Q.1 A massless spring \((k = 800 \text{ N/m})\), attached with a mass \((500 \text{ g})\) is completely immersed in \(1 \text{ kg}\) of water. The spring is stretched by \(2 \text{ cm}\) and released so that it starts vibrating. What would be the order of magnitude of the change in the temperature of water when the vibrations stop completely? (Assume that the water container and spring receive negligible heat and specific heat of mass \(= 400 \text{ J/kg K}\), specific heat of water \(= 4184 \text{ J/kg K}\)).

Options
1. \(10^{-4} \text{ K}\)
2. \(10^{-5} \text{ K}\)
3. \(10^{-1} \text{ K}\)
4. \(10^{-3} \text{ K}\)

Q.2 A moving coil galvanometer has a coil with 175 turns and area \(1 \text{ cm}^2\). It uses a torsion band of torsion constant \(10^{-6} \text{ N-m/rad}\). The coil is placed in a magnetic field \(B\) parallel to its plane. The coil deflects by \(1^\circ\) for a current of \(1 \text{ mA}\). The value of \(B\) (in Tesla) is approximately:

Options
1. \(10^{-4}\)
2. \(10^{-2}\)
3. \(10^{-1}\)
4. \(10^{-3}\)
Q.3 A metal wire of resistance 3 Ω is elongated to make a uniform wire of double its previous length. This new wire is now bent and the ends joined to make a circle. If two points on this circle make an angle 60° at the centre, the equivalent resistance between these two points will be:

Options
1. \( \frac{12}{5} \) Ω
2. \( \frac{5}{2} \) Ω
3. \( \frac{5}{3} \) Ω
4. \( \frac{7}{2} \) Ω

Q.4 The parallel combination of two air filled parallel plate capacitors of capacitance C and nC is connected to a battery of voltage, V. When the capacitors are fully charged, the battery is removed and after that a dielectric material of dielectric constant K is placed between the two plates of the first capacitor. The new potential difference of the combined system is:

Options
1. \( \frac{nV}{K + n} \)
2. \( V \)
3. \( \frac{V}{K + n} \)
4. \( \frac{(n + 1)V}{(K + n)} \)
Q.5 The logic gate equivalent to the given logic circuit is:

![Logic Circuit Diagram](image)

Options
1. NAND
2. OR
3. NOR
4. AND

Q.6 A He⁺ ion is in its first excited state. Its ionization energy is:

Options
1. 48.36 eV
2. 54.40 eV
3. 13.60 eV
4. 6.04 eV

Q.7
A particle of mass 'm' is moving with speed '2u' and collides with a mass '2m' moving with speed 'v' in the same direction. After collision, the first mass is stopped completely while the second one splits into two particles each of mass 'm', which move at angle 45° with respect to the original direction.

The speed of each of the moving particle will be :

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

Q.8 The resistance of a galvanometer is 50 ohm and the maximum current which can be passed through it is 0.002 A. What resistance must be connected to it in order to convert it into an ammeter of range 0–0.5 A?

Options
1. 0.5 ohm
2. 0.002 ohm
3. 0.02 ohm
4. 0.2 ohm

Q.9
Two cars A and B are moving away from each other in opposite directions. Both the cars are moving with a speed of 20 m/s with respect to the ground. If an observer in car A detects a frequency 2000 Hz of the sound coming from car B, what is the natural frequency of the sound source in car B?

(speed of sound in air = 340 m/s)

Options
1. 2250 Hz
2. 2060 Hz
3. 2300 Hz
4. 2150 Hz

Question Type: MCQ
Question ID: 41652912889
Option 1 ID: 41652950336
Option 2 ID: 41652950335
Option 3 ID: 41652950334
Option 4 ID: 41652950337
Status: Answered
Chosen Option: 1

Q.10 The position of a particle as a function of time t, is given by
\[ x(t) = at + bt^2 - ct^3 \]
where a, b and c are constants. When the particle attains zero acceleration, then its velocity will be:

Options
1. \[ a + \frac{b^2}{4c} \]
2. \[ a + \frac{b^2}{3c} \]
3. \[ a + \frac{b^2}{c} \]
4. \[ a + \frac{b^2}{2c} \]

Question Type: MCQ
Question ID: 41652912877
Option 1 ID: 41652950286
Option 2 ID: 41652950287
Option 3 ID: 41652950289
Option 4 ID: 41652950288
Status: Not Answered
Chosen Option: --

