

Advanced Practice Test-1

TIME : 3 hrs	M.M. : 228
--------------	------------

Read the following Instructions very carefully before you proceed.

- The question paper consists of 3 parts (Part I : Chemistry, Part II : Physics, Part III : Mathematics). Each Part has 3 sections (Section I, Section II & Section III).
- Section I** contains 2 types of questions [**Type 1, Type 2 & Type 3**]
Type 1 contains **4 Single Correct Answer Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.
 ➤ *Marking scheme [3 Marks for Correct answer & **-1 NEGATIVE MARKING** for wrong answer]*
Type 2 contains **3 Multiple Correct Answer Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE CHOICES** may be correct.
 ➤ *Marking scheme [5 Marks for All Correct answers & **-2 NEGATIVE MARKING** for wrong answer]*
Type 3 contains **ONE** paragraph. Based on this paragraph, there are **THREE** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
 ➤ *Marking scheme [3 Marks for Correct answer & **-1 NEGATIVE MARKING** for wrong answer]*
- Section II** contains **6 Single Integer Value Type Questions**. The answer to each of the questions is a single-digit integer, ranging from 0 to 9 (both inclusive).
 ➤ *Marking scheme [4 Marks for Correct answer & **NO NEGATIVE MARKING** for wrong answer]*
- Section III** contains **2 Match the columns type questions**. Each question contains statements given in 2 columns. Statements in the first column have to be matched with statements in the second column. The answers to these questions have to be appropriately bubbled in the answer sheet.
 ➤ *Marking scheme [8 Marks if you darken ALL the bubbles corresponding ONLY to the correct answer or given 2 Marks each for correct bubbling of answer in any row. **No Negative mark will be given for an incorrectly bubbled answer]***
- 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.

SECTION-I/TYPE-1

SINGLE CORRECT ANSWER

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

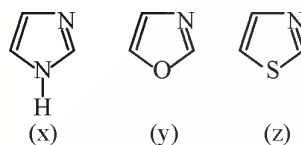
1. Arrange the following compounds in decreasing order of their boiling points.

(A) $(x) > (y) > (z)$

(B) $(x) > (z) > (y)$

(C) $(z) > (y) > (x)$

(D) $(z) > (x) > (y)$



2. Which isomer of C_4H_8 has the lowest absolute entropy at $25^\circ C$?

(A) 1-butene (B) cis-2-butene (C) trans-2-butene (D) cyclobutane

3. It is well known that the structure of ethylene ($CH_2 = CH_2$) is planar. Hence, what would be the structure of allene ($CH_2 = C = CH_2$) and cumulene ($CH_2 = C = C = CH_2$) ?

(A) Both will be planar (B) Both will be staggered

(C) Allene will be planar and cumulene will be staggered

(D) Allene will be staggered and cumulene will be planar

4. Which of the following plots represents the behaviour of an ideal binary liquid solution?

(A) Plot of p_{total} versus y_A (mole fraction of A in vapour phase) is linear

(B) Plot of p_{total} versus y_B is linear (C) Plot of $1/p_{total}$ versus y_A is linear

(D) Plot of $1/p_{total}$ versus y_B is non-linear

SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 3 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

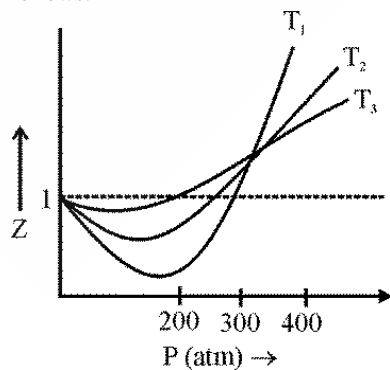
5. Which of the following is(are) Lewis acid?

(A) H_3BO_3 (B) BF_3 (C) B_2H_6 (D) $AlCl_3$

6. An aqueous solution of a solute which neither associates nor dissociates has a freezing point depression of $X^\circ C$. An equimolar solution of a second salt has a freezing point depression of $4X^\circ C$. The second solution could be a salt of formula (assuming 100% dissociation)

(A) A_3B (B) AB_3 (C) AB_2 (D) A_2B_2

7. The variation of compressibility factor Z for a real gas with pressure at different temperatures T_1 , T_2 and T_3 is given as follows:



Which of the following statement is(are) wrong?

