JEE MAIN
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Session 2

QUESTION PAPER

2023

JOINT ENTRANCE EXAMINATION - MAIN
PREVIOUS YEAR QUESTION PAPER

JEE MAINS Session 2_6 to 12 April 2023

Application No	
Candidate Name	
Roll No	
Test Date	
Test Time	
Subject	

Section : **Mathematics Section A**

Q.1 Let the function $f:[0,2] \to \mathbb{R}$ be defined as

$$f(x)=\begin{cases} e^{\min\left\{x^2, x-[x]\right\}}, & x\in[0,1) \\ e^{\left[x-\log_e x\right]}, & x\in[1,2] \end{cases}$$

where $[t]$ denotes the greatest integer less than or equal to t. Then the value of the integral $\int_0^2 xf(x)\,dx$ is

Options

1. $1+\frac{3e}{2}$
2. $2e-\frac{1}{2}$
3. $(e-1)\left(e^2+\frac{1}{2}\right)$
4. $2e-1$

Question Type : **MCQ**
Question ID : **7155054052**
Option 1 ID : **71550512841**
Option 2 ID : **71550512843**
Option 3 ID : **71550512844**
Option 4 ID : **71550512842**
Status : **Answered**
Chosen Option : **2**

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Q.2 Let f and g be two functions defined by

$$f(x)=\begin{cases}x+1, & x<0\\ |x-1|, & x\geq 0\end{cases} \text{ and } g(x)=\begin{cases}x+1, & x<0\\ 1, & x\geq 0\end{cases}$$

Then $(gof)(x)$ is

Options
1. not continuous at $x=-1$
2. continuous everywhere but not differentiable at $x=1$
3. differentiable everywhere
4. continuous everywhere but not differentiable exactly at one point

Question Type : **MCQ**
Question ID : **7155054051**
Option 1 ID : **71550512838**
Option 2 ID : **71550512839**
Option 3 ID : **71550512837**
Option 4 ID : **71550512840**
Status : **Answered**
Chosen Option : **4**

Q.3 If four distinct points with position vectors $\vec{a},\vec{b},\vec{c}$ and $\vec{d}$ are coplanar, then $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ is equal to

Options
1. $\left[\vec{a}\,\vec{d}\,\vec{b}\right]+\left[\vec{d}\,\vec{c}\,\vec{a}\right]+\left[\vec{d}\,\vec{b}\,\vec{c}\right]$
2. $\left[\vec{b}\,\vec{c}\,\vec{d}\right]+\left[\vec{d}\,\vec{a}\,\vec{c}\right]+\left[\vec{d}\,\vec{b}\,\vec{a}\right]$
3. $\left[\vec{d}\,\vec{b}\,\vec{a}\right]+\left[\vec{a}\,\vec{c}\,\vec{d}\right]+\left[\vec{d}\,\vec{b}\,\vec{c}\right]$
4. $\left[\vec{d}\,\vec{c}\,\vec{a}\right]+\left[\vec{b}\,\vec{d}\,\vec{a}\right]+\left[\vec{c}\,\vec{d}\,\vec{b}\right]$

Question Type : **MCQ**
Question ID : **7155054058**
Option 1 ID : **71550512867**
Option 2 ID : **71550512868**
Option 3 ID : **71550512865**
Option 4 ID : **71550512866**
Status : **Not Answered**
Chosen Option : **--**

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Q.4 Let $y = y(x)$ be the solution of the differential equation

$$\frac{dy}{dx}+\frac{5}{x\left(x^5+1\right)}y=\frac{\left(x^5+1\right)^2}{x^7},\ x>0.$$ If $y(1) = 2$, then $y(2)$ is equal to

Options

1. $\frac{697}{128}$
2. $\frac{637}{128}$
3. $\frac{693}{128}$
4. $\frac{679}{128}$

Question Type : **MCQ**
Question ID : **7155054054**
Option 1 ID : **71550512852**
Option 2 ID : **71550512849**
Option 3 ID : **71550512851**
Option 4 ID : **71550512850**
Status : **Answered**
Chosen Option : **1**

Q.5 If the radius of the largest circle with centre (2,0) inscribed in the ellipse $x^2+4y^2 = 36$ is r, then $12r^2$ is equal to

Options

1. 115
2. 92
3. 72
4. 69

Question Type : **MCQ**
Question ID : **7155054055**
Option 1 ID : **71550512856**
Option 2 ID : **71550512855**
Option 3 ID : **71550512854**
Option 4 ID : **71550512853**
Status : **Answered**
Chosen Option : **4**

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Q.6 Let a, b, c and d be positive real numbers such that $a + b + c + d = 11$. If the maximum value of $a^5b^3c^2d$ is 3750β, then the value of β is

Options
1. 55
2. 110
3. 108
4. 90

Question Type : **MCQ**
Question ID : **7155054050**
Option 1 ID : **71550512833**
Option 2 ID : **71550512836**
Option 3 ID : **71550512835**
Option 4 ID : **71550512834**
Status : **Answered**
Chosen Option : **4**

Q.7 Let P be the plane passing through the points (5,3,0), (13,3, −2) and (1,6,2). For $\alpha \in \mathbb{N}$, if the distances of the points A (3, 4, α) and B (2, α, a) from the plane P are 2 and 3 respectively, then the positive value of a is

Options
1. 6
2. 4
3. 5
4. 3

Question Type : **MCQ**
Question ID : **7155054056**
Option 1 ID : **71550512860**
Option 2 ID : **71550512858**
Option 3 ID : **71550512859**
Option 4 ID : **71550512857**
Status : **Answered**
Chosen Option : **2**

Q.8 The angle of elevation of the top P of a tower from the feet of one person standing due South of the tower is 45° and from the feet of another person standing due west of the tower is 30°. If the height of the tower is 5 meters, then the distance (in meters) between the two persons is equal to

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

Question Type : **MCQ**
Question ID : **7155054060**
Option 1 ID : **71550512876**
Option 2 ID : **71550512875**
Option 3 ID : **71550512874**
Option 4 ID : **71550512873**
Status : **Answered**
Chosen Option : **1**

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Q.9 If $\begin{vmatrix} x+1 & x & x \\ x & x+\lambda & x \\ x & x & x+\lambda^2 \end{vmatrix} = \frac{9}{8}(103x+81)$, then $\lambda, \frac{\lambda}{3}$ are the roots of the equation

Options
1. $4x^2+24x+27=0$
2. $4x^2-24x+27=0$
3. $4x^2-24x-27=0$
4. $4x^2+24x-27=0$

Question Type : **MCQ**
Question ID : **7155054046**
Option 1 ID : **71550512819**
Option 2 ID : **71550512820**
Option 3 ID : **71550512818**
Option 4 ID : **71550512817**
Status : **Answered**
Chosen Option : **2**

Q.10 The sum of the coefficients of three consecutive terms in the binomial expansion of $(1+x)^{n+2}$, which are in the ratio 1:3:5, is equal to

