

## JEE(Advanced) : MOCK TEST

PAPER-1

HAVE CONTROL $\longrightarrow$ HAVE PATIENCE $\longrightarrow$ HAVE CONFIDENCE $\Rightarrow 100 \%$ SUCCESS

## BEWARE OF NEGATIVE MARKING

## PART-1 : PHYSICS

## SECTION-I (i) : (Maximum Marks: 12)

- This section contains FOUR (04) 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 : $0 \quad$ If none of the options is chosen (i.e. the question is unanswered)
Negative Marks : -1 In all other cases

1. Figure shows a metal ball suspended by thread of negligible mass from an upright cylinder that floats partially submerged in water. The cylinder has height 6 cm , face area $11 \mathrm{~cm}^{2}$ on the top and bottom and density $0.5 \mathrm{~g} / \mathrm{cm}^{3} .4 \mathrm{~cm}$ of cylinder's height is inside the water surface. If density of the metal ball is $8 \mathrm{gm} / \mathrm{cm}^{3}$ then its radius is equal to :- $\left(\rho_{\mathrm{w}}=1 \mathrm{gm} / \mathrm{cm}^{3}\right)$

(A) $\left(\frac{3}{8}\right)^{1 / 3} \mathrm{~cm}$
(B) $\left(\frac{3}{4}\right)^{1 / 3} \mathrm{~cm}$
(C) $\left(\frac{4}{3}\right)^{1 / 3} \mathrm{~cm}$
(D) $\left(\frac{5}{11}\right)^{1 / 3} \mathrm{~cm}$
2. A light ray is incident on a transparent sphere of index $=\sqrt{2}$, at an angle of incidence $=45^{\circ}$. What is the deviation of a tiny fraction of the ray, which enters the sphere, undergoes two internal reflections and then refracts out into air?
(A) $270^{\circ}$
(B) $240^{\circ}$
(C) $120^{\circ}$
(D) $180^{\circ}$
3. In an aluminum ( Al ) bar of square cross section, a square hole is drilled and is filled with iron $(\mathrm{Fe})$ as shown in the figure. The electrical resistivities of Al and Fe are $2.7 \times 10^{-8} \Omega \mathrm{~m}$ and $1.0 \times 10^{-7} \Omega \mathrm{~m}$, respectively. The electrical resistance between the two faces P and Q of the composite bar is :-

(A) $\frac{2475}{64} \mu \Omega$
(B) $\frac{1875}{64} \mu \Omega$
(C) $\frac{1875}{49} \mu \Omega$
(D) $\frac{2475}{132} \mu \Omega$
4. In the figure shown AB is a rod of length 30 cm and area of cross-section $1.0 \mathrm{~cm}^{2}$ and thermal conductivity 336 S. I. units. The ends A \& B are maintained at temperatures $20^{\circ} \mathrm{C}$ and $40^{\circ} \mathrm{C}$ respectively. A point C of this rod is connected to a box D , containing ice at $0^{\circ} \mathrm{C}$, through a highly conducting wire of negligible heat capacity. The rate at which ice melts in the box is :-
[Assume latent heat of fusion for ice $\mathrm{L}=80 \mathrm{cal} / \mathrm{gm}$ ]

(A) $84 \mathrm{mg} / \mathrm{s}$
(B) $84 \mathrm{~g} / \mathrm{s}$
(C) $20 \mathrm{mg} / \mathrm{s}$
(D) $40 \mathrm{mg} / \mathrm{s}$

## SECTION-I (ii) : (Maximum Marks: 12)

- This section contains THREE (03) questions.
- Each question has FOUR options. ONE OR MORE THAN ONE of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all ) the 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. |  |  |  |

- For Example : If first, third and fourth are the ONLY three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in -2 marks.

5. A thermally insulated chamber of volume $2 \mathrm{~V}_{0}$ is divided by a frictionless piston of area $S$ into two equal parts A and B. Part A has an ideal gas at pressure $\mathrm{P}_{0}$ and temperature $\mathrm{T}_{0}$ and in part B is vacuum. A massless spring of force constant k is connected with a massless piston and the wall of the container as shown. Initially spring is unstretched. Gas in chamber A is allowed to expand. Let in equilibrium spring is compressed by $\mathrm{x}_{0}$. Then :-

(A) Pressure of the gas at equilibrium is $\frac{\mathrm{kx}_{0}}{\mathrm{~S}}$.
(B) Work done by the gas upto equilibrium is $\frac{1}{2} \mathrm{kx}^{2}{ }_{0}$.
(C) Change in internal energy of the gas upto equilibrium is $\frac{1}{2} \mathrm{kx}_{0}^{2}$.
(D) At equilibrium temperature of the gas is decreased.
6. A uniform magnetic field $B$ exists in the region between $x=0$ and $x=\frac{3 R}{2}$ (region 2 in the figure) pointing normally into the plane of the paper. A particle with charge +Q and momentum p directed along x -axis enters region 2 from region 1 at point $P_{1}(y=-R)$. Which of the following option(s) is/are correct?
(A) For $\mathrm{B}=\frac{8}{13} \frac{\mathrm{p}}{\mathrm{QR}}$, the particle will enter region 3 through the point $\mathrm{P}_{2}$ on x -axis.
(B) For $\mathrm{B}>\frac{2}{3} \frac{\mathrm{p}}{\mathrm{QR}}$, the particle will re-enter region 1 .
(C) For a fixed $B$, particles of same charge Q and same velocity v , the distance between the point $P_{1}$ and the point of re-entry into region 1 is inversely proportional to the mass of the particle.
(D) When the particle re-enters region 1 through the longest possible path in region 2, the magnitude of the change in its linear momentum between point $\mathrm{P}_{1}$ and the farthest point from $y$-axis is $\mathrm{p} / \sqrt{2}$.
7. Two blocks of masses 3 kg and 6 kg rest on a horizontal smooth surface. The 3 kg block is attached to a spring with a force constant $\mathrm{k}=900 \mathrm{Nm}^{-1}$ which is compressed 2 m from beyond the equilibrium position. The 6 kg block is at rest at 1 m from mean position. 3 kg mass strikes the 6 kg mass and the two stick together.

