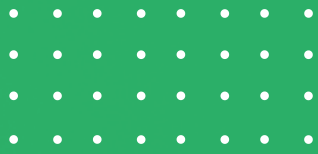




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Session 2

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 $A = \{x \in \mathbb{R} : [x + 3] + [x + 4] \leq 3\}$,

$$B = \left\{ x \in \mathbb{R} : 3^x \left(\sum_{r=1}^{\infty} \frac{3}{10^r} \right)^{x-3} < 3^{-3x} \right\}, \text{ where } [t] \text{ denotes greatest integer}$$

function. Then,

Options 1. $B \subset C, A \neq B$

2. $A \cap B = \phi$

3. $A = B$

4. $A \subset B, A \neq B$

Question Type : **MCQ**

Question ID : **7155053682**

Option 1 ID : **71550511723**

Option 2 ID : **71550511724**

Option 3 ID : **71550511721**

Option 4 ID : **71550511722**

Status : **Not Answered**

Chosen Option : --

Q.2 The mean and variance of a set of 15 numbers are 12 and 14 respectively. The mean and variance of another set of 15 numbers are 14 and σ^2 respectively. If the variance of all the 30 numbers in the two sets is 13, then σ^2 is equal to

Options 1. 10

2. 11

3. 9

4. 12

Question Type : **MCQ**

Question ID : **7155053698**

Option 1 ID : **71550511787**

Option 2 ID : **71550511786**

Option 3 ID : **71550511788**

Option 4 ID : **71550511785**

Status : **Not Answered**

Chosen Option : --

Q.3 The sum of the first 20 terms of the series $5 + 11 + 19 + 29 + 41 + \dots$ is

- Options
1. 3520
 2. 3450
 3. 3420
 4. 3250

Question Type : **MCQ**

Question ID : 7155053688

Option 1 ID : 71550511748

Option 2 ID : 71550511746

Option 3 ID : 71550511747

Option 4 ID : 71550511745

Status : **Answered**

Chosen Option : 1

Q.4 If ${}^{2n}C_3 : {}^nC_3 = 10 : 1$, then the ratio $(n^2 + 3n) : (n^2 - 3n + 4)$ is

- Options
1. 2:1
 2. 65:37
 3. 35:16
 4. 27:11

Question Type : **MCQ**

Question ID : 7155053686

Option 1 ID : 71550511739

Option 2 ID : 71550511740

Option 3 ID : 71550511738

Option 4 ID : 71550511737

Status : **Answered**

Chosen Option : 1

Q.5 One vertex of a rectangular parallelepiped is at the origin O and the lengths of its edges along x, y and z axes are 3, 4 and 5 units respectively. Let P be the vertex (3,4,5). Then the shortest distance between the diagonal OP and an edge parallel to z axis, not passing through O or P is:

- Options
1. $\frac{12}{5}$
 2. $\frac{12}{5\sqrt{5}}$
 3. $12\sqrt{5}$
 4. $\frac{12}{\sqrt{5}}$

Question Type : **MCQ**

Question ID : 7155053695

Option 1 ID : 71550511773

Option 2 ID : 71550511774

Option 3 ID : 71550511775

Option 4 ID : 71550511776

Status : **Answered**

Chosen Option : 2

Q.6 Let the position vectors of the points A, B, C and D be $5\hat{i} + 5\hat{j} + 2\lambda\hat{k}$, $\hat{i} + 2\hat{j} + 3\hat{k}$, $-2\hat{i} + \lambda\hat{j} + 4\hat{k}$ and $-\hat{i} + 5\hat{j} + 6\hat{k}$. Let the set $S = \{\lambda \in \mathbb{R} : \text{the points A, B, C and D are coplanar}\}$. Then $\sum_{\lambda \in S} (\lambda + 2)^2$ is equal to

- Options 1. 41
2. 13
3. $\frac{37}{2}$
4. 25

Question Type : **MCQ**

Question ID : **7155053696**

Option 1 ID : **71550511779**

Option 2 ID : **71550511777**

Option 3 ID : **71550511780**

Option 4 ID : **71550511778**

Status : **Not Answered**

Chosen Option : --

Q.7 Let $5f(x) + 4f\left(\frac{1}{x}\right) = \frac{1}{x} + 3$, $x > 0$. Then $18 \int_1^2 f(x) dx$ is equal to:

- Options 1. $10 \log_e 2 - 6$
2. $5 \log_e 2 + 3$
3. $10 \log_e 2 + 6$
4. $5 \log_e 2 - 3$

Question Type : **MCQ**

Question ID : **7155053691**

Option 1 ID : **71550511759**

Option 2 ID : **71550511758**

Option 3 ID : **71550511760**

Option 4 ID : **71550511757**

Status : **Answered**

Chosen Option : 3

Q.8 If the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6} : 1$, then the third term from the beginning is:

- Options 1. $30\sqrt{2}$
2. $60\sqrt{2}$
3. $30\sqrt{3}$
4. $60\sqrt{3}$

Question Type : **MCQ**

Question ID : **7155053687**

Option 1 ID : **71550511743**

Option 2 ID : **71550511741**

Option 3 ID : **71550511744**

Option 4 ID : **71550511742**

Status : **Not Answered**

Chosen Option : --

Q.9

If $2x^y + 3y^x = 20$, then $\frac{dy}{dx}$ at $(2, 2)$ is equal to:

Options

1. $-\left(\frac{3 + \log_e 16}{4 + \log_e 8}\right)$
2. $-\left(\frac{3 + \log_e 4}{2 + \log_e 8}\right)$
3. $-\left(\frac{2 + \log_e 8}{3 + \log_e 4}\right)$
4. $-\left(\frac{3 + \log_e 8}{2 + \log_e 4}\right)$

Question Type : MCQ

Question ID : 7155053690

Option 1 ID : 71550511754

Option 2 ID : 71550511753

Option 3 ID : 71550511756

Option 4 ID : 71550511755

Status : Answered

Chosen Option : 2

Q.10 Let $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$, $\vec{b} = \hat{i} - 2\hat{j} - 2\hat{k}$ and $\vec{c} = -\hat{i} + 4\hat{j} + 3\hat{k}$.

If $\vec{d}$ is a vector perpendicular to both $\vec{b}$ and $\vec{c}$, and $\vec{a} \cdot \vec{d} = 18$, then $|\vec{a} \times \vec{d}|^2$ is equal to

Options

1. 640
2. 720
3. 760
4. 680

Question Type : MCQ

Question ID : 7155053697

Option 1 ID : 71550511781

Option 2 ID : 71550511783

Option 3 ID : 71550511784

Option 4 ID : 71550511782

Status : Answered

Chosen Option : 2

Q.11 The sum of all the roots of the equation $|x^2 - 8x + 15| - 2x + 7 = 0$ is:

Options

1. $9 + \sqrt{3}$
2. $9 - \sqrt{3}$
3. $11 - \sqrt{3}$
4. $11 + \sqrt{3}$

Question Type : MCQ

Question ID : 7155053683

Option 1 ID : 71550511726

Option 2 ID : 71550511725

Option 3 ID : 71550511728

Option 4 ID : 71550511727

Status : Not Answered

Chosen Option : --

Q.12 Let $a_1, a_2, a_3, \dots, a_n$ be n positive consecutive terms of an arithmetic progression.

