Assume that the displacement (s) of air is proportional to the pressure difference (Δp) created by a sound wave. Displacement (s) further depends on the speed of sound (v), density of air (ρ) and the frequency (f). If Δp ~ 10 Pa, v ~ 300 m/s, ρ ~ 1 kg/m³ and f ~ 1000 Hz, then s will be of the order of (take the multiplicative constant to be 1).

Options
1. \(\frac{3}{100}\) mm
2. 10 mm
3. \(\frac{1}{10}\) mm
4. 1 mm

Question Type: MCQ
Question ID: 40503611765
Option 1 ID: 40503642560
Option 2 ID: 40503642587
Option 3 ID: 40503642599
Option 4 ID: 40503642598
Status: Answered
Chosen Option: 2
Q.2
Activities of three radioactive substances A, B and C are represented by the curves A, B and C, in the figure. Then their half-lives \( T_\frac{1}{2}(A) : T_\frac{1}{2}(B) : T_\frac{1}{2}(C) \) are in the ratio:

\[
\ln R = 6, 4, 2, C, B, A
\]

\( t \) (yrs)

Options 1. 2 : 1 : 1
2. 3 : 2 : 1
3. 2 : 1 : 3
4. 4 : 3 : 1

Question Type: MCQ
Question ID: 40503611773
Option 1 ID: 40503642631
Option 2 ID: 40503642629
Option 3 ID: 40503642632
Option 4 ID: 40503642630
Status: Answered
Chosen Option: 3
A balloon is moving up in air vertically above a point A on the ground. When it is at a height $h_1$, a girl standing at a distance $d$ (point B) from A (see figure) sees it at an angle $45^\circ$ with respect to the vertical. When the balloon climbs up a further height $h_2$, it is seen at an angle $60^\circ$ with respect to the vertical if the girl moves further by a distance $2.464 \, d$ (point C). Then the height $h_2$ is (given $\tan 30^\circ = 0.5774$):

Options:
1. $1.464 \, d$
2. $0.732 \, d$
3. $0.464 \, d$
4. $d$
An electron is constrained to move along the y-axis with a speed of 0.1 \( c \) (\( c \) is the speed of light) in the presence of an electromagnetic wave, whose electric field is \( \vec{E} = 30 \hat{j} \sin(1.5 \times 10^7 t - 5 \times 10^{-2}x) \) V/m.

The maximum magnetic force experienced by the electron will be:

(given \( c = 3 \times 10^8 \) ms\(^{-1} \) and electron charge \( = 1.6 \times 10^{-19} \) C)

Options 1. \( 3.2 \times 10^{-18} \) N
2. \( 2.4 \times 10^{-18} \) N
3. \( 4.8 \times 10^{-19} \) N
4. \( 1.6 \times 10^{-19} \) N
Q.5 A helicopter rises from rest on the ground vertically upwards with a constant acceleration $g$. A food packet is dropped from the helicopter when it is at a height $h$. The time taken by the packet to reach the ground is close to $[g$ is the acceleration due to gravity $]$:

Options
1. $t = \frac{2}{3} \sqrt{\frac{h}{g}}$
2. $t = 1.8 \sqrt{\frac{h}{g}}$
3. $t = 3.4 \sqrt{\frac{h}{g}}$
4. $t = \sqrt{\frac{2h}{3g}}$

Question Type: MCQ
Question ID: 40503611758
Option 1 ID: 40503642572
Option 2 ID: 40503642569
Option 3 ID: 40503642571
Option 4 ID: 40503642570
Status: Answered
Chosen Option: 4

Q.6 A galvanometer of resistance $G$ is converted into a voltmeter of range $0-1V$ by connecting a resistance $R_1$ in series with it. The additional resistance that should be connected in series with $R_1$ to increase the range of the voltmeter to $0-2V$ will be:

Options 1. $G$
2. $R_1$
3. $R_1 - G$
4. $R_1 + G$

Question Type: MCQ
Question ID: 40503611769
Option 1 ID: 40503642513
Option 2 ID: 40503642515
Option 3 ID: 40503642514
Option 4 ID: 40503642516
Status: Answered
Chosen Option: 3
Q.7 Two capacitors of capacitances $C$ and $2C$ are charged to potential differences $V$ and $2V$, respectively. These are then connected in parallel in such a manner that the positive terminal of one is connected to the negative terminal of the other. The final energy of this configuration is:

Options

1. $\frac{25}{6} CV^2$
2. $\frac{3}{2} CV^2$
3. zero
4. $\frac{9}{2} CV^2$

Question Type: MCQ
Question ID: 40603611767
Option 1 ID: 40603642607
Option 2 ID: 40603642606
Option 3 ID: 40603642605
Option 4 ID: 40603642608
Status: Answered
Chosen Option: 1