(A) Velocity of the combined masses immediately after the collision is $10 \mathrm{~ms}^{-1}$.
(B) Velocity of the combined masses immediately after the collision is $5 \mathrm{~ms}^{-1}$.
(C) Amplitude of the resulting oscillation is $\sqrt{2} \mathrm{~m}$.
(D) Amplitude of the resulting oscillation is $\sqrt{5} / 2 \mathrm{~m}$.

## SECTION-I (iii) : (Maximum Marks: 12)

- This section contains FOUR (04) Matching List Sets.
- Each set has ONE Multiple Choice Question.
- Each set has TWO lists : List-I and List-II.
- List-I has Four entries (P), (Q), (R) and (S) and List-II has Five entries (1), (2), (3), (4) and (5).
- FOUR options are given in each Multiple Choice Question based on List-I and List-II and ONLY ONE of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks $\quad:+3$ ONLY if the option corresponding to the correct combination is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks $\quad:-1$ In all other cases.
8. A block of mass $m$ is stationary with respect to a rough wedge as shown in figure. Starting from rest, in time t work done on the block : $\left(\mathrm{m}=1 \mathrm{~kg}, \theta=30^{\circ}, \mathrm{a}=2 \mathrm{~m} / \mathrm{s}^{2}, \mathrm{t}=4 \mathrm{~s}\right)$


|  | List-I |  | List-II |
| :--- | :--- | :--- | :--- |
| (P) | By gravity | (1) | 144 J |
| (Q) | By normal reaction | (2) | 32 J |
| (R) | By friction | (3) | 56 J |
| (S) | By all the forces | (4) | 48 J |
|  |  | (5) | None |

(A) $\mathrm{P} \rightarrow 5 ; \mathrm{Q} \rightarrow 1 ; \mathrm{R} \rightarrow 4 ; \mathrm{S} \rightarrow 2$
(B) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \longrightarrow 3 ; \mathrm{R} \rightarrow 2 ; \mathrm{S} \rightarrow 1$
(C) $\mathrm{P} \rightarrow 1 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 5$
(D) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 1$
9. An isolated zinc bead of radius $r$ charged to a negative potential $V_{0}$ (assuming potential at infinitely distant points to be zero) placed in free space is being continuously irradiated by ultraviolet light of wavelength $\lambda$. Photoelectric threshold wavelength for zinc is $\lambda_{0}$, speed of light is c , Denoting Planck's constant by h , permittivity of free space by $\varepsilon_{0}$, charge and mass of an electron by -e and m .

| List- I |  | List-II |  |
| :---: | :---: | :---: | :---: |
| (P) | Maximum speed of a photoelectron immediately after emission is | (1) | $\frac{\mathrm{hc}}{\mathrm{e}}\left(\frac{1}{\lambda}-\frac{1}{\lambda_{0}}\right)$ |
| (Q) | Maximum speed of a photoelectron at a great distance from the bead is | (2) | $\sqrt{\frac{2 \mathrm{hc}}{\mathrm{m}}\left(\frac{1}{\lambda}-\frac{1}{\lambda_{0}}\right)+\frac{\mathrm{eV}_{0}}{\mathrm{~m}}}$ |
| (R) | Potential of the bead after prolonged irradiation is | (3) | $\frac{4 \pi \varepsilon_{0} \mathrm{r}}{\mathrm{e}}\left\{\frac{\mathrm{hc}}{\mathrm{e}}\left(\frac{1}{\lambda}-\frac{1}{\lambda_{0}}\right)+\mathrm{V}_{0}\right\}$ |
| (S) | Total number of photoelectrons emitted from the bead is | (4) | $\sqrt{\frac{2 \mathrm{hc}}{\mathrm{m}}\left(\frac{1}{\lambda}-\frac{1}{\lambda_{0}}\right)}$ |
|  |  | (5) | None of these |

(A) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 4$
(B) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \rightarrow 5 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 3$
(C) $\mathrm{P} \rightarrow 5 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 4$
(D) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 4 ; \mathrm{S} \rightarrow 1$
10. Two transparent media of refractive indices $\mu_{1}$ and $\mu_{3}$ have a solid lens shaped transparent material of refractive index $\mu_{2}$ between them as shown in figures in List-II. A ray traversing these media is also shown in the figures. In List-I different relationships between $\mu_{1}, \mu_{2}$ and $\mu_{3}$ are given. Match them to the ray diagrams shown in List-II.

| List-I |  | List-II |  |  |
| :---: | :---: | :---: | :---: | :---: |
| (P) | $\mu_{1}<\mu_{2}$ | (1) | $\mu_{3}$ | $\mu_{1}$ |
| (Q) | $\mu_{1}>\mu_{2}$ | (2) |  |  |
| (R) | $\mu_{2}=\mu_{3}$ | (3) |  |  |
| (S) | $\mu_{2}>\mu_{3}$ | (4) |  |  |
|  |  | (5) |  |  |

