Q.1 In the formula $X = 5YZ^2$, $X$ and $Z$ have dimensions of capacitance and magnetic field, respectively. What are the dimensions of $Y$ in SI units?

Options
1. $[M^{-1} L^{-2} T^4 A^2]$
2. $[M^{-2} L^0 T^{-4} A^{-2}]$
3. $[M^{-2} L^{-2} T^6 A^3]$
4. $[M^{-3} L^{-2} T^8 A^4] \checkmark$

Q.2 Two blocks A and B of masses $m_A = 1 \text{ kg}$ and $m_B = 3 \text{ kg}$ are kept on the table as shown in figure. The coefficient of friction between A and B is 0.2 and between B and the surface of the table is also 0.2. The maximum force $F$ that can be applied on B horizontally, so that the block A does not slide over the block B is:

$[\text{Take } g = 10 \text{ m/s}^2]$

Options
1. 16 N \checkmark
2. 12 N
3. 40 N
4. 8 N

Q.3 A solid sphere of mass $M$ and radius $R$ is divided into two unequal parts. The first part has a mass of \( \frac{7M}{8} \) and is converted into a uniform disc of radius $2R$. The second part is converted into a uniform solid sphere. Let $I_1$ be the moment of inertia of the disc about its axis and $I_2$ be the moment of inertia of the new sphere about its axis. The ratio $I_1/I_2$ is given by:

Options
1. 140 ✓
2. 185
3. 65
4. 285

Q.4 One mole of an ideal gas passes through a process where pressure and volume obey the relation $P = P_o \left[ 1 - \frac{1}{2} \left( \frac{V_o}{V} \right)^2 \right]$. Here $P_o$ and $V_o$ are constants. Calculate the change in the temperature of the gas if its volume changes from $V_o$ to $2V_o$.

Options
1. $\frac{1}{4} \frac{P_o V_o}{R}$
Q.5 A square loop is carrying a steady current $I$ and the magnitude of its magnetic dipole moment is $m$. If this square loop is changed to a circular loop and it carries the same current, the magnitude of the magnetic dipole moment of circular loop will be:

Options

1. $\frac{4m}{\pi} \checkmark$
2. $\frac{3m}{\pi}$
3. $\frac{2m}{\pi}$
4. $\frac{m}{\pi}$

Q.6
The figure represents a voltage regulator circuit using a Zener diode. The breakdown voltage of the Zener diode is 6 V and the load resistance is, $R_L = 4 \, k\Omega$. The series resistance of the circuit is $R_s = 1 \, k\Omega$. If the battery voltage $V_B$ varies from 8 V to 16 V, what are the minimum and maximum values of the current through Zener diode?

![Circuit Diagram]

**Options**

1. 0.5 mA; 6 mA
2. 1 mA; 8.5 mA
3. 0.5 mA; 8.5 mA □
4. 1.5 mA; 8.5 mA

Question Type: MCQ
- Question ID: 41652914342
- Option 1 ID: 41652956146
- Option 2 ID: 41652956149
- Option 3 ID: 41652956148
- Option 4 ID: 41652956147
- Status: Answered
- Chosen Option: 3

Q.7

A spaceship orbits around a planet at a height of 20 km from its surface. Assuming that only gravitational field of the planet acts on the spaceship, what will be the number of complete revolutions made by the spaceship in 24 hours around the planet?

[Given: Mass of planet $= 8 \times 10^{22}$ kg,
Radius of planet $= 2 \times 10^6$ m,
Gravitational constant $G = 6.67 \times 10^{-11}$ Nm²/kg²]

**Options**

1. 17
2. 9
3. 13
4. Light is incident normally on a completely absorbing surface with an energy flux of 25 W cm\(^{-2}\). If the surface has an area of 25 cm\(^2\), the momentum transferred to the surface in 40 min time duration will be:

Options:
1. \(6.3 \times 10^{-4}\) Ns
2. \(5.0 \times 10^{-3}\) Ns \(\checkmark\)
3. \(3.5 \times 10^{-6}\) Ns
4. \(1.4 \times 10^{-6}\) Ns

Q.9 A metal coin of mass 5 g and radius 1 cm is fixed to a thin stick AB of negligible mass as shown in the figure. The system is initially at rest. The constant torque, that will make the system rotate about AB at 25 rotations per second in 5 s, is close to:

Options:
1. \(1.6 \times 10^{-5}\) Nm
2. \(2.0 \times 10^{-5}\) Nm \(\checkmark\)
3. \(7.9 \times 10^{-6}\) Nm
4. $4.0 \times 10^{-6} \text{ Nm}$

**Q.10**  
A 2 mW laser operates at a wavelength of 500 nm. The number of photons that will be emitted per second is:  
[Given Planck’s constant $h = 6.6 \times 10^{-34} \text{ Js}$, speed of light $c = 3.0 \times 10^8 \text{ m/s}$]