Q.8 With increasing biasing voltage of a photodiode, the photocurrent magnitude:

Options

1. remains constant
2. increases initially and after attaining certain value, it decreases
3. increases linearly
4. increases initially and saturates finally

Question Type: MCQ
Question ID: 40603611774
Option 1 ID: 40603642634
Option 2 ID: 40603642636
Option 3 ID: 40603642635
Option 4 ID: 40603642633
Status: Answered
Chosen Option: 2
Q.9
The value of the acceleration due to gravity
is $g_1$ at a height $h = \frac{R}{2}$ ($R$ = radius of the
earth) from the surface of the earth. It is
again equal to $g_1$ at a depth $d$ below the
surface of the earth. The ratio $\left(\frac{d}{R}\right)$
equals:

Options:
1. $\frac{4}{9}$
2. $\frac{5}{9}$
3. $\frac{1}{3}$
4. $\frac{7}{9}$
A solid sphere of radius $R$ carries a charge $Q + q$ distributed uniformly over its volume. A very small point like piece of it of mass $m$ gets detached from the bottom of the sphere and falls down vertically under gravity. This piece carries charge $q$. If it acquires a speed $v$ when it has fallen through a vertical height $y$ (see figure), then: (assume the remaining portion to be spherical).

Options

1. $v^2 = y \left[ \frac{qQ}{4\pi \varepsilon_0 R^2} + g \right]$
2. $v^2 = y \left[ \frac{qQ}{4\pi \varepsilon_0 R(R + y)} + g \right]$
3. $v^2 = 2y \left[ \frac{QqR}{4\pi \varepsilon_0 (R + y)^3} + g \right]$
4. $v^2 = 2y \left[ \frac{qQ}{4\pi \varepsilon_0 R(R + y)} + g \right]$

Question Type: MCQ
Question ID: 405036411766
Option 1 ID: 40503642604
Option 2 ID: 40503642601
Option 3 ID: 40503642602
Option 4 ID: 40503642603
Status: Not Answered
Chosen Option: --
A wheel is rotating freely with an angular speed \( \omega \) on a shaft. The moment of inertia of the wheel is \( I \) and the moment of inertia of the shaft is negligible. Another wheel of moment of inertia \( 3I \) initially at rest is suddenly coupled to the same shaft. The resultant fractional loss in the kinetic energy of the system is:

Options
1. \( \frac{5}{6} \)
2. \( \frac{1}{4} \)
3. 0
4. \( \frac{3}{4} \)
For a concave lens of focal length \( f \), the relation between object and image distances \( u \) and \( v \), respectively, from its pole can best be represented by \( (u=v) \) is the reference line:

Options

1.

2.

3.

4.

---

Question Type: MCQ
Question ID: 40503611772
Option 1 ID: 40503642628
Option 2 ID: 40503642825
Option 3 ID: 40503642626
Option 4 ID: 40503642827
Status: Answered
Chosen Option: 2
Q.13

Three different processes that can occur in an ideal monoatomic gas are shown in the P vs V diagram. The paths are labelled as A→B, A→C and A→D. The change in internal energies during these processes are taken as $E_{AB}$, $E_{AC}$ and $E_{AD}$ and the work done as $W_{AB}$, $W_{AC}$ and $W_{AD}$.

The correct relation between these parameters are:

Options

1. $E_{AB} = E_{AC} < E_{AD}$, $W_{AB} > 0$, $W_{AC} = 0$, $W_{AD} < 0$
2. $E_{AB} = E_{AC} = E_{AD}$, $W_{AB} = 0$, $W_{AC} = 0$, $W_{AD} > 0$
3. $E_{AB} < E_{AC} < E_{AD}$, $W_{AB} > 0$, $W_{AC} = W_{AD}$
4. $E_{AB} > E_{AC} > E_{AD}$, $W_{AB} < W_{AC} < W_{AD}$

Question Type: MCQ
Question ID: 40503611763
Option 1 ID: 40503642590
Option 2 ID: 40503642589
Option 3 ID: 40503642591
Option 4 ID: 40503642592
Status: Answered
Chosen Option: 4
Q.14 Number of molecules in a volume of 4 cm\(^3\) of a perfect monoatomic gas at some temperature T and at a pressure of 2 cm of mercury is close to? (Given, mean kinetic energy of a molecule (at T) is 4 \times 10^{-14} \text{ erg}, \ g = 980 \text{ cm/s}^2, \text{ density of mercury} = 13.6 \text{ g/cm}^3)