- (A) $T_1 = 250 \text{ K}$, $T_2 = 600 \text{ K}$ and $T_3 = 1100 \text{ K}$
 (B) $T_1 = 1100 \text{ K}$, $T_2 = 600 \text{ K}$ and $T_3 = 250 \text{ K}$
 (C) At low pressure and high temperature, gas behaves ideally
 (D) At low pressure, an ideal gas becomes real gas

SECTION-I/TYPE-3
LINK COMPREHENSION TYPE

This section contains 3 multiple choice questions relating to one paragraph. Each question has four choices A, B, C and D out of which ONLY ONE choice is correct.

Paragraphs for Questions 8 - 10

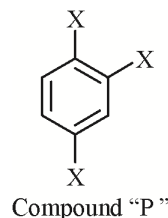
Ice that burns? Yes, there is such a thing. It is called methane hydrate, and there is enough of it to meet India's energy needs for years. Bacteria in the sediments on the ocean floor consume organic material and generate methane gas. Under high pressure and low temperature conditions, methane forms methane hydrate, which consists of single molecule of the natural gas trapped within crystalline cages formed by frozen water molecules. A lump of methane hydrate looks like a gray ice cube, but if one puts a lighted match to it. It will burn. The main characteristics of structure of crystal of methane hydrate is dodecahedra formed from 20 water molecules. The unit cell of the crystal can be thought as a body centered cubic arrangement built from these dodecahedra which are almost spherical objects. The dodecahedra are connected via additional water molecules located on the faces of the unit cell. Two water molecules can be found on each face of the unit cell. The unit cell has an edge dimension of 1.182 nm. There are two types of cavities in this structure. One is the internal space in the dodecahedra(A). These are some what smaller than the other type of voids(B), of which there are 6 for each unit cell.

8. How many water molecules are there in a unit cell?
 (A) 46 (B) 40 (C) 12 (D) 52
9. How many type A cavities can be found in a unit cell?
 (A) 4 (B) 2 (C) 1 (D) 4
10. If all cavities contain a guest molecule, what is the ratio of the number of water to the number of guest molecules?
 (A) 5.75 (B) 5.00 (C) 1.50 (D) 6.50

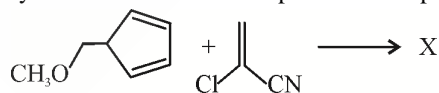
SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 6 Single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. Compound (P) is a 1, 2, 4-trisubstituted benzene, where there are substituents present at the positions labelled with an X. How many possible structures are there of this 1, 2, 4-trisubstituted benzene when all of the X-substituents are different from each other.



2. How many chiral carbon atoms are present in the product 'X' of the following Diels-Alder reaction?



3. A sample of moon rock is found to contain 25% K^{40} and 75% Ar^{40} by mass. If age of the rock in years is $x \times 10^y$ years then find the numerical value of x. ($t_{1/2}$ of $K^{40} = 2 \times 10^9$ year)

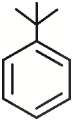
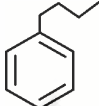
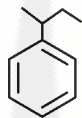

4. The resistance of N/10 solution is $2.5 \times 10^3 \Omega$ and equivalent conductance is $x \times 10^y \Omega^{-1} \text{cm}^2 \text{eq}^{-1}$, when measured in a cell having a cell constant of 1.25 cm^{-1} . What is numerical value of x?
5. How many of the following are intensive properties?
Chemical potential, Specific gravity, Viscosity, specific heat capacity, Hardness, Melting point, Pressure, Concentration.
6. Assuming 2s-2p mixing is NOT operative, how many electrons are present in highest energy occupied molecular orbitals of carbide ion (C_2^{2-}) ?

SECTION - III

MATRIX MATCH TYPE

This section contains 2 questions. Each question contains statements given in two columns which have to be matched. Statements in Column I are labelled as (A), (B), (C) & (D) whereas statements in Column II are labeled as p, q, r, s & t. The answers to these questions have to be appropriately bubbled. More than one choice from Column II can be matched with Column I.

