VMC Vidyamandir Classes SINCE 1986
IIT JEE | MEDICAL | FOUNDATION

CODE A

JEE Advanced Revision Test-1 | Paper – 2 | JEE 2024

Date : 15/02/2024 **Maximum Marks: 180**

Timing: 2:00 PM to 5:00 PM **Duration: 3.0 Hours**

General Instructions

1. The question paper consists of 3 Subjects (Subject I: **Physics**, Subject II: **Chemistry**, Subject III: **Mathematics**). Each subject has **four** sections (Section 1, Section 2, Section 3 and Section 4).

2. **Section 1** contains **4 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

   Section 2 contains **3 Multiple Correct Answers Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

   Section 3 contains **2** Paragraphs. Based on each paragraph, there are **TWO (02)** questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places

   Section 4 contains **6 Non-Negative Integer Type Questions**. The answer to each question is a **NON-NEGATIVE INTEGER.**

3. For answering a question, an ANSWER SHEET (OMR SHEET) is provided separately. Please fill your **Test Code, Roll No.** and **Group** properly in the space given in the ANSWER SHEET.

Syllabus: Complete Class XII Syllabus

Name of the Candidate (In CAPITALS) : _____

Roll Number : _____

OMR Bar Code Number : _____

Candidate's Signature : _____ Invigilator's Signature _____

MARKING SCHEME

SECTION – 1 | (Maximum Marks: 12)

- This section contains **Four (04)** Multiple Choice Questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme.

Full Marks : +3 If ONLY the correct option is chosen.
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).
Negative Marks : −1 In all other cases.

SECTION – 2 | (Maximum Marks: 12)

- This section consists of **Three (03)** Questions. Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is(are) chosen
Partial Marks: +3 If all the four options are correct but ONLY three options are chosen
Partial Marks: +2 If three or more options are correct but ONLY two options are chosen and both of which are correct
Partial Marks: +1 If two or more options are correct but ONLY one option is chosen, and it is a correct option
Zero Mark: 0 if none of the options is chosen (i.e. the question is unanswered)
Negative Marks: –2 In all other cases.

SECTION – 3 | (Maximum Marks: 12)

- This section contains **Two (02)** Paragraphs. Based on each paragraph, there are **TWO (02)** questions. The answer to each question is a **NUMERICAL VALUE.**
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme.

Full Marks : +3 If ONLY the correct numerical value is entered in the designated place.
Zero Marks : 0 In all other cases

SECTION – 4 | (Maximum Marks: 24)

- This section contains **SIX (06)** Questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**
- Answer to each question will be evaluated according to the following marking scheme.

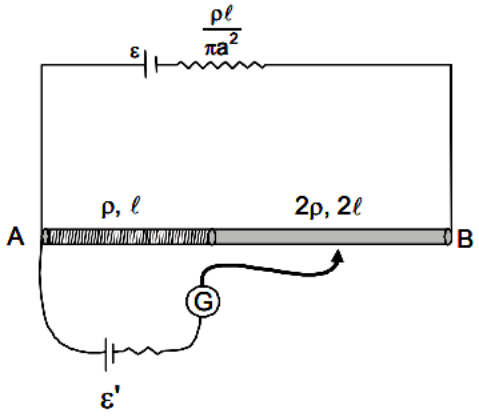
Full Marks : +4 If ONLY the correct integer is entered;
Zero Marks : 0 In all other cases.

SUBJECT I : PHYSICS 60 MARKS

SECTION-1

This section consists of 4 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

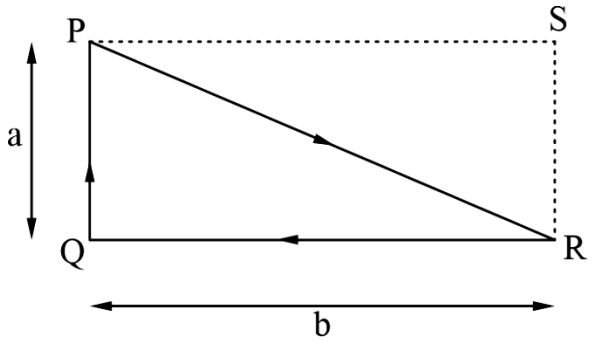
1. In a potentiometer primary cell has internal resistance of $\frac{\rho\ell}{\pi a^2}$ as shown in figure. The potentiometer wire is combination of two wires connected in series as shown in figure. The common cross sectional radius of both wires used for potentiometer is $'a'$. If null point is at mid point of longer wire then.



