VMC Vidyamandir Classes SINCE 1986
IIT JEE | MEDICAL | FOUNDATION

CODE A

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

Date: 18/02/2024   **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 the circuit shown, the battery is ideal, and both capacitors are initially uncharged. If the switch S is closed, the current through the switch immediately afterwards, and the current through it after a long time is respectively:
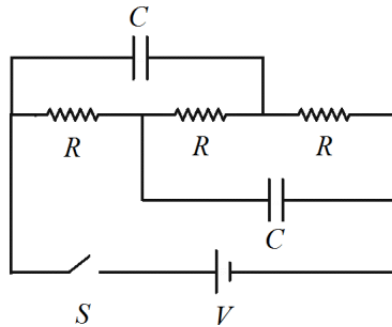
(A) $\dfrac{V}{3R}, \dfrac{3V}{R}$ (B) $\dfrac{3V}{R}, \dfrac{V}{3R}$ (C) $\dfrac{3V}{R}$, zero   (D) zero, $\dfrac{3V}{R}$

SPACE FOR ROUGH WORK

2. A non-conducting ball carrying a charge $+Q$ is placed on a smooth horizontal non-conducting table and tied to a spring of spring constant k whose other end is fixed. Initially the spring is unstretched. Now, another identical ball, also carrying charge $+Q$, is slowly moved closer from a very large initial distance directly towards the first ball until it reaches the position initially occupied by the first ball. If the work done in the process is proportional to $Q^M k^N$, then:

(The balls are small enough that the electrostatic force between them can be calculated by assuming that they are point charges)

(A) $M = 2, N = \dfrac{4}{3}$ **(B)** $M = \dfrac{2}{3}, N = \dfrac{1}{3}$

(C) $M = \dfrac{2}{3}, N = 1$ **(D)** $M = \dfrac{4}{3}, N = \dfrac{1}{3}$
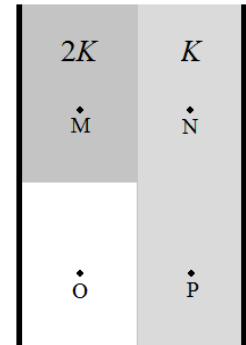
SPACE FOR ROUGH WORK

3. A pulse of light of duration 100 *ns* is absorbed completely by a small object initially at rest. Power of the pulse is 30 *mW* and the speed of light is $3 \times 10^8 \, m/s$. The final momentum of the object is:

(A) $0.3 \times 10^{-17} \, kg \, ms^{-1}$ **(B)** $1.0 \times 10^{-17} \, kg \, ms^{-1}$

(C) $0.6 \times 10^{-17} \, kg \, ms^{-1}$ **(D)** $9.0 \times 10^{-17} \, kg \, ms^{-1}$

4. A ball is dropped from a height of 20*m* above the surface of water in a lake. The refractive index of water is 4/3. A fish inside the lake, in the line of fall of the ball, is looking at the ball. At an instant when the ball is 12.8 *m* above the water surface, the fish sees the speed of ball as:

(A) $9 \, m \, s^{-1}$ **(B)** $12 \, m \, s^{-1}$ **(C)** $16 \, m \, s^{-1}$ **(D)** $21.33 \, m \, s^{-1}$

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. Two dielectric slabs of dielectric constant K and $2K$ are placed inside a parallel-plate capacitor as shown. The separation between the plates is d. The thickness of both slabs is $\dfrac{d}{2}$. The slab of dielectric constant $2K$ covers half the area of the left plate, while the slab of dielectric constant K covers the entire area of the right plate. The remaining space is vacuum. The capacitor is now charged such that the potential difference between the plates is ΔV. The magnitude electric field at the points M, N, O and P is E_M, E_N, E_O and E_P. Which of the following statements is/are correct?

2K	K
$\overset{\bullet}{M}$	$\overset{\bullet}{N}$
$\overset{\bullet}{O}$	$\overset{\bullet}{P}$

(A) $E_P = \dfrac{E_O}{K}$

(B) $E_M = \left(\dfrac{K+1}{3K}\right)E_O$

(C) $E_N = \dfrac{E_M}{2}$

(D) $\dfrac{\Delta V}{d} = \left(\dfrac{K+1}{2}\right)E_O$

SPACE FOR ROUGH WORK

6. Suppose all the space between the planes $z = 0$ and $z = a$ (i.e. spanning all X and Y coordinates between $-\infty$ and ∞) contains charge with uniform density $+\rho$, and all the space between the planes $z = 0$ and $z = -a$ contains charge with uniform density $-\rho$. Which of these options is/are correct?