(A) $\mathrm{P} \rightarrow 1,4 ; \mathrm{Q} \rightarrow 2,3 ; \mathrm{R} \rightarrow 3,4 ; \mathrm{S} \rightarrow 1,5$
(B) $\mathrm{P} \rightarrow 1,4,5 ; \mathrm{Q} \rightarrow 1,3,5 ; \mathrm{R} \rightarrow 1,2 ; \mathrm{S} \rightarrow 1,5$
(C) $\mathrm{P} \rightarrow 1,3 ; \mathrm{Q} \rightarrow 2,4,5 ; \mathrm{R} \rightarrow 1,3,5 ; \mathrm{S} \rightarrow 2,4$
(D) $\mathrm{P} \rightarrow 1,3,5 ; \mathrm{Q} \rightarrow 2,4 ; \mathrm{R} \rightarrow 2,3 ; \mathrm{S} \rightarrow 4,5$
11. You are given many resistances, capacitors and inductors. These are connected to a variable DC voltage source (the first two circuits) or an AC voltage source of 50 Hz frequency (the next three circuits) in different ways as shown in List-II. When a current I (steady state for DC or rms for AC) flows through the circuit, the corresponding voltage $\mathrm{V}_{1}$ and $\mathrm{V}_{2}$ (indicated in circuits) are related as shown in List-I. Match the two list.
(P) $\mathrm{I} \neq 0, \mathrm{~V}_{1}$ is proportional to L (1)
(A) $\mathrm{P} \rightarrow 3,4,5 ; \mathrm{Q} \rightarrow 2,3,4,5 ; \mathrm{R} \longrightarrow 1,2 ; \mathrm{S} \rightarrow 2,3,4,5$
(B) $\mathrm{P} \rightarrow 1,3,5 ; \mathrm{Q} \rightarrow 2,3,4,5 ; \mathrm{R} \rightarrow 3,4 ; \mathrm{S} \rightarrow 2,5$
(C) $\mathrm{P} \rightarrow 3,4,5 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 3,5 ; \mathrm{S} \rightarrow 1,4$
(D) $\mathrm{P} \rightarrow 2,4 ; \mathrm{Q} \rightarrow 2,3 ; \mathrm{R} \rightarrow 1,4 ; \mathrm{S} \rightarrow 1,5$

## SECTION-II : (Maximum Marks: 24)

- This section contains SIX (06) questions.
- The answer to each question is a NON-NEGATIVE INTEGER
- For each question, enter the correct integer value of the answer in the place designated to enter the answer.
- For each question, marks will be awarded in one of the following categories :
$\begin{array}{llll}\text { Full Marks } & : & +4 \text { If only the correct answer is given. } \\ \text { Zero Marks } & : & 0 & \text { In all other cases. }\end{array}$

1. A $2 \mu \mathrm{~F}$ capacitor $\mathrm{C}_{1}$ is first charged to a potential difference of 10 V using a battery. Then the battery is removed and the capacitor is connected to an uncharged capacitor $\mathrm{C}_{2}$ of $8 \mu \mathrm{~F}$. The charge in $\mathrm{C}_{2}$ on equilibrium condition is $\qquad$ $\mu \mathrm{C}$. (Round off to the Nearest Integer)

2. A bullet of 10 g , moving with velocity v , collides head-on with the stationary bob of a pendulum and recoils with velocity $100 \mathrm{~m} / \mathrm{s}$. The length of the pendulum is 0.5 m and mass of the bob is 1 kg . The minimum value of $v=$ $\qquad$ $\mathrm{m} / \mathrm{s}$ so that the pendulum describes a circle. (Assume the string to be inextensible and $\mathrm{g}=10 \mathrm{~m} / \mathrm{s}^{2}$ )

3. An electric field $\vec{E}=4 x \hat{i}-\left(y^{2}+1\right) \hat{j} N / C$ passes through the box shown in figure. The flux of the electric field through surfaces ABCD and BCGF are marked as $\phi_{\mathrm{I}}$ and $\phi_{\text {II }}$ respectively. The magnitude of difference between $\left(\phi_{I}-\phi_{I I}\right)$ is (in $\left.\mathrm{Nm}^{2} / \mathrm{C}\right)$ $\qquad$ .

4. A signal of 0.1 kW is transmitted in a cable. The attenuation of cable is -5 dB per km and cable length is 20 km . The power received at receiver is $10^{-x} \mathrm{~W}$. The value of x is $\qquad$ .
[Gain in dB $=10 \log _{10}\left(\frac{\mathrm{P}_{0}}{\mathrm{P}_{\mathrm{i}}}\right)$ ]
5. A carpet of mass ' M ' made of inextensible material is rolled along its length in the form of a cylinder of radius ' R ' and is kept on a rough floor. The carpet starts unrolling without sliding on the floor when a negligibly small push is given to it. The horizontal velocity of the axis of the cylindrical part of the carpet when its radius reduces to $R / 2$ is $\sqrt{\frac{x \times 7 g R}{3}}$ then find $x$.

6. A particle is projected from point $A$, that is at a distance $4 R$ from the centre of the Earth, with speed $v_{1}$ in a direction making $30^{\circ}$ with the line joining the centre of the Earth and point A, as shown. Find the speed $v_{1}$ if particle passes grazing the surface of the earth. Consider gravitational interaction only between these two. (use $\frac{\mathrm{GM}}{\mathrm{R}}=6.4 \times 10^{7} \mathrm{~m}^{2} / \mathrm{s}^{2}$ ) Express your answer in the form $(500 \sqrt{2} \mathrm{X}) \mathrm{m} / \mathrm{s}$ and write the value of X .


## PART-2 : CHEMISTRY

## SECTION-I (i) : (Maximum Marks: 12)

- This section contains FOUR (04) 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

