$
2. $\text{H}_2\text{SO}_4 + \text{NaCl} \xrightarrow{420 K}$
3. $\text{NH}_3 \xrightarrow{H^+}$
4. $\text{XeF}_4 + \text{SbF}_5 \rightarrow$

Question Type: MCQ
Question ID: 40503811264
Option 1 ID: 40503840896
Option 2 ID: 40503840894
Option 3 ID: 40503840895
Option 4 ID: 40503840893
Status: Answered
Chosen Option: 4

Q.2 250 mL of a waste solution obtained from the workshop of a goldsmith contains 0.1 M $\text{AgNO}_3$ and 0.1 M $\text{AuCl}$. The solution was electrolyzed at 2 V by passing a current of 1 A for 15 minutes. The metal/metal electrodeposited will be:

$$\left( E^0_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}, E^0_{\text{Au}^+/\text{Au}} = 1.69 \text{ V} \right)$$

Options
1. only gold
2. silver and gold in proportion to their atomic weights
3. only silver
4. silver and gold in equal mass proportion

Question Type: MCQ
Question ID: 40503811257
Option 1 ID: 40503840868
Option 2 ID: 40503840867
Option 3 ID: 40503840866
Option 4 ID: 40503840865
Status: Answered
Chosen Option: 1
Q.3 An alkaline earth metal ‘M’ readily forms water soluble sulphate and water insoluble hydroxide. Its oxide MO is very stable to heat and does not have rock-salt structure. M is:

Options 1. Sr  
2. Ca  
3. Mg  
4. Be

Q.4 The incorrect statement(s) among (a) - (c) is (are):
(a) W(VI) is more stable than Cr(VI).
(b) in the presence of HCl, permanganate titrations provide satisfactory results.
(c) some lanthanoid oxides can be used as phosphors.

Options 1. (b) and (c) only  
2. (a) and (b) only  
3. (b) only  
4. (a) only
Q.5 The shortest wavelength of H atom in the Lyman series is \( \lambda_1 \). The longest wavelength in the Balmer series of He\(^+\) is:

Options

1. \( \frac{36\lambda_1}{5} \)
2. \( \frac{5\lambda_1}{9} \)
3. \( \frac{9\lambda_1}{5} \)
4. \( \frac{27\lambda_1}{5} \)

Question Type: MCQ
Question ID: 40503611261
Option 1 ID: 40503640884
Option 2 ID: 40503640882
Option 3 ID: 40503640883
Option 4 ID: 40503640884
Status: Not Answered
Chosen Option: --
Q.6 Which of the following compounds will form the precipitate with aq. AgNO₃ solution most readily?

Options

1. 

2. 

3. 

4. 

Question Type: MCQ  
Question ID: 40503611270  
Option 1 ID: 40503640920  
Option 2 ID: 40503640919  
Option 3 ID: 40503640917  
Option 4 ID: 40503640918  
Status: Not Answered  
Chosen Option: --

Q.7 If the equilibrium constant for \( A \rightleftharpoons B + C \) is \( K_{eq}^{(1)} \) and that of \( B + C \rightleftharpoons P \) is \( K_{eq}^{(2)} \), the equilibrium constant for \( A \rightleftharpoons P \) is:

Options

1. \( \frac{K_{eq}^{(1)}}{K_{eq}^{(2)}} \)  
2. \( K_{eq}^{(2)} - K_{eq}^{(1)} \)  
3. \( K_{eq}^{(1)} + K_{eq}^{(2)} \)  
4. \( K_{eq}^{(1)} \times K_{eq}^{(2)} \)

Question Type: MCQ  
Question ID: 40503611258  
Option 1 ID: 40503640870  
Option 2 ID: 40503640872  
Option 3 ID: 40503640869  
Option 4 ID: 40503640871  
Status: Answered  
Chosen Option: 4
Q.8  The major product [R] in the following sequence of reactions is:

\[ \text{HC}=\text{CH} \xrightarrow{(i) \text{ LiNH}_2/\text{ether}} [\text{P}] \]
\[ \xrightarrow{(ii) \text{ H}_3\text{C}} \text{CH} \xrightarrow{\text{Br}} \text{H}_2\text{C} \xrightarrow{\text{(CH}_3)_2\text{C}} \]
\[ \xrightarrow{(i) \text{ HgSO}_4/\text{H}_2\text{SO}_4} [\text{Q}] \xrightarrow{\text{Conc. H}_2\text{SO}_4} [\text{R}] \]
\[ \xrightarrow{(ii) \text{ NaBH}_4} \]