Q.11
A very long solenoid of radius R is carrying current \( I(t) = k e^{-at} \) (\( k > 0 \)), as a function of time \( t \geq 0 \). Counter clockwise current is taken to be positive. A circular conducting coil of radius 2R is placed in the equatorial plane of the solenoid and concentric with the solenoid. The current induced in the outer coil is correctly depicted, as a function of time, by:

Options
1. t = 0
2. t = 0
3. t = 0
4. t = 0

Q.12
In a conductor, if the number of conduction electrons per unit volume is \( 8.5 \times 10^{28} \, \text{m}^{-3} \) and mean free time is \( 25 \, \text{fs} \) (femto second), it's approximate resistivity is:

\( (\rho_e = 9.1 \times 10^{-31} \, \text{kg}) \)

Options
1. \( 10^{-6} \, \Omega \text{m} \)
2. \( 10^{-7} \, \Omega \text{m} \)
3. \( 10^{-8} \, \Omega \text{m} \)
4. \( 10^{-5} \, \Omega \text{m} \)
Q.13 A wedge of mass \( M = 4m \) lies on a frictionless plane. A particle of mass \( m \) approaches the wedge with speed \( v \). There is no friction between the particle and the plane or between the particle and the wedge. The maximum height climbed by the particle on the wedge is given by:

Options
1. \( \frac{v^2}{8g} \)
2. \( \frac{2v^2}{7g} \)
3. \( \frac{2v^2}{5g} \)
4. \( \frac{v^2}{2g} \)

Q.14 Moment of inertia of a body about a given axis is 1.5 kg m\(^2\). Initially the body is at rest. In order to produce a rotational kinetic energy of 1200 J, the angular acceleration of 20 rad/s\(^2\) must be applied about the axis for a duration of:

Options
1. 2.5 s
2. 2 s
3. 5 s
4. 3 s

Q.15
A test particle is moving in a circular orbit in the gravitational field produced by a mass density $\rho(r) = \frac{K}{r^2}$. Identify the correct relation between the radius $R$ of the particle's orbit and its period $T$:

Options
1. $T/R$ is a constant
2. $T^2/R^3$ is a constant
3. $T/R^2$ is a constant
4. $TR$ is a constant

Q.16 Four point charges $-q$, $+q$, $+q$ and $-q$ are placed on $y$-axis at $y = -2d$, $y = -d$, $y = +d$ and $y = +2d$, respectively. The magnitude of the electric field $E$ at a point on the $x$-axis at $x = D$, with $D >> d$, will behave as:

Options
1. $E \propto \frac{1}{D^3}$
2. $E \propto \frac{1}{D}$
3. $E \propto \frac{1}{D^4}$
4. $E \propto \frac{1}{D^2}$

Q.17 The physical sizes of the transmitter and receiver antenna in a communication system are:

Options
1. independent of both carrier and modulation frequency

Question Type: MCQ
Question ID: 41652912891
Option 1 ID: 41652950343
Option 2 ID: 41652950345
Option 3 ID: 41652950344
Option 4 ID: 41652950342
Status: Not Answered
Chosen Option: --
2. inversely proportional to carrier frequency
3. inversely proportional to modulation frequency
4. proportional to carrier frequency

Q.18
50 W/m² energy density of sunlight is normally incident on the surface of a solar panel. Some part of incident energy (25%) is reflected from the surface and the rest is absorbed. The force exerted on 1 m² surface area will be close to (c = 3 × 10⁸ m/s):

Options
1. 15 × 10⁻⁸ N
2. 20 × 10⁻⁸ N
3. 10 × 10⁻⁸ N
4. 35 × 10⁻⁸ N

Q.19
A thin smooth rod of length L and mass M is rotating freely with angular speed ω₀ about an axis perpendicular to the rod and passing through its center. Two beads of mass m and negligible size are at the center of the rod initially. The beads are free to slide along the rod. The angular speed of the system, when the beads reach the opposite ends of the rod, will be:

Options
1. \( \frac{M \omega_0}{M + m} \)
2. \( \frac{M \omega_0}{M + 3m} \)
Q.20 Diameter of the objective lens of a telescope is 250 cm. For light of wavelength 600 nm coming from a distant object, the limit of resolution of the telescope is close to:

Options
1. $1.5 \times 10^{-7}$ rad
2. $2.0 \times 10^{-7}$ rad
3. $3.0 \times 10^{-7}$ rad
4. $4.5 \times 10^{-7}$ rad