Options
1. \(4.0 \times 10^{18}\)
2. \(4.0 \times 10^{16}\)
3. \(5.8 \times 10^{16}\)
4. \(5.8 \times 10^{18}\)

Question Type: MCQ
Question ID: 40503611764
Option 1 ID: 40503642596
Option 2 ID: 40503642594
Option 3 ID: 40503642593
Option 4 ID: 40503642595
Status: Answered
Chosen Option: 1

Q.15 A square loop of side 2a, and carrying current I, is kept in XZ plane with its centre at origin. A long wire carrying the same current I is placed parallel to the z-axis and passing through the point \((0, b, 0)\). (b > a). The magnitude of the torque on the loop about z-axis is given by:

Options
1. \(\frac{\mu_0 I^2 a^2}{2\pi b}\)
2. \(\frac{\mu_0 I^2 a^3}{2\pi b^2}\)
3. \(\frac{2\mu_0 I^2 a^2}{\pi b}\)
4. \(\frac{2\mu_0 I^2 a^3}{\pi b^2}\)

Question Type: MCQ
Question ID: 40503611770
Option 1 ID: 40503642620
Option 2 ID: 40503642619
Option 3 ID: 40503642617
Option 4 ID: 40503642618
Status: Not Answered
Chosen Option: --
Q.16
A physical quantity $z$ depends on four observables $a$, $b$, $c$ and $d$, as $z = \frac{a^2 b^3}{\sqrt{c} d^3}$.

The percentages of error in the measurement of $a$, $b$, $c$ and $d$ are 2%, 1.5%, 4% and 2.5% respectively. The percentage of error in $z$ is:

Options 1. 12.25%
2. 16.5%
3. 13.5%
4. 14.5%

Q.17
A hollow spherical shell at outer radius $R$ floats just submerged under the water surface. The inner radius of the shell is $r$. If the specific gravity of the shell material is $\frac{27}{8}$ w.r.t water, the value of $r$ is:

Options
1. $\frac{8}{9} R$
2. $\frac{4}{9} R$
3. $\frac{2}{3} R$
4. $\frac{1}{3} R$
Q.18. In a resonance tube experiment when the tube is filled with water up to a height of 17.0 cm from bottom, it resonates with a given tuning fork. When the water level is raised the next resonance with the same tuning fork occurs at a height of 24.5 cm. If the velocity of sound in air is 330 m/s, the tuning fork frequency is:

Options:
1. 2200 Hz
2. 550 Hz
3. 1100 Hz
4. 3300 Hz

Question Type: MCQ
Question ID: 40503611775
Option 1 ID: 40503642840
Option 2 ID: 40503642639
Option 3 ID: 40503642637
Option 4 ID: 40503642639
Status: Not Answered
Chosen Option: --

Q.19. An electrical power line, having a total resistance of 2 Ω, delivers 1 kW at 220 V. The efficiency of the transmission line is approximately:

Options:
1. 72%
2. 91%
3. 85%
4. 96%

Question Type: MCQ
Question ID: 40503611768
Option 1 ID: 40503642612
Option 2 ID: 40503642611
Option 3 ID: 40503642610
Option 4 ID: 40503642609
Status: Answered
Chosen Option: 2
Q.20
A bullet of mass 5 g, travelling with a speed of 210 m/s, strikes a fixed wooden target. One half of its kinetic energy is converted into heat in the bullet while the other half is converted into heat in the wood. The rise of temperature of the bullet if the specific heat of its material is 0.030 cal/(g°C) (1 cal = 4.2 × 10^7 ergs) close to:

Options:
1. 87.5°C
2. 83.3°C
3. 119.2°C
4. 38.4°C

Q.21
A force \( \vec{F} = (i + 2j + 3k) \) N acts at a point \( (4i + 3j - k) \) m. Then the magnitude of torque about the point \( (i + 2j + k) \) m will be \( \sqrt{x} \) N-m. The value of x is ________.

Given
Answer:
Q.22 A beam of electrons of energy E scatters from a target having atomic spacing of 1 Å. The first maximum intensity occurs at \( \theta = 60^\circ \). Then E (in eV) is ________.
(Planck constant \( h = 6.64 \times 10^{-34} \text{ Js} \),
\( 1 \text{ eV} = 1.6 \times 10^{-19} \text{ J} \),
electron mass \( m = 9.1 \times 10^{-31} \text{ kg} \))

Given 8
Answer :

Q.23 A particle of mass 200 MeV/c\(^2\) collides with a hydrogen atom at rest. Soon after the collision the particle comes to rest, and the atom recoils and goes to its first excited state. The initial kinetic energy of the particle (in eV) is \( \frac{N}{4} \). The value of N is :

(Given the mass of the hydrogen atom to be 1 GeV/c\(^2\) ________.