1. Identify the incorrect statement(s) among the following :
(i) Moist ammonia gas can be dried by using anhydrous $\mathrm{CaCl}_{2}$.
(ii) When metallic copper react with very dilute nitric acid, ammonium nitrite is one of the products.
(iii) Phosphine is a weaker base than ammonia because phosphorous atom is less electronegative than nitrogen.
(iv) $\mathrm{NaH}_{2} \mathrm{PO}_{2}$ is an acidic salt and it is named as sodium hypophosphate.
(A) (i) and (iii)
(B) (i) and (iv)
(C) (ii) and (iii)
(D) All of these
2. $\quad 2.5 \mathrm{~mL}$ of $\frac{2}{5} \mathrm{M}$ weak monoacidic base $\left(\mathrm{K}_{\mathrm{b}}=1 \times 10^{-12}\right.$ at $\left.25^{\circ} \mathrm{C}\right)$ is titrated with $\frac{2}{15} \mathrm{M} \mathrm{HCl}$ in water at $25^{\circ} \mathrm{C}$. The concentration of $\mathrm{H}^{+}$at equivalence point is
$\left(\mathrm{K}_{\mathrm{w}}=1 \times 10^{-14}\right.$ at $\left.25^{\circ} \mathrm{C}\right)$
(A) $3.7 \times 10^{-13} \mathrm{M}$
(B) $3.2 \times 10^{-7} \mathrm{M}$
(C) $3.2 \times 10^{-2} \mathrm{M}$
(D) $2.7 \times 10^{-2} \mathrm{M}$
3. Sodium phenoxide when heated with $\mathrm{CO}_{2}$ under pressure at $125^{\circ} \mathrm{C}$ yields a product which on acetylation produces C.


The major product C would be :
(A)

(B)

(C)

(D)

4. Nitric acid is prepared by ostwald method using given Steps :-

$$
\begin{aligned}
& \mathrm{NH}_{3}+\mathrm{O}_{2} \xrightarrow{\text { catalyst }}(\mathrm{X})+\mathrm{H}_{2} \mathrm{O} \\
& (\mathrm{X})+\mathrm{O}_{2} \rightarrow(\mathrm{Y}) \\
& (\mathrm{Y})+\mathrm{H}_{2} \mathrm{O} \rightarrow \mathrm{HNO}_{3}+(\mathrm{X})
\end{aligned}
$$

$(\mathrm{X})$ and $(\mathrm{Y})$ are respectively
(A) $\mathrm{NO}_{2}$ and NO
(B) NO and $\mathrm{N}_{2} \mathrm{O}$
(C) $\mathrm{N}_{2} \mathrm{O}$ and $\mathrm{NO}_{2}$
(D) NO and $\mathrm{NO}_{2}$

## SECTION-I (ii) : (Maximum Marks: 12)

- This section contains THREE (03) questions.
- Each question has FOUR options. ONE OR MORE THAN ONE of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all ) the 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 Marks : $0 \quad$ If none of the options is chosen (i.e. the question is unanswered).
Negative Marks : -2 In all other cases.

- For Example : If first, third and fourth are the ONLY three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in -2 marks.

5. The number of correct statements among the following is
(A) $\mathrm{NF}_{3}<\mathrm{NH}_{3}<\mathrm{CH}_{4}<\mathrm{CO}_{2}$ (bond angle)
(B) $\mathrm{S}-\mathrm{H}---\mathrm{O}<\mathrm{O}-\mathrm{H}---\mathrm{S}<\mathrm{F}-\mathrm{H}---\mathrm{O}<\mathrm{F}-\mathrm{H}---\mathrm{F}^{-}$(Strength of H -bond)
(C) $\mathrm{Be}_{2} \mathrm{H}_{4}=\mathrm{C}_{2} \mathrm{H}_{4}<\mathrm{B}_{2} \mathrm{H}_{6}$ (max number of H atoms in plane)
(D) $\mathrm{O}_{2}<\mathrm{O}_{2}^{-}<\mathrm{O}_{2}^{-2}$ (unpaired electron)
6. 



G \& reagent can be :
(A) $-\mathrm{CN} ; \mathrm{SnCl}_{2}+\mathrm{HCl}$ (aq.)
(B) $-\underset{\mathrm{O}}{\mathrm{C}-\mathrm{Cl}} \underset{\sim}{\mathrm{H}} \underset{2}{ }\left(\mathrm{Pd} / \mathrm{BaSO}_{4}\right)$
(C) $-\underset{\mathrm{O}}{\substack{\mathrm{C}-\mathrm{OEt}}} \mathfrak{\mathrm { O }} \mathrm{DBALH}\left(-78^{\circ} \mathrm{C}\right)$
(D) $-\mathrm{CH}=\mathrm{CH}_{2} ; \mathrm{O}_{3} / \mathrm{Zn} / \mathrm{H}_{2} \mathrm{O}$
7. Which of the following is/are reducing sugar/s ?
(A)

(B)

(C)

(D)


## SECTION-I (iii) : (Maximum Marks: 12)

- This section contains FOUR (04) Matching List Sets.
- Each set has ONE Multiple Choice Question.
- Each set has TWO lists : List-I and List-II.
- List-I has Four entries (P), (Q), (R) and (S) and List-II has Five entries (1), (2), (3), (4) and (5).
- FOUR options are given in each Multiple Choice Question based on List-I and List-II and ONLY ONE of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks $\quad:+3$ ONLY if the option corresponding to the correct combination 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.
8. Match the reactions (in the given stoichiometry of the reactants) in List-I with one of their products given in List-II and choose the correct option.

| List-I |  | List-II |  |
| :--- | :--- | :--- | :--- |
| (P) | $\mathrm{P}_{2} \mathrm{O}_{3}+3 \mathrm{H}_{2} \mathrm{O} \rightarrow$ | $(1)$ | $\mathrm{P}(\mathrm{O})\left(\mathrm{OCH}_{3}\right) \mathrm{Cl}_{2}$ |
| (Q) | $\mathrm{P}_{4}+3 \mathrm{NaOH}+3 \mathrm{H}_{2} \mathrm{O} \rightarrow$ | (2) | $\mathrm{H}_{3} \mathrm{PO}_{3}$ |
| (R) | $\mathrm{PCl}_{5}+\mathrm{CH}_{3} \mathrm{COOH} \rightarrow$ | (3) | $\mathrm{PH}_{3}$ |
| (S) | $\mathrm{H}_{3} \mathrm{PO}_{2}+2 \mathrm{H}_{2} \mathrm{O}+4 \mathrm{AgNO}_{3} \rightarrow$ | (4) | $\mathrm{POCl}_{3}$ |
|  |  | (5) | $\mathrm{H}_{3} \mathrm{PO}_{4}$ |