1. Match the organic compounds (Column-I) with reaction characteristic shown by them (Column-II).

Column I		Column II	
(A)		(p)	Compound that is readily oxidized by hot aqueous KMnO_4 and on free-radical chlorination yields only one monochlorosubstituted derivative.
(B)		(q)	Compound that is not readily oxidized by hot aqueous KMnO_4 and on free radical chlorination yields only one monochlorosubstituted derivative.
(C)		(r)	Optically active compound that is readily oxidized by hot aqueous KMnO_4 and on free radical chlorination yield four isomeric monochlorosubstituted derivatives.
(D)		(s)	Optically inactive compound that is readily oxidized by hot aqueous KMnO_4 and on free radical chlorination yields four monochlorosubstituted derivatives.
		(t)	Compound on electrophilic chlorination by using $\text{Cl}_2/\text{AlCl}_3$ yields three monochloro substituted derivatives.

2. MATCH THE COLUMNS:

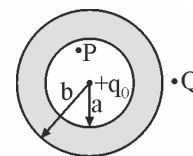
Column I		Column II	
(A)	Carbondioxide (CO_2)	(p)	Resonance
(B)	Ozone (O_3)	(q)	$\mu_{\text{resul tan t}} \neq 0$
(C)	Boron trifluoride (BF_3)	(r)	One of the contributor has positive formal charge on more electronegative atom
(D)	Carbon monoxide (CO)	(s)	$\text{P}\pi - \text{P}\pi$ bond
		(t)	One of the contributor has double bond

SECTION-I/TYPE-1

SINGLE CORRECT ANSWER

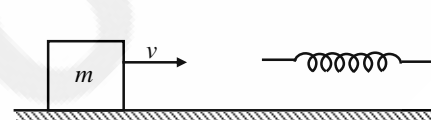
This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. A conducting spherical shell of inner radius a and outer radius b is having charge q_0 at the centre. There are two points P and Q at the locations as shown in figure. If the charge q_0 is shifted to point P then chose the correct statement(s).



- (A) Distribution of induced charge will change on inner surface, the distribution of charge on outer surface will not change but the electric field at point Q will change
- (B) Distribution of induced charge will change on the inner surface, the distribution of charge on outer surface as well as electric field at point Q will not change
- (C) Distribution of charge on inner and outer surfaces as well as electric field at point Q will change
- (D) Distribution of charge on inner and outer surfaces both will change and electric field at point Q remains unchanged

2. A block of mass m moving at speed v collides with a spring of restoring force $F = -k_1x - k_2x^3$ on a frictionless surface. Find the maximum compression of the spring.



- (A) $\sqrt{\frac{k_1}{k_2}}$
 - (B) $\frac{k_1}{k_2} \left[\sqrt{1 + \frac{mv^2 k_2}{k_1^2}} \right]$
 - (C) $\left[\frac{k_1}{k_2} \left\{ \sqrt{1 + \frac{mv^2 k_2}{k_1^2}} - 1 \right\} \right]^{1/2}$
 - (D) $\left[\frac{k_1}{k_2} \left\{ \sqrt{1 + \frac{2mv^2 k_2}{k_1^2}} - 1 \right\} \right]^{1/2}$
3. An ideal gas has molar heat capacity C_v at constant volume. The gas undergo the process $T = T_0(1 - \alpha V)$ where α , T_0 is constant and V is volume. Then molar heat capacity of the gas is :

- (A) $C_v + \frac{R}{\alpha V}(1 - \alpha V)$
 - (B) $C_v - \frac{R}{\alpha V}(1 - \alpha V)$
 - (C) $C_v - \frac{R}{2\alpha V}(1 + \alpha V)$
 - (D) $C_v + \frac{R}{2\alpha V}(1 + \alpha V)$
4. Current I is flowing along the path ABCD, along the four edges of the cube (figure-a), creates a magnetic field in the centre of the cube of B_0 . Find the magnetic field B created at the center of the cube by a current I flowing along the path of the six edges ABCGHEA (figure-b)

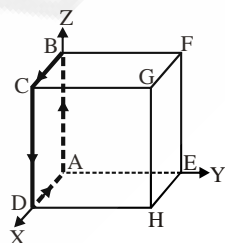


Figure-(a)