Q.21 The area of a square is 5.29 cm$^2$. The area of 7 such squares taking into account the significant figures is:

Options
1. 37 cm$^2$
2. 37.030 cm$^2$
3. 37.03 cm$^2$
4. 37.0 cm$^2$

Q.22
A string 2.0 m long and fixed at its ends is driven by a 240 Hz vibrator. The string vibrates in its third harmonic mode. The speed of the wave and its fundamental frequency is:

Options
1. 180 m/s, 80 Hz
2. 320 m/s, 80 Hz
3. 320 m/s, 120 Hz
4. 180 m/s, 120 Hz

Q.23 Two materials having coefficients of thermal conductivity ‘3K’ and ‘K’ and thickness ‘d’ and ‘3d’, respectively, are joined to form a slab as shown in the figure. The temperatures of the outer surfaces are ‘θ₂’ and ‘θ₁’ respectively, (θ₂ > θ₁). The temperature at the interface is:

\[
\begin{array}{c|c|c|c}
\text{d} & 3d & \text{3K} & \text{K} \\
\hline
\theta_2 & \theta_1 \\
\end{array}
\]

Options
1. \(\frac{\theta_2}{10} + \frac{9\theta_2}{10}\)
2. \(\frac{\theta_2 + \theta_1}{2}\)
3. \(\frac{\theta_1}{6} + \frac{5\theta_2}{6}\)
4. \(\frac{\theta_1}{3} + \frac{2\theta_2}{3}\)
Two coils 'P' and 'Q' are separated by some distance. When a current of 3 A flows through coil 'P', a magnetic flux of $10^{-3}$ Wb passes through 'Q'. No current is passed through 'Q'. When no current passes through 'P' and a current of 2 A passes through 'Q', the flux through 'P' is:

Options

1. $6.67 \times 10^{-4}$ Wb  
2. $3.67 \times 10^{-3}$ Wb  
3. $6.67 \times 10^{-3}$ Wb  
4. $3.67 \times 10^{-4}$ Wb

Q.25 The position vector of a particle changes with time according to the relation 
\[ \mathbf{r}(t) = 15t^2 \mathbf{i} + (4-20 t^2) \mathbf{j}. \] What is the magnitude of the acceleration at $t = 1$?

Options

1. 40  
2. 25  
3. 100  
4. 50

Q.26 The specific heats, $C_p$ and $C_v$ of a gas of diatomic molecules, A, are given (in units of J mol$^{-1}$K$^{-1}$) by 29 and 22, respectively. Another gas of diatomic molecules, B, has the corresponding values 30 and 21. If they are treated as ideal gases, then:

Options

1. A is rigid but B has a vibrational mode.  
2. A has a vibrational mode but B has none.
3. A has one vibrational mode and B has two.
4. Both A and B have a vibrational mode each.

Q.27 A wooden block floating in a bucket of water has \( \frac{4}{5} \) of its volume submerged.

When certain amount of an oil is poured into the bucket, it is found that the block is just under the oil surface with half of its volume under water and half in oil. The density of oil relative to that of water is:

Options 1. 0.5  
2. 0.8  
3. 0.6  
4. 0.7

Q.28 A convex lens of focal length 20 cm produces images of the same magnification 2 when an object is kept at two distances \( x_1 \) and \( x_2 \) (\( x_1 > x_2 \)) from the lens. The ratio of \( x_1 \) and \( x_2 \) is:

Options 1. 2 : 1  
2. 3 : 1  
3. 5 : 3  
4. 4 : 3
Q.29 A particle ‘P’ is formed due to a completely inelastic collision of particles ‘x’ and ‘y’ having de-Broglie wavelengths ‘λ_x’ and ‘λ_y’ respectively. If x and y were moving in opposite directions, then the de-Broglie wavelength of ‘P’ is:

Options
1. \( \frac{λ_x \cdot λ_y}{λ_x + λ_y} \)
2. \( \frac{λ_x \cdot λ_y}{|λ_x - λ_y|} \)
3. \( λ_x - λ_y \)
4. \( λ_x + λ_y \)

Q.30 A thin convex lens L (refractive index = 1.5) is placed on a plane mirror M. When a pin is placed at A, such that OA = 18 cm, its real inverted image is formed at A' itself, as shown in figure. When a liquid of refractive index \( \mu_L \) is put between the lens and the mirror, the pin has to be moved to A', such that OA' = 27 cm, to get its inverted real image at A' itself. The value of \( \mu_L \) will be:

