Vidyamandir Classes
Gurukul for IITJEE Preparation

Advanced Practice Test-2

TIME : 3 hrs	M.M. : 237

Read the following Instructions very carefully before you proceed.

1. The question paper consists of 3 parts (Part I : Chemistry, Part II : Physics, Part III : Mathematics). Each Part has 2 sections (Section I & Section II).

2. **Section I** contains 2 types of questions **[Type 1, Type 2 & Type 3]**

Type 1 contains **6 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 **5 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 **TWO** paragraph. Based on each paragraphs, there are **FOUR** 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*]

3. **Section II** contains **8 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* [3 *Marks for Correct answer* & ***NO NEGATIVE MARKING*** *for wrong answer*]

4. 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.

5. No candidate is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc., except the Admit Card inside the examination hall/room.

6. On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.

PART - I (CHEMISTRY)	79 MARKS

SECTION-I/TYPE-1

SINGLE CORRECT ANSWER

This section contains 6 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

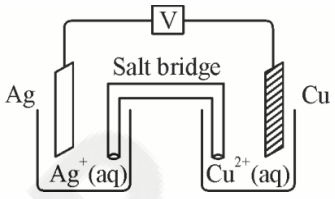
1. For given electrochemical cell which increases immediately if the surface area of the silver electrode is increased?

(A) overall cell voltage

(B) rate of change of $[Ag^+]$

(C) mass of Cu electrode

(D) change in ratio of electrode masses; $\Delta\left\{\frac{\text{mass of Cu}}{\text{mass of Ag}}\right\}$



2. A solution with a mass of 1.263 g containing an unknown amount of potassium ions was heated with excess sodium tetraphenyl borate to precipitate 1.003 g of $KB(C_6H_5)_4$ (M= 358.33). What is the mass percentage of potassium in the original solution? (Atomic mass of K = 39)

(A) 8.67% **(B)** 9.16% **(C)** 10.9% **(D)** 13.8%

3. For the following chemical reactions

$$A \xrightarrow{k_1} B$$

$$A \xrightarrow{k_2} C$$

$$B \xrightarrow{k_3} C$$

$$C \xrightarrow{k_4} B$$

The rate constants k_1 and k_2 are at least 1000 times slower than either k_3 or k_4. During the course of the above reactions the ratio of the products B and C will be

(A) $[B]/[C] = k_3/k_4$ **(B)** $[B]/[C] = k_4/k_3$

(C) $[B]/[C] = k_2k_3/k_1k_4$ **(D)** $[B]/[C] = k_1/k_3$

4. A sample of water is found to contain 244 ppm of HCO_3^- ions, 192 ppm of SO_4^{2-} ions and 71 ppm of Cl^- ions. Assuming the source of these ions to be their respective calcium salts, what is the concentration of Ca^{2+} ions in terms of ppm ?

(A) 320 **(B)** 560 **(C)** 200 **(D)** 280

5. Which of the following is(are) correct ?

I. The order of repulsion between different pair of electron is *l*p – *l*p > *l*p – bp > bp – bp .

II. In general, as the number of lone pair of electrons on central atom increases, value of bond angle from normal bond angle also increases.

III. The number of lone pair on O in H_2O is 2 while on N in NH_3 is 1.

IV. In cumulated diene, $CH_2 = C = CH - CH_3$; there are 2 sp^2, 1 sp and 1 sp^3 hybrid carbon atoms.

The correct option is :

(A) I, II, IV **(B)** I, III, IV **(C)** II, III, IV **(D)** I, II, III, IV

6. The correct IUPAC name of *Isopropyl di-tert.butyl methane* is :

(A) 2, 2, 4-Trimethyl 3-(1′, 1′-dimethylethyl) pentane

(B) 3-Isopropyl 2, 2, 4, 4-tetramethyl pentane

(C) 2, 2, 4, 4-Tetramethyl 3-(1′-methylethyl) pentane

(D) Given name is already correct

SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 5 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

7. Which of the following statement(s) is(are) CORRECT?

(A) Sodium ions are discharged in preference of hydrogen ion at a mercury cathode

(B) The limiting molar conductivity (Λ^{∞}) for weak electrolyte is obtained by using Kohlrausch law of independent migration of ions

(C) During electrolysis of 1 M $CuSO_4(aq)$ using copper as electrode there is no change in molarity of electrolyte solution

