Q.2

A quantity f is given by $f = \sqrt{\dfrac{hc^5}{G}}$ where

c is speed of light, G universal gravitational constant and h is the Planck's constant. Dimension of f is that of :

Options 1. momentum

2. area

3. energy

4. volume

Q.3

A body A of mass m is moving in a circular orbit of radius R about a planet. Another body B of mass $\dfrac{m}{2}$ collides with A with a velocity which is half $\left(\dfrac{\vec{v}}{2}\right)$ the instantaneous velocity $\vec{v}$ of A. The collision is completely inelastic. Then, the combined body :

Options

1. starts moving in an elliptical orbit around the planet

2. continues to move in a circular orbit

3. Falls vertically downwards towards the planet

4. Escapes from the Planet's Gravitational field

Q.4 The electric fields of two plane electromagnetic plane waves in vacuum are given by

$$\vec{E_1} = E_0\hat{j}\ \cos(\omega t - kx)\ \text{and}$$

$$\vec{E_2} = E_0\hat{k}\ \cos(\omega t - ky)$$

At $t=0$, a particle of charge q is at origin with a velocity $\vec{v} = 0.8\ c\hat{j}$ (c is the speed of light in vaccum). The instantaneous force experienced by the particle is :

1. $E_0q\left(-0.8\hat{i} + \hat{j}+\hat{k}\right)$

2. $E_0q\left(0.8\hat{i} - \hat{j} + 0.4\hat{k}\right)$

3. $E_0q\left(0.8\hat{i} + \hat{j} + 0.2\hat{k}\right)$

4. $E_0q\left(0.4\hat{i} - 3\hat{j} + 0.8\hat{k}\right)$

Q.5 Consider a sphere of radius R which carries a uniform charge density ρ. If a sphere of radius $\dfrac{R}{2}$ is carved out of it, as shown, the ratio $\dfrac{\left|\overrightarrow{E_A}\right|}{\left|\overrightarrow{E_B}\right|}$ of magnitude of electric field $\overrightarrow{E_A}$ and $\overrightarrow{E_B}$, respectively, at points A and B due to the remaining portion is :
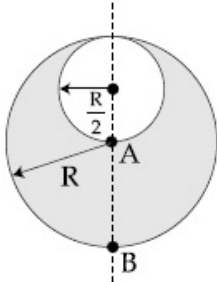
Options

1. $\dfrac{18}{54}$

2. $\dfrac{21}{34}$

3. $\dfrac{17}{54}$

4. $\dfrac{18}{34}$

Question Type : **MCQ**
Question ID : **4050361928**
Option 1 ID : **4050366935**
Option 2 ID : **4050366933**
Option 3 ID : **4050366934**
Option 4 ID : **4050366932**
Status : **Answered**
Chosen Option : **4**

Q.6
A long, straight wire of radius a carries a current distributed uniformly over its cross-section. The ratio of the magnetic fields due to the wire at distance $\frac{a}{3}$ and 2a, respectively from the axis of the wire is :

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

Question Type : **MCQ**
Question ID : **4050361930**
Option 1 ID : **4050366942**
Option 2 ID : **4050366943**
Option 3 ID : **4050366940**
Option 4 ID : **4050366941**
Status : **Answered**
Chosen Option : **1**

Q.7
Consider two ideal diatomic gases A and B at some temperature T. Molecules of the gas A are rigid, and have a mass m. Molecules of the gas B have an additional vibrational mode, and have a mass $\frac{m}{4}$. The ratio of the specific heats $(C_V^A$ and $C_V^B)$ of gas A and B, respectively is :

Options
1. 7 : 9
2. 5 : 7
3. 3 : 5
4. 5 : 9

Question Type : **MCQ**
Question ID : **4050361926**
Option 1 ID : **4050366926**
Option 2 ID : **4050366925**
Option 3 ID : **4050366924**
Option 4 ID : **4050366927**
Status : **Answered**
Chosen Option : **2**

Q.8 A particle moving with kinetic energy E has de Broglie wavelength λ. If energy ΔE is added to its energy, the wavelength become $\lambda/2$. Value of ΔE, is :

Options
1. 2E
2. E
3. 3E
4. 4E

Question Type : **MCQ**
Question ID : **4050361935**
Option 1 ID : **4050366961**
Option 2 ID : **4050366960**
Option 3 ID : **4050366962**
Option 4 ID : **4050366963**
Status : **Answered**
Chosen Option : **2**

Q.9 If the screw on a screw-gauge is given six rotations, it moves by 3 mm on the main scale. If there are 50 divisions on the circular scale the least count of the screw gauge is :

Options
1. 0.001 mm
2. 0.001 cm
3. 0.02 mm
4. 0.01 cm

Question Type : **MCQ**
Question ID : **4050361937**
Option 1 ID : **4050366971**
Option 2 ID : **4050366970**
Option 3 ID : **4050366969**
Option 4 ID : **4050366968**
Status : **Answered**
Chosen Option : **2**

Q.10 A vessel of depth 2h is half filled with a liquid of refractive index $2\sqrt{2}$ and the upper half with another liquid of refractive index $\sqrt{2}$. The liquids are immiscible. The apparent depth of the inner surface of the bottom of vessel will be :