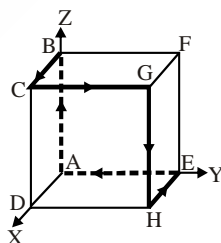


Figure-(b)

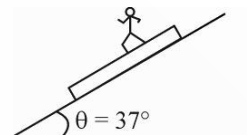
- (A) $\sqrt{\frac{3}{2}} B_0$ Towards corner G
- (B) $\sqrt{3} B_0$ Towards corner E
- (C) $\sqrt{\frac{3}{2}} B_0$ Towards corner H
- (D) $\sqrt{3} B_0$ Towards corner F

SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

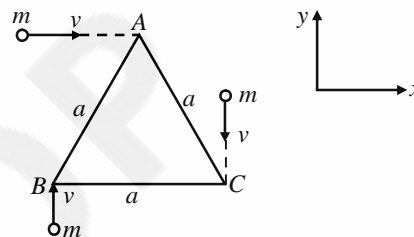
This section contains 3 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

5. A plank of mass $3m$ is placed on a rough inclined plane and a man of mass m walks down the board. If the coefficient of friction between the board and inclined plane is $\mu = 0.5$, the minimum acceleration of man so that plank does not slide is : (Take $g = 10 \text{ m/s}^2$)



- (A) $8m/s^2$ (B) $4m/s^2$ (C) $6m/s^2$ (D) $3m/s^2$

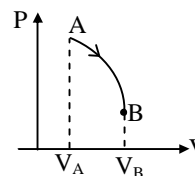
6. Figure shows an overhead view of a triangular block ABC kept on smooth horizontal (x - y) surface. The mass of block is m and each side has length a . Three particles each of mass m and moving with a speed v hits the block at corners A , B and C . The particles come to rest just after collision. Choose the correct option. (Moment of inertia of block about axis passing through centre of mass and perpendicular to its plane is I)



- (A) The centre of mass of the block moves with velocity $v\hat{i}$ just after collision.
 (B) The angular velocity of the block just after collision is $\omega = \frac{\sqrt{3}mva}{I}$
 (C) The angular impulse received by the block about centroid is $mva\left(1 + \frac{1}{\sqrt{3}}\right)$
 (D) Angular momentum of the block is conserved about the centroid

7. One mole of ideal monoatomic gas is taken through process AB given by $P = \alpha - \beta V^2$ (where α and β are positive constant) on P - V diagram. Which of the following is the correct statement regarding the given process?

- (A) Temperature is maximum at $V = \sqrt{\frac{\alpha}{3\beta}}$
 (B) Temperature is minimum at $V = \sqrt{\frac{\alpha}{3\beta}}$
 (C) Rate of increase of temperature of gas with volume is maximum at A
 (D) Rate of increase of temperature of gas with volume is maximum at $V = \sqrt{\frac{\alpha}{\beta}}$



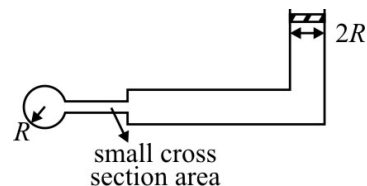
SECTION-I/TYPE-3

LINK COMPREHENSION TYPE

This section contains 3 multiple choice questions relating to one paragraph. Each question has four choices A, B, C and D out of which ONLY ONE choice is correct.

Paragraph for Questions 8 - 10

Soap bubble of radius R is blown at end of pipe of circular cross-section of radius R as shown in diagram. On the vertical portion of pipe, there is a piston of mass m . T is surface tension of liquid.



8. Find the mass of piston for which it remain in equilibrium.

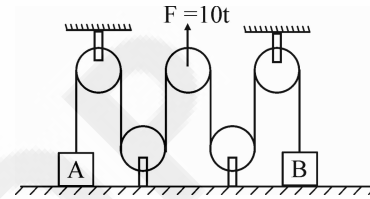
- (A) $\frac{4\pi TR}{g}$ (B) $\frac{2\pi TR}{g}$ (C) $\frac{4TR}{g}$ (D) $\frac{4TR^2}{g}$

9. If a block is kept on top of the piston, then radius of bubble :
 (A) Decreases (B) Increases
 (C) Remains unchanged (D) Decreases to zero
10. If piston is slightly displaced in downward direction, then its acceleration when radius of bubble grows to $2R$ is :
 (A) $2g$ (B) $g/2$ (C) $3g/2$ (D) $g/4$