(D) Density of $H_2SO_4(aq)$ decreases during recharging of lead storage battery

8. Which of the following pairs have the first compound more covalent than the second ?

(A) $BeCl_2$, LiCl **(B)** LiI, LiF **(C)** AgCN, KCN **(D)** $ZnCl_2$, $CaCl_2$

9. Which statement(s) is(are) correct regarding the photoelectric effect?

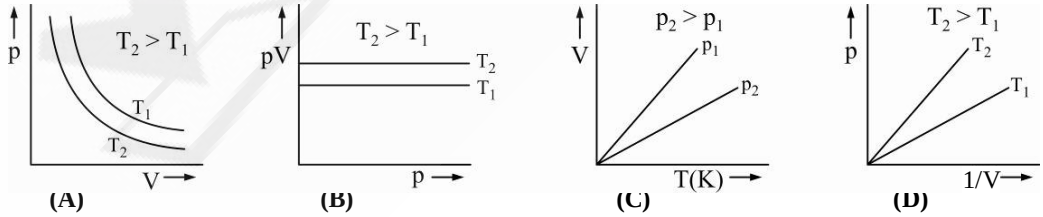
(A) There is no electron ejection, regardless of intensity of the radiation unless the frequency, exceeds a threshold value

(B) Kinetic energy of ejected electrons varies linearly with the frequency of incident radiation

(C) Even at low intensity, electrons are ejected immediately if the frequency of incident light is more than the threshold frequency

(D) At high intensity, more number of electrons are ejected provided that the frequency of incident light is more than the threshold frequency

10. Which of the following graphs is(are) consistent with ideal gas behaviour ?



11. Which of the following can exhibit both chain and functional group isomerism ?

(A) Propanol **(B)** Butanoic Acid **(C)** Butanol **(D)** Acetone

SECTION-I/TYPE-3
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE choice is correct.

Paragraph for Questions 12 - 13

There is great current interest in developing fuel cells based on the reaction :

$$2CH_3OH(l) + 3O_2(g) \longrightarrow 2CO_2(g) + 4H_2O(l)$$

12. Which of the following represents balanced equation for the half reaction that occurs in acid solution for such a fuel cell at the anode and cathode respectively?

	Anode	Cathode
(A)	$CH_3OH + 8OH^- \rightarrow CO_3^{2-} + 6H_2O + 6e^-$;	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$
(B)	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$;	$CH_3OH + 8OH^- \rightarrow CO_3^{2-} + 6H_2O + 6e^-$
(C)	$CH_3OH + H_2O \rightarrow CO_2 + 6H^+ + 6e^-$;	$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$
(D)	$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$;	$CH_3OH + H_2O \rightarrow CO_2 + 6H^+ + 6e^-$

13. The E° value for the $O_2(g)$ half reaction is 1.23 V in 1 M H^+, what is the E value expected in 1 M OH^-?

[Given $\frac{2.303\,RT}{F} = 0.059$ and K_w for water $= 10^{-14}$]

(A) -1.23 V **(B)** 0.40 V **(C)** –0.40 V **(D)** 2.05 V

SPACE FOR ROUGH WORK

Paragraph for Questions 14 - 15

In order to decompose hydrogen peroxide (H_2O_2) with iodide ion as catalyst in neutral solution, the 3% H_2O_2 solution (which approximately corresponds to 30g of H_2O_2 in 1L of solution) is mixed with 0.1M KI solution and water at different volumetric ratios; and the volume of the oxygen gas released V_{O_2} (mL) is measured.

Experiment	$V_{H_2O_2}$ (mL)	V_{KI} (mL)	V_{H_2O} (mL)	V_{O_2} (mL/min) at 298K and 1 atm
1.	25	50	75	4.4
2.	50	50	50	8.5
3.	100	50	0	17.5
4.	50	25	75	4.25
5.	50	100	0	16.5

14. What is the overall order of decomposition reaction of H_2O_2?

(A) first order **(B)** second order **(C)** third order **(D)** zero order

15. What is molarity of H_2O_2 at the beginning of the experiment No. 4?

(A) 0.882 M **(B)** 0.285 M **(C)** 0.294 M **(D)** 0.588 M

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

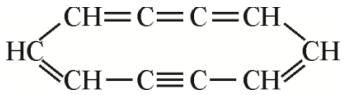
This section contains 8 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. How many constitutional isomers of C_5H_8 which are cyclic alkenes and which do not contain an ethyl group are possible?