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

Options
1. \( \frac{4}{3} \)
2. \( \frac{3}{2} \)
3. \( \sqrt{3} \)
4. \( \sqrt{2} \)
Q.1 Increasing order of reactivity of the following compounds for $S\textsubscript{N}1$ substitution is:

\[ \text{CH}_3 \text{CH}_2 \text{CH}_2 \text{Cl} \quad \text{CH}_3 \text{CH} \quad \text{Cl} \]

(A) \quad (B)

\[ \text{CH}_3 \text{CO} \quad \text{Cl} \quad \text{CH}_3 \]

(C) \quad (D)

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

Question ID: 41652912905
Option 1 ID: 41652950400
Option 2 ID: 41652950398
Option 3 ID: 41652950399
Option 4 ID: 41652950401
Status: Not Answered
Chosen Option: --

Q.2 In an acid-base titration, 0.1 M HCl solution was added to the NaOH solution of unknown strength. Which of the following correctly shows the change of pH of the titration mixture in this experiment?

\[ \text{pH} \quad \text{V (mL)} \]

(A) \quad (B)

\[ \text{pH} \quad \text{V (mL)} \]

(C) \quad (D)

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

Q.3  The peptide that gives positive ceric ammonium nitrate and carbylamine tests is:
Options  
1. Ser - Lys  
2. Gln - Asp  
3. Lys - Asp  
4. Asp - Gln

Q.4  The structures of beryllium chloride in the solid state and vapour phase, respectively, are:
Options  
1. chain and chain  
2. dimeric and dimeric  
3. chain and dimeric  
4. dimeric and chain

Q.5  Hinsberg's reagent is:
Options  
1. C₆H₅COCl  
2. SOCl₂  
3. C₆H₅SO₂Cl  
4. (COCl)₂
Q.6 The maximum number of possible oxidation states of actinoids are shown by:

Options
1. nobelium (No) and lawrencium (Lr)
2. actinium (Ac) and thorium (Th)
3. berkelium (Bk) and californium (Cf)
4. neptunium (Np) and plutonium (Pu)

Q.7 Assertion:
For the extraction of iron, haematite ore is used.
Reason:
Haematite is a carbonate ore of iron.

Options
1. Only the reason is correct.
   Both the assertion and reason are correct, but the reason is not the correct explanation for the assertion.
2. correct and the reason is the correct explanation for the assertion.
3. Only the assertion is correct.

Q.8 HF has highest boiling point among hydrogen halides, because it has:
Options 1. strongest van der Waals’ interactions  
   2. lowest ionic character  
   3. strongest hydrogen bonding  
   4. lowest dissociation enthalpy

Q.9  
10 mL of 1 mM surfactant solution forms a monolayer covering 0.24 cm² on a polar substrate. If the polar head is approximated as a cube, what is its edge length?

Options 1. 1.0 pm  
   2. 2.0 pm  
   3. 0.1 nm  
   4. 2.0 nm

Q.10  
Consider the given plot of enthalpy of the following reaction between A and B.  
A + B → C + D.  
Identify the incorrect statement:

Options 1. Activation enthalpy to form C is 5 kJ mol⁻¹ less than that to form D.  
   2. C is the thermodynamically stable product.  
   3. D is kinetically stable product.
4. Formation of A and B from C has highest enthalpy of activation.

**Q.11**
Molal depression constant for a solvent is 4.0 K kg mol\(^{-1}\). The depression in the freezing point of the solvent for 0.03 mol kg\(^{-1}\) solution of K\(_2\)SO\(_4\) is:
(Assume complete dissociation of the electrolyte)

**Options**
1. 0.18 K
2. 0.24 K
3. 0.12 K
4. 0.36 K

**Q.12**
During compression of a spring the work done is 10 kJ and 2 kJ escaped to the surroundings as heat. The change in internal energy, \(\Delta U\) (in kJ) is:

**Options**
1. −12
2. −8
3. 8
4. 12
The correct statements among I to III regarding group 13 element oxides are,

(i) Boron trioxide is acidic.
(ii) Oxides of aluminium and gallium are amphoteric.
(iii) Oxides of indium and thallium are basic.

Options
1. (I) and (II) only
2. (I), (II) and (III)
3. (I) and (III) only
4. (II) and (III) only

Q.14 Which one of the following about an electron occupying the 1s orbital in a hydrogen atom is incorrect? (The Bohr radius is represented by a₀).