Options
1. 25
2. 41
3. 63
4. 92

Question Type : **MCQ**
Question ID : **7155054049**
Option 1 ID : **71550512829**
Option 2 ID : **71550512830**
Option 3 ID : **71550512831**
Option 4 ID : **71550512832**
Status : **Answered**
Chosen Option : **3**

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Q.11 For $a \in \mathbb{C}$, let $A = \{ z \in \mathbb{C} : \text{Re}(a+\bar{z}) > \text{Im}(\bar{a}+z) \}$ and $B = \{ z \in \mathbb{C} : \text{Re}(a+\bar{z}) < \text{Im}(\bar{a}+z) \}$. Then among the two statements:

(S1) : If Re (a), Im $(a) > 0$, then the set A contains all the real numbers

(S2) : If Re (a), Im $(a) < 0$, then the set B contains all the real numbers,

Options
1. both are true
2. only (S1) is true
3. only (S2) is true
4. both are false

Question Type : **MCQ**
Question ID : **7155054044**
Option 1 ID : **71550512809**
Option 2 ID : **71550512811**
Option 3 ID : **71550512812**
Option 4 ID : **71550512810**
Status : **Not Answered**
Chosen Option : **--**

Q.12 If the letters of the word MATHS are permuted and all possible words so formed are arranged as in a dictionary with serial numbers, then the serial number of the word THAMS is

Options
1. 102
2. 101
3. 103
4. 104

Question Type : **MCQ**
Question ID : **7155054047**
Option 1 ID : **71550512822**
Option 2 ID : **71550512821**
Option 3 ID : **71550512823**
Option 4 ID : **71550512824**
Status : **Answered**
Chosen Option : **3**

Q.13 The converse of $((\sim p) \wedge q) \Rightarrow r$ is

Options
1. $((\sim p) \vee q) \Rightarrow r$
2. $(\sim r) \Rightarrow ((\sim p) \wedge q)$
3. $(\sim r) \Rightarrow p \wedge q$
4. $(p \vee (\sim q)) \Rightarrow (\sim r)$

Question Type : **MCQ**
Question ID : **7155054061**
Option 1 ID : **71550512878**
Option 2 ID : **71550512880**
Option 3 ID : **71550512879**
Option 4 ID : **71550512877**
Status : **Answered**
Chosen Option : **4**

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Q.14 Let A = {1, 3, 4, 6, 9} and B = {2, 4, 5, 8, 10}. Let R be a relation defined on A × B such that R = $\{((a_1, b_1), (a_2, b_2)) : a_1 \le b_2$ and $b_1 \le a_2\}$. Then the number of elements in the set R is

Options
1. 52
2. 160
3. 180
4. 26

Question Type : **MCQ**
Question ID : **7155054042**
Option 1 ID : **71550512802**
Option 2 ID : **71550512803**
Option 3 ID : **71550512804**
Option 4 ID : **71550512801**
Status : **Not Answered**
Chosen Option : **--**

Q.15 The domain of the function $f(x)=\frac{1}{\sqrt{[x]^2-3[x]-10}}$ is (where [x] denotes the greatest integer less than or equal to x)

Options
1. $(-\infty,-2)\cup[6,\infty)$
2. $(-\infty,-3]\cup(5,\infty)$
3. $(-\infty,-2)\cup(5,\infty)$
4. $(-\infty,-3]\cup[6,\infty)$

Question Type : **MCQ**
Question ID : **7155054043**
Option 1 ID : **71550512805**
Option 2 ID : **71550512808**
Option 3 ID : **71550512807**
Option 4 ID : **71550512806**
Status : **Answered**
Chosen Option : **1**

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Q.16 If the system of linear equations

$$7x+11y+\alpha z=13$$
$$5x+4y+7z=\beta$$
$$175x+194y+57z=361$$

has infinitely many solutions, then $\alpha + \beta + 2$ is equal to:

Options
1. 4
2. 6
3. 3
4. 5

Question Type : **MCQ**
Question ID : **7155054045**
Option 1 ID : **71550512814**
Option 2 ID : **71550512816**
Option 3 ID : **71550512813**
Option 4 ID : **71550512815**
Status : **Not Answered**
Chosen Option : **--**

Q.17 Let the line passing through the points P (2, −1, 2) and Q (5, 3, 4) meet the plane $x - y + z = 4$ at the point R. Then the distance of the point R from the plane $x + 2y + 3z + 2 = 0$ measured parallel to the line $\frac{x-7}{2}=\frac{y+3}{2}=\frac{z-2}{1}$ is equal to

Options
1. $\sqrt{31}$
2. $\sqrt{61}$
3. 3
4. $\sqrt{189}$

Question Type : **MCQ**
Question ID : **7155054057**
Option 1 ID : **71550512862**
Option 2 ID : **71550512863**
Option 3 ID : **71550512861**
Option 4 ID : **71550512864**
Status : **Not Answered**
Chosen Option : **--**

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Q.18 If the 1011^{th} term from the end in the binominal expansion of $\left(\frac{4x}{5}-\frac{5}{2x}\right)^{2022}$ is 1024 times 1011^{th} term from the beginning, then $|x|$ is equal to

Options
1. 15
2. 12
3. 8
4. 10

Question Type : **MCQ**
Question ID : **7155054048**
Option 1 ID : **71550512828**
Option 2 ID : **71550512827**
Option 3 ID : **71550512825**
Option 4 ID : **71550512826**
Status : **Answered**
Chosen Option : **4**

Q.19 If $f:\mathbb{R}\to\mathbb{R}$ be a continuous function satisfying $\int_0^{\frac{\pi}{2}} f(\sin 2x)\sin x\,dx+\alpha\int_0^{\frac{\pi}{4}} f(\cos 2x)\cos x\,dx=0$, then the value of α is

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

Question Type : **MCQ**
Question ID : **7155054053**
Option 1 ID : **71550512845**
Option 2 ID : **71550512846**
Option 3 ID : **71550512848**
Option 4 ID : **71550512847**
Status : **Answered**
Chosen Option : **1**

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Q.20 Let the mean of 6 observations 1, 2, 4, 5, x and y be 5 and their variance be 10. Then their mean deviation about the mean is equal to

Options 1. 3

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

3. $\frac{10}{3}$

4. $\frac{8}{3}$

Question Type : **MCQ**
Question ID : **7155054059**
Option 1 ID : **71550512871**
Option 2 ID : **71550512869**
Option 3 ID : **71550512872**
Option 4 ID : **71550512870**
Status : **Answered**
Chosen Option : **4**

Section : **Mathematics Section B**

Q.21 Let $S=\left\{z\in\mathbb{C}-\{i,2i\}:\frac{z^2+8iz-15}{z^2-3iz-2}\in\mathbb{R}\right\}$. If $\alpha-\frac{13}{11}i\in S$, $\alpha\in\mathbb{R}-\{0\}$, then $242\alpha^2$ is equal to _____.