2. Aluminium chloride dissociates in basic solution yielding several aluminium polycations. What is the numerical value of n in a typical aluminium polycation containing chloride with the molecular formula of $[Al_{13}O_{28}H_{24}(H_2O)_{12}]Cl_n$?

3. How many stable resonance forms can be written for the oxalate ion, $C_2O_4^{2-}$?

4. Aromatic compounds have delocalizable $(4n + 2)\pi$ electrons in a close cyclic loop. What is the value of '*n*' for given compound?

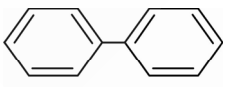


5. A gaseous mixture containing 5 mL of a gaseous hydrocarbon (C_xH_y) and 30 mL O_2 was exploded. The volume of reaction mixture obtained was found to be 25 mL. If all the volume measurements are at NTP, then value of *y* is _____.

6. The difference in the oxidation numbers of the two types of sulphur atoms in $Na_2S_4O_6$ is _____.

7. In the Bohr's model of the hydrogen atom, the ratio of the potential energy of an electron to the total energy of the electron is _____.

8. How many isomeric nonachlorobiphenyls are possible ?



Biphenyl

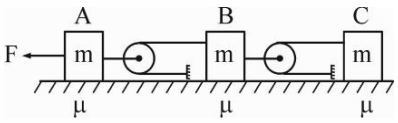
PART - II (PHYSICS)	79 MARKS

SECTION-I/TYPE-1

SINGLE CORRECT ANSWER

This section contains 6 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. On a table, three blocks are placed as shown in the figure. Mass of each block is m and coefficient of friction for each block is μ. A force F is applied on block A so as to move the system. The minimum value of F should be :

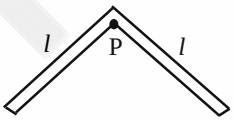


(A) $8\mu mg$ **(B)** $9\mu mg$ **(C)** $7\mu mg$ **(D)** $5\mu mg$

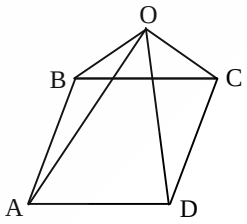
2. A system of two identical rods (at right angle) each of mass m and length l are resting on peg P as shown in the figure. If the system is displaced in its plane by a small angle θ, find the period of oscillations :

(A) $2\pi\sqrt{\frac{\sqrt{2}\,\ell}{3g}}$ **(B)** $2\pi\sqrt{\frac{2\sqrt{2}\,\ell}{3g}}$

(C) $2\pi\sqrt{\frac{2\ell}{3g}}$ **(D)** $2\pi\sqrt{\frac{\ell}{3g}}$



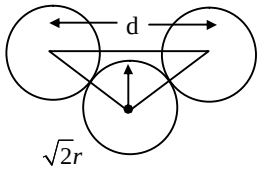
3. Eight identical resistance r each are connected as shown. If equivalent resistance between AD is :



(A) $\frac{8r}{15}$ **(B)** $\frac{4r}{15}$

(C) $\frac{4r}{5}$ **(D)** $\frac{7r}{10}$

4. Two identical ball of radii r are kept on a horizontal plane with their centres d distance apart. A third identical ball, collides elastically with both the balls symmetrically as shown in the figure. If the third ball comes to rest after the collision, d should be:



(A) $2r$ **(B)** $2\sqrt{2}r$ **(C)** $\left(\sqrt{2}+1\right)r$ **(D)** $\sqrt{2}r$

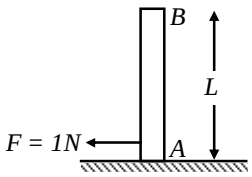
5. A uniform smooth rod of mass $m = 1kg$ and length L is balanced in the vertical position. When a horizontal force F is applied at end A, the acceleration of top point B is:

(A) 2 m/s^2 to right

(B) 1 m/s^2 to left

(C) 1 m/s^2 to right

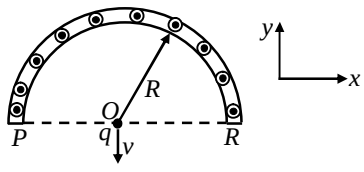
(D) None of these



6. A current i flows in a long straight wire with cross-section having the form of a thin half ring of radius R. a charged particle of charge q is projected with speed v from the centre O of ring in a direction perpendicular to diameter PR as shown in the figure. The force acting on the charge is:

(A) Zero **(B)** $\frac{qv\mu_0 i}{4R}$

(C) $\frac{qv\mu_0 i}{\pi^2 R}$ **(D)** $\frac{qv\mu_0 i}{2R}$

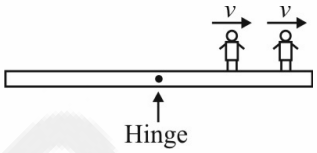


SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 5 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

7. A plank of mass M and length L is hinged at its mid point from a fixed support in vertical plane as shown. Plank is free to rotate in vertical plane about the hinge. Two persons of equal mass running on the plank with same speed v relative to the plank so that angular velocity ω of the plank remains constant. Assuming they run till running is possible then v is :



(A) A constant

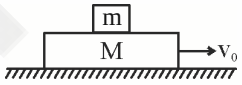
(B) Independent of the separation between the persons

(C) Independent of the distance of the persons from the hinge

(D) Independent of their mass

8. A block of mass M is placed gently onto a long smooth horizontal floor. If friction is present between M and m:

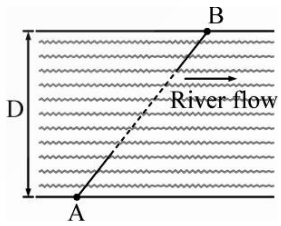
v_C :velocity of centre of mass



(A) $v_C = \dfrac{Mv_0}{M+m}$ **(B)** W_f on m is positive

(C) W_f on M is negative **(D)** $W_f = -\dfrac{Mmv_0^2}{2(M+m)}$

9. Figure shows two swimmers starting from points A and B on opposite banks. They started at same instant with a constant velocity. Both of them are heading in a direction parallel to line AB always. The river flows towards east.



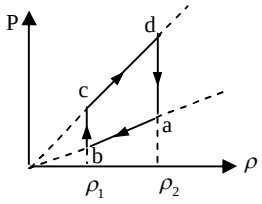
(A) Swimmers A and B cannot collide

(B) Simmers A and B will definitely collide some where on line AB

(C) Swimmers A and B will definitely collide some where to the east of line AB

(D) Swimmers A and B will definitely collide some where to the west of line AB

10. An ideal gas undergoes a cyclic process *abcda* which is shown by pressure-density curve.



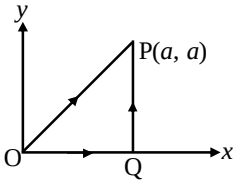
(A) Work done by the gas in the process '*bc*' is zero

(B) Work done by the gas in the process '*cd*' is negative

(C) Internal energy of the gas at point '*a*' is greater than at state '*c*'

(D) Net work done by the gas in the cycle is negative

11. A particle is moved from point O (0, 0) to point P (a, a) (a in meter) under a force $\vec{F} = \left(3x\hat{i} + 4y\hat{j}\right)N$ from two paths. Path 1 is OP and path 2 is OQP. Choose the correct option(s)



(A) Force is conservative

(B) Work done on path $OP = 7a^2/2$

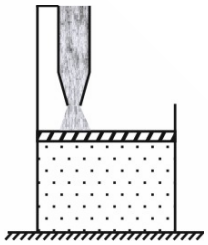
(C) Work done of path $OQP = 7a^2/2$

(D) Work done on path OP is $7a^2$

SECTION-I/TYPE-3
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE choice is correct.

Paragraph for Questions 12 - 13



One mole of an ideal gas is enclosed in a vertical cylinder, under a weightless piston. The temperature of the gas varies according to the law $T = T_0\left(1+bt^2\right)$ where b is a constant. Atmospheric pressure is P_0. Sand is falling very slowly through a sand hopper. Cross-section area of the piston is A.

12. At what rate sand should fall on the piston so as to keep the volume of the gas constant?

(A) $\frac{2P_0A}{gt}$ **(B)** $\frac{P_0btA}{g}$ **(C)** $\frac{2P_0btA}{g}$ **(D)** $\frac{P_0A}{gt}$

13. Find the heat supplied to the gas till the pressure inside the cylinder becomes twice of the pressure at $t = 0$. Take the gas to monoatomic.