Options
1. The probability density of finding the electron is maximum at the nucleus.
2. The electron can be found at a distance 2a₀ from the nucleus.
3. The magnitude of the potential energy is double that of its kinetic energy on an average.
4. The total energy of the electron is maximum when it is at a distance a₀ from the nucleus.

Q.15 The amorphous form of silica is:

Options
1. tridymite
2. kieselguhr
3. cristobalite
4. quartz

Q.16 What would be the molality of 20% (mass/mass) aqueous solution of KI?
(molar mass of KI = 166 g mol\(^{-1}\))

Options
1. 1.08
2. 1.35
3. 1.48
4. 1.51

Q.17 The layer of atmosphere between 10 km to 50 km above the sea level is called as:

Options
1. troposphere
2. thermosphere
3. stratosphere
4. mesosphere

Q.18 Which of the following potential energy (PE) diagrams represents the \(S_N^1\) reaction?

Options
1. PE diagram
Question 19

At a given temperature T, gases Ne, Ar, Xe and Kr are found to deviate from ideal gas behaviour. Their equation of state is given as:

\[ p = \frac{RT}{V - b} \] at T.

Here, \( b \) is the van der Waals constant. Which gas will exhibit steepest increase in the plot of \( Z \) (compression factor) vs \( p \)?

Options:
1. Xe
2. Kr
3. Ne
4. Ar

Question 20

Noradrenaline is a/an:

Options:
1. Antacid
2. Neurotransmitter
3. Antidepressant
4. Antihistamine
Q.21 Among the following species, the diamagnetic molecule is:

Options
1. NO
2. CO
3. B₂
4. O₂

Q.22 The correct statements among I to III are:

(I) Valence bond theory cannot explain the color exhibited by transition metal complexes.

(II) Valence bond theory can predict quantitatively the magnetic properties of transition metal complexes.

(III) Valence bond theory cannot distinguish ligands as weak and strong field ones.

Options
1. (II) and (III) only
2. (I), (II) and (III)
3. (I) and (III) only
4. (I) and (II) only

Q.23 The one that is not a carbonate ore is:

Options

---
1. malachite  
2. calamine  
3. siderite  
4. bauxite

Q.24 A solution of Ni(NO₃)₂ is electrolysed between platinum electrodes using 0.1 Faraday electricity. How many mole of Ni will be deposited at the cathode?

Options
1. 0.05
2. 0.20
3. 0.15
4. 0.10

Q.25 p-Hydroxybenzophenone upon reaction with bromine in carbon tetrachloride gives:

Options
1. 
2. 
3. 
4. 

Question Type: MCQ  
Question ID: 41652912917  
Option 1 ID: 41652950448  
Option 2 ID: 41652950447  
Option 3 ID: 41652950449  
Option 4 ID: 41652950446  
Status: Answered  
Chosen Option: 4

Question Type: MCQ  
Question ID: 41652912933  
Option 1 ID: 41652950511  
Option 2 ID: 41652950512  
Option 3 ID: 41652950513  
Option 4 ID: 41652950510  
Status: Not Answered  
Chosen Option: --
Q.26 In the following reaction

\[ \text{carbonyl compound} + \text{MeOH} \xrightarrow{\text{HCl}} \text{acetal} \]

Rate of the reaction is the highest for:

**Options**
1. Acetone as substrate and methanol in excess
2. Propanal as substrate and methanol in stoichiometric amount
3. Propanal as substrate and methanol in excess
4. Acetone as substrate and methanol in stoichiometric amount

Q.27 Which of the following compounds is a constituent of the polymer

\[ \left[ \text{HN} = \text{C} = \text{NH} - \text{CH}_2 \right]_n \]?

**Options**
1. N-Methyl urea
2. Formaldehyde
3. Methylamine
4. Ammonia
Q.28 The major products A and B for the following reactions are, respectively:

\[ \text{KCN} \quad \text{DMSO}^* \quad [A] \quad \text{H}_2/\text{Pd} \quad [B] \]

Options
1. \( \text{HO-CN} \quad \text{HO-CH}_2-\text{NH}_2 \)
2. \( \text{CO-CN} \quad \text{CH}_3\text{NH}_2 \)
3. \( \text{CO-CN} \quad \text{OH} \quad \text{CH}_2\text{NH}_2 \)
4. \( \text{HO-CN} \quad \text{HO-CH}_2-\text{NH}_2 \)