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

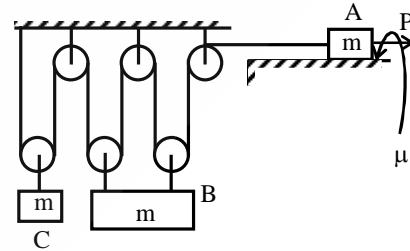
This section contains 6 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. In the arrangement shown $m_A = 1 \text{ kg}$ and $m_B = 2 \text{ kg}$ while all the pulleys and strings are massless and frictionless. At $t = 0$, a force $F = 10 \text{ t}$ starts acting over central pulley in vertical direction. Where B loses contact with floor the velocity of A is $(5n) \text{ m/sec}$. Find out the value of 'n'.

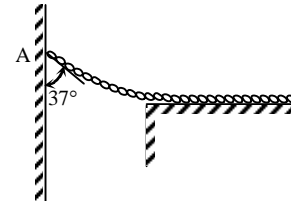


2. A solid conducting sphere of radius R having charge Q is surrounded by an uncharged concentric conducting hollow spherical shell of radius $2R$. Let the potential difference between the surface of the solid sphere and that of the outer surface of the hollow shell be V . If the shell is now given a charge of $-3Q$, the new potential difference between the same two surfaces is KV then value of K is _____.

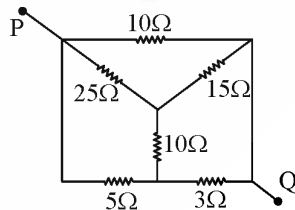
3. Three blocks A , B and C each of mass m are arranged in pulley string system as shown in the figure. All pulleys are massless and frictionless, while all strings are light and inextensible. Coefficient of friction, μ between block A and horizontal surface is equal to 0.5 and force P acts on it. The value of P/mg for which block C does not move, is _____.



4. A uniform chain of length L has one of its end attached to the wall at point A , while $\frac{3L}{4}$ of the length of the chain is lying on table as shown in figure. The minimum coefficient of friction between table and chain so that chain remains in equilibrium is K then value of $8K$ will be _____.



5. Find the effective resistance across terminals PQ in ohm.



6. A 3 m long organ pipe open at both ends is driven to third harmonic standing wave. The amplitude of pressure oscillation is 0.1% of the mean atmospheric pressure $P_0 = 10^5 \text{ N/m}^2$. The amplitude of particle oscillation in metre is $\frac{a}{1089\pi}$, find a . Speed of sound $v = 330 \text{ m/s}$, density of air $\rho_0 = 1.0 \text{ kg/m}^3$.

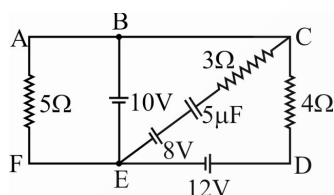
SECTION - III
MATRIX MATCH TYPE

This section contains 2 questions. Each question contains statements given in two columns which have to be matched. Statements in Column I are labelled as (A), (B), (C) & (D) whereas statements in Column II are labeled as p, q, r, s & t. The answers to these questions have to be appropriately bubbled. More than one choice from Column II can be matched with Column I.

1. In a container of negligible mass m grams of steam at 100°C is added to 100 g of water that has temperature 20°C . If no heat is lost to the surroundings at equilibrium match the items given in List 1 with that in List 2.

	Column I		Column II
(A)	Mass of steam in the mixture, if $m = 20$ g (in g)	(p)	114.8
(B)	Mass of water in the mixture, if $m = 20$ g (in g)	(q)	76.4
(C)	If $m = 20$ g, final temperature of the mixture (in $^\circ\text{C}$)	(r)	5.2
(D)	If $m = 10$ g, final temperature of the mixture (in $^\circ\text{C}$)	(s)	100

2. A network consisting of three resistors, three batteries, and a capacitor is shown in figure.



	Column I		Column II
(A)	Current in branch EB is	(p)	$10 \mu\text{C}$
(B)	Current in branch CB is	(q)	0.5 A
(C)	Current in branch ED is	(r)	1.5 A
(D)	Charge on capacitor is	(s)	$5 \mu\text{C}$