Options  
1. $1.5 \times 10^{16}$  
2. $5 \times 10^{15}$  
3. $2 \times 10^{16}$  
4. $1 \times 10^{16}$

**Q.11**  
A simple pendulum of length $L$ is placed between the plates of a parallel plate capacitor having electric field $E$, as shown in figure. Its bob has mass $m$ and charge $q$. The time period of the pendulum is given by:

Options

![Diagram of a pendulum with electric field](https://cdn3.digialm.com//per/g21/pub/2083/touchstone/AssessmentQPHTMLMode1//2083O1951/2083O1951S8D37100/15549622225...
1. \( \frac{2\pi L}{\sqrt{g^2 + \left(\frac{qE}{m}\right)^2}} \) √

2. \( \frac{2\pi L}{\sqrt{g + \frac{qE}{m}}} \)

3. \( \frac{2\pi L}{\sqrt{g - \frac{qE}{m}}} \)

4. \( \frac{2\pi L}{\sqrt{g^2 - \frac{q^2E^2}{m^2}}} \)

---

**Q.12**

The elastic limit of brass is 379 MPa. What should be the minimum diameter of a brass rod if it is to support a 400 N load without exceeding its elastic limit?

**Options**

1. 1.00 mm
2. 1.35 mm
3. 1.16 mm √
4. 0.90 mm

---

**Q.13**
A cubical block of side 0.5 m floats on water with 30% of its volume under water. What is the maximum weight that can be put on the block without fully submerging it under water?

[Take, density of water = 10^3 kg/m^3]

Options
1. 87.5 kg ✓
2. 65.4 kg
3. 30.1 kg
4. 46.3 kg

Q.14 When heat Q is supplied to a diatomic gas of rigid molecules, at constant volume its temperature increases by ΔT. The heat required to produce the same change in temperature, at a constant pressure is:

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

Q.15
In a Young’s double slit experiment, the ratio of the slit’s width is 4 : 1. The ratio of the intensity of maxima to minima, close to the central fringe on the screen, will be:

Options
1. $25 : 9$
2. $9 : 1$ \(\sqrt{\text{CHECKED}}\)
3. $(\sqrt{3}+1)^4 : 16$
4. $4 : 1$

Q.16

In an experiment, brass and steel wires of length 1 m each with areas of cross section 1 mm² are used. The wires are connected in series and one end of the combined wire is connected to a rigid support and other end is subjected to elongation. The stress required to produce a net elongation of 0.2 mm is,

[Given, the Young’s Modulus for steel and brass are, respectively, $120 \times 10^9$ N/m² and $60 \times 10^9$ N/m²]

Options
1. $4.0 \times 10^5$ N/m² \(\sqrt{\text{CHECKED}}\)
2. $1.2 \times 10^6$ N/m²
3. $0.2 \times 10^6$ N/m²
4. $1.8 \times 10^6$ N/m²

Q.17
A source of sound $S$ is moving with a velocity of 50 m/s towards a stationary observer. The observer measures the frequency of the source as 1000 Hz. What will be the apparent frequency of the source when it is moving away from the observer after crossing him? (Take velocity of sound in air is 350 m/s)

**Options**

1. 750 Hz  
2. 857 Hz  
3. 1143 Hz  
4. 807 Hz

---

**Q.18**

A coil of self inductance 10 mH and resistance 0.1 Ω is connected through a switch to a battery of internal resistance 0.9 Ω. After the switch is closed, the time taken for the current to attain 80% of the saturation value is: [take $\ln 5 = 1.6$]

**Options**

1. 0.103 s  
2. 0.002 s  
3. 0.324 s  
4. 0.016 s
Water from a tap emerges vertically downwards with an initial speed of 1.0 ms\(^{-1}\). The cross-sectional area of the tap is 10\(^{-4}\) m\(^2\). Assume that the pressure is constant throughout the stream of water and that the flow is streamlined. The cross-sectional area of the stream, 0.15 m below the tap would be:
(Take g = 10 ms\(^{-2}\))

**Options**
1. \(1 \times 10^{-5}\) m\(^2\)
2. \(5 \times 10^{-4}\) m\(^2\)
3. \(2 \times 10^{-5}\) m\(^2\)
4. \(5 \times 10^{-5}\) m\(^2\) \(\checkmark\)

Q.20

The time dependence of the position of a particle of mass \(m = 2\) is given by
\[\vec{r}(t) = 2t\hat{i} - 3t^2\hat{j}\]. Its angular momentum, with respect to the origin, at time \(t = 2\) is:

**Options**
1. \(36\hat{k}\)
2. \(48\left(\hat{i} + \hat{j}\right)\)
3. \(-48\hat{k}\) \(\checkmark\)
4. \(-34\left(\hat{k} - \hat{i}\right)\)

Q.21
In Li$^{+ +}$, electron in first Bohr orbit is excited to a level by a radiation of wavelength $\lambda$. When the ion gets deexcited to the ground state in all possible ways (including intermediate emissions), a total of six spectral lines are observed. What is the value of $\lambda$?