Given --
Answer :

Q.24 A compound microscope consists of an objective lens of focal length 1 cm and an eye piece of focal length 5 cm with a separation of 10 cm.
The distance between an object and the objective lens, at which the strain on the eye is minimum is \( \frac{n}{40} \) cm. The value of n is ________.

Given --
Answer :
Q. 25
Two concentric circular coils, C₁ and C₂, are placed in the XY plane. C₁ has 500 turns, and a radius of 1 cm. C₂ has 200 turns and radius of 20 cm. C₂ carries a time dependent current I(t) = (5t² - 2t + 3)A where t is in s. The emf induced in C₁ (in mV), at the instant t = 1 s is \( \frac{4}{x} \). The value of x is __________.

Given:

Answer:

Question Type: SA
Question ID: 40503611778
Status: Not Answered

Section: Chemistry

Q. 1
Which of the following derivatives of alcohols is unstable in an aqueous base?

Options

1. RO\(\text{Me}\)
2. RO
3. RO
4. RO\(-\text{CMe}_3\)

Question Type: MCQ
Question ID: 40503611786
Option 1 ID: 40503642666
Option 2 ID: 40503642648
Option 3 ID: 40503642649
Option 4 ID: 40503642667
Status: Answered
Chosen Option: 3
Q.2  The values of the crystal field stabilization energies for a high spin d^6 metal ion in octahedral and tetrahedral fields, respectively, are:

Options:
1. \(-0.4 \Delta_o\) and \(-0.6 \Delta_t\)
2. \(-2.4 \Delta_o\) and \(-0.6 \Delta_t\)
3. \(-1.6 \Delta_o\) and \(-0.4 \Delta_t\)
4. \(-0.4 \Delta_o\) and \(-0.27 \Delta_t\)

Question Type: MCQ
Question ID: 40503611793
Option 1 ID: 40503642694
Option 2 ID: 40503642676
Option 3 ID: 40503642696
Option 4 ID: 40503642697
Status: Answered
Chosen Option: 3

Q.3  Consider the following reaction:

\[ \text{N}_2\text{O}_4(g) = 2\text{NO}_2(g); \Delta H^0 = +58 \text{ kJ} \]

For each of the following cases (a, b), the direction in which the equilibrium shifts is:

(a) Temperature is decreased.
(b) Pressure is increased by adding \(\text{N}_2\) at constant \(T\).

Options:
1. (a) towards product, (b) towards reactant
2. (a) towards reactant, (b) towards product
3. (a) towards reactant, (b) no change
4. (a) towards product, (b) no change

Question Type: MCQ
Question ID: 40503611798
Option 1 ID: 40503642714
Option 2 ID: 40503642715
Option 3 ID: 40503642716
Option 4 ID: 40503642717
Status: Not Answered
Chosen Option: --
Q.4

The increasing order of the acidity of the α-hydrogen of the following compounds is:

(A) Ph
(B) Ph
(C) OMe
(D) NMe₂

Options:
1. (D) < (C) < (A) < (B)
2. (B) < (C) < (A) < (D)
3. (A) < (C) < (D) < (B)
4. (C) < (A) < (B) < (D)

Question Type: MCQ
Question ID: 40503611765
Option 1 ID: 40503642563
Option 2 ID: 40503642565
Option 3 ID: 40503642562
Option 4 ID: 40503642564
Status: Not Answered
Chosen Option: --

Q.5

A diatomic molecule X₂ has a body-centred cubic (bcc) structure with a cell edge of 300 pm. The density of the molecule is 6.17 g cm⁻³. The number of molecules present in 200 g of X₂ is:

(Avogadro's constant (Nₐ) = 6 × 10²³ mol⁻¹)

Options:
1. 40 Nₐ
2. 8 Nₐ
3. 4 Nₐ
4. 2 Nₐ

Question Type: MCQ
Question ID: 40503611795
Option 1 ID: 40503642704
Option 2 ID: 40503642705
Option 3 ID: 40503642703
Option 4 ID: 40503642702
Status: Answered
Chosen Option: 3
The potential energy curve for the $\text{H}_2$ molecule as a function of internuclear distance is:

Options

1. 
   \[ \text{Energy} \uparrow \]
   \[ \rightarrow \text{Internuclear distance} \]

2. 
   \[ \text{Energy} \uparrow \]
   \[ \rightarrow \text{Internuclear distance} \]

3. 
   \[ \text{Energy} \uparrow \]
   \[ \rightarrow \text{Internuclear distance} \]

4. 
   \[ \text{Energy} \uparrow \]
   \[ \rightarrow \text{Internuclear distance} \]

Question Type: MCQ
Question ID: 40503611797
Option 1 ID: 40503642713
Option 2 ID: 40503642712
Option 3 ID: 40503642710
Option 4 ID: 40503642711
Status: Answered
Chosen Option: 1
Q.7 Identify the correct molecular picture showing what happens at the critical micellar concentration (CMC) of an aqueous solution of a surfactant (φ polar head; ϵ non-polar tail; ⊳ water).