Given Answer : --

Question Type : **SA**
Question ID : **7155054062**
Status : **Not Answered**

Q.22 The number of points, where the curve $f(x)=e^{8x}-e^{6x}-3e^{4x}-e^{2x}+1$, $x\in\mathbb{R}$ cuts x-axis, is equal to _____

Given Answer : **3**

Question Type : **SA**
Question ID : **7155054065**
Status : **Answered**

Q.23 Let the probability of getting head for a biased coin be $\frac{1}{4}$. It is tossed repeatedly until a head appears. Let N be the number of tosses required. If the probability that the equation $64x^2+5Nx+1=0$ has no real root is $\frac{p}{q}$, where p and q are co-prime, then $q-p$ is equal to _____.

Given Answer : --

Question Type : **SA**
Question ID : **7155054071**
Status : **Not Answered**

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Q.24 If A is the area in the first quadrant enclosed by the curve C: $2x^2 - y + 1 = 0$, the tangent to C at the point (1, 3) and the line $x + y = 1$, then the value of 60A is _____.

Given --
Answer :

Question Type : **SA**
Question ID : **7155054066**
Status : **Not Answered**

Q.25 Let A = {1, 2, 3, 4, 5} and B = {1, 2, 3, 4, 5, 6}. Then the number of functions f: A→ B satisfying $f(1) + f(2) = f(4) - 1$ is equal to _____.

Given --
Answer :

Question Type : **SA**
Question ID : **7155054063**
Status : **Not Answered**

Q.26 Let the line $l : x = \frac{1-y}{-2} = \frac{z-3}{\lambda}, \lambda \in \mathbb{R}$ meet the plane $P : x + 2y + 3z = 4$ at the point (α, β, γ). If the angle between the line l and the plane P is $\cos^{-1}\left(\sqrt{\frac{5}{14}}\right)$, then $\alpha + 2\beta + 6\gamma$ is equal to _____.

Given --
Answer :

Question Type : **SA**
Question ID : **7155054069**
Status : **Not Answered**

Q.27 If the line $l_1 : 3y - 2x = 3$ is the angular bisector of the lines $l_2 : x - y + 1 = 0$ and $l_3 : \alpha x + \beta y + 17 = 0$, then $\alpha^2 + \beta^2 - \alpha - \beta$ is equal to _____.

Given --
Answer :

Question Type : **SA**
Question ID : **7155054067**
Status : **Not Answered**

Q.28 For $k \in \mathbb{N}$, if the sum of the series $1 + \frac{4}{k} + \frac{8}{k^2} + \frac{13}{k^3} + \frac{19}{k^4} + \ldots$ is 10, then the value of k is _____

Given --
Answer :

Question Type : **SA**
Question ID : **7155054064**
Status : **Not Answered**

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Q.29 Let $\vec{a}=\hat{i}+2\hat{j}+3\hat{k}$ and $\vec{b}=\hat{i}+\hat{j}-\hat{k}$. If $\vec{c}$ is a vector such that $\vec{a}\cdot\vec{c}=11$, $\vec{b}\cdot(\vec{a}\times\vec{c})=27$ and $\vec{b}\cdot\vec{c}=-\sqrt{3}|\vec{b}|$, then $|\vec{a}\times\vec{c}|^2$ is equal to _____.

Given **243**
Answer :

Question Type : **SA**
Question ID : **7155054070**
Status : **Answered**

Q.30 Let the tangent to the parabola $y^2 = 12x$ at the point $(3, \alpha)$ be perpendicular to the line $2x + 2y = 3$. Then the square of distance of the point $(6, -4)$ from the normal to the hyperbola $\alpha^2 x^2 - 9y^2 = 9\alpha^2$ at its point $(\alpha - 1, \alpha + 2)$ is equal to _____.

Given **116**
Answer :

Question Type : **SA**
Question ID : **7155054068**
Status : **Answered**

Section : **Physics Section A**

Q.31 A car P travelling at 20 ms^{-1} sounds its horn at a frequency of 400 Hz. Another car Q is travelling behind the first car in the same direction with a velocity 40 ms^{-1}. The frequency heard by the passenger of the car Q is approximately [Take, velocity of sound = 360 ms^{-1}]

Options
1. 485 Hz
2. 471 Hz
3. 514 Hz
4. 421 Hz

Question Type : **MCQ**
Question ID : **7155054072**
Option 1 ID : **71550512893**
Option 2 ID : **71550512894**
Option 3 ID : **71550512891**
Option 4 ID : **71550512892**
Status : **Answered**
Chosen Option : **4**

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Q.32 If V is the gravitational potential due to sphere of uniform density on it's surface, then it's value at the center of sphere will be:-

Options

1. $\frac{V}{2}$
2. V
3. $\frac{3V}{2}$
4. $\frac{4}{3}V$

Question Type : **MCQ**
Question ID : **7155054078**
Option 1 ID : **71550512916**
Option 2 ID : **71550512915**
Option 3 ID : **71550512917**
Option 4 ID : **71550512918**
Status : **Answered**
Chosen Option : **3**

Q.33 A space ship of mass 2×10^4 kg is launched into a circular orbit close to the earth surface. The additional velocity to be imparted to the space ship in the orbit to overcome the gravitational pull will be (if g = 10 m/s^2 and radius of earth = 6400 km):

Options

1. $8\left(\sqrt{2}-1\right)$ km/s
2. $11.2\left(\sqrt{2}-1\right)$ km/s
3. $7.9\left(\sqrt{2}-1\right)$ km/s
4. $7.4\left(\sqrt{2}-1\right)$ km/s

Question Type : **MCQ**
Question ID : **7155054074**
Option 1 ID : **71550512901**
Option 2 ID : **71550512899**
Option 3 ID : **71550512902**
Option 4 ID : **71550512900**
Status : **Answered**
Chosen Option : **1**

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Q.34 A plane electromagnetic wave of frequency 20 MHz propagates in free space along x-direction. At a particular space and time, $\vec{E} = 6.6\,\hat{j}\ \text{V/m}$. What is $\vec{B}$ at this point?