(A) The electric field at a point on the plane $z = \dfrac{a}{2}$ is $\left(\dfrac{\rho a}{2\varepsilon_0} \right)(-\hat{k})$

(B) The electric field at a point on the plane $z = \dfrac{a}{2}$ is $\left(\dfrac{\rho a}{\varepsilon_0} \right)(-\hat{k})$

(C) The potential difference between the planes $z = 0$ and $z = a$ is $V(z = a) - V(z = 0) = \dfrac{\rho a^2}{2\varepsilon_0}$

(D) The potential difference between the planes $z = 0$ and $z = a$ is $V(z = a) - V(z = 0) = \dfrac{\rho a^2}{\varepsilon_0}$

7. When a monochromatic point source of light is at a distance of 0.2 m from a photoelectric cell, the cut-off voltage and the saturation current are respectively 0.6 volt and 18.0 mA. If the same source is placed 0.6 m away from the photoelectric cell, then:

(A) The stopping potential will be 0.2 volt **(B)** The stopping potential will be 0.6 volt
(C) The saturation current will be 6.0 mA **(D)** The saturation current will be 2.0 mA
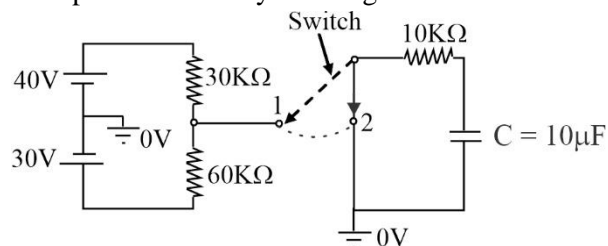
SPACE FOR ROUGH WORK

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

A Capacitor C is fully discharged since switch is in position 2. At $t = 0$ switch is shifted to position 1.

1. Maximum voltage to which capacitor is charged when in position 1, is $\dfrac{x}{3}V$, where x is_____.

2. Charging time constant λ_1 in position 1, is _____ S.

SPACE FOR ROUGH WORK

Paragraph for Questions 3 – 4

A battery of voltage V (=1 volt) and three large plates of area A are connected as shown in figure. Plate (1) and plate (3) are fixed and plate (2) is movable. Initial position of middle plate is shown in figure (1). Now middle plate is shifted by a distance $\dfrac{d}{2}$ towards plate (3) and final position is shown in figure (2). (Take the value of $\dfrac{\varepsilon_0 A}{d}=1$ in SI unit)
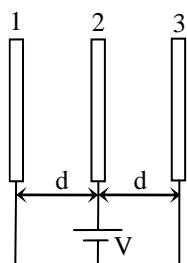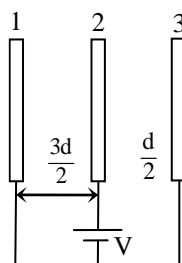

Figure-1   **Figure-2**

3.   Total charge on plate (2) initially is _____ C.

4.   If middle plate was slowly moved from initial to final position by applying Force (F) normal to plate surface. Find the magnitude of work done by F(in joules).

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. A series circuit consists of a resistance $R = 100\,\Omega$, a coil of inductance $L = 2\,mH$, a capacitor of capacitance $C = 10\,\mu F$ and an AC source of angular frequency $\omega = 200\,\text{rad/s}$. If the rms value of the potential difference across the capacitor is 40 *V*, the rms value of the potential difference (in Volts) across the resistance is _____.

6. *N* identical uncharged capacitors are connected in series with a battery and a switch. The switch is closed and kept closed until the capacitors are completely charged. Let the total potential energy stored now in all the capacitors be U_I. Now, the switch is opened, the battery is removed from the circuit and an identical uncharged capacitor is connected in its place. Now the switch is closed again and kept closed for a long time. The total potential energy stored in all the capacitors is now U_F. If $\dfrac{U_F}{U_I} = \dfrac{1}{6}$, then *N* is _____.