(Given : $h = 6.63 \times 10^{-34}$ Js; $c = 3 \times 10^8$ ms$^{-1}$)

Options
1. 10.8 nm ✓
2. 9.4 nm
3. 11.4 nm
4. 12.3 nm

Q.22 A plane is inclined at an angle $\alpha = 30^\circ$ with respect to the horizontal. A particle is projected with a speed $u = 2$ m$s^{-1}$, from the base of the plane, making an angle $\theta = 15^\circ$ with respect to the plane as shown in the figure. The distance from the base, at which the particle hits the plane is close to :

(Take $g = 10$ m$s^{-2}$)

Options
1. 20 cm ✓
2. 18 cm
3. 14 cm
4. 26 cm
Q.23 Two radioactive substances A and B have decay constants $5\lambda$ and $\lambda$ respectively. At $t=0$, a sample has the same number of the two nuclei. The time taken for the ratio of the number of nuclei to become $\left(\frac{1}{e}\right)^2$ will be:

Options
1. $\frac{1}{\lambda}$
2. $\frac{1}{2\lambda}$ ✓
3. $\frac{2}{\lambda}$
4. $\frac{1}{4\lambda}$

Q.24 The graph shows how the magnification $m$ produced by a thin lens varies with image distance $v$. What is the focal length of the lens used?

Options
1. $\frac{b}{c}$ ✓
2. $\frac{a}{c}$
3. $\frac{b^2c}{a}$
4. \( \frac{b^2}{ac} \)

---

### Q.25

In free space, a particle A of charge 1 \( \mu \)C is held fixed at a point P. Another particle B of the same charge and mass 4 \( \mu \)g is kept at a distance of 1 mm from P. If B is released, then its velocity at a distance of 9 mm from P is:

\[
\text{Take } \frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \text{ Nm}^2 \text{C}^{-2}
\]

**Options**

1. 1.0 m/s
2. 1.5 \times 10^2 \text{ m/s}
3. 2.0 \times 10^3 \text{ m/s} \quad \checkmark
4. 3.0 \times 10^4 \text{ m/s}

---

### Q.26

The correct figure that shows, schematically, the wave pattern produced by superposition of two waves of frequencies 9 Hz and 11 Hz, is:

**Options**

1. ![Wave Pattern](image.png) \quad \checkmark
Q.27  Space between two concentric conducting spheres of radii a and b \((b > a)\) is filled with a medium of resistivity \(\rho\). The resistance between the two spheres will be:

Options
1. \(\frac{\rho}{4\pi} \left( \frac{1}{a} + \frac{1}{b} \right)\)

2. \(\frac{\rho}{2\pi} \left( \frac{1}{a} + \frac{1}{b} \right)\)

3. \(\frac{\rho}{4\pi} \left( \frac{1}{a} - \frac{1}{b} \right)\)

4. \(\frac{\rho}{2\pi} \left( \frac{1}{a} - \frac{1}{b} \right)\)

Q.28
A submarine experiences a pressure of $5.05 \times 10^6$ Pa at a depth of $d_1$ in a sea. When it goes further to a depth of $d_2$, it experiences a pressure of $8.08 \times 10^6$ Pa. Then $d_2 - d_1$ is approximately (density of water = $10^3$ kg/m$^3$ and acceleration due to gravity = $10$ m/s$^2$):

Options
1. 600 m
2. 500 m
3. 300 m ✓
4. 400 m

Q.29
The magnitude of the magnetic field at the center of an equilateral triangular loop of side 1 m which is carrying a current of 10 A is:

[Take $\mu_0 = 4\pi \times 10^{-7}$ NAm$^{-2}$]

Options
1. 3 $\mu$T
2. 1 $\mu$T
3. 18 $\mu$T ✓
4. 9 $\mu$T

Q.30
A bullet of mass 20 g has an initial speed of 1 ms\(^{-1}\), just before it starts penetrating a mud wall of thickness 20 cm. If the wall offers a mean resistance of \(2.5 \times 10^{-2}\) N, the speed of the bullet after emerging from the other side of the wall is close to:

Options
1. 0.7 ms\(^{-1}\) ✓
2. 0.3 ms\(^{-1}\)
3. 0.1 ms\(^{-1}\)
4. 0.4 ms\(^{-1}\)

Q.1
The INCORRECT statement is:

1. \([\text{Fe}(\text{H}_2\text{O})_6]^{2+}\) and \([\text{Cr}(\text{H}_2\text{O})_6]^{2+}\) are nearly similar.
2. \([\text{Ni}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}\) is 2.83 BM.
3. the spin-only magnetic moment of the gemstone, ruby, has Cr\(^{3+}\) ions occupying the octahedral sites of beryl.
4. the color of \([\text{CoCl}(\text{NH}_3)_5]^{2+}\) is violet as it absorbs the yellow light.