Options

1. \[ \text{H}_2\text{C} \xrightarrow{\text{C}} \text{CH} \xrightarrow{\text{CH}_3} \text{CH} \]
\[ \text{CH}(\text{CH}_3)_2 \]

2. \[ \text{C}=\text{CH} \xrightarrow{\text{CH}_3} \text{C} \]
\[ \text{H}_3\text{C} \xrightarrow{\text{(CH}_3)_2\text{C}} \]

3. \[ \text{C}=\text{C}(\text{CH}_3)_2 \]
\[ \text{H}_3\text{C} \xrightarrow{\text{CH}_2} \]
\[ \text{H}_3\text{C} \xrightarrow{\text{(CH}_3)_2\text{C}} \]

4. \[ \text{CH} \xrightarrow{\text{CH}} \text{CH} \xrightarrow{\text{CH}_2} \]
\[ \text{(CH}_3)_2\text{C} \]

Question Type: MCQ
Question ID: 40503511274
Option 1 ID: 40503540934
Option 2 ID: 40503540933
Option 3 ID: 40503540935
Option 4 ID: 40503540936
Status: Not Answered
Chosen Option: --
Q.9  The Crystal Field Stabilization Energy (CFSE) of \([\text{CoF}_3(\text{H}_2\text{O})_2]\) \((\Delta_0<P)\) is:

Options:
1. \(-0.8\Delta_0 + 2P\)
2. \(-0.4\Delta_0\)
3. \(-0.8\Delta_0\)
4. \(-0.4\Delta_0 + P\)

Q.10  The processes of calcination and roasting in metallurgical industries, respectively, can lead to:

Options:
1. Global warming and photochemical smog
2. Global warming and acid rain
3. Photochemical smog and ozone layer depletion
4. Photochemical smog and global warming
Q.11 Five moles of an ideal gas at 1 bar and 298 K is expanded into vacuum to double the volume. The work done is:

Options
1. $C_v(T_2 - T_1)$
2. $-RT(V_2 - V_1)$
3. $-RT \ln \frac{V_2}{V_1}$
4. zero

Question Type: MCQ
Question ID: 40503611259
Option 1 ID: 40503640876
Option 2 ID: 40503640875
Option 3 ID: 40503640874
Option 4 ID: 40503640873
Status: Answered
Chosen Option: 4

Q.12 The one that can exhibit highest paramagnetic behaviour among the following is:
gly = glycinate; bpy = 2, 2'-bipyridine

Options
1. $[\text{Pd(gly)}_2]$
2. $[\text{Fe(en)}(\text{bpy})(\text{NH}_3)_2]^2^+$
3. $[\text{Co(OX)}_2(\text{OH})_2]^- (\Delta_0 > P)$
4. $[\text{Ti(NH}_3)_6]^{3^+}$

Question Type: MCQ
Question ID: 40503611267
Option 1 ID: 40503640905
Option 2 ID: 40503640906
Option 3 ID: 40503640907
Option 4 ID: 40503640908
Status: Not Answered
Chosen Option: --
Q.13

In the following reaction sequence, [C] is:

\[
\begin{align*}
\text{NH}_2 & \rightarrow [A] \\
\text{CH}_3 & \\
(i) \text{NaNO}_2 + \text{HCl}, 0-5 \, {^\circ}\text{C} & \rightarrow [A] \\
(ii) \text{Cu}_2\text{Cl}_2 + \text{HCl} & \\
\text{Cl}_2 & \rightarrow [B] \text{Na} + \text{dry ether} \\
\text{hv} & \rightarrow [C] \text{(Major Product)}
\end{align*}
\]

Options

1. Cl-C=CH2-CH2-Cl
2. Cl-C=CH-CH2-CH2-Cl
3. CH2=CH-CH2-Cl
4. CH3-C=CH-CH3

Question Type: MCQ
Question ID: 40503611272
Option 1 ID: 40503646928
Option 2 ID: 40503646927
Option 3 ID: 40503646926
Option 4 ID: 40503646925
Status: Not Answered
Chosen Option: --
Q.14 The process that is NOT endothermic in nature is:

Options
1. $\text{Ar}_\text{(g)} + e^- \rightarrow \text{Ar}_\text{(g)}^-$
2. $\text{H}_\text{(g)} + e^- \rightarrow \text{H}_\text{(g)}^-$
3. $\text{O}_\text{(g)} + e^- \rightarrow \text{O}_\text{(g)}^2-$
4. $\text{Na}_\text{(g)} \rightarrow \text{Na}_\text{(g)}^+ + e^-$

Question Type: MCQ
Question ID: 40503811262
Option 1 ID: 40503840886
Option 2 ID: 40503840885
Option 3 ID: 40503840887
Option 4 ID: 40503840888
Status: Answered
Chosen Option: 4

Q.15 The mechanism of action of "Terfenadine" (Seldane) is:

Options
1. Activates the histamine receptor
2. Inhibits the secretion of histamine
3. Helps in the secretion of histamine
4. Inhibits the action of histamine receptor

Question Type: MCQ
Question ID: 40503811273
Option 1 ID: 40503840931
Option 2 ID: 40503840929
Option 3 ID: 40503840930
Option 4 ID: 40503840932
Status: Not Answered
Chosen Option: --
Q.16 The major product [B] in the following reactions is:

\[
\begin{align*}
CH_3 \\
CH_3 \cdot CH_2 \cdot CH - CH_2 \cdot OCH_2 \cdot CH_3 \\
\xrightarrow{HI \text{ Heat}} [A] \text{ alcohol} \xrightarrow{\text{H}_2\text{SO}_4 \Delta} [B]
\end{align*}
\]

Options:
1. \(CH_2 = CH_2\)
2. \(CH_3\)
3. \(CH_3 \cdot CH = C \cdot CH_3\)
4. \(CH_3 \cdot CH_2 \cdot CH = CH \cdot CH_3\)

Question Type: MCQ
Question ID: 40503611271
Option 1 ID: 40503640922
Option 2 ID: 40503640921
Option 3 ID: 40503640924
Option 4 ID: 40503640923
Status: Not Answered
Chosen Option: --

Q.17 A sample of red ink (a colloidal suspension) is prepared by mixing eosin dye, egg white, HCHO and water. The component which ensures stability of the ink sample is:

Options:
1. Egg white
2. Water
3. HCHO
4. Eosin dye

Question Type: MCQ
Question ID: 40503611256
Option 1 ID: 40503640862
Option 2 ID: 40503640864
Option 3 ID: 40503640863
Option 4 ID: 40503640861
Status: Not Answered
Chosen Option: --
Q.18 Among the following compounds, which one has the shortest C−Cl bond?

Options
1. \( \text{H}_3\text{C}\text{CH}_2\text{Cl} \)
2. \( \text{HC} = \text{Cl} \)
3. \( \text{H}_3\text{C}−\text{Cl} \)
4. \( \text{CH} = \text{Cl} \)

Q.19 The molecule in which hybrid MOs involve only one d-orbital of the central atom is:

Options
1. \([\text{Ni(CN)}_4]^{2−}\)
2. \(\text{BrF}_5\)
3. \(\text{XeF}_4\)
4. \([\text{CrF}_6]^{3−}\)
Q.20 The major product [C] of the following reaction sequence will be:

\[ \text{CH}_2=\text{CH}-\text{CHO} \overset{(i) \text{ NaBH}_4}{\rightarrow} [A] \overset{(ii) \text{ SOCl}_2 \text{ Anhy. AlCl}_3}{\rightarrow} [B] \]

\[ \text{DBr} \rightarrow [C] \]

Options

1.  

2.  

3.  

4.  

Q.21 The osmotic pressure of a solution of NaCl is 0.10 atm and that of a glucose solution is 0.20 atm. The osmotic pressure of a solution formed by mixing 1 L of the sodium chloride solution with 2 L of the glucose solution is \( x \times 10^{-3} \) atm. \( x \) is \underline{_______}. (nearest integer)
Q.22 The number of chiral centres present in threonine is _________.