(A) $\varepsilon' = \frac{\varepsilon}{6}$ **(B)** $\varepsilon' = \frac{\varepsilon}{4}$ **(C)** $\varepsilon' = \frac{\varepsilon}{2}$ **(D)** $\varepsilon' = \frac{\varepsilon}{3}$

SPACE FOR ROUGH WORK

2. A triangular loop consists of two adjacent sides and a diagonal of a rectangle *PQRS*. If the loop carries a steady current I in the direction $P \to R \to Q \to P$ as shown, the magnetic field at the vertex S of the rectangle is:



(A) $\frac{\mu_0 I}{4\pi ab}\left(2(a+b)-\sqrt{a^2+b^2}\right)$, directed out of the plane

(B) $\frac{\mu_0 I}{4\pi ab}\left(a+b-\sqrt{a^2+b^2}\right)$, directed out of the plane

(C) $\frac{\mu_0 I}{4\pi ab}\left(2(a+b)-\sqrt{a^2+b^2}\right)$, directed into the plane

(D) $\frac{\mu_0 I}{4\pi ab}\left(a+b-\sqrt{a^2+b^2}\right)$, directred into the plane

SPACE FOR ROUGH WORK

3. A plane electromagnetic wave propagates in a medium. At a particular point inside the medium, the electric field and the magnetic field of the wave vary with time as: $\vec{E}(t)=60\sin\left(\left(6\pi\times10^{9}\right)t\right)\left(-\hat{x}\right)$ and $\vec{B}(t)=\left(2.4\times10^{-7}\right)\sin\left(\left(6\pi\times10^{9}\right)t\right)\left(\hat{y}\right)$, all quantities being in SI units. The wave vector of the wave is given by:

(A) $\vec{k}=\left(24\pi\ m^{-1}\right)\left(-\hat{z}\right)$ **(B)** $\vec{k}=\left(20\pi\ m^{-1}\right)\left(-\hat{z}\right)$

(C) $\vec{k}=\left(24\pi\ m^{-1}\right)\left(\hat{z}\right)$ **(D)** $\vec{k}=\left(20\pi\ m^{-1}\right)\left(\hat{z}\right)$

4. A conducting rod moves without rotation with uniform velocity $\vec{v}$ (i.e. each point on the rod has the same velocity $\vec{v}$) in a region with a uniform magnetic field $\vec{B}$. Let the unit vector parallel to the length of the rod be $\hat{L}$. In which of the following cases is there no emf induced across the ends of the rod?

(A) $\vec{v}=v\,\hat{j},\ \vec{B}=B\,\hat{i},\ \hat{L}=\frac{1}{\sqrt{2}}\left(\hat{i}-\hat{k}\right)$ **(B)** $\vec{v}=v\,\hat{j},\ \vec{B}=B\,\hat{k},\ \hat{L}=\frac{1}{\sqrt{2}}\left(-\hat{i}+\hat{k}\right)$

(C) $\vec{v}=v\left(\frac{\hat{i}-\hat{j}}{\sqrt{2}}\right),\ \vec{B}=B\left(-\hat{i}\right),\ \hat{L}=\hat{j}$ **(D)** $\vec{v}=v\left(\frac{\hat{i}-\hat{j}}{\sqrt{2}}\right),\ \vec{B}=B\left(-\hat{k}\right),\ \hat{L}=-\hat{i}$

SPACE FOR ROUGH WORK

SECTION-2

This section consists of 3 Multiple Correct Answers Type Questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

5. A long cylindrical conductor of radius R is fixed with its axis along the Z-axis. The conductor carries a uniform current density $\vec{J} = J\ \hat{k}$. Let $\vec{B}\left(\vec{r}\right)$ denote the magnetic field at a point with position vector $\vec{r}$. Which of these options is/are correct?