Options

1. $-2.2\times10^{-8}\,\hat{k}\ T$
2. $2.2\times10^{-8}\,\hat{i}\ T$
3. $-2.2\times10^{-8}\,\hat{i}\ T$
4. $2.2\times10^{-8}\,\hat{k}\ T$

Question Type : **MCQ**
Question ID : **7155054087**
Option 1 ID : **71550512952**
Option 2 ID : **71550512953**
Option 3 ID : **71550512954**
Option 4 ID : **71550512951**
Status : **Answered**
Chosen Option : **4**

Q.35 The energy of He^+ ion in its first excited state is, (The ground state energy for the Hydrogen atom is –13.6 eV):

Options

1. –54.4 eV
2. –3.4 eV
3. –27.2 eV
4. –13.6 eV

Question Type : **MCQ**
Question ID : **7155054085**
Option 1 ID : **71550512943**
Option 2 ID : **71550512945**
Option 3 ID : **71550512946**
Option 4 ID : **71550512944**
Status : **Answered**
Chosen Option : **4**

Q.36 A capacitor of capacitance C is charged to a potential V. The flux of the electric field through a closed surface enclosing the positive plate of the capacitor is :

Options

1. $\frac{CV}{2\varepsilon_0}$
2. $\frac{2CV}{\varepsilon_0}$
3. Zero
4. $\frac{CV}{\varepsilon_0}$

Question Type : **MCQ**
Question ID : **7155054091**
Option 1 ID : **71550512969**
Option 2 ID : **71550512968**
Option 3 ID : **71550512970**
Option 4 ID : **71550512967**
Status : **Answered**
Chosen Option : **4**

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Q.37 A projectile is projected at 30° from horizontal with initial velocity 40 ms^{-1}. The velocity of the projectile at t = 2 s from the start will be :
(Given g = 10 m/s^2)

Options
1. 20 ms^{-1}
2. $40\sqrt{3}$ ms^{-1}
3. $20\sqrt{3}$ ms^{-1}
4. Zero

Question Type : **MCQ**
Question ID : **7155054080**
Option 1 ID : **71550512925**
Option 2 ID : **71550512926**
Option 3 ID : **71550512924**
Option 4 ID : **71550512923**
Status : **Answered**
Chosen Option : **3**

Q.38 The root mean square speed of molecules of nitrogen gas at 27°C is approximately : (Given mass of a nitrogen molecule = 4.6×10^{-26} kg and take Boltzmann constant $k_B = 1.4 \times 10^{-23} JK^{-1}$)

Options
1. 27.4 m/s
2. 1260 m/s
3. 91 m/s
4. 523 m/s

Question Type : **MCQ**
Question ID : **7155054073**
Option 1 ID : **71550512895**
Option 2 ID : **71550512898**
Option 3 ID : **71550512896**
Option 4 ID : **71550512897**
Status : **Answered**
Chosen Option : **4**

Q.39 Eight equal drops of water are falling through air with a steady speed of 10 cm/s. If the drops coalesce, the new velocity is:-

Options
1. 5 cm/s
2. 16 cm/s
3. 10 cm/s
4. 40 cm/s

Question Type : **MCQ**
Question ID : **7155054077**
Option 1 ID : **71550512911**
Option 2 ID : **71550512913**
Option 3 ID : **71550512912**
Option 4 ID : **71550512914**
Status : **Answered**
Chosen Option : **3**

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Q.40 An electron is allowed to move with constant velocity along the axis of current carrying straight solenoid.

A. The electron will experience magnetic force along the axis of the solenoid.
B. The electron will not experience magnetic force.
C. The electron will continue to move along the axis of the solenoid.
D. The electron will be accelerated along the axis of the solenoid
E. The electron will follow parabolic path-inside the solenoid.

Choose the correct answer from the options given below:

Options
1. B and C only
2. B and E only
3. B, C and D only
4. A and D only

Question Type : **MCQ**
Question ID : **7155054089**
Option 1 ID : **71550512960**
Option 2 ID : **71550512962**
Option 3 ID : **71550512961**
Option 4 ID : **71550512959**
Status : **Answered**
Chosen Option : **3**

Q.41 The Thermodynamic process, in which internal energy of the system remains constant is

Options
1. Adiabatic
2. Isobaric
3. Isothermal
4. Isochoric

Question Type : **MCQ**
Question ID : **7155054075**
Option 1 ID : **71550512903**
Option 2 ID : **71550512905**
Option 3 ID : **71550512906**
Option 4 ID : **71550512904**
Status : **Answered**
Chosen Option : **3**

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Q.42 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A: A bar magnet dropped through a metallic cylindrical pipe takes more time to come down compared to a non-magnetic bar with same geometry and mass.

Reason R: For the magnetic bar, Eddy currents are produced in the metallic pipe which oppose the motion of the magnetic bar.

In the light of the above statements, choose the correct answer from the options given below

Options
1. A is false but R is true
2. Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**
3. Both **A** and **R** are true and **R** is the correct explanation of **A**
4. A is true but R is false

Question Type : **MCQ**
Question ID : **7155054088**
Option 1 ID : **71550512958**
Option 2 ID : **71550512956**
Option 3 ID : **71550512955**
Option 4 ID : **71550512957**
Status : **Answered**
Chosen Option : **3**

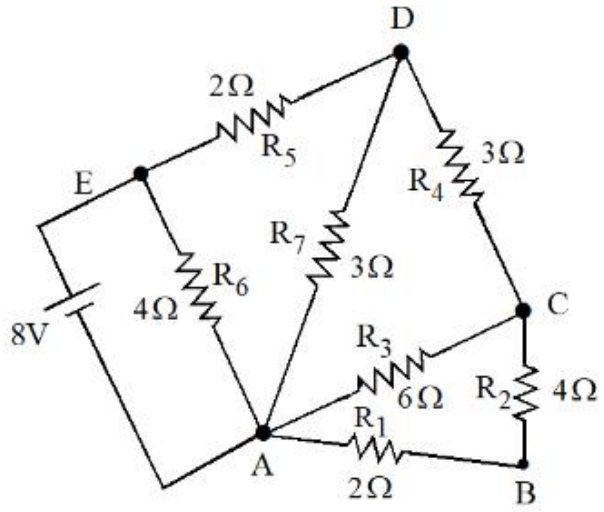
Q.43 When one light ray is reflected from a plane mirror with 30° angle of reflection, the angle of deviation of the ray after reflection is:

Options
1. 110°
2. 140°
3. 120°
4. 130°

Question Type : **MCQ**
Question ID : **7155054084**
Option 1 ID : **71550512939**
Option 2 ID : **71550512942**
Option 3 ID : **71550512940**
Option 4 ID : **71550512941**
Status : **Answered**
Chosen Option : **3**

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Q.44



The current flowing through R_2 is :

Options

1. $\frac{1}{4}$ A
2. $\frac{2}{3}$ A
3. $\frac{1}{2}$ A
4. $\frac{1}{3}$ A

Question Type : **MCQ**
Question ID : **7155054090**
Option 1 ID : **71550512964**
Option 2 ID : **71550512966**
Option 3 ID : **71550512963**
Option 4 ID : **71550512965**
Status : **Answered**
Chosen Option : **3**

Q.45 A body of mass 500 g moves along x-axis such that it's velocity varies with displacement x according to the relation $v = 10\sqrt{x}$ m/s the force acting on the body is:-

Options

1. 166 N
2. 5 N
3. 125 N
4. 25 N

Question Type : **MCQ**
Question ID : **7155054076**
Option 1 ID : **71550512910**
Option 2 ID : **71550512907**
Option 3 ID : **71550512909**
Option 4 ID : **71550512908**
Status : **Answered**
Chosen Option : **4**