Q.2

Section: Chemistry
Compound A\(\text{C}_9\text{H}_{10}\text{O}\) shows positive iodoform test. Oxidation of A with KMnO\(_4\)/KOH gives acid B\(\text{C}_8\text{H}_6\text{O}_4\). Anhydride of B is used for the preparation of phenolphthalein. Compound A is:

Options

1. 
   \[
   \text{CH}_3
   \]

2. 
   \[
   \text{CH}_3
   \]

3. 
   \[
   \text{CH}_3
   \]

4. 
   \[
   \text{CH}_3
   \]

Q.3 The correct order of the first ionization enthalpies is:

Options

1. Ti < Mn < Zn < Ni
2. Ti < Mn < Ni < Zn
3. Mn < Ti < Zn < Ni
4. Zn < Ni < Mn < Ti

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Question ID: 41652914356
Option 1 ID: 41652956204
Option 2 ID: 41652956204
Option 3 ID: 41652956204
Option 4 ID: 41652956204
Status: Answered
Chosen Option: 1
Q.4 Points I, II and III in the following plot respectively correspond to

\( V_{mp} \) : most probable velocity

![Distribution function, f(v)]

Options

1. \( V_{mp} \) of \( N_2 \) (300 K); \( V_{mp} \) of \( H_2 \) (300 K);
   \( V_{mp} \) of \( O_2 \) (400 K)

2. \( V_{mp} \) of \( H_2 \) (300 K); \( V_{mp} \) of \( N_2 \) (300 K);
   \( V_{mp} \) of \( O_2 \) (400 K)

3. \( V_{mp} \) of \( N_2 \) (300 K); \( V_{mp} \) of \( O_2 \) (400 K);
   \( V_{mp} \) of \( H_2 \) (300 K)

4. \( V_{mp} \) of \( O_2 \) (400 K); \( V_{mp} \) of \( N_2 \) (300 K);
   \( V_{mp} \) of \( H_2 \) (300 K)

Chosen Option: 3

Q.5
For the reaction,
\[ 2 \text{SO}_2(g) + \text{O}_2(g) \rightleftharpoons 2 \text{SO}_3(g), \]
\[ \Delta H = -57.2 \text{ kJ mol}^{-1} \text{ and} \]
\[ K_c = 1.7 \times 10^{16}. \]
Which of the following statement is INCORRECT?

Options
1. The equilibrium constant is large suggestive of reaction going to completion and so no catalyst is required.  
   ✗
2. The equilibrium will shift in forward direction as the pressure increases.
3. The equilibrium constant decreases as the temperature increases.
4. The addition of inert gas at constant volume will not affect the equilibrium constant.

**Q.6** The crystal field stabilization energy (CFSE) of \([\text{Fe(H}_2\text{O)}_6]\text{Cl}_2\) and \(\text{K}_2[\text{NiCl}_4]\), respectively, are:

Options
1. \(-0.4\Delta_o\) and \(-1.2\Delta_t\)
2. \(-2.4\Delta_o\) and \(-1.2\Delta_t\)
3. \(-0.4\Delta_o\) and \(-0.8\Delta_t\) ✗
4. \(-0.6\Delta_o\) and \(-0.8\Delta_t\)

**Q.7**
The increasing order of nucleophilicity of the following nucleophiles is:

(a) \( \text{CH}_3\text{CO}_2^- \)
(b) \( \text{H}_2\text{O} \)
(c) \( \text{CH}_3\text{SO}_3^- \)
(d) \( \text{OH}^- \)

Options
1. \( (a) < (d) < (c) < (b) \)
2. \( (b) < (c) < (d) < (a) \)
3. \( (d) < (a) < (c) < (b) \)
4. \( (b) < (c) < (a) < (d) \)

Q.8 Number of stereo centers present in linear and cyclic structures of glucose are respectively:

Options
1. 4 & 4
2. 5 & 5
3. 4 & 5
4. 5 & 4

Q.9
The correct match between **Item - I** and **Item - II** is:

<table>
<thead>
<tr>
<th>Item - I</th>
<th>Item - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) High density polythene</td>
<td>(I) Peroxide catalyst</td>
</tr>
<tr>
<td>(b) Polyacrylonitrile</td>
<td>(II) Condensation at high temperature &amp; pressure</td>
</tr>
<tr>
<td>(c) Novolak</td>
<td>(III) Ziegler-Natta Catalyst</td>
</tr>
<tr>
<td>(d) Nylon 6</td>
<td>(IV) Acid or base catalyst</td>
</tr>
</tbody>
</table>