7. A metal conductor is placed in a room that is maintained at a constant temperature $T_0 = 20°C$ and a potential difference is applied across the conductor. The conductor loses heat from its surface at a rate $\dfrac{dQ}{dt} = k\left(T - T_0\right)$, where *k* is a constant, *T* is the temperature of the conductor in $°C$ and $\dfrac{dQ}{dt}$ is in Watts. Assume that the conductor has high thermal conductivity, so its entire volume is at the same temperature at any instant. When a constant potential difference 50V is applied across the conductor, after a long time the current through it achieves a steady state value of 6*A* and its temperature becomes $120°\,C$. The value of the constant *k* is _____ W/$^{\text{o}}$C.

SPACE FOR ROUGH WORK

8. Two coils of self-inductance $L_1 = 1\ mH$ and $L_2 = 2\ mH$ and negligible internal resistance are connected in parallel across a battery. The mutual inductance of the coils is negligible. Initially, the switch is open and current through both coils is zero. A long time after the switch is closed, the ratio of the current in the coils, $\dfrac{I_1}{I_2}$ is equal to _____.
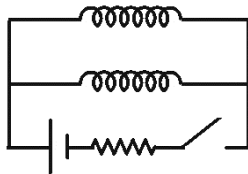
9. A superconducting ring of radius $R = 1m$ and self inductance L is kept coaxial with a long solenoid of radius $r = 0.5\,m$. If current in the solenoid is decreased to $\dfrac{i_0}{3}$ from i_0, where i_0 is initial current in the solenoid. Current induced in the ring is $\dfrac{i_0}{k}$. Value of k is _____.

$$\left[\dfrac{L}{n} = \pi\mu_0, \text{ where } n \text{ is number of turns/length in the solenoid}\right]$$

10. A thin, insulating annular disc of inner and outer radius $\dfrac{R}{2}$ and R is charged uniformly over its surface with a total charge Q. The disc is rotated about an axis passing through its centre and perpendicular to its plane at a constant angular velocity ω. The magnetic moment of the disc is $\dfrac{X}{16}(QR^2\omega)$. The value of X is _____.

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. In the decomposition of H_2O_2 at 300K, the energy of activation was found to be 30 kcal/mole, while it decreased to 21 kcal/mole when the decomposition was carried out in the presence of a catalyst at 300K. If catalysed reaction is X times faster than uncatalyzed reaction, then value of $\log_{10} X$ is:

    (A)   15   **(B)**   1.56   **(C)**   158.67   **(D)**   6.51

2. At what $\dfrac{[Br^-]}{\sqrt{[CO_3^{2-}]}}$ does the following cell have its reaction at equilibrium?

$$Ag_{(s)} \,|\, Ag_2CO_{3(s)} \,|\, Na_2CO_{3(aq)} \,||\, KBr_{(aq)} \,|\, AgBr_{(s)} \,|\, Ag_{(s)}$$

$$(Ksp)_{Ag_2CO_3} = 8 \times 10^{-12}, \quad (Ksp)_{AgBr} = 4 \times 10^{-13}$$

    (A) 10^{-7} **(B)** $\sqrt{2} \times 10^{-7}$ **(C)** $\sqrt{3} \times 10^{-7}$ **(D)** 2×10^{-7}
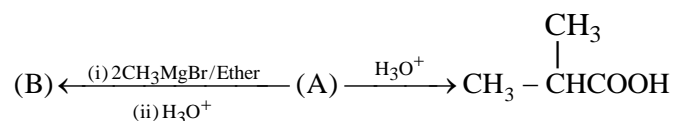
SPACE FOR ROUGH WORK

3. Which one of the following statements is false for hydrophobic sols?

(A) Their viscosity is of the order of that of water

(B) Their surface tension is usually lower than that of dispersion medium

(C) They show Tyndall effect

(D) They can be coagulated by low concentrations of electrolyte

4. Calcium phosphide reacts with water or dil. HCl and gives a compound 'X' which fails to react with HCl but produces dense white fumes with $HI_{(g)}$ due to the formation of 'Y'. Compounds 'X' and 'Y' respectively are:

(A) $X = PH_3, Y = PH_4I$ **(B)** $X = PH_3, Y = H_3PO_2$

(C) $X = NaH_2PO_2, Y = H_3PO_2$ **(D)** $X = PH_4^+, Y = PH_4I$
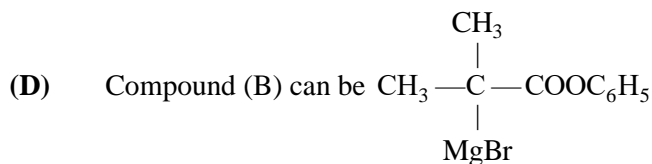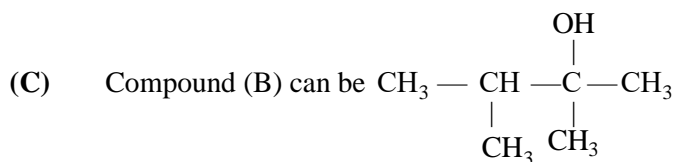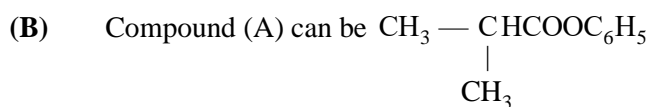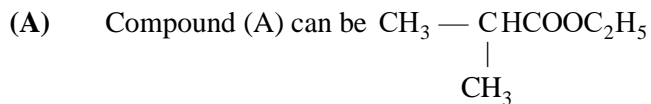
SPACE FOR ROUGH WORK

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.
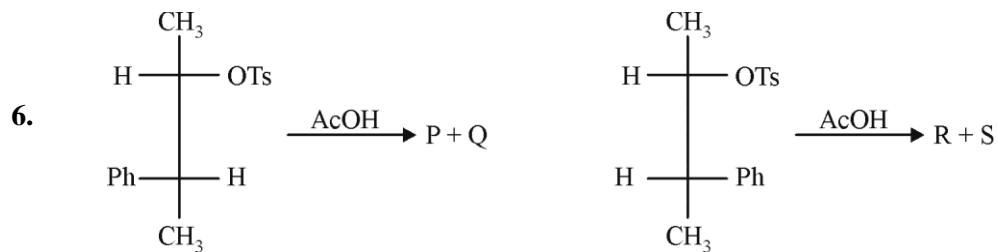
5. Consider the following reaction sequence.

$$(B) \xleftarrow[\text{(ii)} H_3O^+]{\text{(i)} 2CH_3MgBr/Ether} (A) \xrightarrow{H_3O^+} CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{CH}COOH$$

Which of the following statements are true?

(A) Compound (A) can be $CH_3 - \overset{}{\underset{\underset{\displaystyle CH_3}{|}}{C}}HCOOC_2H_5$

(B) Compound (A) can be $CH_3 - \overset{}{\underset{\underset{\displaystyle CH_3}{|}}{C}}HCOOC_6H_5$

(C) Compound (B) can be $CH_3 - \underset{\underset{\displaystyle CH_3}{|}}{CH} - \overset{\overset{\displaystyle OH}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - CH_3$

(D) Compound (B) can be $CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle MgBr}{|}}{C}} - COOC_6H_5$
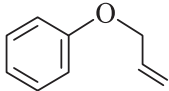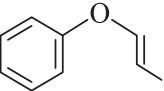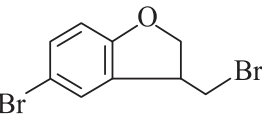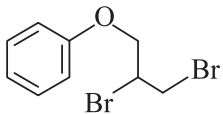
SPACE FOR ROUGH WORK

6.

Identify the correct statements about the above conversions.

(A) P and Q is an enantiomeric pair   **(B)** R and S is an enantiomeric pair

(C) P and R are diastereomers   **(D)** R and S are identical

7.
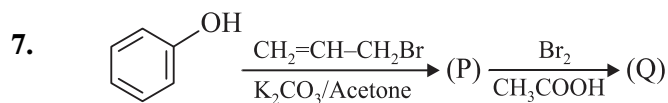
Identify major product (P) and (Q).

(A) (P) :

(B) (P) :
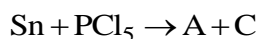

(C) (Q) :

(D) (Q) :

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

Consider the reaction.

$Ag + PCl_5 \rightarrow A + B$

$Sn + PCl_5 \rightarrow A + C$
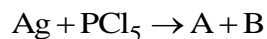
In products B, C and A the oxidation number of silver, tin and phosphorus is t, y and z respectively.