(A) $\frac{3RT_0}{2}$ **(B)** $3RT_0$ **(C)** $\frac{5RT_0}{2}$ **(D)** $5RT_0$

Paragraph for Questions 14 - 15

A horizontal spring block system executes *SHM* with amplitude $A = 10$ *cm*, initial phase $\phi = 0$ and angular frequency ω. The mass of block is $M = 13$ *kg* and there is no friction between the block and the horizontal surface. The spring constant is 2500 *N/m*.

At $t = 0$, a mass $m = 12$ *kg* is gently put on the block when it is passing through mean position. [Assume that collision between the block and the mass is perfectly inelastic and mass *m* remains stationary *w. r. t.* the block *M* always]

14. Loss of energy of system in collision is nearly:

(A) 1.67 *J* **(B)** 6 *J* **(C)** 4 *J* **(D)** 5.5 *J*

15. The new amplitude of the system will be nearly:

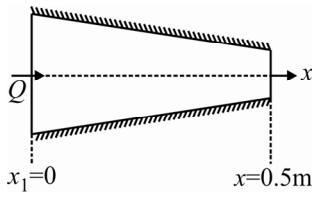
(A) 8.5 *cm* **(B)** 7.2 *cm* **(C)** 10 *cm* **(D)** 12.3 *cm*

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

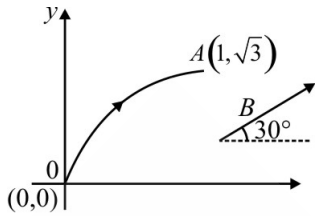
This section contains 8 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. Three small identical bodies each of mass *m* are moving in circular orbit around a fixed point with same angular velocity under their gravitational attraction. The separation between any two bodies is *R*, the total energy *E* possessed by the system is given by $E = -x\left(\frac{GM^2}{4R}\right)$. What is the value of *x*?

2. In steady state rate of heat flow through rod of variable thermal conductivity shown in the figure is 6000 W. Area of cross section of rod in m^2 varies with x according to relation $A(x) = (1-x)$, while temperature in Kelvin of rod is $T(x) = 300\left(1-4x-x^3\right)(K)$, find thermal conductivity (in watt/m Kelvin) of rod at $x = 0$. (Thermal conductivity depends only on x).

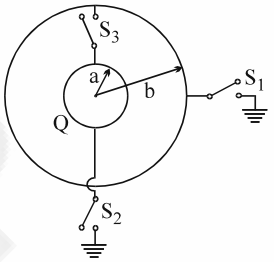


3. A wire having current $3A$ is lying is x-y plane along curve $3x = y^2$. Find the force (in Newton) acting on wire due to uniform magnetic field of magnitude $B = 1T$ and at an angle 30° with x-axis.



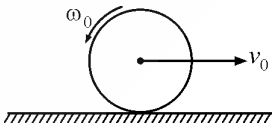
4. A small wooden ball of density 'p' is immersed in water of density σ to depth h and then released. The height H above the surface of water up to which the ball jumps out of water is $\left(\frac{\sigma}{p} - \frac{n}{2}\right)h$, value of n is _____.

5. The figure shows a conducting sphere 'A' of radius 'a' which is surrounded by a neutral conducting spherical shell B of radius 'b' ($>a$). Initially switches S_1, S_2 and S_3 are open and sphere 'A' carries a charge Q. First the switch 'S_1' is closed to connect the shell B with the ground and then opened. Now the switch 'S_2' is closed so that the sphere 'A' is grounded and then S_2 is opened. Finally, the switch 'S_3' is closed to connect the spheres together. Find $5Q$ if Q is the heat (in Joule) which is produced after closing the switch S_3. [Consider b = 4 cm, a = 2 cm and Q = 8 μC]

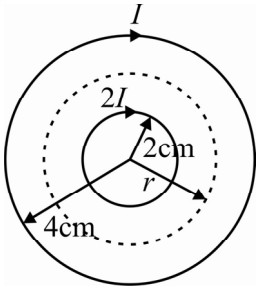


6. An open lift is coming down from the top of a building at a constant speed v = 10 m/s. A boy standing on the lift throws a stone vertically upwards at a speed of 30 m/s w.r.t. himself. Find the time after which he will catch the stone in seconds. (Take g = 10 m/s^2)

7. A uniform circular disc of radius r placed on a rough horizontal surface has initially a velocity v_0 and angular velocity ω_0 as shown in the figure. The disc comes to rest completely after moving some distance. Then $\frac{3r\omega_0}{v_0}$ is _____.