**Options**

1. (a) → (IV), (b) → (II), (c) → (I), (d) → (III)
2. (a) → (III), (b) → (I), (c) → (IV), (d) → (II)
3. (a) → (III), (b) → (I), (c) → (II), (d) → (IV)
4. (a) → (II), (b) → (IV), (c) → (I), (d) → (III)

---

**Q.10** In chromatography, which of the following statements is INCORRECT for \( R_f \)?

**Options**

1. Higher \( R_f \) value means higher adsorption. ✓
2. The value of \( R_f \) can not be more than one.
3. \( R_f \) value depends on the type of chromatography.
4. \( R_f \) value is dependent on the mobile phase.
Q.11 For the reaction of H₂ with I₂, the rate constant is \(2.5 \times 10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}\) at 327 °C and \(1.0 \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}\) at 527 °C. The activation energy for the reaction, in kJ mol⁻¹ is:

\[R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}\]

Options 1. 166  ✓
2. 59
3. 72
4. 150

Q.12 The number of pentagons in C₆₀ and trigons (triangles) in white phosphorus, respectively, are:

Options 1. 12 and 3  ✓
2. 20 and 4
3. 20 and 3
4. 12 and 4

Q.13 The ratio of the shortest wavelength of two spectral series of hydrogen spectrum is found to be about 9. The spectral series are:

Options 1. Paschen and Pfund
2. Balmer and Brackett
3. Lyman and Paschen ✓
4. Brackett and Pfund

Q. 14
The major product ‘Y’ in the following reaction is:

\[
\text{Ph} - \overset{\text{NaOCl}}{\rightarrow} \text{CH}_3 \quad \text{(i) SOCl}_2 \quad \xrightarrow{\text{(ii) aniline}} \text{Y}
\]

Options

1. ![Option 1]
2. ![Option 2]
3. ![Option 3] ✓
4. ![Option 4]
Q.15 Which of these factors does not govern the stability of a conformation in acyclic compounds?

Options
1. Steric interactions
2. Angle strain  ✓
3. Torsional strain
4. Electrostatic forces of interaction

Q.16 1 g of a non-volatile non-electrolyte solute is dissolved in 100 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 5. The ratio of the elevation in their boiling points, \( \frac{\Delta T_b(A)}{\Delta T_b(B)} \), is:

Options
1. 10 : 1
2. 1 : 5  ✓
3. 1 : 0.2
4. 5 : 1

Q.17
The correct statements among (a) to (d) are:
(a) saline hydrides produce H₂ gas when reacted with H₂O.
(b) reaction of LiAlH₄ with BF₃ leads to B₂H₆.
(c) PH₃ and CH₄ are electron-rich and electron-precise hydrides, respectively.
(d) HF and CH₄ are called as molecular hydrides.

Options 1. (a), (b) and (c) only.
2. (a), (c) and (d) only.
3. (c) and (d) only.
4. (a), (b), (c) and (d).

Q.18 The difference between ΔH and ΔU (ΔH − ΔU), when the combustion of one mole of heptane(l) is carried out at a temperature T, is equal to:

Options 1. − 4 RT
2. 3 RT
3. 4 RT
4. − 3 RT

Q.19 The correct statement is:
Q.20  The minimum amount of O$_2$(g) consumed per gram of reactant is for the reaction:
\[ \text{Given atomic mass: } \text{Fe} = 56, \quad \text{O} = 16, \quad \text{Mg} = 24, \quad \text{P} = 31, \quad \text{C} = 12, \quad \text{H} = 1 \]

Options
1. \( \text{P}_4\text{(s)} + 5 \text{O}_2\text{(g)} \rightarrow \text{P}_4\text{O}_{10}\text{(s)} \)
2. \( 2 \text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow 2 \text{MgO(s)} \)
3. \( 4 \text{Fe(s)} + 3 \text{O}_2\text{(g)} \rightarrow 2 \text{Fe}_2\text{O}_3\text{(s)} \)
4. \( \text{C}_3\text{H}_8\text{(g)} + 5 \text{O}_2\text{(g)} \rightarrow 3 \text{CO}_2\text{(g)} + 4 \text{H}_2\text{O(l)} \)

Q.21  The major product ‘Y’ in the following reaction is:

\[
\begin{array}{c}
\text{Cl} \\
\text{EtONa} \\
\text{Heat} \\
\text{X} \\
\text{HBr} \\
\text{Y}
\end{array}
\]

Options
1. \( \text{HO} \)
Q.22 The highest possible oxidation states of uranium and plutonium, respectively, are:
Options
1. 4 and 6
2. 7 and 6
3. 6 and 4
4. 6 and 7

Q.23 Air pollution that occurs in sunlight is:
Options
1. acid rain
2. reducing smog
3. fog
4. oxidising smog
Q.24  The correct option among the following is:

Options

1. Brownian motion in colloidal solution is faster if the viscosity of the solution is very high.

Colloidal particles in lyophobic sols can be precipitated by electrophoresis.

Colloidal medicines are more effective because they have small surface area.