If $d > 0$ is its common difference, then

$$\lim_{n \rightarrow \infty} \sqrt{\frac{d}{n}} \left(\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \dots + \frac{1}{\sqrt{a_{n-1}} + \sqrt{a_n}} \right) \text{ is}$$

- Options
1. $\sqrt{d}$
 2. $\frac{1}{\sqrt{d}}$
 3. 0
 4. 1

Question Type : **MCQ**

Question ID : **7155053689**

Option 1 ID : **71550511751**

Option 2 ID : **71550511752**

Option 3 ID : **71550511750**

Option 4 ID : **71550511749**

Status : **Answered**

Chosen Option : **3**

Q.13 From the top A of a vertical wall AB of height 30 m, the angles of depression of the top P and bottom Q of a vertical tower PQ are 15° and 60° respectively, B and Q are on the same horizontal level. If C is a point on AB such that $CB = PQ$, then the area (in m^2) of the quadrilateral BCPQ is equal to

- Options
1. $600(\sqrt{3} - 1)$
 2. $300(\sqrt{3} - 1)$
 3. $300(\sqrt{3} + 1)$
 4. $200(3 - \sqrt{3})$

Question Type : **MCQ**

Question ID : **7155053700**

Option 1 ID : **71550511794**

Option 2 ID : **71550511795**

Option 3 ID : **71550511796**

Option 4 ID : **71550511793**

Status : **Answered**

Chosen Option : **3**

Q.14 If the equation of the plane passing through the line of intersection of the planes $2x - y + z = 3$, $4x - 3y + 5z + 9 = 0$ and parallel to the line

$$\frac{x+1}{-2} = \frac{y+3}{4} = \frac{z-2}{5} \text{ is } ax + by + cz + 6 = 0, \text{ then } a + b + c \text{ is equal to}$$

- Options
1. 12
 2. 13
 3. 14
 4. 15

Question Type : **MCQ**

Question ID : **7155053694**

Option 1 ID : **71550511769**

Option 2 ID : **71550511770**

Option 3 ID : **71550511771**

Option 4 ID : **71550511772**

Status : **Not Answered**

Chosen Option : **--**

Q.15 Let $A = [a_{ij}]_{2 \times 2}$, where $a_{ij} \neq 0$ for all i, j and $A^2 = I$. Let a be the sum of all diagonal elements of A and $b = |A|$.
Then $3a^2 + 4b^2$ is equal to

- Options 1. 3
2. 14
3. 4
4. 7

Question Type : **MCQ**
Question ID : **7155053684**
Option 1 ID : **71550511729**
Option 2 ID : **71550511732**
Option 3 ID : **71550511730**
Option 4 ID : **71550511731**
Status : **Answered**
Chosen Option : **3**

Q.16 A pair of dice is thrown 5 times. For each throw, a total of 5 is considered a success. If the probability of at least 4 successes is $\frac{k}{3^{11}}$, then k is equal to

- Options 1. 123
2. 75
3. 164
4. 82

Question Type : **MCQ**
Question ID : **7155053699**
Option 1 ID : **71550511791**
Option 2 ID : **71550511789**
Option 3 ID : **71550511792**
Option 4 ID : **71550511790**
Status : **Not Answered**
Chosen Option : --

Q.17 If the system of equations

$$x + y + az = b$$

$$2x + 5y + 2z = 6$$

$$x + 2y + 3z = 3$$

has infinitely many solutions, then $2a + 3b$ is equal to

- Options 1. 23
2. 20
3. 28
4. 25

Question Type : **MCQ**
Question ID : **7155053685**
Option 1 ID : **71550511734**
Option 2 ID : **71550511733**
Option 3 ID : **71550511736**
Option 4 ID : **71550511735**
Status : **Answered**
Chosen Option : **1**

Q.18 The straight lines l_1 and l_2 pass through the origin and trisect the line segment of the line $L: 9x + 5y = 45$ between the axes. If m_1 and m_2 are the slopes of the lines l_1 and l_2 , then the point of intersection of the line $y = (m_1 + m_2)x$ with L lies on

- Options**
1. $6x - y = 15$
 2. $6x + y = 10$
 3. $y - 2x = 5$
 4. $y - x = 5$

Question Type : **MCQ**

Question ID : **7155053693**

Option 1 ID : **71550511766**

Option 2 ID : **71550511768**

Option 3 ID : **71550511765**

Option 4 ID : **71550511767**

Status : **Answered**

Chosen Option : **2**

Q.19

Let $I(x) = \int \frac{x^2 (x \sec^2 x + \tan x)}{(x \tan x + 1)^2} dx$. If $I(0) = 0$, then $I(\frac{\pi}{4})$ is equal to

- Options**
1. $\log_e \frac{(\pi+4)^2}{32} - \frac{\pi^2}{4(\pi+4)}$
 2. $\log_e \frac{(\pi+4)^2}{16} + \frac{\pi^2}{4(\pi+4)}$
 3. $\log_e \frac{(\pi+4)^2}{32} + \frac{\pi^2}{4(\pi+4)}$
 4. $\log_e \frac{(\pi+4)^2}{16} - \frac{\pi^2}{4(\pi+4)}$

Question Type : **MCQ**

Question ID : **7155053692**

Option 1 ID : **71550511761**

Option 2 ID : **71550511762**

Option 3 ID : **71550511764**

Option 4 ID : **71550511763**

Status : **Not Answered**

Chosen Option : --

Q.20 Statement $(P \Rightarrow Q) \wedge (R \Rightarrow Q)$ is logically equivalent to

- Options**
1. $(P \vee R) \Rightarrow Q$
 2. $(P \wedge R) \Rightarrow Q$
 3. $(P \Rightarrow R) \vee (Q \Rightarrow R)$
 4. $(P \Rightarrow R) \wedge (Q \Rightarrow R)$

Question Type : **MCQ**

Question ID : **7155053701**

Option 1 ID : **71550511800**

Option 2 ID : **71550511798**

Option 3 ID : **71550511799**

Option 4 ID : **71550511797**

Status : **Answered**

Chosen Option : **4**

Q.21 Let $y = y(x)$ be a solution of the differential equation $(x \cos x)dy + (xy \sin x + y \cos x - 1)dx = 0$, $0 < x < \frac{\pi}{2}$.