(A) $\mathrm{P} \rightarrow 2 ; \mathrm{Q} \rightarrow 3 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 5$
(B) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 5 ; \mathrm{R} \rightarrow 4 ; \mathrm{S} \rightarrow 2$
(C) $\mathrm{P} \rightarrow 5 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 3$
(D) $\mathrm{P} \rightarrow 2 ; \mathrm{Q} \rightarrow 3 ; \mathrm{R} \rightarrow 4 ; \mathrm{S} \rightarrow 5$
9. Match the List :

| List-I |  | List-II |  |
| :--- | :--- | :--- | :--- |
| (P) | Tetragonal and Hexagonal | (1) | are two crystal systems |
| (Q) | Cubic and Rhombohedral | (2) | $\mathrm{a}=\mathrm{b} \neq \mathrm{c}$ |
| (R) | Monoclinic and Triclinic | (3) | $\mathrm{a} \neq \mathrm{b} \neq \mathrm{c}$ |
| (S) | Cubic and Hexagonal | (4) | $\mathrm{a}=\mathrm{b}=\mathrm{c}$ |
|  |  | (5) | $\alpha=\beta=90^{\circ}$ |

(A) $\mathrm{P} \rightarrow 1,2 ; \mathrm{Q} \rightarrow 1,2,5 ; \mathrm{R} \rightarrow 1,4 ; \mathrm{S} \rightarrow 1,5$
(B) $\mathrm{P} \rightarrow 1,5 ; \mathrm{Q} \rightarrow 1,3 ; \mathrm{R} \rightarrow 1,4 ; \mathrm{S} \rightarrow 2,5$
(C) $\mathrm{P} \rightarrow 1,3,5 ; \mathrm{Q} \rightarrow 1,2 ; \mathrm{R} \rightarrow 1,3 ; \mathrm{S} \rightarrow 1,2,5$
(D) $\mathrm{P} \rightarrow 1,2,5 ; \mathrm{Q} \rightarrow 1,4 ; \mathrm{R} \rightarrow 1,3 ; \mathrm{S} \rightarrow 1,5$
10. $t_{x / y}=$ time in which $x / y$ fraction of reactant converts into product :

| List-I |  | List-II |  |
| :--- | :--- | :--- | :--- |
| (P) | $\mathrm{t}_{5 / 9}$ | (1) | Equal to 54 sec. if $\mathrm{t}_{1 / 3}$ is 18 sec. in case of first order reaction. |
| (Q) | $\mathrm{t}_{19 / 27}$ | (2) | Equal to 32 sec. if $\mathrm{t}_{1 / 4}$ is 16 sec . in case of first order reaction. |
| (R) | $\mathrm{t}_{7 / 8}$ | (3) | Equal to 56 sec. if $\mathrm{t}_{1 / 3}$ is 4 sec. in case of second order reaction. |
| (S) | $\mathrm{t}_{7 / 16}$ | (4) | Equal to 30 sec. if $\mathrm{t}_{1 / 3}$ is 18 sec. in case of zero order reaction. |
|  |  | (5) | Equal to 28 sec. if $\mathrm{t}_{1 / 2}$ is 16 sec. in case of zero order reaction. |

(A) $\mathrm{P} \rightarrow 1 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 4,5$
(B) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \rightarrow 1 ; \mathrm{R} \rightarrow 3,5 ; \mathrm{S} \rightarrow 2$
(C) $\mathrm{P} \rightarrow 2 ; \mathrm{Q} \rightarrow 3 ; \mathrm{R} \rightarrow 1,3 ; \mathrm{S} \rightarrow 5$
(D) $\mathrm{P} \rightarrow 1,3 ; \mathrm{Q} \rightarrow 2,4 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 5$
11. The desired product X can be prepared by reacting the major product of the reactions in

List-I with one or more appropriate reagents in List-II.
(given, order of migratory aptitude: aryl > alkyl > hydrogen)


| List-I |  | List-II |  |
| :---: | :---: | :---: | :---: |
| (P) |  | (1) | $\mathrm{l}_{2}, \mathrm{NaOH}$ |
| (Q) |  | (2) | $\left[\mathrm{Ag}\left(\mathrm{NH}_{3}\right)_{2}\right] \mathrm{OH}$ |
| (R) |  | (3) | Fehling solution |
| (S) |  $+\mathrm{AgNO}_{3}$ | (4) | HCHO, NaOH |
|  |  | (5) | NaOBr |

The correct option is
(A) $\mathrm{P} \rightarrow 1 ; \mathrm{Q} \longrightarrow 2,3 ; \mathrm{R} \rightarrow 1,4 ; \mathrm{S} \rightarrow 2,4$
(B) $\mathrm{P} \rightarrow 1,5 ; \mathrm{Q} \rightarrow 3,4 ; \mathrm{R} \rightarrow 4,5 ; \mathrm{S} \rightarrow 3$
(C) $\mathrm{P} \rightarrow 1,5 ; \mathrm{Q} \rightarrow 1,5 ; \mathrm{R} \rightarrow 1,5 ; \mathrm{S} \rightarrow 1,5$
(D) $\mathrm{P} \rightarrow 1,5 ; \mathrm{Q} \rightarrow 2,3 ; \mathrm{R} \rightarrow 1,5 ; \mathrm{S} \rightarrow 2,3$

## SECTION-II : (Maximum Marks: 24)

- This section contains SIX (06) questions.
- The answer to each question is a NON-NEGATIVE INTEGER
- For each question, enter the correct integer value of the answer in the place designated to enter the answer.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +4 If only the correct answer is given.
Zero Marks : $0 \quad$ In all other cases.