(A) $\vec{B}\left(\frac{R}{2}\left(\frac{1}{2}\hat{i}+\frac{\sqrt{3}}{2}\hat{j}\right)\right)=\frac{\mu_0 J R}{4}\left(-\frac{\sqrt{3}}{2}i+\frac{1}{2}\hat{j}\right)$

(B) $\vec{B}\left(2R\left(-\hat{i}\right)\right)=\frac{\mu_0 J R}{4}\left(-\hat{j}\right)$

(C) $\vec{B}\left(R\left(-\hat{j}\right)\right)=\frac{\mu_0 J R}{2}\left(-\hat{i}\right)$

(D) $\vec{B}\left(\frac{R}{3}\left(\frac{1}{\sqrt{2}}\hat{i}-\frac{1}{\sqrt{2}}\hat{j}\right)\right)=\frac{\mu_0 J R}{6}\left(\frac{1}{\sqrt{2}}\hat{i}+\frac{1}{\sqrt{2}}\hat{j}\right)$

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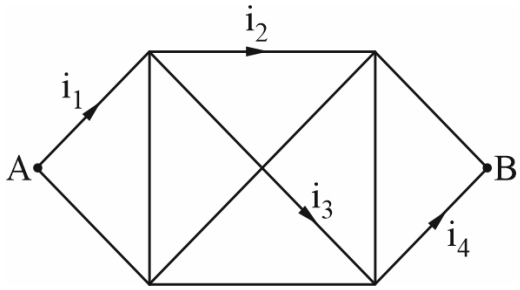
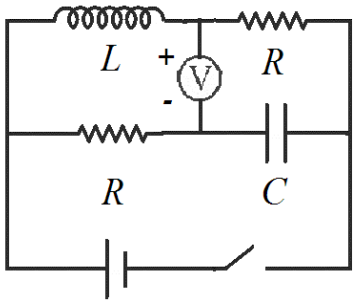
6. Each of the 12 branches of the following network has resistance $1\ \Omega$. The positive and negative terminals of an ideal battery of emf 12 V are connected at the points A and B respectively, resulting in the currents shown. Which of these options is/are correct?



(A) $i_1 = 4.5\ A$ **(B)** $i_2 = 3.0\ A$ **(C)** $i_3 = 1.5\ A$ **(D)** $i_4 = 6.0\ A$

7. An uncharged capacitor of capacitance $C = 10\ \mu F$ and an inductor coil of inductance $L = 2\ mH$ are connected with two identical resistances $R = 20\ \Omega$ each, an ideal voltmeter and an ideal battery of emf 100 V as shown. Initially, the switch is open and current is zero everywhere. The switch is closed at $t = 0$. If the reading of the voltmeter reaches its maximum value V_{MAX} at $t = t_1$, then:



(A) $t_1 = (2\log_e 2)\times 10^{-4}\ s$ **(B)** $V_{MAX} = 25\ V$

(C) $t_1 = (4\log_e 2)\times 10^{-4}\ s$ **(D)** $V_{MAX} = 50\ V$

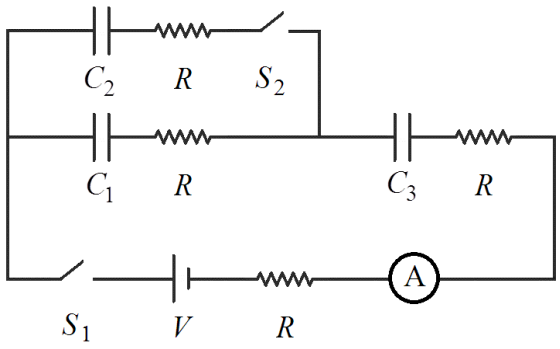
SPACE FOR ROUGH WORK

SECTION-3

This section consists of 2 Paragraphs. Based on each paragraph, there are **TWO (02)** questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places

Paragraph for Questions 1 – 2

Three uncharged capacitors of capacitance C each are connected in a circuit with an ideal battery of emf V and an ideal ammeter as shown with the switches S_1 and S_2 initially open. Now, S_1 is closed. After the current in the ammeter has become negligible, S_2 is closed.