PART - III (MATHEMATICS)

76 MARKS

SECTION-I/TYPE-1

SINGLE CORRECT ANSWER

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

- Complete set of real values 'a' for which the equation $x^4 - 2ax^2 + x + a^2 - a = 0$ has all its roots real :
 (A) $\left[\frac{3}{4}, \infty\right)$ (B) $[1, \infty)$ (C) $[2, \infty)$ (D) $[0, \infty)$
- Point A lies on the curve $y = e^{-x^2}$ and has the coordinates (x, e^{-x^2}) where $x > 0$. Point B has coordinates $(x, 0)$. If O is origin, then the maximum area of ΔAOB is :
 (A) $\frac{1}{\sqrt{8e}}$ (B) $\frac{1}{\sqrt{4e}}$ (C) $\frac{1}{\sqrt{2e}}$ (D) $\frac{1}{\sqrt{e}}$
- The line $x + y = 5$ intersects the circle $x^2 + y^2 - 6x - 8y + 21 = 0$ at points A and B, then the locus of the point C such that AC is perpendicular to BC is
 (A) $x^2 + y^2 - 6x - 4y + 11 = 0$ (B) $x^2 + y^2 - 4x - 6y + 11 = 0$
 (C) $x^2 + y^2 + 6x + 4y + 11 = 0$ (D) None of these

4. If $\lim_{x \rightarrow 1} \frac{a \sin(x-1) + b \cos(x-1) + 4}{x^2 - 1} = -2$, then (a, b) is equal to :
- (A) $(2, -4)$ (B) $(-4, -4)$ (C) $(-4, 2)$ (D) $(4, -4)$

SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 3 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

5. $f(x) = \lim_{n \rightarrow \infty} \frac{x}{x^{2n} + 1}$ then :
- (A) $f(1^+) + f(1^-) = 0$ (B) $f(1^+) + f(1) + f(1^-) = \frac{3}{2}$
 (C) $f(-1^+) + f(-1^-) = -1$ (D) $f(1^+) + f(-1^-) = 0$
6. Consider the circle $x^2 + y^2 - 10x - 6y + 30 = 0$. Let O be the centre of the circle and tangent at A(7, 3) and B(5, 1) meet at C. Let S = 0 represents family of circles passing through A and B, then :
- (A) Area of quadrilateral OACB = 4
 (B) The radical axis for the family of circles S = 0 is $x + y = 10$
 (C) The smallest possible circle of the family S = 0 is $x^2 + y^2 - 12x - 4y + 38 = 0$
 (D) The coordinates of point C is (7, 1)
7. If $f(x)$ be a differentiable function satisfying $f\left(\frac{x}{y}\right) = f(x) \forall x, y \in R, y \neq 0$ and $f(1) \neq 0, f'(1) = 3$, then :
- (A) $\text{sgn}(f(x))$ is non-differentiable at exactly one point (B) $\lim_{x \rightarrow 0} \frac{x^2(\cos x - 1)}{f(x)} = 0$
 (C) $f(x) = x$ has exactly 3 solutions
 (D) $f(f(x)) - f^3(x) = 0$ has infinitely many solutions

SECTION-I/TYPE-3

LINK COMPREHENSION TYPE

This section contains 3 multiple choice questions relating to one paragraph. Each question has four choices A, B, C and D out of which ONLY ONE choice is correct.

Paragraph for Questions 8 - 10

Let z_1 and z_2 be complex numbers, such that $z_1^2 - 4z_2 = 16 + 20i$. Also suppose the roots α and β of $t^2 + z_1 t + z_2 + m = 0$ for some complex number m satisfy $|\alpha - \beta| = 2\sqrt{7}$, then :

8. The complex number m lies on :
- (A) a circle with radius $\sqrt{7}$ and centre (4, 5) (B) a circle with radius 7 and centre (4, 5)
 (C) a circle with radius 7 and centre (-4, 5) (D) a circle with radius $\sqrt{7}$ and centre (-4, 5)
9. Greatest value of $|m|$ is :
- (A) $5 + \sqrt{23}$ (B) $5 + \sqrt{21}$ (C) $7 + \sqrt{41}$ (D) $7 + \sqrt{43}$
10. Least value of $|m|$ is :
- (A) $5 - \sqrt{23}$ (B) $5 - \sqrt{21}$ (C) $7 - \sqrt{41}$ (D) $7 - \sqrt{43}$