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Q.46 If force (F), velocity (V) and time (T) are considered as fundamental physical quantity, then dimensional formula of density will be :

Options
1. $F^2V^{-2}T^6$
2. $FV^{-4}T^{-2}$
3. $FV^{-2}T^2$
4. FV^4T^{-6}

Question Type : **MCQ**
Question ID : **7155054081**
Option 1 ID : **71550512927**
Option 2 ID : **71550512929**
Option 3 ID : **71550512930**
Option 4 ID : **71550512928**
Status : **Answered**
Chosen Option : **2**

Q.47 When vector $\vec{A} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ is subtracted from vector $\vec{B}$, it gives a vector equal to $2\hat{j}$. Then the magnitude of vector $\vec{B}$ will be :

Options
1. $\sqrt{13}$
2. $\sqrt{6}$
3. $\sqrt{5}$
4. 3

Question Type : **MCQ**
Question ID : **7155054079**
Option 1 ID : **71550512921**
Option 2 ID : **71550512922**
Option 3 ID : **71550512920**
Option 4 ID : **71550512919**
Status : **Answered**
Chosen Option : **2**

Q.48 The ratio of the de-Broglie wavelengths of proton and electron having same Kinetic energy :
(Assume $m_p = m_e \times 1849$)

Options
1. 1:43
2. 2:43
3. 1:30
4. 1:62

Question Type : **MCQ**
Question ID : **7155054086**
Option 1 ID : **71550512950**
Option 2 ID : **71550512947**
Option 3 ID : **71550512949**
Option 4 ID : **71550512948**
Status : **Answered**
Chosen Option : **1**

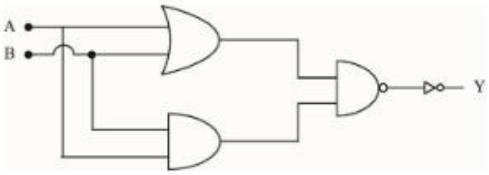
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Q.49 In satellite communication, the uplink frequency band used is :

Options 1. 420 – 890 MHz
2. 3.7 – 4.2 GHz
3. 76 – 88 MHz
4. 5.925 – 6.425 GHz

Question Type : **MCQ**
Question ID : **7155054082**
Option 1 ID : **71550512932**
Option 2 ID : **71550512933**
Option 3 ID : **71550512931**
Option 4 ID : **71550512934**
Status : **Not Answered**
Chosen Option : **--**

Q.50 The logic operations performed by the given digital circuit is equivalent to:



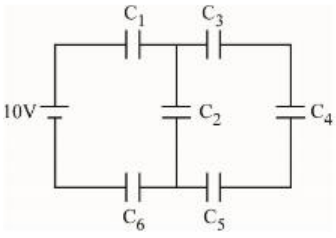
Options 1. NAND
2. NOR
3. AND
4. OR

Question Type : **MCQ**
Question ID : **7155054083**
Option 1 ID : **71550512937**
Option 2 ID : **71550512938**
Option 3 ID : **71550512935**
Option 4 ID : **71550512936**
Status : **Answered**
Chosen Option : **3**

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Section : **Physics Section B**

Q.51 In the given circuit,
$C_1 = 2\ \mu F$, $C_2 = 0.2\ \mu F$, $C_3 = 2\ \mu F$, $C_4 = 4\ \mu F$, $C_5 = 2\ \mu F$, $C_6 = 2\ \mu F$, The charge stored on capacitor C_4 is_____ μC.



Given Answer : **4**

Question Type : **SA**
Question ID : **7155054101**
Status : **Answered**

Q.52 Two identical cells each of emf 1.5 V are connected in series across a 10 Ω resistance. An ideal voltmeter connected across 10 Ω resistance reads 1.5 V. The internal resistance of each cell is _____ Ω.

Given --
Answer :

Question Type : **SA**
Question ID : **7155054100**
Status : **Not Answered**

Q.53 A block of mass 5 kg starting from rest pulled up on a smooth incline plane making an angle of 30° with horizontal with an affective acceleration of 1 ms^{-2}. The power delivered by the pulling force at t = 10 s from the start is _____ W
[use g = 10 ms^{-2}]
(calculate the nearest integer value)

Given --
Answer :

Question Type : **SA**
Question ID : **7155054095**
Status : **Not Answered**

Q.54 The surface tension of soap solution is 3.5×10^{-2} Nm^{-1}. The amount of work done required to increase the radius of soap bubble from 10 cm to 20 cm is _____ $\times 10^{-4}$ J.

(take $\pi = 22/7$)

Given **132**
Answer :

Question Type : **SA**
Question ID : **7155054093**
Status : **Answered**

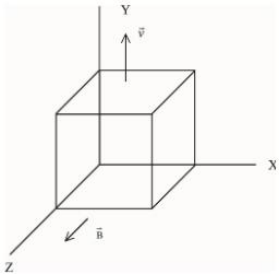
Q.55 A wire of density 8×10^3 kg/m^3 is stretched between two clamps 0.5 m apart. The extension developed in the wire is 3.2×10^{-4} m. If $Y = 8 \times 10^{10}$ N/m^2, the fundamental frequency of vibration in the wire will be _____ Hz

Given --
Answer :

Question Type : **SA**
Question ID : **7155054092**
Status : **Not Answered**

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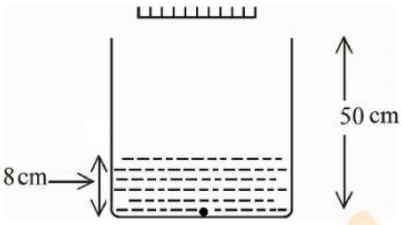
Q.56 A metallic cube of side 15 cm moving along y-axis at a uniform velocity of 2 ms^{-1}. In a region of uniform magnetic field of magnitude 0.5T directed along z-axis. In equilibrium the potential difference between the faces of higher and lower potential developed because of the motion through the field will be _____ mV.



Given --
Answer :

Question Type : **SA**
Question ID : **7155054099**
Status : **Not Answered**

Q.57 As shown in the figure, a plane mirror is fixed at a height of 50 cm from the bottom of tank containing water $\left(\mu=\frac{4}{3}\right)$. The height of water in the tank is 8 cm. A small bulb is placed at the bottom of the water tank.
The distance of image of the bulb formed by mirror from the bottom of the tank is _____ cm.



Given --
Answer :

Question Type : **SA**
Question ID : **7155054097**
Status : **Not Answered**

Q.58 A nucleus disintegrates into two nuclear parts, in such a way that ratio of their nuclear sizes is $1 : 2^{1/3}$. Their respective speed have a ratio of n : 1. The value of n is _____

Given **8**
Answer :

Question Type : **SA**
Question ID : **7155054096**
Status : **Answered**

Q.59 A coil has an inductance of 2H and resistance of 4 Ω. A 10 V is applied across the coil. The energy stored in the magnetic field after the current has built up to its equilibrium value will be _____ $\times 10^{-2}$J.