Options

1. $\dfrac{h}{\sqrt{2}}$

2. $\dfrac{3}{4} h\sqrt{2}$

3. $\dfrac{h}{2(\sqrt{2}+1)}$

4. $\dfrac{h}{3\sqrt{2}}$

Q.11 Radiation, with wavelength 6561 Å falls on a metal surface to produce photoelectrons. The electrons are made to enter a uniform magnetic field of 3×10^{-4} T. If the radius of the largest circular path followed by the electrons is 10 mm, the work function of the metal is close to :

Options
1. 1.8 eV

2. 1.1 eV

3. 0.8 eV

4. 1.6 eV

Q.12 The aperture diameter of a telescope is 5 m. The separation between the moon and the earth is 4×10^5 km. With light of wavelength of 5500 Å, the minimum separation between objects on the surface of moon, so that they are just resolved, is close to :

Options 1. 20 m

2. 600 m

3. 60 m

4. 200 m

Q.13 Two particles of equal mass m have respective initial velocities $u\hat{i}$ and $u\left(\dfrac{\hat{i} + \hat{j}}{2}\right)$. They collide completely inelastically. The energy lost in the process is :
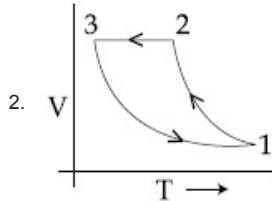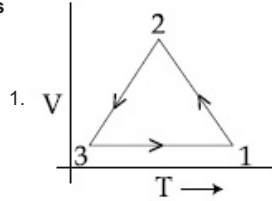
Options

1. $\dfrac{3}{4} mu^2$

2. $\dfrac{1}{8} mu^2$

3. $\sqrt{\dfrac{2}{3}} mu^2$

4. $\dfrac{1}{3} mu^2$

Q.14 Which of the following is an equivalent cyclic process corresponding to the thermodynamic cyclic given in the figure ?

where, $1 \rightarrow 2$ is adiabatic.

(Graphs are schematic and are not to scale)
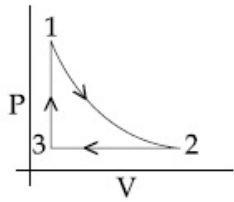
Options
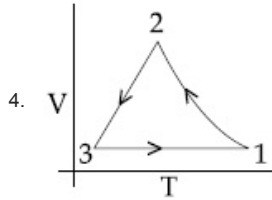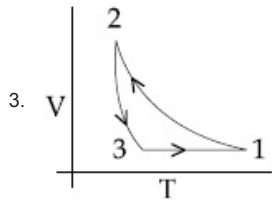
1.

2.

3.

4.

Q.15

In the given circuit diagram, a wire is joining points B and D. The current in this wire is :
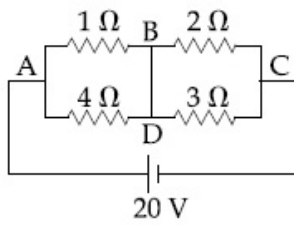
Options
1. 4A
2. 2A
3. 0.4A
4. zero

Question Type : **MCQ**
Question ID : **4050361938**
Option 1 ID : **4050366974**
Option 2 ID : **4050366973**
Option 3 ID : **4050366975**
Option 4 ID : **4050366972**
Status : **Answered**
Chosen Option : **2**

Q.16 A charged particle of mass 'm' and charge 'q' moving under the influence of uniform electric field $\vec{E}i$ and a uniform magnetic field $\vec{B}k$ follows a trajectory from point P to Q as shown in figure. The velocities at P and Q are respectively, $v\vec{i}$ and $-2v\vec{j}$. Then which of the following statements (A, B, C, D) are the correct ? (Trajectory shown is schematic and not to scale)
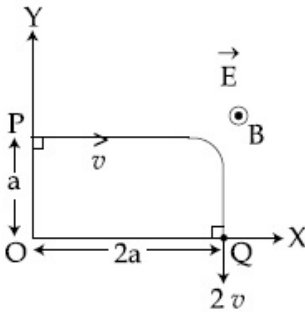
(A) $E = \dfrac{3}{4}\left(\dfrac{mv^2}{qa}\right)$

(B) Rate of work done by the electric field at P is $\dfrac{3}{4}\left(\dfrac{mv^3}{a}\right)$

(C) Rate of work done by both the fields at Q is zero

(D) The difference between the magnitude of angular momentum of the particle at P and Q is 2 mav.

1. (A), (B), (C), (D)

2. (A), (B), (C)

3. (B), (C), (D)

4. (A), (C), (D)

Q.17 Three harmonic waves having equal frequency ν and same intensity I_0, have phase angles 0, $\frac{\pi}{4}$ and $-\frac{\pi}{4}$ respectively.