If $\frac{\pi}{3}y\left(\frac{\pi}{3}\right) = \sqrt{3}$, then $\left|\frac{\pi}{6}y''\left(\frac{\pi}{6}\right) + 2y'\left(\frac{\pi}{6}\right)\right|$ is equal to _____

Given --
Answer :

Question Type : **SA**
Question ID : **7155053710**
Status : **Not Answered**

Q.22 The number of ways of giving 20 distinct oranges to 3 children such that each child gets at least one orange is _____

Given --
Answer :

Question Type : **SA**
Question ID : **7155053704**
Status : **Not Answered**

Q.23 Let $A = \{1, 2, 3, 4, \dots, 10\}$ and $B = \{0, 1, 2, 3, 4\}$. The number of elements in the relation $R = \{(a, b) \in A \times A : 2(a - b)^2 + 3(a - b) \in B\}$ is _____

Given --
Answer :

Question Type : **SA**
Question ID : **7155053702**
Status : **Not Answered**

Q.24 Let the image of the point $P(1, 2, 3)$ in the plane $2x - y + z = 9$ be Q . If the coordinates of the point R are $(6, 10, 7)$, then the square of the area of the triangle PQR is _____

Given --
Answer :

Question Type : **SA**
Question ID : **7155053711**
Status : **Not Answered**

Q.25 Let the point $(p, p + 1)$ lie inside the region $E = \{(x, y) : 3 - x \leq y \leq \sqrt{9 - x^2}, 0 \leq x \leq 3\}$. If the set of all values of p is the interval (a, b) , then $b^2 + b - a^2$ is equal to _____

Given --
Answer :

Question Type : **SA**
Question ID : **7155053703**
Status : **Not Answered**

Q.26 The coefficient of x^{18} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is _____

Given **5005**
Answer :

Question Type : **SA**
Question ID : **7155053705**
Status : **Answered**

Q.27 If the area of the region $S = \{(x, y) : 2y - y^2 \leq x^2 \leq 2y, x \geq y\}$ is equal to $\frac{n+2}{n+1} - \frac{\pi}{n-1}$, then the natural number n is equal to _____

Given --
Answer :

Question Type : SA
Question ID : 7155053707
Status : Not Answered

Q.28 A circle passing through the point $P(\alpha, \beta)$ in the first quadrant touches the two coordinate axes at the points A and B. The point P is above the line AB. The point Q on the line segment AB is the foot of perpendicular from P on AB. If PQ is equal to 11 units, then the value of $\alpha\beta$ is _____

Given --
Answer :

Question Type : SA
Question ID : 7155053708
Status : Not Answered

Q.29 Let $a \in \mathbb{Z}$ and $[t]$ be the greatest integer $\leq t$. Then the number of points, where the function $f(x) = [a + 13 \sin x]$, $x \in (0, \pi)$ is not differentiable, is _____

Given --
Answer :

Question Type : SA
Question ID : 7155053706
Status : Not Answered

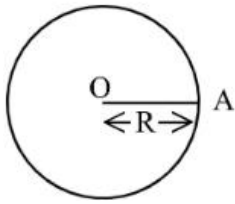
Q.30 Let the tangent to the curve $x^2 + 2x - 4y + 9 = 0$ at the point $P(1, 3)$ on it meet the y -axis at A. Let the line passing through P and parallel to the line $x - 3y = 6$ meet the parabola $y^2 = 4x$ at B. If B lies on the line $2x - 3y = 8$, then $(AB)^2$ is equal to _____

Given --
Answer :

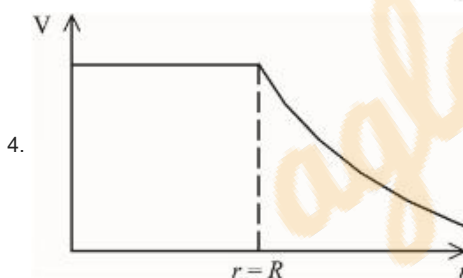
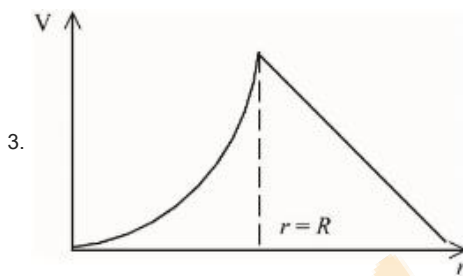
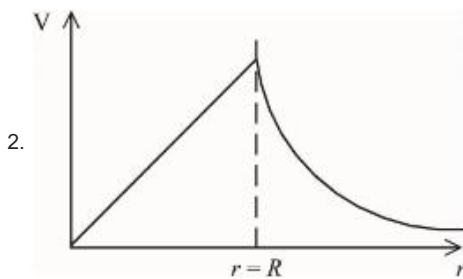
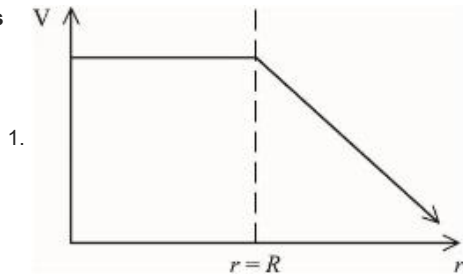
Question Type : SA
Question ID : 7155053709
Status : Not Answered

Section : Physics Section A

Q.31 For a uniformly charged thin spherical shell, the electric potential (V) radially away from the centre (O) of shell can be graphically represented as -



Options



Question Type : **MCQ**

Question ID : **7155053723**

Option 1 ID : **71550511855**

Option 2 ID : **71550511857**

Option 3 ID : **71550511858**

Option 4 ID : **71550511856**

Status : **Answered**

Chosen Option : **4**

Q.32 By what percentage will the transmission range of a TV tower be affected when the height of the tower is increased by 21% ?

- Options
1. 15%
 2. 10%
 3. 14%
 4. 12%

Question Type : **MCQ**

Question ID : **7155053712**

Option 1 ID : **71550511814**

Option 2 ID : **71550511812**

Option 3 ID : **71550511811**

Option 4 ID : **71550511813**

Status : **Answered**

Chosen Option : **2**

Q.33 Two resistances are given as $R_1 = (10 \pm 0.5) \Omega$ and $R_2 = (15 \pm 0.5) \Omega$. The percentage error in the measurement of equivalent resistance when they are connected in parallel is -