Options 1. (D)
2. (B)
3. (A)
4. (C)

Q.8 The difference between the radii of 3\textsuperscript{rd} and 4\textsuperscript{th} orbits of Li\textsuperscript{2+} is \( \Delta R_1 \). The difference between the radii of 3\textsuperscript{rd} and 4\textsuperscript{th} orbits of He\textsuperscript{+} is \( \Delta R_2 \). Ratio \( \Delta R_1 : \Delta R_2 \) is:

Options 1. 8 : 3
2. 3 : 8
3. 2 : 3
4. 3 : 2
Q.9 In the sixth period, the orbitals that are filled are:

Options:
1. 6s, 4f, 5d, 6p
2. 6s, 5d, 5f, 6p
3. 6s, 5f, 6d, 6p
4. 6s, 6p, 6d, 6f

Q.10 The most appropriate reagent for conversion of C_2H_5CN into CH_3CH_2CH_2NH_2 is:

Options:
1. NaBH_4
2. CaH_2
3. LiAlH_4
4. Na(CN)BH_3
Q.11  If a person is suffering from the deficiency of nor-adrenaline, what kind of drug can be suggested?

Options:
1. Anti-inflammatory
2. Antidepressant
3. Antihistamine
4. Analgesic

Q.12  Which of the following is not an essential amino acid?

Options:
1. Tyrosine
2. Leucine
3. Valine
4. Lysine
G.13
The correct electronic configuration and spin-only magnetic moment (BM) of Gd\(^{3+}\) (Z = 64), respectively, are:

Options:
1. [Xe] 4f\(^7\) and 8.9
2. [Xe] 4f\(^7\) and 7.9
3. [Xe] 5f\(^7\) and 8.9
4. [Xe] 5f\(^7\) and 7.9

Question Type: MCQ
Question ID: 40503611792
Option 1 ID: 40503642691
Option 2 ID: 40503642690
Option 3 ID: 40503642693
Option 4 ID: 40503642692
Status: Answered
Chosen Option: 3

G.14
The increasing order of basicity of the following compounds is:

(A) \[
\begin{array}{c}
\text{N} \\
\text{H}
\end{array}
\]

(B) \[
\begin{array}{c}
\text{N} \\
\text{H}
\end{array}
\]

(C) \[
\begin{array}{c}
\text{N} \\
\text{H}
\end{array}
\]

(D) \[
\begin{array}{c}
\text{N} \\
\text{H}
\end{array}
\]

Options:
1. (A) < (B) < (C) < (D)
2. (B) < (A) < (D) < (C)
3. (D) < (A) < (B) < (C)
4. (B) < (A) < (C) < (D)

Question Type: MCQ
Question ID: 40503611782
Option 1 ID: 40503642650
Option 2 ID: 40503642651
Option 3 ID: 40503642653
Option 4 ID: 40503642652
Status: Answered
Chosen Option: 1
A flask contains a mixture of compounds A and B. Both compounds decompose by first-order kinetics. The half-lives for A and B are 300 s and 180 s, respectively. If the concentrations of A and B are equal initially, the time required for the concentration of A to be four times that of B (in s) is: (Use $\ln 2 = 0.693$)

Options:
1. 180
2. 900
3. 300
4. 120

The structure of $\text{PCl}_5$ in the solid state is:
1. tetrahedral $[\text{PCl}_4]^+$ and octahedral $[\text{PCl}_6]^-$
2. square planar $[\text{PCl}_4]^+$ and octahedral $[\text{PCl}_6]^-$
3. square pyramidal
4. trigonal bipyramidal
An Ellingham diagram provides information about:

Options:
1. the conditions of pH and potential
2. under which a species is thermodynamically stable.
3. the temperature dependence of the standard Gibbs energies of formation of some metal oxides.
4. the pressure dependence of the standard electrode potentials of reduction reactions involved in the extraction of metals.
5. the kinetics of the reduction process.