Given --
Answer :

Question Type : SA
Question ID : 40503811280
Status : Not Answered

Q.23 A 100 mL solution was made by adding 1.43 g of Na₂CO₃ \( x \) H₂O. The normality of the solution is 0.1 N. The value of \( x \) is _________.
(The atomic mass of Na is 23 g/mol)

Given 1
Answer :

Question Type : SA
Question ID : 40503811275
Status : Not Answered

Q.24 The number of molecules with energy greater than the threshold energy for a reaction increases five fold by a rise of temperature from 27 °C to 42 °C. Its energy of activation in J/mol is _________. (Take In 5 =1.6094 ; R=8.314 J mol⁻¹K⁻¹)

Given --
Answer :

Question Type : SA
Question ID : 40503811278
Status : Not Answered
Q.25
Consider the following equations:
\[ 2 \text{Fe}^{2+} + \text{H}_2\text{O}_2 \rightarrow x \text{A} + y \text{B} \]
(in basic medium)
\[ 2 \text{MnO}_4^- + 6 \text{H}^+ + 5 \text{H}_2\text{O}_2 \rightarrow x' \text{C} + y' \text{D} + z' \text{E} \]
(in acidic medium)
The sum of the stoichiometric coefficients \(x, y, x', y'\) and \(z'\) for products A, B, C, D and E, respectively, is __________.

Given 6
Answer:

Question Type: SA
Question ID: 40503511279
Status: Answered

Section: Mathematics

Q.1
The circle passing through the intersection of the circles, \(x^2 + y^2 - 6x = 0\) and \(x^2 + y^2 - 4y = 0\), having its centre on the line, \(2x - 3y + 12 = 0\), also passes through the point:

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

Question Type: MCQ
Question ID: 40503511295
Option 1 ID: 40503541005
Option 2 ID: 40503541004
Option 3 ID: 40503541003
Option 4 ID: 40503541002
Status: Not Answered
Chosen Option: --
Q.2 Let $x=4$ be a directrix to an ellipse whose centre is at the origin and its eccentricity is $\frac{1}{2}$. If $P(1, \beta), \beta > 0$ is a point on this ellipse, then the equation of the normal to it at $P$ is:

Options 1. $4x - 3y = 2$
2. $8x - 2y = 5$
3. $7x - 4y = 1$
4. $4x - 2y = 1$

Q.3 The minimum value of $2^{\sin x} + 2^{\cos x}$ is:

Options 1. $2^{1+\frac{1}{\sqrt{2}}}$
2. $2^{1+\sqrt{2}}$
3. $2^{1-\sqrt{2}}$
4. $2^{1-\frac{1}{\sqrt{2}}}$
Q.4  The angle of elevation of a cloud C from a point P, 200 m above a still lake is 30°. If the angle of depression of the image of C in the lake from the point P is 60°, then PC (in m) is equal to:

Options 1. 100
2. $200\sqrt{3}$
3. 400
4. $400\sqrt{3}$

Q.5  If the system of equations
\[x + y + z = 2\]
\[2x + 4y - z = 6\]
\[3x + 2y + \lambda z = \mu\]
has infinitely many solutions, then:

Options 1. $\lambda + 2\mu = 14$
2. $2\lambda - \mu = 5$
3. $\lambda - 2\mu = -5$
4. $2\lambda + \mu = 14$
Q.6  The area (in sq. units) of the largest rectangle ABCD whose vertices A and B lie on the x-axis and vertices C and D lie on the parabola, \( y = x^2 - 1 \) below the x-axis, is:

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

Q.7  The function \( f(x) = \begin{cases} \frac{\pi}{4} + \tan^{-1}x, & |x| \leq 1 \\ \frac{1}{2}(|x| - 1), & |x| > 1 \end{cases} \)

is:

Options
1. continuous on \( R - \{1\} \) and differentiable on \( R - \{-1, 1\} \).
2. both continuous and differentiable on \( R - \{1\} \).
3. continuous on \( R - \{-1\} \) and differentiable on \( R - \{-1, 1\} \).
4. both continuous and differentiable on \( R - \{-1\} \).
Q.8 If for some positive integer $n$, the coefficients of three consecutive terms in the binomial expansion of $(1 + x)^n + 5$ are in the ratio $5 : 10 : 14$, then the largest coefficient in this expansion is:

Options:
1. 462
2. 330
3. 792
4. 252
Q.9
Suppose the vectors $x_1$, $x_2$ and $x_3$ are the solutions of the system of linear equations,
$Ax = b$ when the vector $b$ on the right side is equal to $b_1$, $b_2$ and $b_3$ respectively. If
\[
\begin{bmatrix}
1 \\
1
\end{bmatrix}, \quad \begin{bmatrix}
0 \\
2
\end{bmatrix}, \quad \begin{bmatrix}
0 \\
1
\end{bmatrix}, \quad \begin{bmatrix}
1 \\
0
\end{bmatrix},
\]
\[
\begin{bmatrix}
0 \\
2
\end{bmatrix} \quad \text{and} \quad \begin{bmatrix}
0 \\
2
\end{bmatrix},
\]
then the determinant of $A$ is equal to:

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

Question Type: MCQ
Question ID: 40503611285
Option 1 ID: 40503646965
Option 2 ID: 40503646963
Option 3 ID: 40503646962
Option 4 ID: 40503646964
Status: Not Attempted and Marked For Review
Chosen Option: --
Q.10  Contrapositive of the statement:
'If a function $f$ is differentiable at $a$, then it is also continuous at $a$', is:

Options
1. If a function $f$ is continuous at $a$, then it is not differentiable at $a$.
2. If a function $f$ is not continuous at $a$, then it is not differentiable at $a$.
3. If a function $f$ is not continuous at $a$, then it is differentiable at $a$.
4. If a function $f$ is continuous at $a$, then it is differentiable at $a$.

Q.11  The solution of the differential equation
\[ \frac{dy}{dx} - \frac{y + 3x}{\log_e(y + 3x)} + 3 = 0 \]
(where $C$ is a constant of integration.)

Options
1. $x - \frac{1}{2}(\log_e(y + 3x))^2 = C$
2. $x - \log_e(y + 3x) = C$
3. $y + 3x - \frac{1}{2}(\log_e x)^2 = C$
4. $x - 2\log_e(y + 3x) = C$
Q.12 In a game two players A and B take turns in throwing a pair of fair dice starting with player A and total of scores on the two dice, in each throw is noted. A wins the game if he throws a total of 6 before B throws a total of 7 and B wins the game if he throws a total of 7 before A throws a total of six. The game stops as soon as either of the players wins. The probability of A winning the game is:

Options
1. \( \frac{5}{31} \)
2. \( \frac{31}{61} \)
3. \( \frac{5}{6} \)
4. \( \frac{30}{61} \)

Question Type: MCQ
Question ID: 40503611298
Option 1 ID: 40503641015
Option 2 ID: 40503641016
Option 3 ID: 40503641014
Option 4 ID: 40503641017
Status: Answered
Chosen Option: 4
Q.13  The distance of the point \((1, -2, 3)\) from the plane \(x - y + z = 5\) measured parallel to the line \(\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}\) is:

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

Question Type: MCQ
Question ID: 40503611297
Option 1 ID: 40503641013
Option 2 ID: 40503641011
Option 3 ID: 40503641010
Option 4 ID: 40503641012
Status: Answered
Chosen Option: 2

Q.14  Let \(\lambda \neq 0\) be in \(\mathbb{R}\). If \(\alpha\) and \(\beta\) are the roots of the equation, \(x^2 - x + 2\lambda = 0\) and \(\alpha\) and \(\gamma\) are the roots of the equation, \(3x^2 - 10x + 27\lambda = 0\), then \(\frac{\beta\gamma}{\lambda}\) is equal to:

Options
1. 27
2. 18
3. 9
4. 36

Question Type: MCQ
Question ID: 40503611282
Option 1 ID: 40503640951
Option 2 ID: 40503640952
Option 3 ID: 40503640953
Option 4 ID: 40503640950
Status: Answered
Chosen Option: 3
Q.15
The integral 
\[ \int \frac{\tan^3 x \cdot \sin^2 x \cdot (2 \sec^2 x \cdot \sin^2 x + 3 \tan x \cdot \sin 6x)}{x} \, dx \] is equal to:

Options
1. \( \frac{7}{18} \)
2. \( \frac{1}{9} \)
3. \( \frac{1}{18} \)
4. \( \frac{9}{2} \)

Q.16
Let \( a_1, a_2, \ldots, a_n \) be a given A.P. whose common difference is an integer and 
\( S_n = a_1 + a_2 + \ldots + a_n \). If \( a_1 = 1, a_n = 300 \) and 
\( 15 \leq n \leq 50 \), then the ordered pair \( (S_{n-4}, a_{n-4}) \) is equal to:

Options
1. \( (2490, 249) \)
2. \( (2480, 249) \)
3. \( (2480, 248) \)
4. \( (2490, 248) \)
Q.17 If \( a \) and \( b \) are real numbers such that 
\[
(2 + \alpha)^4 = a + b\alpha, \text{ where } \alpha = \frac{-1 + i\sqrt{3}}{2}
\]
then \( a + b \) is equal to:

Options:
1. 9
2. 24
3. 33
4. 57

Q.18 If the perpendicular bisector of the line segment joining the points \( P(1, 4) \) and \( Q(k, 3) \) has \( y \)-intercept equal to \(-4\), then a value of \( k \) is:

Options:
1. \(-2\)
2. \(-4\)
3. \(\sqrt{14}\)
4. \(\sqrt{15}\)
Q.19 Let \( f: (0, \infty) \to (0, \infty) \) be a differentiable function such that \( f(1) = e \) and
\[
\lim_{t \to x} \frac{t^2 f^2(x) - x^2 f^2(t)}{t - x} = 0.
\]
If \( f(x) = 1 \), then \( x \) is equal to:

Options:
1. \( \frac{1}{e} \)
2. \( 2e \)
3. \( \frac{1}{2e} \)
4. \( e \)

Q.20 Let \( \bigcup_{i=1}^{50} X_i = \bigcup_{i=1}^{n} Y_i = T \), where each \( X_i \) contains 10 elements and each \( Y_i \) contains 5 elements. If each element of the set \( T \) is an element of exactly 20 of sets \( X_i \)'s and exactly 6 of sets \( Y_i \)'s, then \( n \) is equal to:

Options:
1. 15
2. 50
3. 45
4. 30
Q.21
A test consists of 6 multiple choice questions, each having 4 alternative answers of which only one is correct. The number of ways, in which a candidate answers all six questions such that exactly four of the answers are correct, is _________.

Given 15
Answer:

Q.22
If \( \mathbf{a} = 2\mathbf{i} + \mathbf{j} + 2\mathbf{k} \), then the value of
\[
\left| \mathbf{i} \times (\mathbf{a} \times \mathbf{i}) \right|^2 + \left| j \times (\mathbf{a} \times j) \right|^2 + \left| k \times (\mathbf{a} \times k) \right|^2
\]
is equal to _________.

Given 18
Answer:

Q.23
Let \( \{x\} \) and \( [x] \) denote the fractional part of \( x \) and the greatest integer \( \leq x \) respectively of a real number \( x \). If
\[
\int_0^1 \{x\} \, dx, \int_0^1 [x] \, dx \quad \text{and} \quad 10(n^2 - n), \quad (n \in \mathbb{N}, \, n > 1)
\]
are three consecutive terms of a G.P., then \( n \) is equal to _________.

Given --
Answer:

Question Type: SA
Question ID: 40503611302
Status: Answered

Question Type: SA
Question ID: 40503611305
Status: Answered

Question Type: SA
Question ID: 40503611303
Status: Not Answered
Q.24 If the variance of the following frequency distribution:
Class : 10-20  20-30  30-40
Frequency : 2  x  2
is 50, then x is equal to ________.

Given 2
Answer :

Question Type : SA
Question ID : 40503611301
Status : Answered

Q.25 Let PQ be a diameter of the circle $x^2 + y^2 = 9$. If $\alpha$ and $\beta$ are the lengths of the perpendiculrars from P and Q on the straight line $x + y = 2$ respectively, then the maximum value of $\alpha \beta$ is ________.

Given --
Answer :

Question Type : SA
Question ID : 40503611304
Status : Not Answered