- Options
1. 6.33
 2. 2.33
 3. 5.33
 4. 4.33

Question Type : **MCQ**

Question ID : **7155053727**

Option 1 ID : **71550511872**

Option 2 ID : **71550511873**

Option 3 ID : **71550511874**

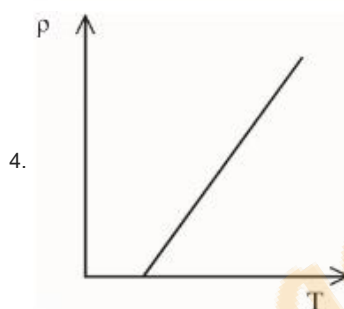
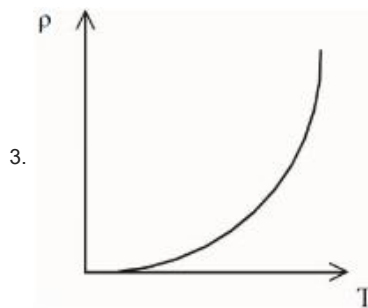
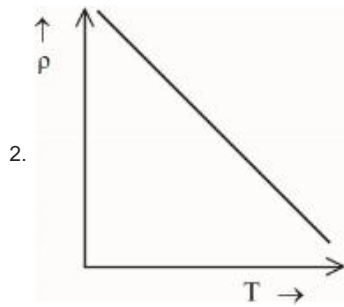
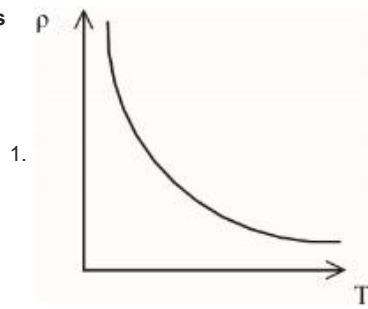
Option 4 ID : **71550511871**

Status : **Answered**

Chosen Option : **1**

Q.34 The resistivity (ρ) of semiconductor varies with temperature. Which of the following curve represents the correct behaviour

Options



Question Type : **MCQ**

Question ID : **7155053722**

Option 1 ID : **71550511854**

Option 2 ID : **71550511851**

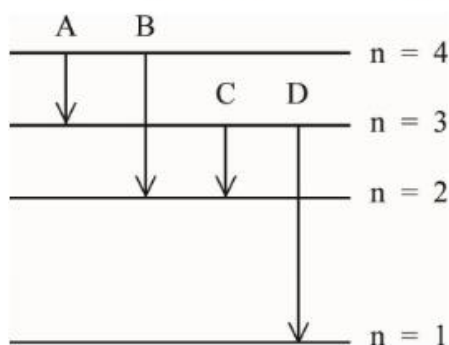
Option 3 ID : **71550511853**

Option 4 ID : **71550511852**

Status : **Not Answered**

Chosen Option : --

Q.35 The energy levels of an hydrogen atom are shown below. The transition corresponding to emission of shortest wavelength is



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

Question Type : **MCQ**

Question ID : **7155053715**

Option 1 ID : **71550511823**

Option 2 ID : **71550511825**

Option 3 ID : **71550511824**

Option 4 ID : **71550511826**

Status : **Answered**

Chosen Option : **4**

Q.36 A particle is moving with constant speed in a circular path. When the particle turns by an angle 90° , the ratio of instantaneous velocity to its average velocity is

$\pi : x\sqrt{2}$. The value of x will be -

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

Question Type : **MCQ**

Question ID : **7155053720**

Option 1 ID : **71550511843**

Option 2 ID : **71550511844**

Option 3 ID : **71550511846**

Option 4 ID : **71550511845**

Status : **Not Answered**

Chosen Option : **--**

Q.37 The kinetic energy of an electron, α -particle and a proton are given as 4 K, 2 K and K respectively. The de-Broglie wavelength associated with electron (λ_e), α -particle (λ_α) and the proton (λ_p) are as follows:

- Options 1. $\lambda_\alpha > \lambda_p > \lambda_e$
2. $\lambda_\alpha < \lambda_p < \lambda_e$
3. $\lambda_\alpha = \lambda_p > \lambda_e$
4. $\lambda_\alpha = \lambda_p < \lambda_e$

Question Type : **MCQ**

Question ID : **7155053716**

Option 1 ID : **71550511827**

Option 2 ID : **71550511828**

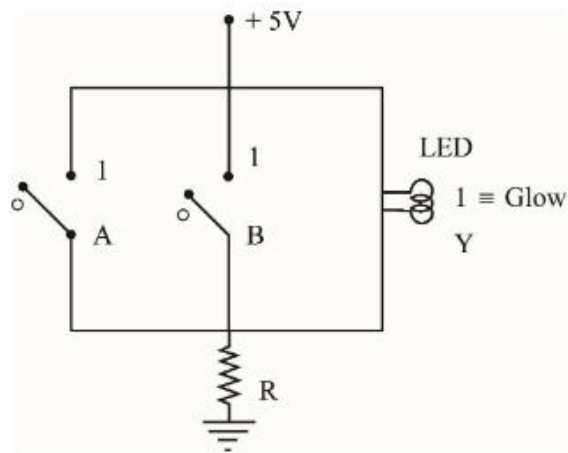
Option 3 ID : **71550511830**

Option 4 ID : **71550511829**

Status : **Answered**

Chosen Option : **3**

Q.38 Name the logic gate equivalent to the diagram attached



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

Question Type : **MCQ**

Question ID : **7155053713**

Option 1 ID : **71550511816**

Option 2 ID : **71550511815**

Option 3 ID : **71550511818**

Option 4 ID : **71550511817**

Status : **Not Answered**

Chosen Option : --

Q.39 For the plane electromagnetic wave given by $E = E_0 \sin(\omega t - kx)$ and $B = B_0 \sin(\omega t - kx)$, the ratio of average electric energy density to average magnetic energy density is

- Options 1. $1/2$
2. 1
3. 4
4. 2

Question Type : **MCQ**

Question ID : **7155053718**

Option 1 ID : **71550511838**

Option 2 ID : **71550511835**

Option 3 ID : **71550511837**

Option 4 ID : **71550511836**

Status : **Answered**

Chosen Option : **2**

Q.40 Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : When a body is projected at an angle 45° , it's range is maximum.

Reason R : For maximum range, the value of $\sin 2\theta$ should be equal to one.

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

Options 1.

- Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**
- A** is false but **R** is true
- Both **A** and **R** are correct and **R** is the correct explanation of **A**
- A** is true but **R** is false

Question Type : **MCQ**

Question ID : **7155053728**

Option 1 ID : **71550511876**

Option 2 ID : **71550511878**

Option 3 ID : **71550511875**

Option 4 ID : **71550511877**

Status : **Answered**

Chosen Option : **3**

Q.41 Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A : Earth has atmosphere whereas moon doesn't have any atmosphere.

Reason R : The escape velocity on moon is very small as compared to that on earth.

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

Options 1.