1. How many of the following have $\mathrm{d}^{2} \mathrm{sp}^{3}$ hybridization?
$\left[\mathrm{Ni}\left(\mathrm{NH}_{3}\right)_{6}\right]^{2+},\left[\mathrm{Co}\left(\mathrm{NH}_{3}\right)_{6}\right]^{3+},\left[\mathrm{Fe}(\mathrm{CN})_{6}\right]^{4-}$,
$\left[\mathrm{Cr}\left(\mathrm{NH}_{3}\right)_{6}\right]^{3+},\left[\mathrm{Co}(\mathrm{en})_{3}\right]^{3+},\left[\mathrm{CoF}_{6}\right]^{3-},\left[\mathrm{Co}\left(\mathrm{H}_{2} \mathrm{O}\right)_{6}\right]^{2+}$
2. $\underset{\substack{\text { Orange } \\ \text { solid }}}{\mathrm{K}_{2} \mathrm{Cr}_{2} \mathrm{O}_{7}} \xrightarrow{\Delta} \underset{\substack{\text { Yellow } \\ \text { compound }}}{\text { ' } \mathrm{X}^{\prime}}+\underset{\substack{\text { Green } \\ \text { compound }}}{\text { ' } \mathrm{Y}^{\prime}}+\mathrm{O}_{2} \uparrow$

In the given reaction how many statement is CORRECT?
(A) ' Y ' is $\mathrm{CrO}_{3}$
(B) Aqueous solution of ' X ' with conc. $\mathrm{H}_{2} \mathrm{SO}_{4}$ is converted into orange solution
(C) When aqueous solution of ' X ' is treated with $\mathrm{H}_{2} \mathrm{O}_{2}$ in acidic medium blue colour compound is obtained
(D) ' Y ' is formed on thermal decomposition of $\left(\mathrm{NH}_{4}\right)_{2} \mathrm{Cr}_{2} \mathrm{O}_{7}$
3. Consider the following reversible reaction,

$$
\mathrm{A}(\mathrm{~g})+\mathrm{B}(\mathrm{~g}) \rightleftharpoons \mathrm{AB}(\mathrm{~g})
$$

The activation energy of the backward reaction exceeds that of the forward reaction by 2 RT ( $\mathrm{in} \mathrm{J} \mathrm{mol}^{-1}$ ). If the pre-exponential factor of the forward reaction is 4 times that of the reverse reaction, the absolute value of $\Delta \mathrm{G}^{\theta}$ (in J mol ${ }^{-1}$ ) for the reaction at 300 K is $\qquad$
(Given : $\ln (2)=0.7, \mathrm{RT}=2500 \mathrm{~J} \mathrm{~mol}^{-1}$ at 300 K and G is the Gibbs energy)
4. Estimate the cell potential (in milli volt) of a Daniel cell having $1 \mathrm{M}_{\mathrm{Zn}}{ }^{++}$and originally having 1 M $\mathrm{Cu}^{++}$after sufficient $\mathrm{NH}_{3}$ has been added to the cathode compartment to make $\mathrm{NH}_{3}$ concentration 2 M . $\mathrm{K}_{\mathrm{f}}$ for $\left[\mathrm{Cu}\left(\mathrm{NH}_{3}\right)_{4}\right]^{2+}=1 \times 10^{12}, \mathrm{E}^{\circ}$ for the reaction, $\mathrm{Zn}+\mathrm{Cu}^{2+} \rightarrow \mathrm{Zn}^{2+}+\mathrm{Cu}$ is 1.1 V .
[Given : $\log 2=0.3, \frac{2.303 \mathrm{RT}}{\mathrm{F}}=0.06$ ]
5. How many of the following will not give iodoform test :
(a) $\sim_{\mathrm{OH}}$
(b)

(c)

(d) $\mathrm{PhCOCH}_{3}$ (e)


(g) $\mathrm{CI}_{3}-\mathrm{CHO}$
(h) PhCOPh
6. In how many reactions primary amine will be one of the products?
(i)

(ii)

(iii)

(iv)

(v)

(vi)


(vii) $\mathrm{CH}_{3}-\mathrm{CH}_{2}-\mathrm{COOH} \xrightarrow[\mathrm{H}_{2} \mathrm{SO}_{4}]{\mathrm{HN}_{3}}$
(viii) $\mathrm{CH}_{3}-\mathrm{CH}_{2}-\mathrm{NC} \xrightarrow{\mathrm{H}_{3} \mathrm{O}^{\oplus}}$
(ix) $\mathrm{Ph}-\mathrm{CH}_{2} \mathrm{NC} \xrightarrow{\mathrm{LiAlH}_{4}}$
(x) $\mathrm{Ph}-\mathrm{CH}=\mathrm{NH} \xrightarrow{\mathrm{NaBH}_{4}}$

## PART-3 : MATHEMATICS

## SECTION-I (i) : (Maximum Marks: 12)

- This section contains FOUR (04) 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

1. If $\sum_{i=1}^{10}\left(x_{i}-5\right)=5$ and $\sum_{i=1}^{10}\left(x_{i}-5\right)^{2}=125$, variance of $x_{1}, x_{2}, \ldots \ldots x_{10}$ will be -
(A) $\frac{9}{4}$
(B) $\frac{25}{4}$
(C) $\frac{49}{4}$
(D) $\frac{81}{4}$
2. Let $A$ and $B$ be two non-empty subsets of set $X$ such that $A$ is not a subset of $B$, then -
$(\mathrm{A}) \mathrm{A} \subseteq \mathrm{B}^{\prime}$
(B) $\mathrm{B} \subseteq \mathrm{A}^{\prime}$
(C) A and B are disjoint
(D) A and $\mathrm{B}^{\prime}$ are non disjoint
3. Let ' $R$ ' be a relation over the set of natural numbers defined by $(p, q) R(r, s) \Rightarrow p s-q r=0$. Then ' $R$ ' is-
(A) Reflexive only
(B) Symmetric only
(C) Transitive only
(D) Equivalence
4. Let $B$ be a square matrix such that $|B|=1$ and $2 A+B=B^{T}-A^{T}$, then $|A+B|$ is -
(A) 0
(B) -1
(C) 1
(D) 2

## SECTION-I (ii) : (Maximum Marks: 12)

- This section contains THREE (03) questions.
- Each question has FOUR options. ONE OR MORE THAN ONE of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all ) the 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 Marks : $0 \quad$ If none of the options is chosen (i.e. the question is unanswered).
Negative Marks : -2 In all other cases.