8. Two long coaxial solenoids of radius 2 cm and 4 cm respectively, have same number of turns per unit length and carry initially no currents. Current starts flowing in same direction in both solenoid simultaneously, such that both currents increases linearly with time. Instantaneous current in inner solenoid is double the current in outer solenoid. As a result of increasing currents in solenoids, a charged particle initially at rest between solenoids starts moving along a circular path of radius r. Find r^2 (in cm^2).



PART - III (MATHEMATICS) — 79 MARKS

SECTION-I/TYPE-1

SINGLE CORRECT ANSWER

This section contains 6 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. If 1, $\omega_1, \omega_2, \ldots, \omega_6$ are 7^{th} roots of unity then $Im(\omega_1 + \omega_2 + \omega_4)$ is equal to :

(A) $\frac{1}{\sqrt{7}}$ **(B)** $\frac{\sqrt{7}}{8}$ **(C)** $\frac{\sqrt{7}}{2}$ **(D)** None of these

2. The latus rectum of the hyperbola $9x^2 - 16y^2 - 18x - 32y - 151 = 0$ is :

(A) 9/4 **(B)** 9 **(C)** 3/2 **(D)** 9/2

3. If $a_1, a_2, a_3, \ldots, a_{2n+1}$ are in A.P., then $\frac{a_{2n+1}-a_1}{a_{2n+1}+a_1}+\frac{a_{2n}-a_2}{a_{2n}+a_2}+\ldots+\frac{a_{n+2}-a_n}{a_{n+2}+a_n}$ is equal to :

(A) $\frac{n(n+1)}{2}\times\frac{a_2-a_1}{a_{n+1}}$ **(B)** $\frac{n(n+1)}{2}$

(C) $(n+1)(a_2-a_1)$ **(D)** None of these

4. Number of points where $f(x)=\begin{cases} max\left(\left|x^2-x-2\right|, x^2-3x\right) & ; \quad x\geq 0 \\ max\left(\ell n(-x), e^x\right) & ; \quad x<0 \end{cases}$ is non-differentiable will be :

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

5. If $f(x) = |1 - x|$, then the points where $sin^{-1}(f|x|)$ is non-differentiable are :

(A) {0, 1} **(B)** {0, – 1} **(C)** {0, 1, – 1} **(D)** None of these

6. If tangents PQ and PR are drawn from a point P on the circle $x^2+y^2=25$ to the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1,\ (b<4)$, so that the fourth vertex S of parallelogram PQSR lies on the circumcircle of triangle PQR, then eccentricity of the ellipse is :

(A) $\frac{\sqrt{5}}{4}$ **(B)** $\frac{\sqrt{7}}{3}$ **(C)** $\frac{\sqrt{7}}{4}$ **(D)** $\frac{\sqrt{5}}{3}$

SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 5 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

7. 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

8. If the quadratic equation $ax^2+bx+c=0\,(a>0)$ has $sec^2\theta$ and $cosec^2\theta$ as its roots, then which of the following must hold good ?

(A) $b+c=0$ **(B)** $c^2-4ac\geq 0$ **(C)** $c\geq 4a$ **(D)** $4a+b>0$

9. If $f(x)=\begin{cases} x^2\left(sgn[x]\right)+\{x\} & ,\quad 0\leq x\leq 2 \\ sin\,x+\left|x-3\right| & ,\quad 2<x<4 \end{cases}$, where [.] and {.} represent integer and fractional part functions respectively, then :

(A) $f(x)$ is differentiable at $x = 1$ **(B)** $f(x)$ is continuous but non-differentiable at $x = 1$

(C) $f(x)$ is non-differentiable at $x = 2$ **(D)** $f(x)$ is discontinuous at $x = 2$

10. Let $f\colon R\to[-1,\infty)$ and $f(x)=ln\left(\left[\left|sin\,2x\right|+\left|cos\,2x\right|\right]\right)$, where [.] in greatest integer function then :

(A) $f(x)$ has range Z (the set of integers) **(B)** $f(x)$ is periodic

(C) $f(x)$ is one-one **(D)** $f(x)$ is into function

11. If $f(x)=\left[\ell n\frac{x}{e}\right]+\left[\ell n\frac{e}{x}\right]$, [.] denotes greatest integer function, then :

(A) Range of $f(x)$ is $\{-1, 0\}$ **(B)** If $f(x) = 0$, then x must be irrational

(C) If $f(x)=-1$, then x can be rational as well as irrational

(D) $f(x)$ is a periodic function

SECTION-I/TYPE-3
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE choice is correct.