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 6 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

- Let 'p' be an integer for which both roots of the quadratic equation $x^2 + 2(p-3)x + 9 = 0$ lie in $(-6, 1)$.
If $2, g_1, g_2, \dots, g_{19}, g_{20}, p$ are in G.P., then the value of $\frac{(g_4 \times g_{17})}{2}$ is _____.
- If $\alpha, \beta; \beta, \gamma; \gamma, \alpha$ are the roots of $a_r x^2 + b_r x + c_r = 0$ for $r=1, 2, 3$ where $\alpha, \beta, \gamma > 0$ and $\Sigma \alpha + \Sigma \alpha\beta + \alpha\beta\gamma - \left(\prod_{r=1}^3 \left(\frac{a_r - b_r + c_r}{a_r} \right) \right)^{1/2} = -k$ then k is equal to _____.
- If $S = \sqrt{\frac{1}{2}} \sqrt{\frac{1}{2} + \frac{1}{2}} \sqrt{\frac{1}{2}} \sqrt{\frac{1}{2} + \frac{1}{2}} \sqrt{\frac{1}{2}} \sqrt{\frac{1}{2} + \frac{1}{2}} \sqrt{\frac{1}{2}} \dots \infty$ then the value of πS is _____.
- Tangents are drawn to the circle $x^2 + y^2 = 1$ at its intersection points with the circle $x^2 + y^2 + (\lambda - 3)x + (2\lambda + 2)y + 2 = 0$, the locus of intersection of tangents is a straight line whose slope is _____.
- Let the number of arrangements of digits of the number 12345 such that atleast 3 digits will not come in its original position is N, then number of divisors of N is _____.
- If z be a complex number such that $|z| = 1$, then number of integers lying in the range of $|z+1| + |z^2 - z + 1|$ is _____.

SECTION - III
MATRIX MATCH TYPE

This section contains 2 questions. Each question contains statements given in two columns which have to be matched. Statements in Column I are labelled as (A), (B), (C) & (D) whereas statements in Column II are labeled as p, q, r, s & t. The answers to these questions have to be appropriately bubbled. More than one choice from Column II can be matched with Column I.

- MATCH THE FOLLOWING LISTS :**

	Column I		Column II
(A)	The sum of abscissa and ordinate of the point on the parabola $y = x^2 + 7x + 2$ which is nearest to the straight line $y = 3x - 3$ is equal to	(p)	1
(B)	If a circle is drawn with variable chord $x + ay - 5 = 0$ ('a' being a parameter) of the parabola $y^2 = 20x$ as diameter, then it always touches the line $x + k = 0$, where k is equal to	(q)	-10
(C)	The foot of perpendicular from a point P on the parabola to its directrix is M. If R is the mid-point of SM ($S \equiv$ focus), then the angle between PR and SM is equal to $\frac{\pi k}{2}$, where k is equal to	(r)	5
(D)	If the normals at the end points of a variable chord AB of the parabola $y^2 - 4y - 2x = 0$ are perpendicular, then the tangents at A and B will intersect at the line $2x + k = 0$, where k is equal to	(s)	-5

2. A point P moves such that the sum of the slopes of the normals drawn from it to the hyperbola $xy = 16$ is equal to the sum of the ordinates of the feet of the normals. Let P lies on the curve C, then :

	Column I		Column II
(A)	Area of equilateral triangle (in sq. units) inscribed in C, having one vertex at (0, 0) is λ , then $\frac{\lambda}{256\sqrt{3}}$ is	(p)	1
(B)	If intercept of normal drawn at (x, y) by curve C subtends 90° at (0, 0) then $\left[\frac{ x + y }{8} \right] = ([.]$ denotes greatest integer function)	(q)	2
(C)	Area bounded by latus rectum of C and curve C is λ then $\frac{3\lambda}{128}$ is	(r)	3
(D)	Focal distance of (x, 1) on curve C is	(s)	4
		(t)	5