1. If immediately after S_2 is closed, the current through the ammeter is $n\left(\frac{V}{R}\right)$, then n is _____.

2. When the current through the ammeter has become negligible again, the electrostatic potential energy stored in capacitor C_3 is $m\left(CV^2\right)$, where m is _____.

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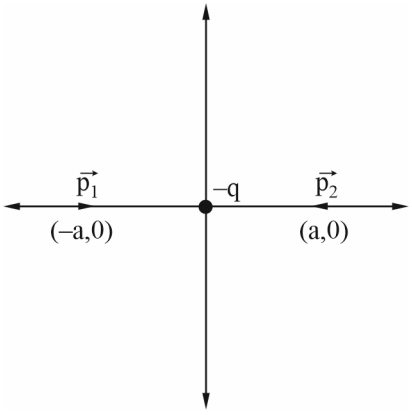
Paragraph for Questions 3 – 4

Two dipoles $\vec{p}_1$ and $\vec{p}_2$ of dipole moment p each are fixed at the points $(-a,0)$ and $(a,0)$. A point charge $-q$ is initially at the origin. The initial equilibrium condition is shown in the figure below. Assume that $q \gg \frac{p}{a}$.



Now, the point charge is slowly carried to the point $\left(0,\sqrt{3}\,a\right)$ along the Y-axis. Consider the work done in this process in two cases:

Case 1: the dipoles are fixed at their positions and are also not allowed to rotate, their dipole moment vectors $\vec{p}_1$ and $\vec{p}_2$ fixed to point in the +X and –X directions respectively, as shown in the figure above. Let the work done in this case be W_1.

Case 2: the dipoles are fixed at their positions, but are allowed to rotate freely. Let the work done in this case be W_2.

3. If $W_1 = n\left(\frac{p\,q}{4\pi\varepsilon_0 a^2}\right)$, then n is _____.

4. If $W_2 = m\left(\frac{p\,q}{4\pi\varepsilon_0 a^2}\right)$, then m is _____.

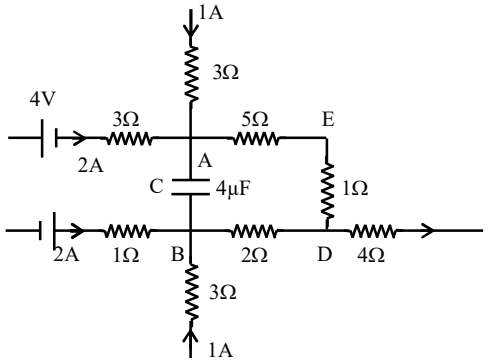
SPACE FOR ROUGH WORK

SECTION-4

This section consists of 6 NON-NEGATIVE INTEGER Type Questions. The answer to each question is a **NON-NEGATIVE INTEGER.**

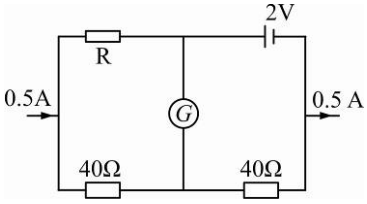
5. An unstable element is produced in a nuclear reactor at a constant rate. If its half-life is 100 years, how much time in years is required to produce 50% of the equilibrium quantity?

6. A part of the circuit in steady state along with the currents flowing in the branches, the values of resistance, etc, is shown in the figure. The energy stored in the capacitor C (4μF) is found to be _____ (in μJ).

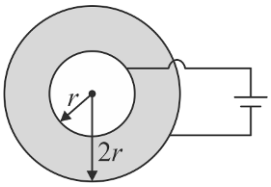


SPACE FOR ROUGH WORK

7. In the circuit shown in the figure, the internal resistance of the cell is negligible. A current of 0.5 A enters the circuit as shown in the figure. The value of R, for which no current flows through the galvanometer is $\frac{n}{9}\Omega$. Find n.