Question Type: MCQ
Question ID: 40503611789
Option 1 ID: 40503642879
Option 2 ID: 40503642560
Option 3 ID: 40503642581
Option 4 ID: 40503642678
Status: Not Answered
Chosen Option: -->
Q.18
In the following reaction sequence the major products A and B are:

\[ \text{Anhydrous } \text{AlCl}_3 \longrightarrow A \quad \text{Zn-Hg/HCl} \quad \text{B} \quad 2 \text{H}_3\text{PO}_4 \]

Options
1. A = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array} 
B = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array}

2. A = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array} 
B = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array}

3. A = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array} 
B = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array}

4. A = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array} 
B = \begin{array}{c}
\text{CO}_2\text{H} \\
\text{CO}_2\text{H}
\end{array}

Q.19
The equation that represents the water-gas shift reaction is:

Options
1. \( \text{CH}_4(g) + \text{H}_2\text{O}(g) \xrightarrow{1270 \text{K} \text{Ni}} \text{CO}(g) + 3 \text{H}_2(g) \)

2. \( 2\text{C(s)} + \text{O}_2(g) + 4\text{N}_2(g) \xrightarrow{1273 \text{K}} 2\text{CO}(g) + 4\text{N}_2(g) \)

3. \( \text{C(s)} + \text{H}_2\text{O}(g) \xrightarrow{1270 \text{K}} \text{CO}(g) + \text{H}_2(g) \)

4. \( \text{CO}(g) + \text{H}_2\text{O}(g) \xrightarrow{673 \text{K} \text{Catalyst}} \text{CO}_2(g) + \text{H}_2(g) \)
Q.20  The condition that indicates a polluted environment is:

Options
1. eutrophication
2. 0.03% of CO₂ in the atmosphere
3. BOD value of 5 ppm
4. pH of rain water to be 5.6

Question Type: MCQ
Question ID: 40503611794
Option 1 ID: 40503642701
Option 2 ID: 40503642999
Option 3 ID: 40503642700
Option 4 ID: 40503642998
Status: Answered
Chosen Option: 3

Q.21  The minimum number of moles of O₂ required for complete combustion of 1 mole of propane and 2 moles of butane is ________.

Given 3.16
Answer:

Question Type: SA
Question ID: 40503611802
Status: Answered

Q.22  The total number of coordination sites in ethylenediaminetetraacetate (EDTA⁻) is ________.

Given 3.16
Answer:

Question Type: SA
Question ID: 40503611861
Status: Answered

Q.23  The number of chiral carbon(s) present in peptide, Ile-Arg-Pro, is ________.

Given 3
Answer:

Question Type: SA
Question ID: 40503611865
Status: Answered
Q.24
A soft drink was bottled with a partial pressure of CO₂ of 3 bar over the liquid at room temperature. The partial pressure of CO₂ over the solution approaches a value of 30 bar when 44 g of CO₂ is dissolved in 1 kg of water at room temperature. The approximate pH of the soft drink is _______ × 10⁻¹.
(First dissociation constant of H₂CO₃ = 4.0 × 10⁻⁷; log 2 = 0.3; density of the soft drink = 1 g mL⁻¹)

Given: 92.89
Answer:

Q.25
An oxidation-reduction reaction in which 3 electrons are transferred has a ΔG⁰ of 17.37 kJ mol⁻¹ at 25°C. The value of E⁺₀ (in V) is _______ × 10⁻².
(1 F = 96,500 C mol⁻¹)

Given: 3160
Answer:

Section: Mathematics

Q.1
If y = y(x) is the solution of the differential equation

\[ \frac{5 + e^x}{2} \frac{dy}{dx} + e^x = 0 \]

satisfying

\[ y(0) = 1, \text{ then a value of } y(\log_{e} 13) \text{ is:} \]

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

Question Type: MCQ
Question ID: 405036118318
Option 1 ID: 40503642779
Option 2 ID: 40503642780
Option 3 ID: 40503642781
Option 4 ID: 40503642782
Status: Answered
Chosen Option: 4
Q.2 The product of the roots of the equation 
$9x^2 - 18|x| + 5 = 0$, is:

Options
1. $\frac{5}{9}$
2. $\frac{25}{81}$
3. $\frac{5}{27}$
4. $\frac{25}{9}$

Question Type: MCQ
Question ID: 40503641808
Option 1 ID: 40503642741
Option 2 ID: 40503642742
Option 3 ID: 40503642740
Option 4 ID: 40503642739
Status: Answered
Chosen Option: 3

Q.3 The negation of the Boolean expression $\overline{x \leftrightarrow y}$ is equivalent to:

Options
1. $(x \wedge y) \vee (\overline{x} \wedge \overline{y})$
2. $(x \wedge y) \wedge (\overline{x} \vee \overline{y})$
3. $(x \wedge \overline{y}) \vee (\overline{x} \wedge y)$
4. $(\overline{x} \wedge y) \vee (\overline{x} \wedge \overline{y})$