- A** is true but **R** is false
- A** is false but **R** is true
- Both **A** and **R** are correct and **R** is the correct explanation of **A**
- Both **A** and **R** are correct but **R** is **NOT** the correct explanation of **A**

Question Type : **MCQ**

Question ID : **7155053730**

Option 1 ID : **71550511885**

Option 2 ID : **71550511886**

Option 3 ID : **71550511883**

Option 4 ID : **71550511884**

Status : **Answered**

Chosen Option : **3**

Q.42 A source supplies heat to a system at the rate of 1000 W. If the system performs work at a rate of 200 W. The rate at which internal energy of the system increases is

- Options
1. 600 W
 2. 500 W
 3. 1200 W
 4. 800 W

Question Type : **MCQ**

Question ID : **7155053725**

Option 1 ID : **71550511864**

Option 2 ID : **71550511863**

Option 3 ID : **71550511865**

Option 4 ID : **71550511866**

Status : **Answered**

Chosen Option : **4**

Q.43 A planet has double the mass of the earth. Its average density is equal to that of the earth. An object weighing W on earth will weigh on that planet:

- Options
1. 2 W
 2. W
 3. $2^{1/3}$ W
 4. $2^{2/3}$ W

Question Type : **MCQ**

Question ID : **7155053731**

Option 1 ID : **71550511888**

Option 2 ID : **71550511887**

Option 3 ID : **71550511890**

Option 4 ID : **71550511889**

Status : **Answered**

Chosen Option : **4**

Q.44 The induced emf can be produced in a coil by

- A. moving the coil with uniform speed inside uniform magnetic field
- B. moving the coil with non uniform speed inside uniform magnetic field
- C. rotating the coil inside the uniform magnetic field
- D. changing the area of the coil inside the uniform magnetic field

Choose the correct answer from the options given below:

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

Question Type : **MCQ**

Question ID : **7155053719**

Option 1 ID : **71550511839**

Option 2 ID : **71550511840**

Option 3 ID : **71550511842**

Option 4 ID : **71550511841**

Status : **Answered**

Chosen Option : **4**

Q.45 The number of air molecules per cm^3 increased from 3×10^{19} to 12×10^{19} . The ratio of collision frequency of air molecules before and after the increase in number respectively is :

- Options
1. 0.25
 2. 0.50
 3. 0.75
 4. 1.25

Question Type : **MCQ**

Question ID : **7155053726**

Option 1 ID : **71550511867**

Option 2 ID : **71550511868**

Option 3 ID : **71550511869**

Option 4 ID : **71550511870**

Status : **Answered**

Chosen Option : **1**

Q.46 A long straight wire of circular cross-section (radius a) is carrying steady current I . The current I is uniformly distributed across this cross-section. The magnetic field is

- Options
1. directly proportional to r in the region $r < a$ and inversely proportional to r in the region $r > a$
 2. inversely proportional to r in the region $r < a$ and uniform throughout in the region $r > a$
 3. zero in the region $r < a$ and inversely proportional to r in the region $r > a$
 4. uniform in the region $r < a$ and inversely proportional to distance r from the axis, in the region $r > a$

Question Type : **MCQ**

Question ID : **7155053721**

Option 1 ID : **71550511849**

Option 2 ID : **71550511850**

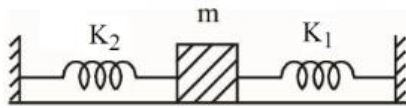
Option 3 ID : **71550511848**

Option 4 ID : **71550511847**

Status : **Not Answered**

Chosen Option : **--**

Q.47 A mass m is attached to two strings as shown in figure. The spring constants of two springs are K_1 and K_2 . For the frictionless surface, the time period of oscillation of mass m is



Options

1. $\frac{1}{2\pi} \sqrt{\frac{K_1 + K_2}{m}}$
2. $\frac{1}{2\pi} \sqrt{\frac{K_1 - K_2}{m}}$
3. $2\pi \sqrt{\frac{m}{K_1 - K_2}}$
4. $2\pi \sqrt{\frac{m}{K_1 + K_2}}$

Question Type : **MCQ**

Question ID : **7155053724**

Option 1 ID : **71550511861**

Option 2 ID : **71550511862**

Option 3 ID : **71550511860**

Option 4 ID : **71550511859**

Status : **Answered**

Chosen Option : **4**

Q.48 A monochromatic light wave with wavelength λ_1 and frequency ν_1 in air enters another medium. If the angle of incidence and angle of refraction at the interface are 45° and 30° respectively, then the wavelength λ_2 and frequency ν_2 of the refracted wave are:

Options

1. $\lambda_2 = \sqrt{2}\lambda_1, \nu_2 = \nu_1$
2. $\lambda_2 = \lambda_1, \nu_2 = \frac{1}{\sqrt{2}}\nu_1$
3. $\lambda_2 = \lambda_1, \nu_2 = \sqrt{2}\nu_1$
4. $\lambda_2 = \frac{1}{\sqrt{2}}\lambda_1, \nu_2 = \nu_1$

Question Type : **MCQ**

Question ID : **7155053717**

Option 1 ID : **71550511831**

Option 2 ID : **71550511833**

Option 3 ID : **71550511834**

Option 4 ID : **71550511832**

Status : **Answered**

Chosen Option : **4**

Q.49 A small ball of mass M and density ρ is dropped in a viscous liquid of density ρ_0 . After some time, the ball falls with a constant velocity. What is the viscous force on the ball ?

Options 1. $F = Mg (1 \pm \rho\rho_0)$

2. $F = Mg \left(1 - \frac{\rho_0}{\rho} \right)$

3. $F = Mg \left(1 + \frac{\rho}{\rho_0} \right)$

4. $F = Mg \left(1 + \frac{\rho_0}{\rho} \right)$

Question Type : **MCQ**

Question ID : **7155053714**

Option 1 ID : **71550511822**

Option 2 ID : **71550511819**

Option 3 ID : **71550511821**

Option 4 ID : **71550511820**

Status : **Answered**

Chosen Option : **2**

Q.50 A small block of mass 100 g is tied to a spring of spring constant 7.5 N/m and length 20 cm. The other end of spring is fixed at a particular point A. If the block moves in a circular path on a smooth horizontal surface with constant angular velocity 5 rad/s about point A, then tension in the spring is -

Options 1. **1.5 N**

2. **0.25 N**

3. **0.50 N**

4. **0.75 N**

Question Type : **MCQ**

Question ID : **7155053729**

Option 1 ID : **71550511882**

Option 2 ID : **71550511879**

Option 3 ID : **71550511880**

Option 4 ID : **71550511881**

Status : **Answered**

Chosen Option : **1**

Section : **Physics Section B**

Q.51 Two identical solid spheres each of mass 2 kg and radii 10 cm are fixed at the ends of a light rod. The separation between the centres of the spheres is 40 cm. The moment of inertia of the system about an axis perpendicular to the rod passing through its middle point is $\times 10^{-3} \text{ kg-m}^2$

Given --

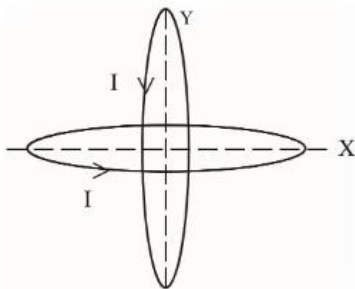
Answer :

Question Type : **SA**

Question ID : **7155053741**

Status : **Not Answered**

- Q.52** Two identical circular wires of radius 20 cm and carrying current $\sqrt{2}$ A are placed in perpendicular planes as shown in figure. The net magnetic field at the centre of the circular wires is $\text{_____} \times 10^{-8}$ T.