Given **625**
Answer :

Question Type : **SA**
Question ID : **7155054098**
Status : **Answered**

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Q.60 A circular plate is rotating in horizontal plane, about an axis passing through its center and perpendicular to the plate, with an angular velocity ω. A person sits at the center having two dumbbells in his hands. When he stretches out his hands, the moment of inertia of the system becomes triple. If E be the initial Kinetic energy of the system, then final Kinetic energy will be $\frac{E}{x}$. The value of x is

Given Answer : **3**

Question Type : **SA**
Question ID : **7155054094**
Status : **Answered**

Section : **Chemistry Section A**

Q.61 Which one of the following pairs is an example of polar molecular solids?

Options
1. $SO_2(s), NH_3(s)$
2. $SO_2(s), CO_2(s)$
3. $MgO\ (s), SO_2(s)$
4. $HCl\ (s), AlN\ (s)$

Question Type : **MCQ**
Question ID : **7155054102**
Option 1 ID : **71550512981**
Option 2 ID : **71550512982**
Option 3 ID : **71550512984**
Option 4 ID : **71550512983**
Status : **Answered**
Chosen Option : **1**

Q.62 Alkali metal from the following with least melting point is:

Options
1. K
2. Na
3. Cs
4. Rb

Question Type : **MCQ**
Question ID : **7155054109**
Option 1 ID : **71550513010**
Option 2 ID : **71550513009**
Option 3 ID : **71550513012**
Option 4 ID : **71550513011**
Status : **Answered**
Chosen Option : **3**

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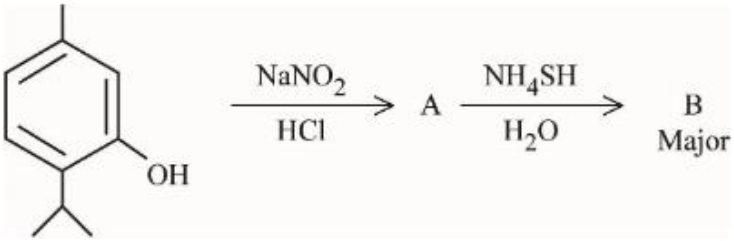
Q.63 What weight of glucose must be dissolved in 100 g of water to lower the vapour pressure by 0.20 mm Hg ?
(Assume dilute solution is being formed)
Given : Vapour pressure of pure water is 54.2 mm Hg at room temperature. Molar mass of glucose is 180 g mol^{-1}

Options
1. 4.69 g
2. 3.59 g
3. 2.59 g
4. 3.69 g

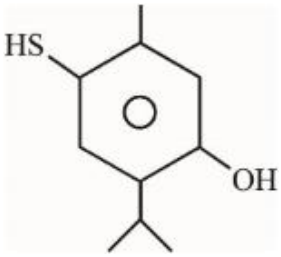
Question Type : **MCQ**
Question ID : **7155054103**
Option 1 ID : **71550512986**
Option 2 ID : **71550512988**
Option 3 ID : **71550512987**
Option 4 ID : **71550512985**
Status : **Answered**
Chosen Option : **4**

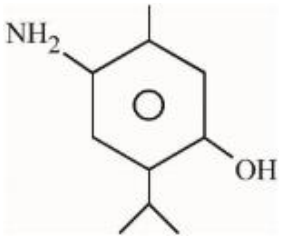
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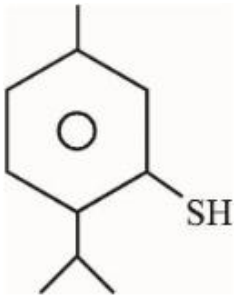
Q.64 Compound 'B' is



Options

1. 

2. 

3. 

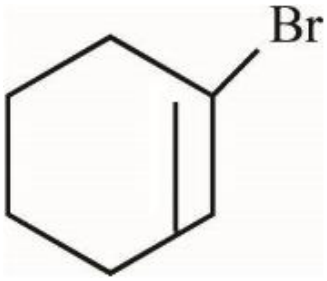
4. 

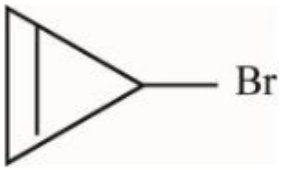
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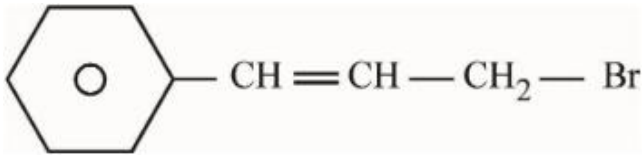
Question Type : **MCQ**
Question ID : **7155054119**
Option 1 ID : **71550513050**
Option 2 ID : **71550513049**
Option 3 ID : **71550513051**
Option 4 ID : **71550513052**
Status : **Not Answered**
Chosen Option : **--**

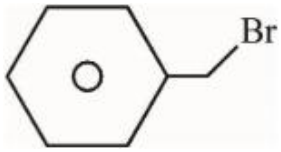
Q.65 Compound from the following that will not produce precipitate on reaction with $AgNO_3$ is :

Options

1. 

2. 

3. 

4. 

Question Type : **MCQ**
Question ID : **7155054115**
Option 1 ID : **71550513036**
Option 2 ID : **71550513035**
Option 3 ID : **71550513034**
Option 4 ID : **71550513033**
Status : **Answered**
Chosen Option : **1**

Q.66 A solution is prepared by adding 2 g of "X" to 1 mole of water. Mass percent of "X" in the solution is

Options

1. 10%
2. 5%
3. 20%
4. 2%

Question Type : **MCQ**
Question ID : **7155054105**
Option 1 ID : **71550512995**
Option 2 ID : **71550512994**
Option 3 ID : **71550512996**
Option 4 ID : **71550512993**
Status : **Answered**
Chosen Option : **1**

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Q.67 Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : A solution of the product obtained by heating a mole of glycine with a mole of chlorine in presence of red phosphorous generates chiral carbon atom.

Reason R : A molecule with 2 chiral carbons is always optically active.

In the light of the above statements, choose the correct answer from the options given below:

Options
1. Both A and R are true and R is the correct explanation of A
2. A is true but R is false
3. Both A and R are true but R is NOT the correct explanation of A
4. A is false but R is true

Question Type : **MCQ**
Question ID : **7155054120**
Option 1 ID : **71550513053**
Option 2 ID : **71550513055**
Option 3 ID : **71550513054**
Option 4 ID : **71550513056**
Status : **Answered**
Chosen Option : **2**

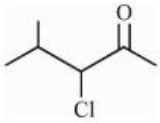
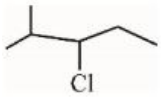
Q.68 Which hydride among the following is less stable?