Question Type: MCQ
Question ID: 40503611825
Option 1 ID: 40503642810
Option 2 ID: 40503642809
Option 3 ID: 40503642807
Option 4 ID: 40503642808
Status: Answered
Chosen Option: 3
Q.4 The mean and variance of 7 observations are 8 and 16, respectively. If five observations are 2, 4, 10, 12, 14, then the absolute difference of the remaining two observations is:

Options:
1. 1
2. 4
3. 2
4. 3

Question Type: MCQ
Question ID: 40503611823
Option 1 ID: 40503642799
Option 2 ID: 40503642802
Option 3 ID: 40503642800
Option 4 ID: 40503642801
Status: Answered
Chosen Option: 3

Q.5 If \( 2^{10} + 2^9 \cdot 3^1 + 2^8 \cdot 3^2 + \ldots + 2 \cdot 3^9 + 3^{10} = S - 2^{11} \), then \( S \) is equal to:

Options:
1. \( 3^{11} - 2^{12} \)
2. \( 3^{11} \)
3. \( \frac{3^{11}}{2} + 2^{10} \)
4. \( 2 \cdot 3^{11} \)

Question Type: MCQ
Question ID: 40503611812
Option 1 ID: 40503642757
Option 2 ID: 40503642755
Option 3 ID: 40503642758
Option 4 ID: 40503642756
Status: Answered
Chosen Option: 3
Q.6
If \(3^2 \sin 2\alpha - 1, 14, \text{ and } 3^4 - 2 \sin 2\alpha\) are the first three terms of an A.P. for some \(\alpha\), then the sixth term of this A.P. is:

Options
1. 66
2. 81
3. 65
4. 78

Q.7
If the volume of a parallelepiped, whose coterminus edges are given by the vectors \(\mathbf{a} = \hat{i} + \hat{j} + n \hat{k}, \; \mathbf{b} = 2\hat{i} + 4 \hat{j} - n \hat{k} \) and \(\mathbf{c} = \hat{i} + n \hat{j} + 3 \hat{k} \) \((n \geq 0)\), is 158 cu. units, then:

Options
1. \(\mathbf{a} \cdot \mathbf{c} = 17\)
2. \(\mathbf{b} \cdot \mathbf{c} = 10\)
3. \(n = 7\)
4. \(n = 9\)
Q.8 If $S$ is the sum of the first 10 terms of the series
\[ \tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) + \tan^{-1}\left(\frac{1}{21}\right) + \ldots, \]
then $\tan(S)$ is equal to:

Options
1. $\frac{5}{6}$
2. $\frac{5}{11}$
3. $\frac{6}{5}$
4. $\frac{10}{11}$

Q.9 If the four complex numbers $z, i z, i z – 2 \text{Re}(z)$ and $z – 2 \text{Re}(z)$ represent the vertices of a square of side 4 units in the Argand plane, then $|z|$ is equal to:

Options
1. $4\sqrt{2}$
2. 4
3. $2\sqrt{2}$
4. 2
Q.10
A survey shows that 73% of the persons working in an office like coffee, whereas 65% like tea. If \( x \) denotes the percentage of them, who like both coffee and tea, then \( x \) cannot be:

Options:
1. 63
2. 36
3. 54
4. 38

Question Type: MCQ
Question ID: 40603611866
Option 1 ID: 40603642733
Option 2 ID: 40603642734
Option 3 ID: 40603642732
Option 4 ID: 40603642731
Status: Answered
Chosen Option: 2

Q.11
If the co-ordinates of two points A and B are \( (\sqrt{7}, 0) \) and \( (-\sqrt{7}, 0) \) respectively and P is any point on the conic, \( 9x^2 + 16y^2 = 144 \), then \( PA + PB \) is equal to:

Options:
1. 16
2. 8
3. 6
4. 9

Question Type: MCQ
Question ID: 40603611820
Option 1 ID: 40603642787
Option 2 ID: 40603642790
Option 3 ID: 40603642788
Option 4 ID: 40603642789
Status: Not Answered
Chosen Option: --
Q.12
If the point P on the curve, \(4x^2 + 5y^2 = 20\) is farthest from the point Q(0, -4), then \(PQ^2\) is equal to:

Options:
1. 36
2. 48
3. 21
4. 29

Q.13
Let \(\lambda \in \mathbb{R}\). The system of linear equations
\[
\begin{align*}
2x_1 - 4x_2 + \lambda x_3 &= 1 \\
x_1 - 6x_2 + x_3 &= 2 \\
\lambda x_1 - 10x_2 + 4x_3 &= 3
\end{align*}
\]
is inconsistent for:

Options:
1. exactly one negative value of \(\lambda\).
2. exactly one positive value of \(\lambda\).
3. every value of \(\lambda\).
4. exactly two values of \(\lambda\).
Q.14

If the minimum and the maximum values

of the function \( f : \left[ \frac{\pi}{4}, \frac{\pi}{2} \right] \rightarrow \mathbb{R} \), defined by

\[
\begin{vmatrix}
-\sin^2 \theta & 1 \\
-\cos^2 \theta & 1 \\
12 & 10 \\
\end{vmatrix}
\]

are \( m \) and \( M \) respectively, then the ordered pair \((m, M)\) is equal to:

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

Q.15

If \((a, b, c)\) is the image of the point \((1, 2, -3)\) in the line,

\[
\frac{x + 1}{2} = \frac{y - 3}{-2} = \frac{z}{1},
\]

then \(a + b + c\) is equal to:

Options:
1. 2
2. -1
3. 3
4. 1
Q.16

If the function

\[ f(x) = \begin{cases} k_1(x - \pi)^2 - 1, & x \leq \pi \\ k_2 \cos x, & x > \pi \end{cases} \]

d is twice differentiable, then the ordered pair \((k_1, k_2)\)
is equal to:

Options

1. \(\left(\frac{1}{2}, 1\right)\)
2. \((1, 0)\)
3. \(\left(\frac{1}{2}, -1\right)\)
4. \((1, 1)\)

Question Type: MCQ
Question ID: 40503611814
Option 1 ID: 40503642763
Option 2 ID: 40503642766
Option 3 ID: 40503642765
Option 4 ID: 40503642764
Status: Not Answered
Chosen Option: --

Q.17

If the common tangent to the parabolas,

\[ y^2 = 4x \text{ and } x^2 = 4y \]

also touches the circle,

\[ x^2 + y^2 = c^2 \],

then \(c\) is equal to:

Options

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

Question Type: MCQ
Question ID: 40503611819
Option 1 ID: 40503642786
Option 2 ID: 40503642783
Option 3 ID: 40503642785
Option 4 ID: 40503642784
Status: Not Answered
Chosen Option: --
Q. 18
If $\alpha$ is the positive root of the equation,
$p(x) = x^2 - x - 2 = 0$, then
$$\lim_{x \to \alpha^+} \frac{\sqrt{1 - \cos(p(x))}}{x + \alpha - 4}$$
is equal to:

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

Q. 19
If $\int (e^{2x} + 2e^x - e^{-x} - 1) e^{e^x + e^{-x}} \, dx$

$= g(x) e^{e^x + e^{-x}} + C$, where $C$ is a constant
of integration, then $g(0)$ is equal to:

Options
1. $e$
2. $e^2$
3. 1
4. 2
Q.20

The value of \( \int_{-\pi/2}^{\pi/2} \frac{1}{1 + e^{\sin x}} \, dx \) is:

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

Question Type: MCQ
Question ID: 40503611817
Option 1 ID: 40503642777
Option 2 ID: 40503642778
Option 3 ID: 40503642776
Option 4 ID: 40503642775
Status: Answered
Chosen Option: 2

Q.21

Let \( f(x) = x \left[ \frac{x}{2} \right] \), for \(-10 < x < 10\), where \([t]\) denotes the greatest integer function. Then the number of points of discontinuity of \( f \) is equal to ________.

Given 1
Answer:

Question Type: SA
Question ID: 40503611828
Status: Answered

Q.22

If the line, \( 2x - y + 3 = 0 \) is at a distance \( \frac{1}{\sqrt{5}} \) and \( \frac{2}{\sqrt{5}} \) from the lines \( 4x - 2y + \alpha = 0 \) and \( 6x - 3y + \beta = 0 \), respectively, then the sum of all possible values of \( \alpha \) and \( \beta \) is ________.

Given 26
Answer:

Question Type: SA
Question ID: 40503611829
Status: Answered
Q. 23  The number of words, with or without meaning, that can be formed by taking 4 letters at a time from the letters of the word 'SYLLABUS' such that two letters are distinct and two letters are alike, is __________.

Given 120
Answer:

Question Type: SA
Question ID: 40503611826
Status: Answered

Q. 24  The natural number m, for which the coefficient of \(x\) in the binomial expansion of \(\left(x^m + \frac{1}{x^2}\right)^{22}\) is 1540, is __________.

Given 8
Answer:

Question Type: SA
Question ID: 40503611827
Status: Answered

Q. 25  Four fair dice are thrown independently 27 times. Then the expected number of times, at least two dice show up a three or a five, is __________.

Given 0.76
Answer:

Question Type: SA
Question ID: 40503611830
Status: Answered