When they are superimposed the intensity of the resultant wave is close to :
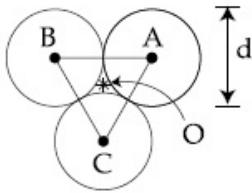
1. $5.8\,I_0$

2. $0.2\,I_0$

3. I_0

4. $3\,I_0$

Q.18 An electric dipole of moment $\vec{p} = (-\hat{i} - 3\hat{j} + 2\hat{k}) \times 10^{-29}$ C.m is at the origin $(0, 0, 0)$. The electric field due to this dipole at $\vec{r} = +\hat{i} + 3\hat{j} + 5\hat{k}$

(note that $\vec{r} \cdot \vec{p} = 0$) is parallel to :

1. $(-\hat{i} + 3\hat{j} - 2\hat{k})$

2. $(+\hat{i} - 3\hat{j} - 2\hat{k})$

3. $(+\hat{i} + 3\hat{j} - 2\hat{k})$

4. $(-\hat{i} - 3\hat{j} + 2\hat{k})$

Q.19

Three solid spheres each of mass m and diameter d are stuck together such that the lines connecting the centres form an equilateral triangle of side of length d. The ratio I_0/I_A of moment of inertia I_0 of the system about an axis passing the centroid and about center of any of the spheres I_A and perpendicular to the plane of the triangle is :

Options

1. $\dfrac{13}{23}$

2. $\dfrac{15}{13}$

3. $\dfrac{23}{13}$

4. $\dfrac{13}{15}$

Q.20 Water flows in a horizontal tube (see figure). The pressure of water changes by 700 Nm^{-2} between A and B where the area of cross section are 40 cm^2 and 20 cm^2, respectively. Find the rate of flow of water through the tube.

(density of water $= 1000 \text{ kgm}^{-3}$)
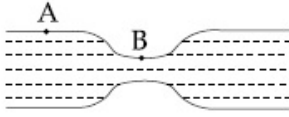
(Fig)

Options 1. $1810 \text{ cm}^3/\text{s}$

2. $3020 \text{ cm}^3/\text{s}$

3. $2720 \text{ cm}^3/\text{s}$

4. $2420 \text{ cm}^3/\text{s}$

Question Type : **MCQ**
Question ID : **4050361924**
Option 1 ID : **4050366916**
Option 2 ID : **4050366919**
Option 3 ID : **4050366918**
Option 4 ID : **4050366917**
Status : **Answered**
Chosen Option : **3**

Q.21 In a fluorescent lamp choke (a small transformer) 100 V of reverse voltage is produced when the choke current changes uniformly from 0.25 A to 0 in a duration of 0.025 ms. The self-inductance of the choke (in mH) is estimated to be _____.
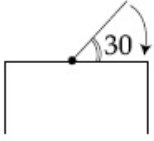
Given **10.00**
Answer :

Question Type : **SA**
Question ID : **4050361942**
Status : **Answered**

Q.22 One end of a straight uniform 1 m long bar is pivoted on horizontal table. It is released from rest when it makes an angle $30°$ from the horizontal (see figure). Its angular speed when it hits the table is given as $\sqrt{n}\ s^{-1}$, where n is an integer. The value of n is _____.

Given **15.00**
Answer :

Q.23 The distance x covered by a paritcle in one dimensional motion varies with time t as $x^2 = at^2 + 2bt + c$. If the acceleration of the particle depends on x as x^{-n}, where n is an integer, the value of n is _____.
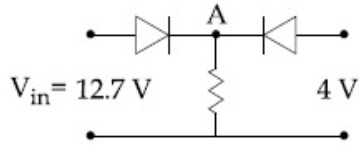
Given **1.00**
Answer :

Q.24 A body of mass $m = 10\,kg$ is attached to one end of a wire of length 0.3 m. The maximum angular speed (in rad s^{-1}) with which it can be rotated about its other end in space station is (Breaking stress of wire $= 4.8 \times 10^7\ Nm^{-2}$ and area of cross-section of the wire $= 10^{-2}\ cm^2$) is :

Given **4.00**
Answer :

Q.25 Both the diodes used in the circuit shown are assumed to be ideal and have negligible resistance when these are forward biased. Built in potential in each diode is 0.7 V. For the input voltages shown in the figure, the voltage (in Volts) at point A is _____.
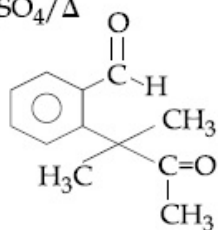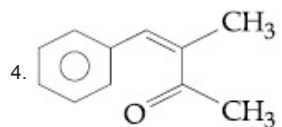

V_{in}= 12.7 V   4 V

Given **12.00**
Answer :

Section : **Chemistry**

Identify (A) in the following reaction sequence :

(A)
Gives
Positive
iodoform
test

$\xrightarrow{\text{(i) CH}_3\text{MgBr}}$ (B) $\xrightarrow{\text{O}_3/\text{Zn,H}_2\text{O}}$
(ii) H$^+$, H$_2$O
(iii) Conc. H$_2$SO$_4$/Δ
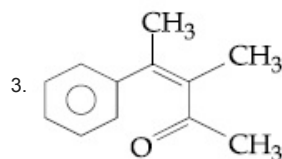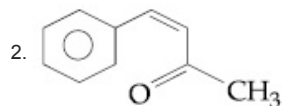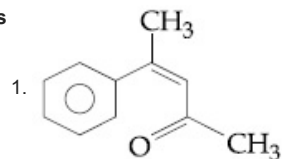
Options

1.

2.

3.

4.