Options
1. BeH_2
2. LiH
3. NH_3
4. HF

Question Type : **MCQ**
Question ID : **7155054107**
Option 1 ID : **71550513002**
Option 2 ID : **71550513001**
Option 3 ID : **71550513003**
Option 4 ID : **71550513004**
Status : **Answered**
Chosen Option : **1**

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Q.69 Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A :  can be subjected to Wolff-Kishner reduction to give 

Reason R : Wolff-Kishner reduction is used to convert  into 

In the light of the above statements, choose the correct answer from the options given below:

Options
1. Both A and R are true and R is the correct explanation of A
2. Both A and R are true but R is NOT the correct explanation of A
3. A is true but R is false
4. A is false but R is true

Question Type : **MCQ**
Question ID : **7155054118**
Option 1 ID : **71550513045**
Option 2 ID : **71550513046**
Option 3 ID : **71550513047**
Option 4 ID : **71550513048**
Status : **Answered**
Chosen Option : **1**

Q.70 Given below are two statements :

Statement I : Ethene at 333 to 343K and 6-7 atm pressure in the presence of $AlEt_3$ and $TiCl_4$ undergoes addition polymerization to give LDP.

Statement II : Caprolactam at 533-543K in H_2O through step growth polymerizes to give Nylon 6.

In the light of the above statements, choose the correct answer from the options given below:

Options
1. Both Statement I and Statement II are true
2. Both Statement I and Statement II are false
3. Statement I is false but Statement II is true
4. Statement I is true but Statement II is false

Question Type : **MCQ**
Question ID : **7155054121**
Option 1 ID : **71550513057**
Option 2 ID : **71550513058**
Option 3 ID : **71550513060**
Option 4 ID : **71550513059**
Status : **Not Answered**
Chosen Option : **--**

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Q.71 If Ni^{2+} is replaced by Pt^{2+} in the complex $[NiCl_2Br_2]^{2-}$, which of the following properties are expected to get changed ?

A. Geometry
B. Geometrical isomerism
C. Optical isomerism
D. Magnetic properties

Options 1. B and C
2. A and D
3. A, B and C
4. A, B and D

Question Type : **MCQ**
Question ID : **7155054113**
Option 1 ID : **71550513026**
Option 2 ID : **71550513025**
Option 3 ID : **71550513027**
Option 4 ID : **71550513028**
Status : **Answered**
Chosen Option : **4**

Q.72 Match List I with List II

LIST I Complex		LIST II Colour	
A.	$Mg(NH_4)PO_4$	I.	brown
B.	$K_3[Co(NO_2)_6]$	II.	white
C.	$MnO(OH)_2$	III.	yellow
D.	$Fe_4[Fe(CN)_6]_3$	IV.	blue

Choose the correct answer from the options given below:

Options 1. A-II, B-IV, C-I, D-III
2. A-II, B-III, C-IV, D-I
3. A-III, B-IV, C-II, D-I
4. A-II, B-III, C-I, D-IV

Question Type : **MCQ**
Question ID : **7155054114**
Option 1 ID : **71550513031**
Option 2 ID : **71550513032**
Option 3 ID : **71550513030**
Option 4 ID : **71550513029**
Status : **Answered**
Chosen Option : **2**

Q.73 For a chemical reaction A + B → Product, the order is 1 with respect to A and B.

Rate mol L^{-1} S^{-1}	**[A]** mol L^{-1}	**[B]** mol L^{-1}
0.10	20	0.5
0.40	x	0.5
0.80	40	y

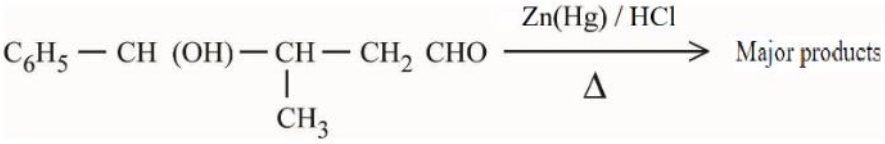
What is the value of x and y ?

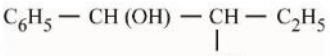
Options
1. 40 and 4
2. 80 and 2
3. 80 and 4
4. 160 and 4

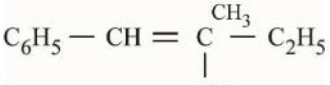
Question Type : **MCQ**
Question ID : **7155054104**
Option 1 ID : **71550512990**
Option 2 ID : **71550512989**
Option 3 ID : **71550512992**
Option 4 ID : **71550512991**
Status : **Answered**
Chosen Option : **2**

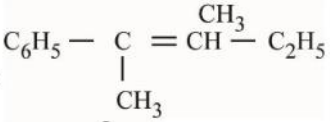
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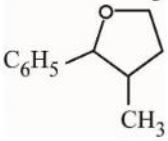
Q.74 The major product formed in the following reaction is



A. 

B. 

C. 

D. 

Choose the correct answer from the options given below:

Options
1. C only
2. D only
3. A only
4. B only

Question Type : **MCQ**
Question ID : **7155054117**
Option 1 ID : **71550513044**
Option 2 ID : **71550513043**
Option 3 ID : **71550513042**
Option 4 ID : **71550513041**
Status : **Not Answered**
Chosen Option : **--**

Q.75 Which of the following compounds is an example of Freon?

Options
1. $C_2Cl_2F_2$
2. C_2F_4
3. C_2HF_3
4. $C_2H_2F_2$

Question Type : **MCQ**
Question ID : **7155054112**
Option 1 ID : **71550513021**
Option 2 ID : **71550513024**
Option 3 ID : **71550513023**
Option 4 ID : **71550513022**
Status : **Answered**
Chosen Option : **1**

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Q.76 One mole of P_4 reacts with 8 moles of $SOCl_2$ to give 4 moles of A, x mole of SO_2 and 2 moles of B. A, B and x respectively are

Options
1. $POCl_3$, S_2Cl_2 and 4
2. PCl_3, S_2Cl_2 and 4
3. PCl_3, S_2Cl_2 and 2
4. $POCl_3$, S_2Cl_2 and 2

Question Type : **MCQ**
Question ID : **7155054108**
Option 1 ID : **71550513008**
Option 2 ID : **71550513005**
Option 3 ID : **71550513007**
Option 4 ID : **71550513006**
Status : **Answered**
Chosen Option : **2**

Q.77 Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : $[CoCl(NH_3)_5]^{2+}$ absorbs at lower wavelength of light with respect to $[Co(NH_3)_5\ (H_2O)]^{3+}$

Reason R : It is because the wavelength of the light absorbed depends on the oxidation state of the metal ion.