Q.29 The maximum possible denticities of a ligand given below towards a common transition and inner-transition metal ion, respectively, are:

\[ \text{N} \quad \text{N} \quad \text{COO}^- \]

Options 1. 8 and 6
2. 6 and 8
3. 6 and 6
4. 8 and 8
**Q.1** The total number of matrices

\[
A = \begin{pmatrix}
0 & 2y & 1 \\
2x & y & 1 \\
2x & -y & 1
\end{pmatrix}, \quad (x, \ y \in \mathbb{R}, \ x \neq y)
\]

which \(A^TA = 3I_3\) is:

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

**Question Type:** MCQ  
**Question ID:** 41652912939
Q.2  The area (in sq. units) of the smaller of the two circles that touch the parabola, $y^2 = 4x$ at the point $(1, 2)$ and the $x$-axis is :

Options
1. $8\pi (2 - \sqrt{2})$
2. $4\pi (2 - \sqrt{2})$
3. $4\pi (3 + \sqrt{2})$
4. $8\pi (3 - 2\sqrt{2})$

Q.3  Some identical balls are arranged in rows to form an equilateral triangle. The first row consists of one ball, the second row consists of two balls and so on. If 99 more identical balls are added to the total number of balls used in forming the equilateral triangle, then all these balls can be arranged in a square whose each side contains exactly 2 balls less than the number of balls each side of the triangle contains. Then the number of balls used to form the equilateral triangle is :

Options
1. 157
2. 262
3. 225
4. 190

Q.4

https://cdn3.digialm.com///per/g21/pub/2083/touchstone/AssessmentQPHTMLMode1//2083O1951/2083O1951S6D34566/155490009029664…
If \( m \) is chosen in the quadratic equation 
\((m^2 + 1)x^2 - 3x + (m^2 + 1)^2 = 0\) such that the sum of its roots is greatest, then the absolute difference of the cubes of its roots is:

Options 1. \( 10\sqrt{5} \)
2. \( 8\sqrt{5} \)
3. \( 8\sqrt{5} \)
4. \( 4\sqrt{5} \)

Q.5

Let \( z \in \mathbb{C} \) be such that \(|z| < 1\). If \( \omega = \frac{5+3z}{5(1-z)} \), then:

Options 1. \( 5 \Re(\omega) > 4 \)
2. \( 4 \Im(\omega) > 5 \)
3. \( 5 \Re(\omega) > 1 \)
4. \( 5 \Im(\omega) < 1 \)

Q.6

If some three consecutive coefficients in the binomial expansion of \((x + 1)^n\) in powers of \( x \) are in the ratio \( 2: 15: 70 \), then the average of these three coefficients is:

Options 1. \( 964 \)
2. \( 232 \)
3. \( 227 \)
4. \( 625 \)
Q.7

If \( f(x) = [x] - \frac{x}{4} \), \( x \in \mathbb{R} \), where \( [x] \) denotes the greatest integer function, then:

Options
1. \( f \) is continuous at \( x = 4 \).
2. \( \lim_{x \to 4^-} f(x) \) exists but \( \lim_{x \to 4^+} f(x) \) does not exist.
3. Both \( \lim_{x \to 4^-} f(x) \) and \( \lim_{x \to 4^+} f(x) \) exist but are not equal.
4. \( \lim_{x \to 4^-} f(x) \) exists but \( \lim_{x \to 4^+} f(x) \) does not exist.

Q.8

Two poles standing on a horizontal ground are of heights 5 m and 10 m respectively. The line joining their tops makes an angle of 15° with the ground. Then the distance (in m) between the poles, is:

Options
1. \( 5(2 + \sqrt{3}) \)
2. \( 5(\sqrt{3} + 1) \)
3. \( \frac{5}{2}(2 + \sqrt{3}) \)
4. \( 10(\sqrt{3} - 1) \)

Q.9

The vertices B and C of a \( \triangle ABC \) lie on the line, \( \frac{x + 2}{3} = \frac{y - 1}{0} = \frac{z}{4} \) such that BC = 5 units. Then the area (in sq. units) of this triangle, given that the point A(1, -1, 2), is:

Question Type: MCQ
Question ID: 41652912947
Option 1 ID: 41652950569
Option 2 ID: 41652950566
Option 3 ID: 41652950568
Option 4 ID: 41652950567
Status: Answered
Chosen Option: 1