Q.2 For following reactions

$$A \xrightarrow{700\ K} Product$$

$$A \xrightarrow[\text{catalyst}]{500\ K} Product$$
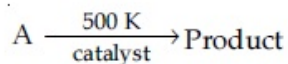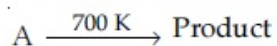
it was found that the E_a is decreased by 30 kJ/mol in the presence of catalyst. If the rate remains unchanged, the activation energy for catalysed reaction is (Assume pre exponential factor is same) :

Options 1. 135 kJ/mol

2. 105 kJ/mol

3. 198 kJ/mol

4. 75 kJ/mol

Q.3 The correct order of heat of combustion for following alkadienes is :

(a)

(b)

(c)
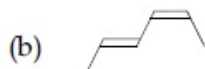
Options 1. (a) < (b) < (c)

2. (b) < (c) < (a)

3. (c) < (b) < (a)

4. (a) < (c) < (b)

Q.4 A chemist has 4 samples of artificial sweetener A, B, C and D. To identify these samples, he performed certain experiments and noted the following observations :

(i) A and D both form blue-violet colour with ninhydrin.

(ii) Lassaigne extract of C gives positive $AgNO_3$ test and negative $Fe_4[Fe(CN)_6]_3$ test.

(iii) Lassaigne extract of B and D gives positive sodium nitroprusside test.

Based on these observations which option is correct ?

Options

1. A : Aspartame; B : Saccharin; C : Sucralose; D : Alitame

2. A : Alitame; B : Saccharin; C : Aspartame; D : Sucralose

3. A : Saccharin; B : Alitame; C : Sucralose; D : Aspartame

4. A : Aspartame; B : Alitame; C : Saccharin; D : Sucralose

Question Type : **MCQ**
Question ID : **4050361959**
Option 1 ID : **4050367042**
Option 2 ID : **4050367041**
Option 3 ID : **4050367044**
Option 4 ID : **4050367043**
Status : **Answered**
Chosen Option : **1**

Q.5 'X' melts at low temperature and is a bad conductor of electricity in both liquid and solid state. X is :

Options
1. Carbon tetrachloride

2. Mercury

3. Silicon carbide

4. Zinc sulphide

Question Type : **MCQ**
Question ID : **4050361949**
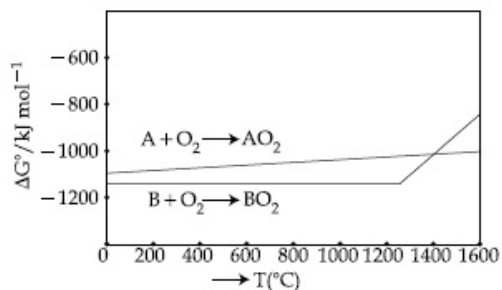Option 1 ID : **4050367002**
Option 2 ID : **4050367004**
Option 3 ID : **4050367003**
Option 4 ID : **4050367001**
Status : **Answered**
Chosen Option : **1**

Q.6 According to the following diagram, A reduces BO_2 when the temperature is :

Options
1. $< 1400\,°C$
2. $> 1400\,°C$
3. $< 1200\,°C$
4. $> 1200\,°C$ but $< 1400\,°C$

Q.7 The K_{sp} for the following dissociation is 1.6×10^{-5}

$$PbCl_{2(s)} \rightleftharpoons Pb^{2+}_{(aq)} + 2Cl^{-}_{(aq)}$$
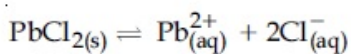
Which of the following choices is correct for a mixture of 300 mL 0.134 M $Pb(NO_3)_2$ and 100 mL 0.4 M NaCl ?

Options
1. $Q < K_{sp}$
2. $Q > K_{sp}$
3. $Q = K_{sp}$
4. Not enough data provided

Q.8 $[Pd(F)(Cl)(Br)(I)]^{2-}$ has n number of geometrical isomers. Then, the spin-only magnetic moment and crystal field stabilisation energy [CFSE] of $[Fe(CN)_6]^{n-6}$, respectively, are :

[Note : Ignore the pairing energy]

Options
1. 2.84 BM and $-1.6\ \Delta_0$

2. 1.73 BM and $-2.0\ \Delta_0$

3. 0 BM and $-2.4\ \Delta_0$

4. 5.92 BM and 0

Question Type : **MCQ**
Question ID : **4050361956**
Option 1 ID : **4050367031**
Option 2 ID : **4050367030**
Option 3 ID : **4050367029**
Option 4 ID : **4050367032**
Status : **Answered**
Chosen Option : **2**

Q.9 If the magnetic moment of a dioxygen species is 1.73 B.M, it may be :

Options
1. O_2^- or O_2^+

2. O_2 or O_2^+

3. O_2 or O_2^-

4. O_2, O_2^- or O_2^+

Question Type : **MCQ**
Question ID : **4050361945**
Option 1 ID : **4050366987**
Option 2 ID : **4050366986**
Option 3 ID : **4050366985**
Option 4 ID : **4050366988**
Status : **Answered**
Chosen Option : **1**

Q.10 If enthalpy of atomisation for $Br_{2(l)}$ is x kJ/mol and bond enthalpy for Br_2 is y kJ/mol, the relation between them :