In the light of the above statements, choose the correct answer from the options given below:

Options
1. Both A and R are true but R is NOT the correct explanation of A
2. A is false but R is true
3. A is true but R is false
4. Both A and R are true and R is the correct explanation of A

Question Type : **MCQ**
Question ID : **7155054111**
Option 1 ID : **71550513018**
Option 2 ID : **71550513020**
Option 3 ID : **71550513019**
Option 4 ID : **71550513017**
Status : **Answered**
Chosen Option : **3**

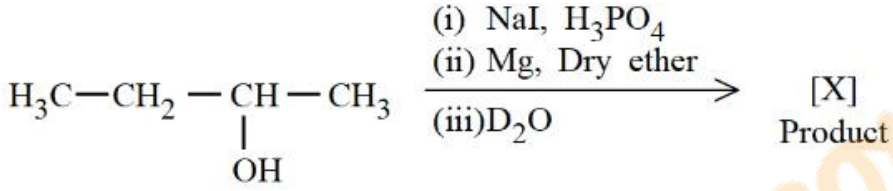
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Q.78 The magnetic moment is measured in Bohr Magneton (BM).
Spin only magnetic moment of Fe in $[Fe(H_2O)_6]^{3+}$ and $[Fe(CN)_6]^{3-}$ complexes respectively is:

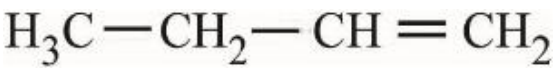
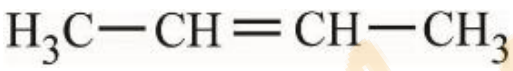
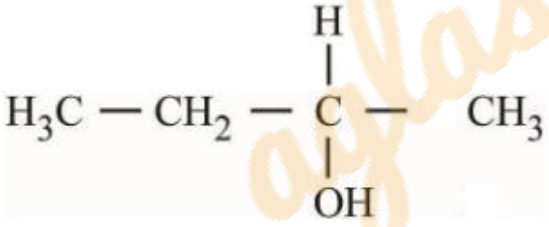
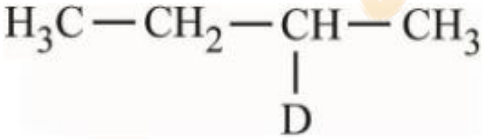
Options
1. 3.87 B.M. and 1.732 B.M.
2. 4.89 B.M. and 6.92 B.M.
3. 6.92 B.M. in both
4. 5.92 B.M. and 1.732 B.M.

Question Type : **MCQ**
Question ID : **7155054110**
Option 1 ID : **71550513016**
Option 2 ID : **71550513014**
Option 3 ID : **71550513013**
Option 4 ID : **71550513015**
Status : **Answered**
Chosen Option : **4**

Q.79



Product [X] formed in the above reaction is :

Options
1. 
2. 
3. 
4. 

Question Type : **MCQ**
Question ID : **7155054116**
Option 1 ID : **71550513040**
Option 2 ID : **71550513038**
Option 3 ID : **71550513037**
Option 4 ID : **71550513039**
Status : **Answered**
Chosen Option : **2**

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Q.80 Given below are two statements :

Statement I : In the metallurgy process, sulphide ore is converted to oxide before reduction.
Statement II : Oxide ores in general are easier to reduce.

In the light of the above statements, choose the most appropriate answer from the options given below:

Options
1. Both Statement I and Statement II are correct
2. Both Statement I and Statement II are incorrect
3. Statement I is correct but Statement II is incorrect
4. Statement I is incorrect but Statement II is correct

Question Type : **MCQ**
Question ID : **7155054106**
Option 1 ID : **71550512997**
Option 2 ID : **71550512998**
Option 3 ID : **71550512999**
Option 4 ID : **71550513000**
Status : **Answered**
Chosen Option : **1**

Section : **Chemistry Section B**

Q.81 The number of possible isomeric products formed when 3-chloro-1-butene reacts with HCl through carbocation formation is _____

Given Answer : --

Question Type : **SA**
Question ID : **7155054131**
Status : **Not Answered**

Q.82 The number of correct statements about modern adsorption theory of heterogeneous catalysis from the following is _____

A. The catalyst is diffused over the surface of reactants.
B. Reactants are adsorbed on the surface of the catalyst.
C. Occurrence of chemical reaction on the catalyst's surface through formation of an intermediate.
D. It is a combination of intermediate compound formation theory and the old adsorption theory.
E. It explains the action of the catalyst as well as those of catalytic promoters and poisons.

Given Answer : --

Question Type : **SA**
Question ID : **7155054128**
Status : **Not Answered**

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Q.83 The total number of intensive properties from the following is _____

Volume, Molar heat capacity, Molarity, E^{θ} cell, Gibbs free energy change, Molar mass, Mole

Given --
Answer :

Question Type : **SA**
Question ID : **7155054125**
Status : **Not Answered**

Q.84 The volume of hydrogen liberated at STP by treating 2.4 g of magnesium with excess of hydrochloric acid is _____ $\times 10^{-2}$ L

Given : Molar volume of gas is 22·4L at STP.
Molar mass of magnesium is 24 g mol^{-1}

Given **112**
Answer :

Question Type : **SA**
Question ID : **7155054122**
Status : **Answered**

Q.85 $Mg(NO_3)_2 \cdot XH_2O$ and $Ba(NO_3)_2 \cdot YH_2O$, represent formula of the crystalline forms of nitrate salts. Sum of X and Y is _____

Given --
Answer :

Question Type : **SA**
Question ID : **7155054129**
Status : **Not Answered**

Q.86 4.5 moles each of hydrogen and iodine is heated in a sealed ten litre vessel. At equilibrium, 3 moles of HI were found. The equilibrium constant for $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ is _____

Given **0.75**
Answer :

Question Type : **SA**
Question ID : **7155054126**
Status : **Answered**

Q.87 The number of correct statements from the following is _____.

A. For 1s orbital, the probability density is maximum at the nucleus
B. For 2s orbital, the probability density first increases to maximum and then decreases sharply to zero.
C. Boundary surface diagrams of the orbitals encloses a region of 100% probability of finding the electron.
D. p and d-orbitals have 1 and 2 angular nodes respectively
E. probability density of p-orbital is zero at the nucleus

Given --
Answer :

Question Type : **SA**
Question ID : **7155054124**
Status : **Not Answered**

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Q.88 The maximum number of lone pairs of electrons on the central atom from the following species is _____

ClO_3^-, XeF_4, SF_4 and I_3^-

Given **3**
Answer :

Question Type : **SA**
Question ID : **7155054123**
Status : **Answered**

Q.89 Number of compounds from the following which will not produce orange red precipitate with Benedict solution is _____

Glucose, maltose, sucrose, ribose, 2-deoxyribose, amylose, lactose

Given **--**
Answer :

Question Type : **SA**
Question ID : **7155054130**
Status : **Not Answered**

Q.90 The number of correct statements from the following is _____

A. E_{cell} is an intensive parameter

B. A negative E^{Θ} means that the redox couple is a stronger reducing agent than the H^+/H_2 couple.

C. The amount of electricity required for oxidation or reduction depends on the stoichiometry of the electrode reaction.

D. The amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte.

Given **2**
Answer :

Question Type : **SA**
Question ID : **7155054127**
Status : **Answered**

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