8. A conductor in the shape of a cylindrical shell of outer and inner radii $2r$ and r is connected to an ideal battery as shown. The length of the conductor is $\ell = 1\,m$. The charge carrier density in the conductor is $n = 8\times10^{28}\,m^{-3}$. The value of $r = \frac{1}{6}cm$. If the current through the battery is $4A$, the drift velocity of electrons at a distance 1.5r from the axis of the conductor is _____$\times10^{-8}$ m/s. [Take $\pi = \frac{25}{8}$, charge on electron, $e = 1.6\times10^{-19}C$]



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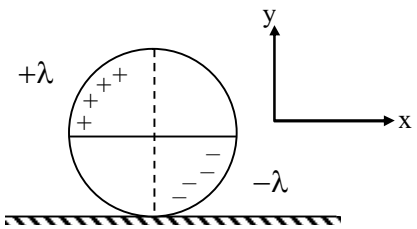
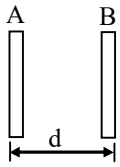
9. A non-conducting ring of mass m = 1 kg, and radius R = 1 m is charged as shown. The charge per unit length is $\lambda = 5C/m$. It is then placed on a rough non-conducting horizontal surface. At time t = 0, a uniform electric field $\vec{E} = E_0\hat{i}\left(E_0 = 1V/m\right)$ is switched on and the ring start rolling without sliding. Determine the friction force (in Newton) acting on the ring, when it starts moving.



10. Each plate of a parallel capacitor has area $S = 5\times10^{-3}m^2$ and are d = 8.85 mm apart. Plate A has a positive charge $q_1 = 10^{-10}$ coulomb and plate B has charge $q_2 = +2\times10^{-10}$ coulomb. Energy supplied by a battery of emf E = 10 volt when its positive terminal is connected with plate A and negative terminal with plate B is $n\times10^{-9}$ Joule. Find the integer n.



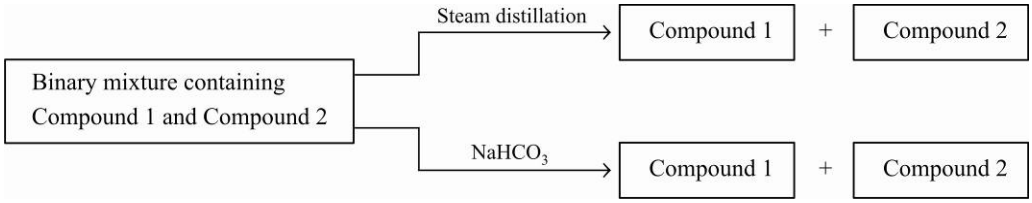
SPACE FOR ROUGH WORK

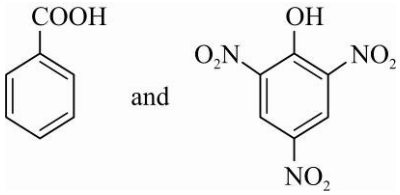
SUBJECT II : CHEMISTRY 60 MARKS

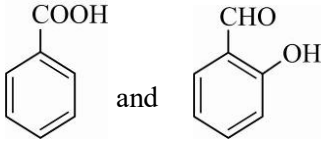
SECTION-1

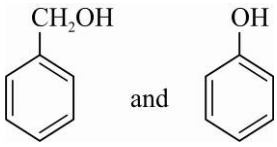
This section consists of 4 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

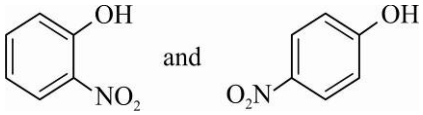
1. Identify the binary mixture(s) that can be separated into individual compounds, by processes as shown in given scheme.



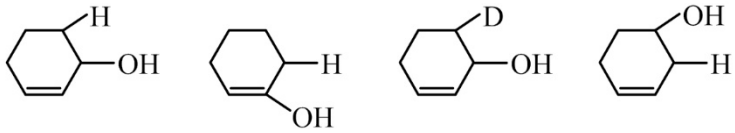
(A) 

(B) 

(C) 

(D) 

2. The decreasing order of ease of dehydration in the following compounds is:



(I) (II) (III) (IV)

(A) I > III > IV > II **(B)** II > I > III > IV

(C) IV > I > III > II **(D)** III > I > II > IV

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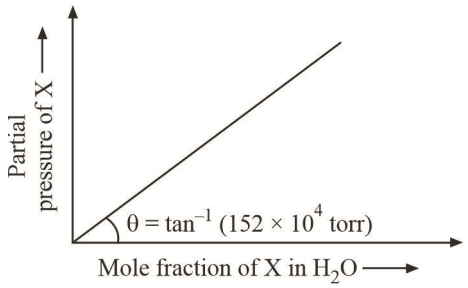
3. Copper has a face centered cubic structure with unit cell edge length of 3.9 Å . The size of the largest atom which could fit into the interstices of the copper lattice without distorting it is:

(A) 0.23 Å **(B)** 0.57 Å **(C)** 0.31 Å **(D)** 1.01 Å

4. A gas 'X' is present with saturated water vapour over liquid water at total pressure of 1.5 atm. Vapour pressure of H_2O at same temperature is 0.5 atm.



The solubility of gas 'X' in terms of moles in 10 moles of $H_2O(\ell)$ is:

(A) 7.5×10^{-3} **(B)** 2.5×10^{-3} **(C)** 5×10^{-3} **(D)** 10^{-2}

SPACE FOR ROUGH WORK

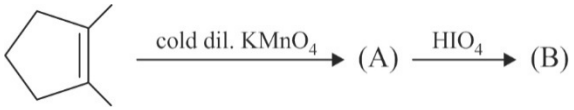
SECTION-2

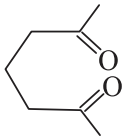
This section consists of 3 Multiple Correct Answers Type Questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

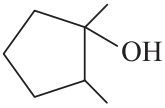
5. The shortest distance between the next to next nearest neighbour of a lattice point of radius R in a BCC unit cell is equal to:

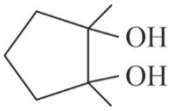
(A) $\frac{4R}{\sqrt{3}}$ **(B)** $\sqrt{2}R$ **(C)** $\frac{4\sqrt{6}R}{3}$ **(D)** $\left(\sqrt{6}+\sqrt{\frac{2}{3}}\right)R$

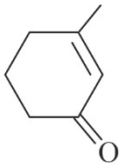
6. In a reaction sequence



(A) (B) is 

(B) (A) is 

(C) (A) is 

(D) (B) is 

7. Which of the following statement is/are correct?

(A) The co-ordination number of an atom in FCC lattice is 12

(B) A metal that crystallizes in bcc structure has a co-ordination no. of 12

(C) The unit cell with lowest symmetry is triclinic

(D) The packing fraction in body centered cubic is $\frac{\sqrt{3}}{8}\pi$

SPACE FOR ROUGH WORK

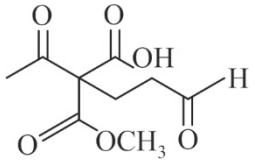
SECTION-3

This section consists of 2 Paragraphs. Based on each paragraph, there are **TWO (02)** questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places

Paragraph for Questions 1 – 2

The most common sources of the hydride nucleophile are lithium aluminium hydride $\left(LiAlH_4\right)$ and sodium borohydride $\left(NaBH_4\right)$. Because aluminium is less electronegative than boron, the Al-H bond in $LiAlH_4$ is more polar thereby making $LiAlH_4$ a stronger reducing agent.

For the reduction of below compound



1. How many functional group are reduced by lithium aluminium hydride?

2. How many functional groups reduced by sodium borohydride?

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Paragraph for Questions 3 – 4

Assume a hypothetical cubic crystal lattice, named J-centered cubic (JCC) with the following characteristics:

a. An atom is present at each corner of the cube.

b. At the center of two pairs of opposite faces an atom is present.

c. At the center of each edge of the cube an atom is present.

d. One atom is present at its body center.

3. How many atoms are present effectively per unit cell in this hypothetical crystal lattice?

4. If the distance between nearest neighbours is 10 nm. Calculate the edge length in nm.

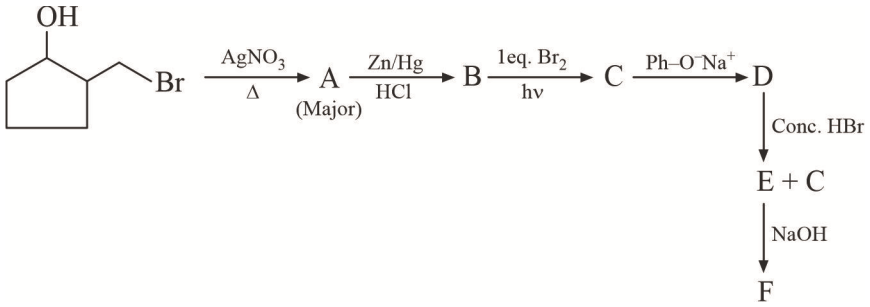
SPACE FOR ROUGH WORK

SECTION-4

This section consists of 6 NON-NEGATIVE INTEGER Type Questions. The answer to each question is a **NON-NEGATIVE INTEGER.**