Options 1. is $x = y$

2. is $x < y$

3. does not exist

4. is $x > y$

Q.11 The increasing order of basicity for the following intermediates is (from weak to strong)

$$\underset{\overset{|}{\underset{CH_3}{|}}}{\overset{\overset{CH_3}{|}}{H_3C-C}}\ominus \qquad H_2C=CH-\overset{\ominus}{CH_2}$$

(i)   (ii)

$$HC\equiv\overset{\ominus}{C} \qquad \overset{\ominus}{CH_3} \qquad \overset{\ominus}{CN}$$
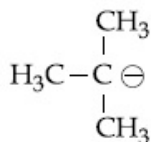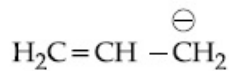
(iii)   (iv)   (v)

Options 1. (v) < (i) < (iv) < (ii) < (iii)

2. (iii) < (i) < (ii) < (iv) < (v)

3. (v) < (iii) < (ii) < (iv) < (i)

4. (iii) < (iv) < (ii) < (i) < (v)

Q.12 B has a smaller first ionization enthalpy than Be. Consider the following statements :

(I) it is easier to remove 2p electron than 2s electron

(II) 2p electron of B is more shielded from the nucleus by the inner core of electrons than the 2s electrons of Be

(III) 2s electron has more penetration power than 2p electron

(IV) atomic radius of B is more than Be

(atomic number B=5, Be=4)

The correct statements are :

Options
1. (I), (II) and (III)

2. (II), (III) and (IV)

3. (I), (III) and (IV)

4. (I), (II) and (IV)

Question Type : **MCQ**

Question ID : **4050361950**

Option 1 ID : **4050367005**

Option 2 ID : **4050367007**

Option 3 ID : **4050367008**

Option 4 ID : **4050367006**

Status : **Answered**

Chosen Option : **1**

Q.13 The acidic, basic and amphoteric oxides, respectively, are :

Options
1. MgO, Cl_2O, Al_2O_3

2. Cl_2O, CaO, P_4O_{10}

3. Na_2O, SO_3, Al_2O_3

4. N_2O_3, Li_2O, Al_2O_3

Question Type : **MCQ**

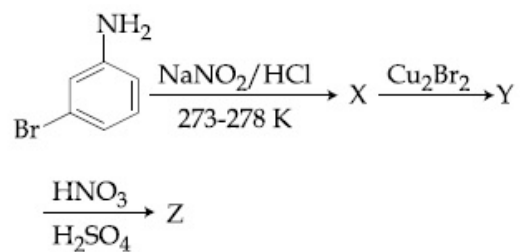Question ID : **4050361952**

Option 1 ID : **4050367013**

Option 2 ID : **4050367015**

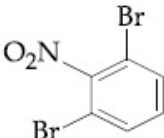Option 3 ID : **4050367016**

Option 4 ID : **4050367014**

Status : **Answered**

Chosen Option : **4**

The major product Z obtained in the following reaction scheme is :

3-bromoaniline $\xrightarrow[\text{273-278 K}]{\text{NaNO}_2/\text{HCl}}$ X $\xrightarrow{\text{Cu}_2\text{Br}_2}$ Y $\xrightarrow[\text{H}_2\text{SO}_4]{\text{HNO}_3}$ Z

Options

1.

2.

3.

4.

Question Type : **MCQ**
Question ID : **4050361960**
Option 1 ID : **4050367046**
Option 2 ID : **4050367045**
Option 3 ID : **4050367048**
Option 4 ID : **4050367047**
Status : **Answered**
Chosen Option : **2**

Q.15 Which of these will produce the highest yield in Friedel Crafts reaction ?

1. $CONH_2$ attached to benzene ring

2. NH_2 attached to benzene ring

3. Cl attached to benzene ring

4. OH attached to benzene ring
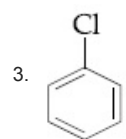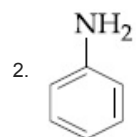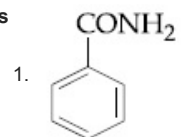
Question Type : **MCQ**
Question ID : **4050361957**
Option 1 ID : **4050367035**
Option 2 ID : **4050367033**
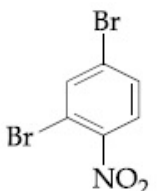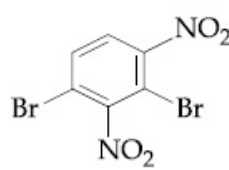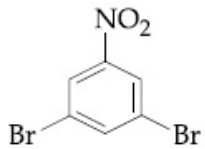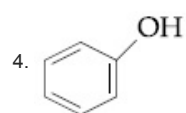Option 3 ID : **4050367036**
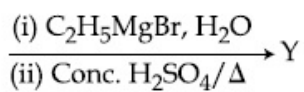Option 4 ID : **4050367034**
Status : **Answered**
Chosen Option : **1**