(Take $\pi = 3.14$)

Given --

Answer :

Question Type : SA

Question ID : 7155053738

Status : Not Answered

- Q.53** A particle of mass 10 g moves in a straight line with retardation $2x$, where x is the displacement in SI units. Its loss of kinetic energy for above displacement is

$\left(\frac{10}{x}\right)^{-n}$ J. The value of n will be _____

Given 2

Answer :

Question Type : SA

Question ID : 7155053740

Status : Answered

- Q.54** The length of a metallic wire is increased by 20% and its area of cross section is reduced by 4%. The percentage change in resistance of the metallic wire is _____

Given 25

Answer :

Question Type : SA

Question ID : 7155053736

Status : Answered

- Q.55** A person driving car at a constant speed of 15 m/s is approaching a vertical wall. The person notices a change of 40 Hz in the frequency of his car's horn upon reflection from the wall. The frequency of horn is _____ Hz.

(Given: Speed of sound : 330 m/s)

Given --

Answer :

Question Type : SA

Question ID : 7155053732

Status : Not Answered

- Q.56** A steel rod has a radius of 20 mm and a length of 2.0 m. A force of 62.8 kN stretches it along its length. Young's modulus of steel is $2.0 \times 10^{11} \text{ N/m}^2$. The longitudinal strain produced in the wire is $\text{_____} \times 10^{-5}$

Given 25
Answer :

Question Type : SA
Question ID : 7155053739
Status : Answered

- Q.57** A parallel plate capacitor with plate area A and plate separation d is filled with a dielectric material of dielectric constant $K = 4$. The thickness of the dielectric material is x, where $x < d$.



Let C_1 and C_2 be the capacitance of the system for $x = \frac{1}{3}d$ and $x = \frac{2d}{3}$, respectively. If $C_1 = 2 \mu\text{F}$ the value of C_2 is $\text{_____} \mu\text{F}$

Given 9
Answer :

Question Type : SA
Question ID : 7155053737
Status : Answered

- Q.58** An ideal transformer with purely resistive load operates at 12 kV on the primary side. It supplies electrical energy to a number of nearby houses at 120 V. The average rate of energy consumption in the houses served by the transformer is 60 kW. The value of resistive load (R_s) required in the secondary circuit will be $\text{_____} \text{ m}\Omega$.

Given --
Answer :

Question Type : SA
Question ID : 7155053735
Status : Not Answered

- Q.59** A pole is vertically submerged in swimming pool, such that it gives a length of shadow 2.15 m within water when sunlight is incident at an angle of 30° with the surface of water. If swimming pool is filled to a height of 1.5 m, then the height of the pole above the water surface in centimeters is ($n_w = 4/3$) _____

Given --
Answer :

Question Type : SA
Question ID : 7155053733
Status : Not Answered

Q.60 The radius of fifth orbit of the Li^{++} is _____ $\times 10^{-12}$ m.

Take: radius of hydrogen atom = 0.51 Å

Given 425

Answer :

Question Type : SA

Question ID : 7155053734

Status : Answered

Section : Chemistry Section A

Q.61 Match List I with List II

LIST I		LIST II	
Element detected		Reagent used / Product formed	
A.	Nitrogen	I.	$\text{Na}_2[\text{Fe}(\text{CN})_5 \text{NO}]$
B.	Sulphur	II.	AgNO_3
C.	Phosphorous	III.	$\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$
D.	Halogen	IV.	$(\text{NH}_4)_2 \text{MoO}_4$

Choose the correct answer from the options given below:

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

2. A-IV, B-II, C-I, D-III

3. A-III, B-I, C-IV, D-II

4. A-II, B-IV, C-I, D-III

Question Type : MCQ

Question ID : 7155053755

Option 1 ID : 71550511953

Option 2 ID : 71550511956

Option 3 ID : 71550511954

Option 4 ID : 71550511955

Status : Answered

Chosen Option : 3

Q.62 The difference between electron gain enthalpies will be maximum between:

Options 1. Ne and F

2. Ar and Cl

3. Ne and Cl

4. Ar and F

Question Type : MCQ

Question ID : 7155053745

Option 1 ID : 71550511913

Option 2 ID : 71550511916

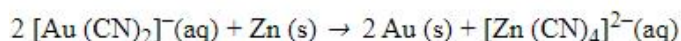
Option 3 ID : 71550511914

Option 4 ID : 71550511915

Status : Answered

Chosen Option : 4

Q.63 Which of the following options are correct for the reaction



- A. Redox reaction
- B. Displacement reaction
- C. Decomposition reaction
- D. Combination reaction

Choose the correct answer from the options given below:

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

Question Type : **MCQ**

Question ID : **7155053746**

Option 1 ID : **71550511918**

Option 2 ID : **71550511919**

Option 3 ID : **71550511920**

Option 4 ID : **71550511917**

Status : **Answered**

Chosen Option : **4**

Q.64 A compound is formed by two elements X and Y. The element Y forms cubic close packed arrangement and those of element X occupy one third of the tetrahedral voids. What is the formula of the compound ?

- Options
- 1. XY_3
 - 2. X_2Y_3
 - 3. X_3Y
 - 4. X_3Y_2

Question Type : **MCQ**

Question ID : **7155053742**

Option 1 ID : **71550511901**

Option 2 ID : **71550511903**

Option 3 ID : **71550511902**

Option 4 ID : **71550511904**

Status : **Answered**

Chosen Option : **2**

Q.65 Polymer used in orlon is:

- Options
- 1. Polyacrylonitrile
 - 2. Polyamide
 - 3. Polyethene
 - 4. Polycarbonate

Question Type : **MCQ**

Question ID : **7155053760**

Option 1 ID : **71550511973**

Option 2 ID : **71550511974**

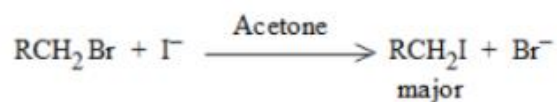
Option 3 ID : **71550511975**

Option 4 ID : **71550511976**

Status : **Answered**

Chosen Option : **1**

Q.66 For the reaction



The correct statement is

- Options
1. The reaction can occur in acetic acid also.
 2. Br^- can act as competing nucleophile.
 3. The transition state formed in the above reaction is less polar than the localised anion.
 4. The solvent used in the reaction solvates the ions formed in rate determining step.