5. $\text{Glycerol} \xrightarrow[\Delta]{KHSO_4} A \xrightarrow[(ii)\,H_2O]{(i)\,LiAlH_4/\text{ether}} B \xrightarrow[H_2]{\text{Raney}-Ni} C \xrightarrow[Al_2O_3,360°C]{1eq.NH_3} D \xrightarrow[aq.HCl]{NaNO_2} \underset{(\text{Major})}{E}$

Number of 1° hydrogen atoms in E is _____ .

6. 

Number of resonating structures of F is _____ .

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7. The minimum concentration of an electrolyte required to cause coagulation of a sol is called its flocculation value. If the flocculation value of $MgSO_4$ for a standard As_2S_3 sol is 3.33. How many milligrams of $MgSO_4$ is to be added to 20 ml standard As_2S_3 sol so that flocculation just starts? (Report your answer to the nearest integer)

8. $\underset{\text{(Pyrolusite)}}{(A)} \xrightarrow[\text{air}]{\text{fused with KOH}} (B) \xrightarrow{\text{excess } CO_2} \underset{+\ (A)\downarrow}{(C)} \xrightarrow{KI, OH^-} (D) + (A)$

Sum of oxidation states of central atom in B and D is _____ .

9. 1g of mono basic acid dissolved in 200 g of water lowers the freezing point by 0.186°C. On the other hand when 1g of same acid is dissolved in water so as to make 200 ml solution, this solution requires 125 ml, decimolar NaOH for complete neutralization then % dissociation of acid in water is _____ . [K_f for H_2O = 1.86 K kg mol^{-1}]

10. A crystalline solid of a pure substance has a face centered cubic structure with a cell edge of 400 pm. If the density of the substance in the crystal is 8 gcm^{-3}, then the number of unit cells present in 256 g of the crystal is $N \times 10^{23}$. The value of N is _____ .

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SUBJECT III : MATHEMATICS 60 MARKS

SECTION-1

This section consists of 4 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.

1. Let $f(x)$ is an even function such that $f(x)+f(x-3)=x(x-3)+1,$ then $\int_0^3 \frac{f(x)dx}{(x^2-3x+1)}$ is:

(A) $-\frac{2}{3}$ **(B)** $-\frac{3}{2}$ **(C)** $\frac{2}{3}$ **(D)** $\frac{3}{2}$

2. $\int \frac{x^2}{(x\cos x-\sin x)}\frac{dx}{(x\sin x+\cos x)}=$

(A) $\ln\left|\frac{x\cos x-\sin x}{x\sin x+\cos x}\right|+c$ **(B)** $\ln\left|\frac{x\sin x+\cos x}{x\cos x-\sin x}\right|+c$

(C) $\frac{x\sin x+\cos x}{x\cos x-\sin x}+c$ **(D)** $\frac{x\cos x-\sin x}{x\sin x+\cos x}+c$

3. Find the minimum value of $(x_1-x_2)^2+\left(\sqrt{1-x_1^2}-12+2\sqrt{x_2}\right)^2$:

(A) $\left(\sqrt{70}-2\right)^2$ **(B)** $\left(\sqrt{80}-1\right)^2$ **(C)** $\left(\sqrt{70}-1\right)^2$ **(D)** $\left(\sqrt{80}+1\right)^2$

4. Solution of differential equation $f'(x)f'''(x)=3(f''(x))^2,(y=f(x))$ is:

(A) $x=k_1y^2+k_2y+k_3$ **(B)** $y=k_1x^2+k_2+k_3$

(C) $x=\sin y$ **(D)** $x=\cos y$

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SECTION-2

This section consists of 3 Multiple Correct Answers Type Questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE THAN ONE CHOICE** is correct.