1. Find the product of t, y and z.

2. When phosphorus treated with aqueous solution of HCl, two products are obtained A and D total number of angle close to 90° in product D would be:

SPACE FOR ROUGH WORK

Paragraph for Questions 3 – 4

Consider the following reaction sequence and answer Q.3 & 4
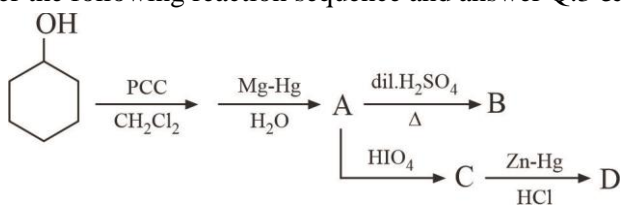
3. Number of sp^3 hybridised carbon atoms in B is _____ .

4. If number of alcoholic groups in A is x and molar mass of D is y $gmol^{-1}$ then x + y 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. How many compounds among the following can show faster S_N1 reaction than $\overset{Cl}{\underset{}{\vee}}$?

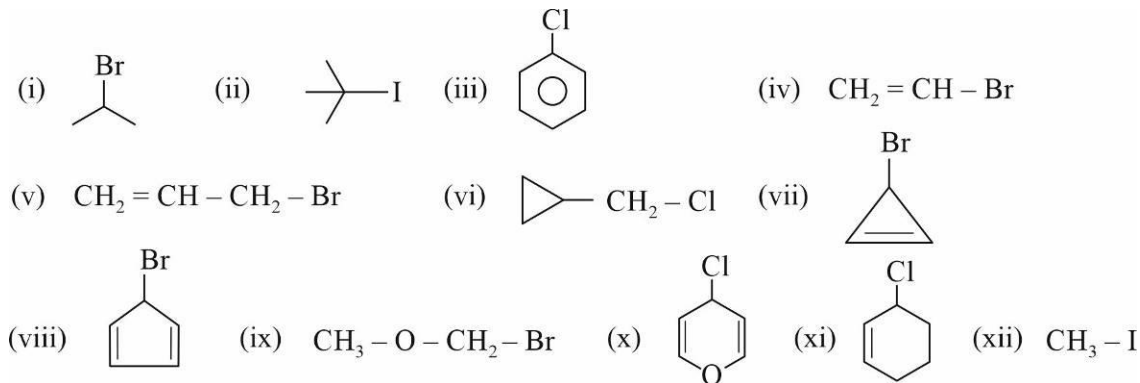(i) $\overset{Br}{\underset{}{\wedge}}$ (ii) $\searrow\!\!-I$ (iii) [benzene ring with Cl]   (iv) $CH_2 = CH - Br$

(v) $CH_2 = CH - CH_2 - Br$ (vi) $\triangleright\!\!- CH_2 - Cl$ (vii) [cyclopropane with Br]

(viii) [cyclopentene with Br]   (ix) $CH_3 - O - CH_2 - Br$ (x) [pyran ring with Cl]   (xi) [cyclohexene with Cl]   (xii) $CH_3 - I$

6. Consider the following reaction:

$$CHCl_3 \xrightarrow[\Delta]{Ag} (A) \xrightarrow{Red\ hot\ Iron\ tube} (B) \xrightarrow{Cl_2,Fe} (C) \xrightarrow[Conc.H_2SO_4]{Chloral,} (D) \xrightarrow{NBS} (E)$$
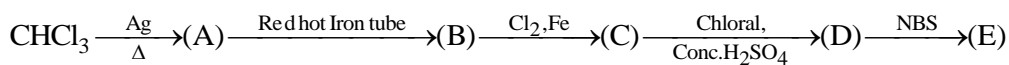
Sum of number of halogen atoms present in products 'D' and 'E' is _____ .