Question Type : MCQ

Question ID : 7155053756

Option 1 ID : 71550511957

Option 2 ID : 71550511958

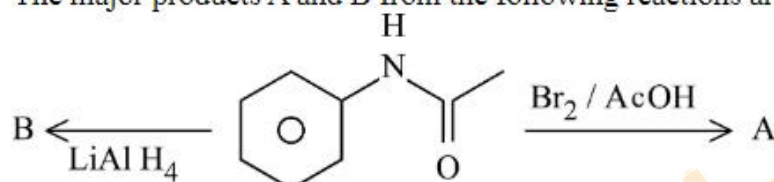
Option 3 ID : 71550511960

Option 4 ID : 71550511959

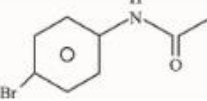
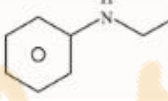
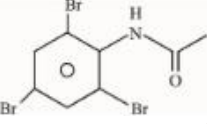
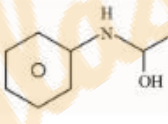
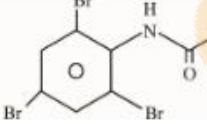
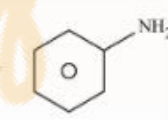
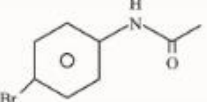
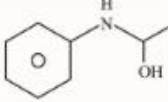
Status : Not Answered

Chosen Option : --

Q.67 The major products A and B from the following reactions are:



Options

1. A =  , B = 
2. A =  , B = 
3. A =  , B = 
4. A =  , B = 

Question Type : MCQ

Question ID : 7155053759

Option 1 ID : 71550511969

Option 2 ID : 71550511970

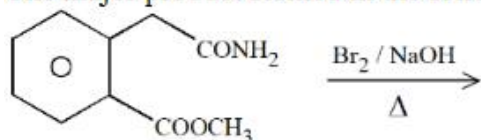
Option 3 ID : 71550511971

Option 4 ID : 71550511972

Status : Answered

Chosen Option : 4

Q.68 The major product formed in the following reaction is



Options

- 1.
- 2.
- 3.
- 4.

Question Type : MCQ

Question ID : 7155053757

Option 1 ID : 71550511962

Option 2 ID : 71550511961

Option 3 ID : 71550511963

Option 4 ID : 71550511964

Status : Answered

Chosen Option : 3

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

Assertion A : Loss of electron from hydrogen atom results in nucleus of $\sim 1.5 \times 10^{-3}$ pm size.

Reason R : Proton (H^+) always exists in combined form.

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

Options 1. A is not correct but R is correct

2.

Both A and R are correct but R is NOT the correct explanation of A

3. A is correct but R is not correct

4. Both A and R are correct and R is the correct explanation of A

Question Type : MCQ

Question ID : 7155053747

Option 1 ID : 71550511924

Option 2 ID : 71550511922

Option 3 ID : 71550511923

Option 4 ID : 71550511921

Status : Answered

Chosen Option : 2

Q.70 Match List I with List II

LIST I		LIST II	
Name of reaction		Reagent used	
A.	Hell-Volhard-Zelinsky reaction	I.	NaOH + I ₂
B.	Iodoform reaction	II.	(i) CrO ₂ Cl ₂ , CS ₂ (ii) H ₂ O
C.	Etard reaction	III.	(i) Br ₂ / red phosphorus (ii) H ₂ O
D.	Gatterman-Koch reaction	IV.	CO, HCl, anhyd. AlCl ₃

Choose the correct answer from the options given below:

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

Question Type : MCQ

Question ID : 7155053758

Option 1 ID : 71550511965

Option 2 ID : 71550511966

Option 3 ID : 71550511967

Option 4 ID : 71550511968

Status : Answered

Chosen Option : 3

Q.71 For a concentrated solution of a weak electrolyte (K_{eq} = equilibrium constant) A_2B_3 of concentration ' c ', the degree of dissociation ' α ' is

Options

1. $\left(\frac{K_{eq}}{25c^2}\right)^{\frac{1}{5}}$

2. $\left(\frac{K_{eq}}{5c^4}\right)^{\frac{1}{5}}$

3. $\left(\frac{K_{eq}}{108c^4}\right)^{\frac{1}{5}}$

4. $\left(\frac{K_{eq}}{6c^5}\right)^{\frac{1}{5}}$

Question Type : MCQ

Question ID : 7155053743

Option 1 ID : 71550511908

Option 2 ID : 71550511907

Option 3 ID : 71550511906

Option 4 ID : 71550511905

Status : Answered

Chosen Option : 3

Q.72 Match List I with List II

LIST I -		LIST II -	
Enzymatic reaction		Enzyme	
A.	Sucrose $\rightarrow$ Glucose and Fructose	I.	Zymase
B.	Glucose $\rightarrow$ ethyl alcohol and CO_2	II.	Pepsin
C.	Starch $\rightarrow$ Maltose	III.	Invertase
D.	Proteins $\rightarrow$ Amino acids	IV.	Diastase

Choose the correct answer from the options given below:

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

2. A-I, B-II, C-IV, D-III

3. A-III, B-I, C-IV, D-II

4. A-III, B-I, C-II, D-IV

Question Type : **MCQ**

Question ID : **7155053744**

Option 1 ID : **71550511912**

Option 2 ID : **71550511909**

Option 3 ID : **71550511910**

Option 4 ID : **71550511911**

Status : **Answered**

Chosen Option : **3**

Q.73 Match List I with List II

LIST I		LIST II	
Vitamin		Deficiency disease	
A.	Vitamin A	I.	Beri-Beri
B.	Thiamine	II.	Cheilosis
C.	Ascorbic acid	III.	Xerophthalmia
D.	Riboflavin	IV.	Scurvy

Choose the correct answer from the options given below:

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

2. A-IV, B-I, C-III, D-II

3. A-IV, B-II, C-III, D-I

4. A-III, B-I, C-IV, D-II

Question Type : **MCQ**

Question ID : **7155053761**

Option 1 ID : **71550511979**

Option 2 ID : **71550511977**

Option 3 ID : **71550511980**

Option 4 ID : **71550511978**

Status : **Answered**

Chosen Option : **3**

Q.74 The possibility of photochemical smog formation is more at

- Options
1. Himalayan villages in winter
 2. The places with healthy vegetation
 3. Industrial areas
 4. Marshy lands

Question Type : **MCQ**

Question ID : **7155053752**

Option 1 ID : **71550511943**

Option 2 ID : **71550511941**

Option 3 ID : **71550511942**

Option 4 ID : **71550511944**

Status : **Answered**

Chosen Option : **3**

Q.75 The standard electrode potential of M^+/M in aqueous solution does not depend on

- Options
1. Ionisation of a solid metal atom
 2. Sublimation of a solid metal
 3. Hydration of a gaseous metal ion
 4. Ionisation of a gaseous metal atom