Q.16 The major product (Y) in the following reactions is :
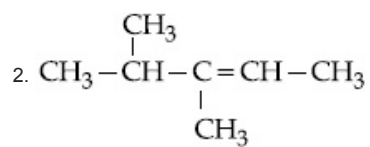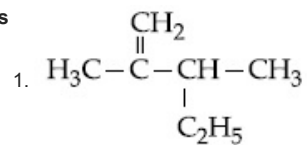
$$CH_3-\underset{\underset{CH_3}{|}}{CH}-C\equiv CH \xrightarrow[\ H_2O\ ]{HgSO_4,\ H_2SO_4} X$$

$$\xrightarrow[\text{(ii) Conc. } H_2SO_4/\Delta]{\text{(i) } C_2H_5MgBr,\ H_2O} Y$$

Options

1. $H_3C-\underset{\underset{C_2H_5}{|}}{\overset{\overset{CH_2}{||}}{C}}-CH-CH_3$

2. $CH_3-\underset{\underset{CH_3}{|}}{CH}-C=CH-CH_3$ with CH_3 above the second carbon

$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{CH}}-C=CH-CH_3$

3. $CH_3-\underset{\underset{CH_2CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}=C-CH_3$

4. $CH_3-\underset{\underset{CH_2CH_3}{|}}{\overset{\overset{CH_3}{|}}{CH}}-C=CH_2$

Q.17 Complex X of composition $Cr(H_2O)_6Cl_n$ has a spin only magnetic moment of 3.83 BM. It reacts with $AgNO_3$ and shows geometrical isomerism. The IUPAC nomenclature of X is :

Options

1. Tetraaquadichlorido chromium(III) chloride dihydrate

2. Hexaaqua chromium(III) chloride

3. Dichloridotetraaqua chromium(IV) chloride dihydrate

4. Tetraaquadichlorido chromium(IV) chloride dihydrate

Question Type : **MCQ**
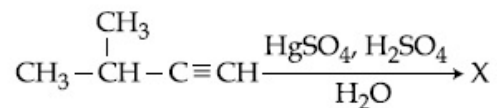Question ID : **4050361955**
Option 1 ID : **4050367027**
Option 2 ID : **4050367025**
Option 3 ID : **4050367028**
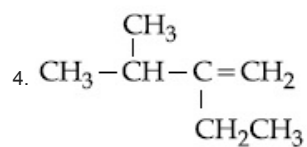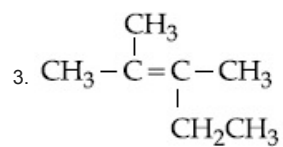Option 4 ID : **4050367026**
Status : **Answered**
Chosen Option : **1**

Q.18 The compound that cannot act both as oxidising and reducing agent is :

Options

1. H_2O_2

2. H_2SO_3

3. HNO_2

4. H_3PO_4

Question Type : **MCQ**
Question ID : **4050361953**
Option 1 ID : **4050367018**
Option 2 ID : **4050367019**
Option 3 ID : **4050367017**
Option 4 ID : **4050367020**
Status : **Answered**
Chosen Option : **1**

Q.19 The de Broglie wavelength of an electron
in the 4th Bohr orbit is :

Options 1. $8\pi a_0$

2. $2\pi a_0$

3. $4\pi a_0$

4. $6\pi a_0$

Question Type : **MCQ**
Question ID : **4050361944**
Option 1 ID : **4050366982**
Option 2 ID : **4050366984**
Option 3 ID : **4050366981**
Option 4 ID : **4050366983**
Status : **Answered**
Chosen Option : **1**

Q.20 The electronic configurations of bivalent
europium and trivalent cerium are :
(atomic number : Xe $=54$, Ce $=58$, Eu $=63$)

Options 1. $[Xe]\, 4f^4$ and $[Xe]\, 4f^9$

2. $[Xe]\, 4f^7$ and $[Xe]\, 4f^1$

3. $[Xe]\, 4f^7\, 6s^2$ and $[Xe]\, 4f^2\, 6s^2$

4. $[Xe]\, 4f^2$ and $[Xe]\, 4f^7$

Question Type : **MCQ**
Question ID : **4050361954**
Option 1 ID : **4050367024**
Option 2 ID : **4050367023**
Option 3 ID : **4050367021**
Option 4 ID : **4050367022**
Status : **Answered**
Chosen Option : **2**

Q.21 The hardness of a water sample containing
10^{-3} M $MgSO_4$ expressed as $CaCO_3$
equivalents (in ppm) is _____.
(molar mass of $MgSO_4$ is 120.37 g/mol)

Given **1.20**
Answer :

Question Type : **SA**
Question ID : **4050361967**
Status : **Answered**

Q.22 The molarity of HNO_3 in a sample which has density 1.4 g/mL and mass percentage of 63% is _____. (Molecular Weight of $HNO_3 = 63$)

Given **7.14**
Answer :

Q.23 108 g of silver (molar mass 108 g mol^{-1}) is deposited at cathode from $AgNO_3$(aq) solution by a certain quantity of electricity. The volume (in L) of oxygen gas produced at 273 K and 1 bar pressure from water by the same quantity of electricity is _____.

Given **11.35**
Answer :

Q.24 The mass percentage of nitrogen in histamine is _____.