- For Example : If first, third and fourth are the ONLY three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in -2 marks.

5. If n is a positive integer and $(5+2 \sqrt{6})^{2 \mathrm{n}+1}=\mathrm{I}+\mathrm{f}$, where I is an integer and $0 \leq f<1$, then which of the following is/are true.
(A) I is an odd integer
(B) $\mathrm{I}+1$ is divisible by 9
(C) the integer next above $(5+2 \sqrt{6})^{2 n+1}$ is divisible by 10
(D) $\mathrm{I}-1=\frac{\mathrm{f}}{1-\mathrm{f}}$
6. If $A$ and $B$ are orthogonal matrices, then which of the following is/are also orthogonal matrix -
(A) $\mathrm{A}^{2}$
(B) AB
(C) $A^{2} B^{2}$
(D) $A^{T} B$
7. If extremities of latus rectum of a hyperbola are (3, 5), (3, -1), ( $-1,5$ ), ( $-1,-1$ ) and its transverse axis is parallel to x -axis, then -
(A) its eccentricity is 2
(B) its eccentricity is greater than 2
(C) one of its directrix is $x=\frac{1}{2}$
(D) one of its directrix is $x=\frac{3}{2}$

## SECTION-I (iii) : (Maximum Marks: 12)

- This section contains FOUR (04) Matching List Sets.
- Each set has ONE Multiple Choice Question.
- Each set has TWO lists : List-I and List-II.
- List-I has Four entries (P), (Q), (R) and (S) and List-II has Five entries (1), (2), (3), (4) and (5).
- FOUR options are given in each Multiple Choice Question based on List-I and List-II and ONLY ONE of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks $\quad:+3$ ONLY if the option corresponding to the correct combination 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.
8. India and Australia play a series of ' $n$ ' one day matches and probability that India wins a match against Australia is $\frac{1}{2}$.

| List-I |  | List-II |  |
| :--- | :--- | :--- | :---: |
| (P) | If ' $n$ ' is not fixed and series ends when any one of the team completes its $4^{\text {th }}$ win <br> then probability that India wins the series is | (1) | $\frac{4}{2^{7}}$ |
| (Q) | If $\mathrm{n}=7$ then probability that India wins atleast three consecutive matches is | (2) | $\frac{47}{2^{7}}$ |
| (R) | For $\mathrm{n}=7$; probability that India wins series through consecutive wins is | (3) | $\frac{1}{2}$ |
| (S) | For $\mathrm{n}=7$; probability that India doesn't win two consecutive matches is | (4) | $\frac{17}{2^{6}}$ |
|  |  | (5) | $\frac{15}{2^{6}}$ |

(A) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 3$
(B) $\mathrm{P} \rightarrow 1 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 4$
(C) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \rightarrow 3 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 2$
(D) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 4$
9. Match the statement in List-I with given value in List-II

| List-I |  | List-II |  |
| :--- | :--- | :---: | :---: |
| (P) | Number of five digit numbers of the form $\mathrm{d}_{1} \mathrm{~d}_{2} \mathrm{~d}_{3} \mathrm{~d}_{4} \mathrm{~d}_{5}$ where $\mathrm{d}_{\mathrm{i}^{\prime} \text { i }} \mathrm{i}=1,2,3,4,5$ <br> are digits and satisfying $\mathrm{d}_{1}<\mathrm{d}_{2} \leqslant \mathrm{~d}_{3}<\mathrm{d}_{4} \leqslant \mathrm{~d}_{5}$, is | (1) | ${ }^{10} \mathrm{C}_{5}$ |
| (Q) | Number of five digit numbers of the form $\mathrm{d}_{1} \mathrm{~d}_{2} \mathrm{~d}_{3} \mathrm{~d}_{4} \mathrm{~d}_{5}$ where $\mathrm{d}_{\mathrm{i} \text { ' }} \mathrm{i}=1,2,3,4,5$ <br> are digits satisfying $\mathrm{d}_{1}>\mathrm{d}_{2} \geqslant \mathrm{~d}_{3}>\mathrm{d}_{4}>\mathrm{d}_{5}$ is | (2) | ${ }^{11} \mathrm{C}_{4}$ |
| (R) | Pankaj and Prateek play a unique game series in a chess tournament. They <br> decide to play on till one of them wins 5 matches. If each match end only in win <br> or loss. Number of ways in which series can be won by either of them, is | $(3)$ | ${ }^{11} \mathrm{C}_{6}$ |
| (S) | A badminton team has to be selected comprising of 5 students out of 10 students <br> for inter school tournament. Number of ways this can be done if a particular <br> players is to be always included or always excluded from the team, is | (4) | $2 .{ }^{9} \mathrm{C}_{5}$ |
|  |  | (5) | $5 .{ }^{9} \mathrm{C}_{5}$ |

(A) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \longrightarrow 3 ; \mathrm{R} \rightarrow 1,3 ; \mathrm{S} \rightarrow 1$
(B) $\mathrm{P} \rightarrow 1,3 ; \mathrm{Q} \rightarrow 3,4 ; \mathrm{R} \rightarrow 2,3 ; \mathrm{S} \rightarrow 1$
(C) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 1,3 ; \mathrm{R} \rightarrow 2 ; \mathrm{S} \rightarrow 4$
(D) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 3 ; \mathrm{R} \rightarrow 1,4 ; \mathrm{S} \rightarrow 1,4$
10. Match List-I with List-II and select the correct answer using the code given below the list.