Question Type : **MCQ**

Question ID : **7155053748**

Option 1 ID : **71550511927**

Option 2 ID : **71550511925**

Option 3 ID : **71550511928**

Option 4 ID : **71550511926**

Status : **Not Answered**

Chosen Option : **--**

Q.76 Match List I with List II

LIST I		LIST II	
Oxide		Type of bond	
A.	N_2O_4	I.	1 N = O bond
B.	NO_2	II.	1 N - O - N bond
C.	N_2O_5	III.	1 N - N bond
D.	N_2O	IV.	1 N=N / N $\equiv$ N bond

Choose the correct answer from the options given below:

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

Question Type : **MCQ**

Question ID : **7155053750**

Option 1 ID : **71550511936**

Option 2 ID : **71550511933**

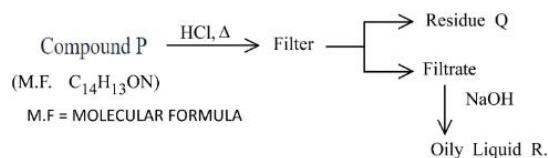
Option 3 ID : **71550511935**

Option 4 ID : **71550511934**

Status : **Answered**

Chosen Option : **2**

Q.77



Compound P is neutral, Q gives effervescence with NaHCO_3 while R reacts with Hinsbergs reagent to give solid soluble in NaOH. Compound P is

Options

- 1.
- 2.
- 3.
- 4.

Question Type : MCQ

Question ID : 7155053754

Option 1 ID : 71550511951

Option 2 ID : 71550511950

Option 3 ID : 71550511952

Option 4 ID : 71550511949

Status : Not Answered

Chosen Option : --

Q.78 Given below are two statements, one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: The spin only magnetic moment value for $[\text{Fe}(\text{CN})_6]^{3-}$ is 1.74 BM, whereas for $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is 5.92 BM.

Reason R : In both complexes, Fe is present in +3 oxidation state.

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 and R is the correct explanation of A

3. A is true but R is false

4. Both A and R are true but R is NOT the correct explanation of A

Question Type : MCQ

Question ID : 7155053753

Option 1 ID : 71550511948

Option 2 ID : 71550511945

Option 3 ID : 71550511947

Option 4 ID : 71550511946

Status : Answered

Chosen Option : 4

Q.79 The setting time of Cement is increased by adding

- Options
1. Silica
 2. Limestone
 3. Clay
 4. Gypsum

Question Type : **MCQ**

Question ID : **7155053749**

Option 1 ID : **71550511932**

Option 2 ID : **71550511929**

Option 3 ID : **71550511930**

Option 4 ID : **71550511931**

Status : **Answered**

Chosen Option : **4**

Q.80 Strong reducing and oxidizing agents among the following, respectively, are

- Options
1. Eu^{2+} and Ce^{4+}
 2. Ce^{4+} and Eu^{2+}
 3. Ce^{4+} and Tb^{4+}
 4. Ce^{3+} and Ce^{4+}

Question Type : **MCQ**

Question ID : **7155053751**

Option 1 ID : **71550511938**

Option 2 ID : **71550511937**

Option 3 ID : **71550511940**

Option 4 ID : **71550511939**

Status : **Answered**

Chosen Option : **1**

Section : **Chemistry Section B**

Q.81 In ammonium – phosphomolybdate, the oxidation state of Mo is + _____

Given --
Answer :

Question Type : **SA**

Question ID : **7155053771**

Status : **Not Answered**

Q.82 The value of log K for the reaction $\text{A} \rightleftharpoons \text{B}$ at 298 K is _____. (Nearest integer)

Given: $\Delta H^\circ = -54.07 \text{ kJ mol}^{-1}$

$\Delta S^\circ = 10 \text{ J K}^{-1} \text{ mol}^{-1}$

(Take $2.303 \times 8.314 \times 298 = 5705$)

Given -10
Answer :

Question Type : **SA**

Question ID : **7155053765**

Status : **Answered**

Q.83 Mass of Urea (NH_2CONH_2) required to be dissolved in 1000 g of water in order to reduce the vapour pressure of water by 25% is _____. (Nearest integer)

Given: Molar mass of N, C, O and H are 14, 12, 16 and 1 g mol^{-1} respectively.

Given --
Answer :

Question Type : **SA**

Question ID : **7155053766**

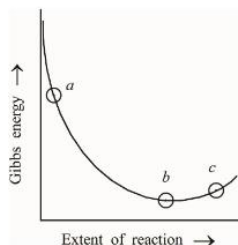
Status : **Not Answered**

Q.84 If 5 moles of BaCl_2 is mixed with 2 moles of Na_3PO_4 , the maximum number of moles of $\text{Ba}_3(\text{PO}_4)_2$ formed is _____ (Nearest integer)

Given 2
Answer :

Question Type : SA
Question ID : 7155053762
Status : Answered

Q.85 Consider the graph of Gibbs free energy G vs Extent of reaction. The number of statement/s from the following which are true with respect to points (a), (b) and (c) is _____



- A. Reaction is spontaneous at (a) and (b)
- B. Reaction is at equilibrium at point (b) and non-spontaneous at point (c)
- C. Reaction is spontaneous at (a) and non-spontaneous at (c)
- D. Reaction is non-spontaneous at (a) and (b)

Given --
Answer :

Question Type : SA
Question ID : 7155053767
Status : Not Answered

Q.86 Number of ambidentate ligands in a representative metal complex $[\text{M}(\text{en})(\text{SCN})_4]$ is _____.
[en = ethylenediamine]

Given --
Answer :

Question Type : SA
Question ID : 7155053769
Status : Not Answered

Q.87 Number of bromo derivatives obtained on treating ethane with excess of Br_2 in diffused sunlight is _____

Given --
Answer :

Question Type : SA
Question ID : 7155053770
Status : Not Answered

Q.88 The number of species from the following which have square pyramidal structure is _____.
 PF_5 , BrF_4^- , IF_5 , BrF_5 , XeOF_4 , ICl_4^-

Given --
Answer :

Question Type : SA
Question ID : 7155053764
Status : Not Answered

Q.89 For the adsorption of hydrogen on platinum, the activation energy is 30 k J mol^{-1} and for the adsorption of hydrogen on nickel, the activation energy is $41.4 \text{ k J mol}^{-1}$. The logarithm of the ratio of the rates of chemisorption on equal areas of the metals at 300 K is _____ (Nearest integer)

Given: $\ln 10 = 2.3$

$$R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$$

Given --

Answer :

Question Type : **SA**

Question ID : **7155053768**

Status : **Not Answered**

Q.90 The wavelength of an electron of kinetic energy $4.50 \times 10^{-29} \text{ J}$ is _____ $\times 10^{-5} \text{ m}$. (Nearest integer)

Given : mass of electron is $9 \times 10^{-31} \text{ kg}$, $h = 6.6 \times 10^{-34} \text{ J s}$

Given 7

Answer :

Question Type : **SA**

Question ID : **7155053763**

Status : **Answered**

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