Given **49.56**
Answer :

Q.25 How much amount of NaCl should be added to 600 g of water ($\rho = 1.00$ g/mL) to decrease the freezing point of water to $-0.2°C$? _____. (The freezing point depression constant for water = 2 K kg mol^{-1})

Given **3.51**
Answer :

Section : **Mathematics**

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

1. $\dfrac{1}{36\pi}$

2. $\dfrac{5}{6\pi}$

3. $\dfrac{1}{18\pi}$

4. $\dfrac{1}{54\pi}$

Question Type : **MCQ**
Question ID : **4050361977**
Option 1 ID : **4050367098**
Option 2 ID : **4050367099**
Option 3 ID : **4050367100**
Option 4 ID : **4050367101**
Status : **Answered**
Chosen Option : **3**

Q.2 If the number of five digit numbers with distinct digits and 2 at the 10th place is 336 k, then k is equal to :

Options 1. 8

2. 6

3. 4

4. 7

Question Type : **MCQ**
Question ID : **4050361974**
Option 1 ID : **4050367086**
Option 2 ID : **4050367088**
Option 3 ID : **4050367089**
Option 4 ID : **4050367087**
Status : **Answered**
Chosen Option : **1**

Q.3

Let z be a complex number such that

$$\left|\frac{z-i}{z+2i}\right| = 1$$

and $|z| = \dfrac{5}{2}$. Then the value of $|z+3i|$ is :

Options 1. $\sqrt{10}$

2. $2\sqrt{3}$

3. $\dfrac{7}{2}$

4. $\dfrac{15}{4}$

Q.4

In a box, there are 20 cards, out of which 10 are labelled as A and the remaining 10 are labelled as B. Cards are drawn at random, one after the other and with replacement, till a second A-card is obtained. The probability that the second A-card appears before the third B-card is :

Options 1. $\dfrac{11}{16}$

2. $\dfrac{13}{16}$

3. $\dfrac{9}{16}$

4. $\dfrac{15}{16}$

Q.5

The value of $\displaystyle\int_{0}^{2\pi} \dfrac{x \sin^8 x}{\sin^8 x + \cos^8 x}\, dx$ is equal

to :

Options 1. 2π

2. 4π

3. $2\pi^2$

4. π^2

Q.6

If $f'(x) = \tan^{-1}(\sec x + \tan x),\ -\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$,

and $f(0) = 0$, then $f(1)$ is equal to :

Options

1. $\dfrac{\pi - 1}{4}$

2. $\dfrac{\pi + 2}{4}$

3. $\dfrac{\pi + 1}{4}$

4. $\dfrac{1}{4}$

Q.7

If the matrices $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 1 & -1 & 3 \end{bmatrix}$, $B = \text{adj } A$

and $C = 3A$, then $\dfrac{|\text{adj } B|}{|C|}$ is equal to :

Options 1. 72

2. 2

3. 8

4. 16

Q.8

The number of real roots of the equation,

$e^{4x} + e^{3x} - 4e^{2x} + e^x + 1 = 0$ is :

Options 1. 4

2. 2

3. 3

4. 1

Q.9 Negation of the statement :

'$\sqrt{5}$ is an integer or 5 is irrational' is :

1. $\sqrt{5}$ is irrational or 5 is an integer.

2. $\sqrt{5}$ is not an integer and 5 is not irrational.

3. $\sqrt{5}$ is an integer and 5 is irrational.

4. $\sqrt{5}$ is not an integer or 5 is not irrational.

Question Type : **MCQ**

Question ID : **4050361988**

Option 1 ID : **4050367142**

Option 2 ID : **4050367144**

Option 3 ID : **4050367145**

Option 4 ID : **4050367143**

Status : **Answered**

Chosen Option : **2**

Q.10 Let the observations $x_i (1 \le i \le 10)$ satisfy

the equations, $\sum\limits_{i=1}^{10}(x_i - 5) = 10$ and

$\sum\limits_{i=1}^{10}(x_i - 5)^2 = 40$. If μ and λ are the mean

and the variance of the observations,

$x_1 - 3, x_2 - 3, ..., x_{10} - 3$, then the ordered

pair (μ, λ) is equal to :

1. $(6, 6)$

2. $(3, 6)$

3. $(6, 3)$

4. $(3, 3)$

Question Type : **MCQ**

Question ID : **4050361986**

Option 1 ID : **4050367134**

Option 2 ID : **4050367135**

Option 3 ID : **4050367136**

Option 4 ID : **4050367137**

Status : **Answered**

Chosen Option : **4**

Q.11 The product

$$2^{\frac{1}{4}} \cdot 4^{\frac{1}{16}} \cdot 8^{\frac{1}{48}} \cdot 16^{\frac{1}{128}} \cdot \ldots \text{ to } \infty$$

is equal to :

Options

1. $2^{\frac{1}{2}}$

2. $2^{\frac{1}{4}}$

3. 2

4. 1

Q.12 A circle touches the y-axis at the point $(0, 4)$ and passes through the point $(2, 0)$. Which of the following lines is not a tangent to this circle ?