| List-I |  | List-II |  |
| :--- | :--- | :---: | :---: |
| (P) | If $\alpha+i \beta, \alpha, \beta \in R, \beta \neq 0$ is a root of $z^{5}=1$, <br> then value of $\frac{\left(\beta^{4}-\alpha^{4}\right)}{1-2 \alpha^{2}}$ is | $(1)$ | 0 |
| (Q) | If $\bar{z}=1$, then value of $\left\|2+\frac{1}{z}\right\|^{2}+\|2-z\|^{2}$ | $(2)$ | 1 |
| (R) | If $\omega=\cos \left(\frac{2 \pi}{7}\right)+\mathrm{i} \sin \frac{2 \pi}{7}$ and $\alpha=\omega+\omega^{2}+\omega^{4}$, <br> $\beta=\omega^{3}+\omega^{5}+\omega^{6}$, then value of $2 \alpha \beta$ is | $(3)$ | 4 |
| (S) | If $z_{1}, z_{2}, z_{3}, z_{4}$ represent vertices of a parallelogram <br> (in order), then $z_{1}-z_{2}+z_{3}-z_{4}$ is | (4) | 10 |
|  |  | (5) | 6 |

(A) $\mathrm{P} \rightarrow 2 ; \mathrm{Q} \rightarrow 4 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 1$
(B) $\mathrm{P} \rightarrow 2 ; \mathrm{Q} \rightarrow 4 ; \mathrm{R} \rightarrow 1 ; \mathrm{S} \rightarrow 3$
(C) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 1$
(D) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 1 ; \mathrm{R} \rightarrow 2 ; \mathrm{S} \rightarrow 4$
11. Match List-I with List-II and select the correct answer using the code given below the list.

| List-I |  | List-II |  |
| :---: | :---: | :---: | :---: |
| (P) | Let $(\vec{a} \times \vec{b}) \times \vec{c}=-5 \vec{a}+4 \vec{b}$ and $\vec{a} \cdot \vec{b}=3$ and $\vec{a} \times(\vec{b} \times \vec{c})=\lambda \vec{b}+\mu \vec{c}$, then $\|\lambda\|+\|\mu\|$ is (Where $\overrightarrow{\mathrm{a}}, \overrightarrow{\mathrm{b}}, \overrightarrow{\mathrm{c}}$ are pairwise non-collinear) | (1) | 2 |
| (Q) | If the line $y-\sqrt{3} x+3=0$ cuts the parabola $y^{2}=x+2$ at $A$ and $B$, given that $\|(\mathrm{PA})(\mathrm{PB})\|=\frac{\lambda_{1}(2+\sqrt{3})}{\lambda_{2}} \text {, then } \frac{\lambda_{1}^{2}+\lambda_{2}^{2}}{5} \text { is }$ <br> (where P is $(\sqrt{3}, 0)$ and $\lambda_{1}, \lambda_{2}$ are relatively prime) | (2) |  |
| (R) | The line $\frac{x-4}{1}=\frac{y-2}{1}=\frac{z-k}{2}$ lies on the plane $2 \mathrm{x}-4 \mathrm{y}+\mathrm{z}=9$, then k is | (3) | 9 |
| (S) | Value of $\int_{-\pi / 4}^{\pi / 4} \frac{x^{9}-3 x^{7}+x^{5}+1}{\cos ^{2} x} d x$ is equal to | (4) | 5 |
|  |  | (5) | 4 |

(A) $\mathrm{P} \rightarrow 1 ; \mathrm{Q} \rightarrow 2 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 4$
(B) $\mathrm{P} \rightarrow 2 ; \mathrm{Q} \rightarrow 4 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 1$
(C) $\mathrm{P} \rightarrow 4 ; \mathrm{Q} \rightarrow 1 ; \mathrm{R} \rightarrow 3 ; \mathrm{S} \rightarrow 2$
(D) $\mathrm{P} \rightarrow 3 ; \mathrm{Q} \rightarrow 4 ; \mathrm{R} \rightarrow 2 ; \mathrm{S} \rightarrow 1$

## SECTION-II : (Maximum Marks: 24)

- This section contains SIX (06) questions.
- The answer to each question is a NON-NEGATIVE INTEGER
- For each question, enter the correct integer value of the answer in the place designated to enter the answer.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +4 If only the correct answer is given.
Zero Marks : 0 In all other cases.

1. Number of ways in which 3 boys and 3 girls can be seated on a line where two particular girls do not want to sit adjacent to a particular boy is equal to -
2. A single die is rolled; then ' $n$ ' coins are tossed, where n is the number shown on the die. If the probability of exactly four tails is $k$, then value of 384 k is
3. The slope of tangent to the curve $y=x e^{x^{2}}$ at the point of inflection is
4. Let $f(\mathrm{x})=\mathrm{px}^{3}+\mathrm{qx}^{2}+\mathrm{rx}$ have local maximum and minimum at $\mathrm{x}=5$ and $\mathrm{x}=1$ respectively. If $\int_{-1}^{1} f(x) d x=6$, then value of $|p+q+r|$ is
5. If the solution of the differential equation $y^{2}+\frac{y}{1+x^{2}}+y^{\prime} \tan ^{-1} x+2 x y y^{\prime}=y^{\prime}\left(\right.$ where $\left.y^{\prime}=\frac{d y}{d x}\right)$ is given by $\mathrm{y}\left(\mathrm{xy}-\mathrm{k}+\tan ^{-1} \mathrm{x}\right)=\mathrm{c}$ (where c is constant of integration) then, k is equal to
6. Let $\alpha, \beta, \gamma$ and $\delta$ be the roots (real or non real) of equations $x^{4}-3 x+1=0$. The value of $\alpha^{3}+\beta^{3}+\gamma^{3}+\delta^{3}$ is