5. The solution of differential equation $3\frac{dx}{dy}=\frac{x}{x^3-y}$ is $x^{\ell}=mx^n y+c,$ then which of the following is/are **CORRECT**? {c is any arbitrary constant}

(A) $\ell+m+n=11$ **(B)** $\ell+n=9$ **(C)** $\ell+2m=10$ **(D)** $m+n=4$

6. If $|a|<1:$ and if $\int_0^{\pi}\frac{\ell n(1+a\cos x)}{\cos x}dx=\pi f(a)$ then:

(A) $f(x)=\sin^{-1}x$ **(B)** $f(1)=\frac{\pi}{2}$

(C) $f(x)=\cos^{-1}x$ **(D)** $f(1)=0$

7. Consider a function $f:[0,1]\to R$ satisfying $\int_0^1\big(f(x)(x-f(x))\big)dx=\frac{1}{12}$ then, which of the following is/are correct?

(A) $f(x)$ is a polynomial of degree 2 **(B)** $f(x)$ is a polynomial of degree 1

(C) $f(x)$ is a monomial (only one term) **(D)** $f(x)$ is constant

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SECTION-3

This section consists of 2 Paragraphs. Based on each paragraph, there are **TWO (02)** questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places

Paragraph for Questions 1-2

Consider $f(x) = \tan^{-1}\left(\frac{(\sqrt{12}-2)x^2}{x^4+2x^2+3}\right)$ and m and M are respectively minimum and maximum values of $f(x)$ and $x = a$ $(a > 0)$ is the point in the domain of $f(x)$, where $f(x)$ attains its maximum value.

1. If $\cos^{-1}x + \cos^{-1}y = 3\left(\tan^{-1}\left(\tan\frac{7M}{2}\right) + \tan^{-1}\left(m + \tan\frac{3\pi}{8}\right)\right)$, then $|x + y|$ is equal to:

2. If α and β are roots of the equation $x^2 - \left(\tan(3\sin^{-1}(\sin M))\right)x + a^4 = 0$, then $\alpha\beta - (\alpha + \beta)$ equals to:

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Paragraph for Questions 3-4

Given a function 'g' which has a derivative $g'(x)$ for every real x and satisfies $g'(0)=3$ and $g(x+y)=e^{y}g(x)+e^{x}g(y)$ for all x and y.

3. The value of $\lim\limits_{x\to 0}\dfrac{g(x)}{x}=$ _____ .

4. The minimum value of $g(x)$ is α. The absolute value of greatest integer of α is:

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SECTION-4

This section consists of 6 NON-NEGATIVE INTEGER Type Questions. The answer to each question is a **NON-NEGATIVE INTEGER.**

5. Find the sum of all integral values of a where $a \in [-10, 10]$ such that the graph of the function $f(x) = \big|\,|\,x-2\,|-a\big|-3$ has exactly three x-intercepts.

6. Let f be real function defined on R (the set of real numbers) such that $f'(x) = 100(x-1)(x-2)^2(x-3)^3...(x-100)^{100}$, for all $x \in R$. If g is a function defined on R such that $\int_a^x e^{f(t)}dt = \int_0^x g(x-t)dt + 2x + 3$, If some of the all the values of x for which $g(x)$ has a local extremum be λ then find λ.

7. The function $f(x) = x^2e^{-2x}, x > 0$. If ℓ is maximum value of $f(x)$ then find $[\ell^{-1}]$. (where [.] represents greater integer function)

8. If $\lim\limits_{x\to 1}\dfrac{100}{1-x^{100}} - \dfrac{50}{1-x^{50}} = A$; find the value of $\dfrac{A}{5}$.

9. $\lim\limits_{n\to\infty}\left[\left(2009\right)^{2010}\right)^n + \left(\left(2010\right)^{2009}\right)^n\Big]^{1/n}$ is equal to $\left|a^b\right|$ where $a, b \in N$ then $|\,a-b\,|$ is ….

10. The area bound by the curves $y = x^2 - 9$ and $x + y = 3$ is A (in square units), then $[A]$ is____.
([•] denotes greatest integer function)

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