Options

1. $3x - 4y - 24 = 0$

2. $3x + 4y - 6 = 0$

3. $4x + 3y - 8 = 0$

4. $4x - 3y + 17 = 0$

Q.13 If e_1 and e_2 are the eccentricities of the

ellipse, $\dfrac{x^2}{18} + \dfrac{y^2}{4} = 1$ and the hyperbola,

$\dfrac{x^2}{9} - \dfrac{y^2}{4} = 1$ respectively and (e_1, e_2) is a

point on the ellipse, $15x^2 + 3y^2 = k$, then k
is equal to :

Options 1. 15

2. 14

3. 17

4. 16

Q.14 Let f be any function continuous on [a, b]
and twice differentiable on (a, b). If for all
$x \in (a, b)$, $f'(x) > 0$ and $f''(x) < 0$, then for

any $c \in (a, b)$, $\dfrac{f(c) - f(a)}{f(b) - f(c)}$ is greater than :

Options

1. $\dfrac{b + a}{b - a}$

2. $\dfrac{b - c}{c - a}$

3. $\dfrac{c - a}{b - c}$

4. 1

Q.15 If for some α and β in $\mathbf{R}$, the intersection of the following three planes

$x + 4y - 2z = 1$

$x + 7y - 5z = \beta$

$x + 5y + \alpha z = 5$

is a line in $\mathbf{R}^3$, then $\alpha + \beta$ is equal to :

Options
1. 10

2. -10

3. 2

4. 0

Q.16

The integral $\displaystyle\int \frac{dx}{(x+4)^{8/7}(x-3)^{6/7}}$ is equal to :

(where C is a constant of integration)

Options

1. $\left(\dfrac{x-3}{x+4}\right)^{1/7} + C$

2. $-\left(\dfrac{x-3}{x+4}\right)^{-1/7} + C$

3. $\dfrac{1}{2}\left(\dfrac{x-3}{x+4}\right)^{3/7} + C$

4. $-\dfrac{1}{13}\left(\dfrac{x-3}{x+4}\right)^{-13/7} + C$

Q.17 Let C be the centroid of the triangle with vertices $(3, -1)$, $(1, 3)$ and $(2, 4)$. Let P be the point of intersection of the lines $x + 3y - 1 = 0$ and $3x - y + 1 = 0$. Then the line passing through the points C and P also passes through the point :

Options
1. $(7, 6)$

2. $(-9, -6)$

3. $(-9, -7)$

4. $(9, 7)$

Q.18

If $f(x) = \begin{cases} \dfrac{\sin(a + 2)x + \sin x}{x} & ; x < 0 \\ b & ; x = 0 \\ \dfrac{(x + 3x^2)^{\frac{1}{3}} - x^{\frac{1}{3}}}{x^{\frac{4}{3}}} & ; x > 0 \end{cases}$

is continuous at $x = 0$, then $a + 2b$ is equal to :

Options
1. -1

2. 1

3. -2

4. 0

Q.19 The value of

$$\cos^3\left(\frac{\pi}{8}\right) \cdot \cos\left(\frac{3\pi}{8}\right) + \sin^3\left(\frac{\pi}{8}\right) \cdot \sin\left(\frac{3\pi}{8}\right)$$

is :

Options

1. $\dfrac{1}{4}$

2. $\dfrac{1}{\sqrt{2}}$

3. $\dfrac{1}{2\sqrt{2}}$

4. $\dfrac{1}{2}$

Q.20 If for all real triplets (a, b, c),

$f(x) = a + bx + cx^2$; then $\int_0^1 f(x)dx$ is equal

to :

Options

1. $\dfrac{1}{2}\left\{ f(1) + 3f\left(\dfrac{1}{2}\right) \right\}$

2. $2\left\{ 3f(1) + 2f\left(\dfrac{1}{2}\right) \right\}$

3. $\dfrac{1}{6}\left\{ f(0) + f(1) + 4f\left(\dfrac{1}{2}\right) \right\}$

4. $\dfrac{1}{3}\left\{ f(0) + f\left(\dfrac{1}{2}\right) \right\}$

Q.21 The coefficient of x^4 in the expansion of $(1+x+x^2)^{10}$ is _____.

Given Answer : **615.00**

Q.22 The number of distinct solutions of the equation, $\log_{\frac{1}{2}}|\sin x| = 2 - \log_{\frac{1}{2}}|\cos x|$ in the interval $[0, 2\pi]$, is _____.

Given Answer : **4.00**

Q.23 If for $x \geqslant 0$, $y=y(x)$ is the solution of the differential equation,

$(x+1)dy = ((x+1)^2 + y - 3)dx, \ y(2) = 0,$

then $y(3)$ is equal to _____.

Given Answer : **7.00**

Q.24 If the vectors, $\vec{p} = (a+1)\hat{i} + a\hat{j} + a\hat{k}$,

$\vec{q} = a\hat{i} + (a+1)\hat{j} + a\hat{k}$ and

$\vec{r} = a\hat{i} + a\hat{j} + (a+1)\hat{k}$ $(a \in R)$ are

coplanar and $3\left(\vec{p} \cdot \vec{q}\right)^2 - \lambda\left|\vec{r} \times \vec{q}\right|^2 = 0$,

then the value of λ is _____.

Given Answer : **1.00**

Q.25 The projection of the line segment joining the points $(1, -1, 3)$ and $(2, -4, 11)$ on the line joining the points $(-1, 2, 3)$ and $(3, -2, 10)$ is _____.

Given **8.00**
Answer :