SPACE FOR ROUGH WORK

7. Consider the following reactions:

1-Bromobutane $\xrightarrow[\text{dry ether}]{\text{Mg}}$ A $\xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } CH_3-CH_2-CHO}$ B $\xrightarrow[\Delta]{\text{Conc. } H_2SO_4}$ C (Major) $\xrightarrow{Br_2/CCl_4}$ D $\xrightarrow[\text{followed by}]{\text{fused KOH}}$ NaNH$_2$ → E $\xrightarrow[HgSO_4, H_2SO_4]{H_2O}$ F
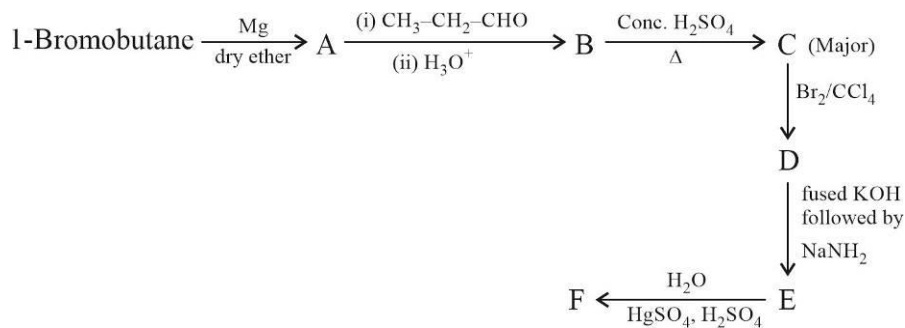
What is the molar mass of compound 'F' in g mol^{-1}.

[Molar mass of C = 12, H = 1, O = 16, N = 14, Br = 80 g mol^{-1}]

8. The conductivity of saturated solution of sparingly soluble salt, $Ba_3(PO_4)_2$ is 1.2×10^{-5} ohm^{-1} cm^{-1}. The limiting equivalent conductivity of $BaCl_2$, K_3PO_4, KCl are 160, 140, 100 ohm^{-1} cm^2 eq^{-1} respectively. If K_{sp} of $Ba_3(PO_4)_2$ is $x \times 10^{-25}$ then the value of x is _____ .

SPACE FOR ROUGH WORK

9. When cells of the skeletal vacuole of a frog were placed in a series of NaCl solutions of different concentrations at 6°C, it was observed microscopically that they remain unchanged in x% NaCl solution, shrank in more concentrated solution and swells in more dilute solutions. Water freezes from the x% salt solution at –0.4°C. Then osmotic pressure of the cell cytoplasm at 6°C is $x \times 10^{-1}$ atm. Find the value of x.

(Assume molarity equal to molality) (K_f of water = 1.86°K/m, R = 0.08 $\dfrac{\text{atm} - \text{L}}{\text{mol} - \text{K}}$)

10. Ammonia gas adsorbs at 4g charcoal having rough surface area of about $10^{16}\,\text{m}^2$ and area occupied by each molecule of NH_3 is $\dfrac{10^{-3}}{18}\,\text{cm}^2$. The mass of ammonia adsorbed per gram of charcoal is $x \times 10^{-2}\,\text{gm}$.

$\left(N_A = 6 \times 10^{23},\ \text{Molar mass of H} = 1,\ N = 14\,\text{g mol}^{-1} \right)$. Find the value of x.

SPACE FOR ROUGH WORK

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. If α is a root of $x^2 + ax + 1 = 0$, then $\lim\limits_{x \to 1/\alpha} \dfrac{\sin\left(x^2 + ax + 1\right)}{(\alpha x - 1)}$ is equal to:

(A) $2a\alpha$ (B) $a\alpha^2$ (C) $\dfrac{1 - \alpha^2}{\alpha^2}$ (D) does not exist

2. $f(x) = \begin{bmatrix} e^{-\sqrt{|\ln\{x\}|}} - \{x\}^{\sqrt{\frac{1}{|\ln\{x\}|}}} & \text{where ever defined} \\ 0 & \text{otherwise} \end{bmatrix}$ is:

(A) Not a periodic function

(B) Even function

(C) Range of $f(x)$ contains more than 1 element

(D) Odd function

SPACE FOR ROUGH WORK

3. If $f(x) = A \sin\left(\dfrac{\pi x}{2}\right) + B$, $f'\left(\dfrac{1}{2}\right) = \sqrt{2}$ and $\displaystyle\int_0^1 f(x)\,dx = \dfrac{2A}{\pi}$, then the constants A and B are respectively:

(A) $\dfrac{\pi}{2}$ and $\dfrac{\pi}{2}$ **(B)** $\dfrac{2}{\pi}$ and $\dfrac{3}{\pi}$ **(C)** 0 and $\dfrac{-4}{\pi}$ **(D)** $\dfrac{4}{\pi}$ and 0

4. Let $f(x)$ be maximum and $g(x)$ be minimum of $\{x\,|\,x\,|,\ x^2\,|\,x\,|\}$, then $\displaystyle\int_{-1}^{1}\big(f(x) - g(x)\big)\,dx =$

(A) $\dfrac{1}{12}$ **(B)** $\dfrac{1}{3}$ **(C)** $\dfrac{2}{3}$ **(D)** $\dfrac{7}{12}$

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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. Let $f(x)$ be an increasing function defined on $(0, \infty)$ if $f\left(2a^2 + a + 1\right) > f\left(3a^2 - 4a + 1\right)$ then possible integers in the range of a is(are) :

(A) 1   (B) 2   (C) 3   (D) 4

6. If $f(x) = \int_{-2}^{x} (t^4 - bt^3 + (b+1)t^2 - bt + b)dt$ strictly increases $\forall x \in R$ then which of the following are NOT in range of b?

(A) −4   (B) 5   (C) 2   (D) 1

7. Suppose $\int \dfrac{1 - 7\cos^2 x}{\sin^7 x \cos^2 x} dx = \dfrac{g(x)}{\sin^7 x} + C$, where C is an arbitrary constant of integration.

(A) The value of $g'(0)$ is 1   (B) The value of $g'\left(\dfrac{\pi}{4}\right)$ is 2

(C) The value of $g''\left(\dfrac{\pi}{4}\right)$ is 4   (D) The value of $g''(0)$ is 1

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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

If Rolle's theorem is applicable to the function f defined by $f(x)\begin{cases} ax^2 + b, & |x| < 1 \\ 1, & |x| = 1 \\ \dfrac{\lambda}{|x|} & |x| > 1 \end{cases}$, for $x \in [-2, 2]$ then:

1.   The value of $a + b$

2.   The value of λ

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Paragraph for Questions 3-4

Given a real valued function f such that $f(x) = \begin{cases} \dfrac{\tan^2\{x\}}{\left(x^2 - [x]^2\right)}, & x > 0 \\ 1 & x = 0 \\ \sqrt{\{x\}\cot\{x\}} & x < 0 \end{cases}$

where $[x]$ is integral part of x and $\{.\}$ is Fractional part of x. Then:

3. $\displaystyle\lim_{x \to 0^+} f(x) = \underline{\hspace{3cm}}.$

4. $\cot^{-1}\left(\displaystyle\lim_{x \to 0^-} f(x)\right)^2 = \underline{\hspace{3cm}}.$

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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. If the area bounded by the curve $f(x) = x^{1/3}(x-1)$ and x-axis is A, then the value of $[A]$ where $[\bullet]$ denotes greatest integer function, is _____.

6. If the area enclosed by the curve $y = \sqrt{x}$ and $x = -\sqrt{y}$, the circle $x^2 + y^2 = 2$ above the x-axis, is A then the value of $\dfrac{2A}{\pi}$ is _____.

7. If the solution of the differential equation $\dfrac{dy}{dx} - y = 1 - e^{-x}$ and $y(0) = y_0$ has a finite value, when $x \to \infty$, then the value of $(-4y_0)$ is _____.

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8. The real value of $2m$ for which the substitution $y = u^m$ will transform the differential equation

$2x^4 y \dfrac{dy}{dx} + y^4 = 4x^6$ in to a homogeneous equation is:

9. $y = f(x)$ passes through (1, 2) and satisfies the relation $y(1 + xy)dx - xdy = 0$. Find value of $7f\left(\dfrac{1}{2}\right)$.

10. The value of $\displaystyle\int \dfrac{(x^2 - 1)dx}{x^3\sqrt{2x^4 - 2x^2 + 1}}$ is $\dfrac{1}{2}\sqrt{2 - \dfrac{l}{x^m} + \dfrac{1}{x^n}} + c$, $(l > 0)$. The value of $m + n - l$ is:

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❧ ❧ ❧ **End of JEE Advanced Revision Test - 2 | PAPER-2 | JEE-2024** ❦ ❦ ❦