Question Type: MCQ
Question ID: 41652912964
Option 1 ID: 41652950636
Option 2 ID: 41652950637
Option 3 ID: 41652950634
Option 4 ID: 41652950635
Status: Answered
Chosen Option: 1
Q.10
If the function \( f(x) = \begin{cases} a|x-x_1|+1, & x \leq 5 \\ b|x-\pi|+3, & x > 5 \end{cases} \)
is continuous at \( x = 5 \), then the value of \( a - b \)
is:

Options
1. \( \frac{2}{\pi+5} \)
2. \( \frac{2}{\pi+5} \)
3. \( \frac{2}{\pi-5} \)
4. \( \frac{2}{5-\pi} \)

Question Type : MCQ
Question ID : 41652912959
Option 1 ID : 41652950614
Option 2 ID : 41652950617
Option 3 ID : 41652950616
Option 4 ID : 41652950615
Status : Not Answered
Chosen Option : --

Q.11
A water tank has the shape of an inverted right circular cone, whose semi-vertical angle is \( \tan^{-1} \left( \frac{1}{2} \right) \). Water is poured into it at a constant rate of 5 cubic meter per minute. Then the rate (in m/min.), at which the level of water is rising at the instant when the depth of water in the tank is 10 m, is:

Options
1. \( \frac{1}{15\pi} \)
2. \( \frac{1}{10\pi} \)
3. \( \frac{2}{\pi} \)
4. \( \frac{1}{5\pi} \)

Question Type : MCQ
Question ID : 41652912946
Option 1 ID : 41652950563
Option 2 ID : 41652950565
Option 3 ID : 41652950562
Option 4 ID : 41652950564
Status : Answered
Chosen Option : 4
Q.12
The value of the integral
\[ \int_0^1 x \cot^{-1}(1-x^2+x^4) \, dx \]
is:

Options
1. \( \frac{\pi}{2} - \frac{1}{2} \log e^2 \)
2. \( \frac{\pi}{4} - \log e^2 \)
3. \( \frac{\pi}{2} - \log e^2 \)
4. \( \frac{\pi}{4} - \frac{1}{2} \log e^2 \)

Q.13
Let \( P \) be the plane, which contains the line of intersection of the planes, \( x + y + z - 6 = 0 \)
and \( 2x + 3y + z + 5 = 0 \) and it is perpendicular to the \( xy \)-plane. Then the distance of the point \( (0, 0, 256) \) from \( P \) is equal to:

Options
1. \( \frac{17}{\sqrt{5}} \)
2. \( \frac{63}{\sqrt{5}} \)
3. \( \frac{205}{\sqrt{5}} \)
4. \( \frac{11}{\sqrt{5}} \)
If the two lines $x + (a - 1)y = 1$ and $2x + ax^2y = 1$ ($a \in \mathbb{R} - [0, 1]$) are perpendicular, then the distance of their point of intersection from the origin is:

Options
1. $\sqrt{\frac{2}{5}}$
2. $\frac{2}{5}$
3. $\frac{2}{\sqrt{5}}$
4. $\frac{\sqrt{2}}{5}$

Q.15 The common tangent to the circles $x^2 + y^2 = 4$ and $x^2 + y^2 + 6x + 8y - 24 = 0$ also passes through the point:

Options
1. $(4, -2)$
2. $(-6, 4)$
3. $(6, -2)$
4. $(-4, 6)$

Q.16 The mean and the median of the following ten numbers in increasing order
10, 22, 26, 29, 34, $x$, 42, 67, 70, $y$

are 42 and 35 respectively, then $\frac{y}{x}$ is equal to:

Options
1. $9/4$
2. $7/2$
3. $8/3$
4. $7/3$
Q.17

If \( \cos x \frac{dy}{dx} - y \sin x = 6x, \ (0 < x < \frac{\pi}{2}) \) and 
\[ y\left(\frac{\pi}{3}\right) = 0, \text{ then } y\left(\frac{\pi}{6}\right) \text{ is equal to :} \]

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

Q.18

The domain of the definition of the function
\[ f(x) = \frac{1}{4-x^2} + \log_{10}(x^3-x) \text{ is :} \]

Options
1. \((-1, 0) \cup (1, 2) \cup (3, \infty)\)
2. \((-2, -1) \cup (-1, 0) \cup (2, \infty)\)
3. \((-1, 0) \cup (1, 2) \cup (2, \infty)\)
4. \((1, 2) \cup (2, \infty)\)
If the sum and product of the first three terms in an A.P. are 33 and 1155, respectively, then a value of its 11th term is:

Options 1. -35  
2. 25  
3. -36  
4. -25

Q.20 Two newspapers A and B are published in a city. It is known that 25% of the city population reads A and 20% reads B while 8% reads both A and B. Further, 30% of those who read A but not B look into advertisements and 40% of those who read B but not A also look into advertisements, while 50% of those who read both A and B look into advertisements. Then the percentage of the population who look into advertisements is:

Options 1. 13.9  
2. 12.8  
3. 13  
4. 13.5

Q.21 If \( f : \mathbb{R} \to \mathbb{R} \) is a differentiable function and \( f(2) = 6 \), then \( \lim_{x \to 2} \int_{0}^{2t} \frac{1}{x-2} \mathrm{d}t \) is:

Options 1. 24\(f''(2)\)  
2. 2\(f''(2)\)  
3. 0  
4. 12\(f''(2)\)
Q.22 If \( p \implies (q \lor r) \) is false, then the truth values of \( p, q, r \) are respectively:

Options
1. F, T, T
2. T, F, F
3. T, T, F
4. F, F, F

Q.23 If the tangent to the parabola \( y^2 = x \) at a point \((\alpha, \beta)\), \((\beta > 0)\) is also a tangent to the ellipse \( x^2 + 2y^2 = 1 \), then \( \alpha \) is equal to:

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

Q.24 If a unit vector \( \vec{a} \) makes angles \( \pi/3 \) with \( \hat{i} \), \( \pi/4 \) with \( \hat{j} \) and \( \theta \in (0, \pi) \) with \( \hat{k} \), then a value of \( \theta \) is:

Options
1. \( \frac{5\pi}{6} \)
2. \( \frac{\pi}{4} \)
3. $\frac{5\pi}{12}$
4. $\frac{2\pi}{3}$

**Q.25**

If

$$\int e^{\sec x}(\sec x \tan x f(x) + (\sec x \tan x + \sec^2 x))dx$$

$$= e^{\sec x}f(x) + C$$, then a possible choice of $f(x)$ is:

Options

1. $\sec x + \tan x + \frac{1}{2}$
2. $\sec x - \tan x - \frac{1}{2}$
3. $\sec x + x \tan x - \frac{1}{2}$
4. $x \sec x + \tan x + \frac{1}{2}$

**Question Type**: MCQ
**Question ID**: 41652912960
**Option 1 ID**: 41652950621
**Option 2 ID**: 41652950620
**Option 3 ID**: 41652950618
**Option 4 ID**: 41652950619
**Status**: Not Answered

**Chosen Option**: --

**Q.26**

A rectangle is inscribed in a circle with a diameter lying along the line $3y = x + 7$. If the two adjacent vertices of the rectangle are $(-8, 5)$ and $(6, 5)$, then the area of the rectangle (in sq. units) is:

Options

1. 84
2. 98
3. 72
4. 56

**Question Type**: MCQ
**Question ID**: 41652912949
**Option 1 ID**: 41652950575
**Option 2 ID**: 41652950574
**Option 3 ID**: 41652950577
**Option 4 ID**: 41652950576
**Status**: Answered

**Chosen Option**: 4
Q.27 The value of \( \sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ \) is:

Options
1. \( \frac{1}{16} \)
2. \( \frac{1}{32} \)
3. \( \frac{1}{18} \)
4. \( \frac{1}{36} \)

Q.28 The sum of the series
\[ 1 + 2 \times 3 + 3 \times 5 + 4 \times 7 + \ldots \text{upto} \ 11^{\text{th}} \text{term} \]
is:

Options
1. 915
2. 946
3. 945
4. 916

Q.29 If the system of equations
\[ 2x + 3y - z = 0, \]
\[ x + ky - 2z = 0 \]
and
\[ 2x - y + z = 0 \]
has a non-trivial solution \((x, y, z)\), then
\[ \frac{x}{y} + \frac{y}{z} + \frac{z}{x} + k \]
is equal to:

Options
1. \( \frac{3}{4} \)
2. \( \frac{1}{2} \)
3. \( -\frac{1}{4} \)
4. \(-4 \)
Q.30 The area (in sq. units) of the region 
\[ A = \{(x, y) : \frac{y^2}{2} \leq x \leq y + 4\} \] is:

Options
1. 53
2. 30
3. 16
4. 18