3. Addition of alum to water makes it unfit for drinking.

Chosen Option: 3

Q.25  A hydrated solid X on heating initially gives a monohydrated compound Y. Y upon heating above 373 K leads to an anhydrous white powder Z. X and Z, respectively, are:

Options

1. Washing soda and soda ash. ✓

2. Baking soda and soda ash.

Washing soda and dead burnt plaster.

4. Baking soda and dead burnt plaster.

Chosen Option: 1
Q.26  The noble gas that does NOT occur in the atmosphere is:

Options
1. Kr
2. Ne
3. Ra ✓
4. He

Q.27  Which of the following is NOT a correct method of the preparation of benzy lamine from cyanobenzene?

Options
1. H₂/Ni
2. (i) HCl/H₂O (ii) NaBH₄ ✓
3. (i) SnCl₂ + HCl(gas) (ii) NaBH₄
4. (i) LiAlH₄ (ii) H₃O⁺

Q.28  The pH of a 0.02 M NH₄Cl solution will be [given Kₐ(NH₄OH) = 10⁻⁵ and log 2 = 0.301]

Options
1. 4.65
2. 2.65
3. 4.35
4. 5.35 ✓
Q.29  The major product obtained in the given reaction is:

\[
\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3\overset{\text{AlCl}_3}{\rightarrow}\text{Product}
\]

Options

1. \(\text{H}_3\text{C} \text{OCH}_2\text{CH}_2\text{CH} = \text{CH}_2\)

2. \(\text{CH}_3\text{O}\text{CH}_2\text{CH} = \text{CH}_2\)

3. \(\text{H}_3\text{C} \text{OCH}_2\text{CH} = \text{CH}_3\)

4. \(\text{H}_3\text{C} \text{OCH}_2\text{CH}_3\)

Q.30  Which one of the following graphs between molar conductivity \((\Lambda_m)\) versus \(\sqrt{C}\) is correct?

Options
1. \( \Lambda_m \) 
\[ \text{KCl} \quad \text{NaCl} \] 
\[ \sqrt{C} \rightarrow \]

2. \( \Lambda_m \) 
\[ \text{NaCl} \quad \text{KCl} \] 
\[ \sqrt{C} \rightarrow \]

3. \( \Lambda_m \) 
\[ \text{KCl} \quad \text{NaCl} \] 
\[ \sqrt{C} \rightarrow \]

4. \( \Lambda_m \) 
\[ \text{NaCl} \quad \text{KCl} \] 
\[ \sqrt{C} \rightarrow \]

Q.1 

The sum 
\[ 1 + \frac{1^3}{1+2} + \frac{2^3}{1+2+3} + \ldots + \frac{1^3+2^3+3^3+\ldots+15^3}{1+2+3+\ldots+15} \] 

is equal to:

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Chosen Option: --

Section: Mathematics
Q.2  Lines are drawn parallel to the line 
$4x - 3y + 2 = 0$, at a distance $\frac{3}{5}$ from the origin. Then which one of the following points lies on any of these lines?

Options
1. $\left(\frac{1}{4}, \frac{1}{3}\right)$
2. $\left(-\frac{1}{4}, \frac{2}{3}\right)$ ✓
3. $\left(-\frac{1}{4}, -\frac{2}{3}\right)$
4. $\left(\frac{1}{4}, \frac{1}{3}\right)$

Q.3  The distance of the point having position vector $-i + 2j + 6k$ from the straight line passing through the point $(2, 3, -4)$ and parallel to the vector, $6i + 3j - 4k$

is:

Options
1. $4\sqrt{3}$
2. \(6\)
3. \(2\sqrt{13}\)
4. \(7\) \(\checkmark\)

**Q.4** The area (in sq. units) of the region bounded by the curves \(y = 2^x\) and \(y = |x+1|\), in the first quadrant is:

**Options**
1. \(\frac{3}{2} - \frac{1}{\log_e 2}\) \(\checkmark\)
2. \(\frac{1}{2}\)
3. \(\log_e 2 + \frac{3}{2}\)
4. \(\frac{3}{2}\)

**Q.5** If the tangent to the curve \(y = \frac{x}{x^2 - 3}\), \(x \in \mathbb{R}, (x \neq \pm \sqrt{3})\), at a point \((\alpha, \beta) \neq (0, 0)\) on it is parallel to the line \(2x + 6y - 11 = 0\), then:

**Options**
1. \(|2\alpha + 6\beta| = 19\)
2. \(|2\alpha + 6\beta| = 11\)
3. \(|6\alpha + 2\beta| = 19\) \(\checkmark\)
4. \(|6\alpha + 2\beta| = 9\)
Q.6 If \( z \) and \( w \) are two complex numbers such that \( |zw| = 1 \) and \( \arg(z) - \arg(w) = \frac{\pi}{2} \), then:

Options
1. \( \overline{zw} = \frac{1 - i}{\sqrt{2}} \)
2. \( \overline{zw} = i \)
3. \( \overline{zw} = \frac{-1 + i}{\sqrt{2}} \)
4. \( \overline{zw} = -i \) √

Q.7 If \( 5x + 9 = 0 \) is the directrix of the hyperbola \( 16x^2 - 9y^2 = 144 \), then its corresponding focus is:

Options
1. \( (-5, 0) \) √
2. \( (5, 0) \)
3. \( \left(-\frac{5}{3}, 0\right) \)
4. \( \left(\frac{5}{3}, 0\right) \)
Q.8 The tangent and normal to the ellipse $3x^2 + 5y^2 = 32$ at the point $P(2, 2)$ meet the $x$-axis at $Q$ and $R$, respectively. Then the area (in sq. units) of the triangle $PQR$ is:

Options  
1. $\frac{68}{15}$ ✓
2. $\frac{16}{3}$
3. $\frac{14}{3}$
4. $\frac{34}{15}$

Q.9 The negation of the Boolean expression $\sim s \lor (\sim r \land s)$ is equivalent to:

Options  
1. $r$
2. $s \land r$ ✓
3. $s \lor r$
4. $\sim s \land \sim r$

Q.10 The sum of the real roots of the equation

$$
\begin{array}{|ccc|}
\hline
x & -6 & -1 \\
2 & -3x & x-3 \\
-3 & 2x & x+2 \\
\hline
\end{array} = 0,
$$

is equal to:

Options  
1. 0 ✓
2. -4
3. 6
4. 1

Q.11 If both the mean and the standard deviation of 50 observations \( x_1, x_2, ..., x_{50} \) are equal to 16, then the mean of \( (x_1 - 4)^2, (x_2 - 4)^2, ..., (x_{50} - 4)^2 \) is:

Options
1. 525
2. 480
3. 400  ✔
4. 380

Q.12 The smallest natural number \( n \), such that the coefficient of \( x \) in the expansion of

\[
\left( x^2 + \frac{1}{x^3} \right)^n \]

is \( ^nC_{23} \), is:

Options
1. 58
2. 38  ✔
3. 35
4. 23

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Option 3 ID: 41652956297
Option 4 ID: 41652956296
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Question Type: MCQ
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Option 3 ID: 41652956383
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Question Type: MCQ
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Option 1 ID: 41652956309
Option 2 ID: 41652956307
Option 3 ID: 41652956308
Option 4 ID: 41652956306
Status: Answered
Chosen Option: 1
Q.13  The angles A, B and C of a triangle ABC are in A.P. and $a:b = 1: \sqrt{3}$. If $c = 4$ cm, then the area (in sq. cm) of this triangle is:

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

Q.14  If $\int x^{5}e^{-x^{2}}dx = g(x)e^{-x^{2}} + c$, where $c$ is a constant of integration, then $g(-1)$ is equal to:

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

Q.15  Suppose that 20 pillars of the same height have been erected along the boundary of a circular stadium. If the top of each pillar has been connected by beams with the top of all its non-adjacent pillars, then the total number of beams is:
Q.16  If \( \lim_{x \to 1} \frac{x^2 - ax + b}{x - 1} = 5 \), then \( a + b \) is equal to:

Options 1. 1
2. 5
3. -4
4. -7

Q.17  Let \( a_1, a_2, a_3, \ldots \) be an A.P. with \( a_6 = 2 \). Then the common difference of this A.P., which maximises the product \( a_1, a_4, a_5 \), is:

Options 1. \( \frac{2}{3} \)
2. \( \frac{3}{2} \)
3. \( \frac{6}{5} \)
4. \( \frac{8}{5} \)
Q.18
Let \( y = y(x) \) be the solution of the differential equation, \( \frac{dy}{dx} + y \tan x = 2x + x^2 \tan x \),
\( xe\left(-\frac{\pi}{2}, \frac{\pi}{2}\right) \), such that \( y(0) = 1 \). Then:

Options

1. \( y\left(\frac{\pi}{4}\right) - y\left(-\frac{\pi}{4}\right) = \pi - \sqrt{2} \)  ✔
2. \( y\left(\frac{\pi}{4}\right) + y\left(-\frac{\pi}{4}\right) = -\sqrt{2} \)
3. \( y\left(\frac{\pi}{4}\right) - y\left(-\frac{\pi}{4}\right) = \sqrt{2} \)
4. \( y\left(\frac{\pi}{4}\right) + y\left(-\frac{\pi}{4}\right) = \frac{\pi}{2} + 2 \)

Q.19
If \( \cos^{-1} x - \cos^{-1} \frac{y}{2} = \alpha \), where \(-1 \leq x \leq 1, -2 \leq y \leq 2, x \leq \frac{y}{2} \), then for all \( x, y \),

\( 4x^2 - 4xy \cos \alpha + y^2 \) is equal to:

Options

1. \( 4 \cos^2 \alpha + 2x^2 y^2 \)
2. \( 4 \sin^2 \alpha - 2x^2 y^2 \)
3. \( 2 \sin^2 \alpha \)
4. \( 4 \sin^2 \alpha \)  ✔
Q.20  
If the plane $2x - y + 2z + 3 = 0$ has the

distances $\frac{1}{3}$ and $\frac{2}{3}$ units from the planes
$4x - 2y + 4z + \lambda = 0$ and $2x - y + 2z + \mu = 0$,
respectively, then the maximum value of $\lambda + \mu$ is equal to:

Options 1. 9  
2. 15  
3. 13  ✔  
4. 5

Q.21  
If the line $ax + y = c$, touches both the curves
$x^2 + y^2 = 1$ and $y^2 = 4\sqrt{2}x$, then $|c|$ is
equal to:

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

Q.22  
The integral $\int_{\pi/6}^{\pi/3} \sec^{3/2} x \csc^{1/3} x \, dx$ is
equal to:

Options
1. \( \frac{7}{6} - \frac{3}{6} \) ✓
2. \( \frac{4}{3} - \frac{1}{3} \)
3. \( \frac{5}{6} - \frac{2}{6} \)
4. \( \frac{7}{3} - \frac{1}{3} \)

**Q.23**
The number of real roots of the equation
\[ 5 + \left| 2^x - 1 \right| = 2^x (2^x - 2) \] is:

Options
1. 2 ✓
2. 3
3. 1
4. 4

**Q.24**
Minimum number of times a fair coin must be tossed so that the probability of getting at least one head is more than 99% is:

Options
1. 8 ✓
2. 6
3. 5
4. 7

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**Option 2 ID:** 41652956387
**Option 3 ID:** 41652956386
**Option 4 ID:** 41652956388
**Status:** Answered

**Chosen Option:** 4
Q.25  
A perpendicular is drawn from a point on the line \( \frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{1} \) to the plane \( x + y + z = 3 \) such that the foot of the perpendicular Q also lies on the plane \( x - y + z = 3 \). Then the co-ordinates of Q are:

Options 1. (2, 0, 1) \( \checkmark \)
2. (-1, 0, 4)
3. (4, 0, -1)
4. (1, 0, 2)

Q.26  
Let a, b and c be in G.P. with common ratio \( r \), where \( a \neq 0 \) and \( 0 < r \leq \frac{1}{2} \). If 3a, 7b and 15c are the first three terms of an A.P., then the 4\textsuperscript{th} term of this A.P. is:

Options 1. a \( \checkmark \)
2. \( \frac{7}{3} a \)
3. 5a
4. \( \frac{2}{3} a \)
A spherical iron ball of radius 10 cm is coated with a layer of ice of uniform thickness that melts at a rate of 50 cm$^3$/min. When the thickness of the ice is 5 cm, then the rate at which the thickness (in cm/min) of the ice decreases, is:

1. $\frac{1}{9\pi}$
2. $\frac{1}{36\pi}$
3. $\frac{1}{18\pi}$ ✓
4. $\frac{5}{6\pi}$

Q.28 Let $\lambda$ be a real number for which the system of linear equations
\[x + y + z = 6\]
\[4x + \lambda y - \lambda z = \lambda - 2\]
\[3x + 2y - 4z = -5\]
has infinitely many solutions. Then $\lambda$ is a root of the quadratic equation:

1. $\lambda^2 + 3\lambda - 4 = 0$
2. $\lambda^2 - \lambda - 6 = 0$ ✓
3. $\lambda^2 - 3\lambda - 4 = 0$
4. $\lambda^2 + \lambda - 6 = 0$
Q.29 Let \( f(x) = \log_e(\sin x) \), \( (0 < x < \pi) \) and 
\( g(x) = \sin^{-1}(e^{-x}) \), \( (x \geq 0) \). If \( \alpha \) is a positive 
real number such that \( a = (f \circ g)'(\alpha) \) and 
\( b = (f \circ g)(\alpha) \), then:

Options
1. \( a \alpha^2 + b\alpha + a = 0 \)
2. \( a \alpha^2 + b\alpha - a = -2\alpha^2 \)
3. \( a \alpha^2 - b\alpha - a = 0 \)
4. \( a \alpha^2 - b\alpha - a = 1 \) ✓

Q.30 The locus of the centres of the circles, which 
touch the circle, \( x^2 + y^2 = 1 \) externally, also 
touch the \( y \)-axis and lie in the first quadrant, 
is:

Options
1. \( y = \sqrt{1+2x}, \ x \geq 0 \) ✓
2. \( y = \sqrt{1+4x}, \ x \geq 0 \)
3. \( x = \sqrt{1+2y}, \ y \geq 0 \)
4. \( x = \sqrt{1+4y}, \ y \geq 0 \)