Paragraph for Questions 12 - 13

Number of ways of arranging 12 boys and 12 girls are as follows :

a_1 = a line such that boys and girls sit alternatively.

a_2 = around a circular table alternatively.

a_3 = around an equilateral triangular table alternatively and eight on each side.

a_4 = around a square table alternatively and six on each side.

(For a_3 and a_4 on a corner if on one side it's a boy then on the other side it should be a girl to maintain alternation). Now answer the following questions :

12. Which of the following is true ?

(A) $a_1 > a_2 > a_3 > a_4$ **(B)** $a_4 > a_3 > a_2 > a_1$

(C) $a_1 > a_3 > a_4 > a_2$ **(D)** $a_1 > a_4 > a_3 > a_2$

13. Which of the following is true if $P(a_r)$ is the probability of arranging boys and girls in their ways explained in the paragraph.

(A) $P(a_1) > P(a_2) > P(a_3) = P(a_4)$ **(B)** $P(a_1) = P(a_2) = P(a_3) = P(a_4)$

(C) $P(a_1) > P(a_3) > P(a_4) > P(a_2)$ **(D)** $P(a_1) > P(a_2) = P(a_3) = P(a_4)$

Paragraph for Questions 14 - 15

Let $f(x) = f_1(x) - 2f_2(x)$, where $f_1(x) = \begin{cases} \min\{x^2, |x|\}, & |x| \le 1 \\ \max\{x^2, |x|\} & |x| > 1 \end{cases}$

and $f_2(x) = \begin{cases} \min\{x^2, |x|\}, & |x| > 1 \\ \max\{x^2, |x|\} & |x| \le 1 \end{cases}$ and $g(x) = \begin{cases} \min\{f(t): -3 \le t \le x\}, & -3 \le x < 0 \\ \max\{f(t): 0 \le t \le x\}, & 0 \le x \le 3 \end{cases}$

14. For $x \in (-1, 0)$, $f(x) + g(x)$ is :

(A) $x^2 - 2x + 1$ **(B)** $x^2 + 2x - 1$ **(C)** $x^2 + 2x + 1$ **(D)** $x^2 - 2x - 1$

15. The graph of $y = g(x)$ in its domain is broken at :

(A) 1 point **(B)** 2 points **(C)** 3 points **(D)** None of these

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 8 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. If a point P denoting the complex number z moves on the complex plane such that, $|Re\, z| + |Im\, z| = 1$ then area bound by locus of z is _____.

2. If $K = \sum_{n=1}^{\infty} \frac{6^n}{\left(3^n - 2^n\right)\left(3^{n+1} - 2^{n+1}\right)}$, then last digit of $(K+6)^{((k+6)!)}$.

3. If eccentricity of conjugate hyperbola of $\left|\sqrt{(x-1)^2+(y-2)^2}-\sqrt{(x-5)^2+(y-5)^2}\right|=3$ is e then $4e$ is_____.

4. A conical vessel is to be prepared out of a circular sheet of metal of unit radius. In order that the vessel has maximum volume, the sectorial area that must be removed from the sheet is A_1 and the area of the given sheet is A_2. If $\frac{A_2}{A_1}=m+\sqrt{n}$, where $m, n \in N$, then $m+n$ is equal to _____.

5. Complete values of x satisfying $\frac{\sin 6x}{\sin x-1}<0$ and $\sec^2 x-2\sqrt{2}\tan x\le 0$ in $\left(0,\frac{\pi}{2}\right)$ is given by $[a,b)\cup(c,d]$, then $\frac{cd}{ab}$ is _____.

6. If $\lim\limits_{n\to\infty}\sum\limits_{r=1}^{n}\frac{r+2}{2^{r+1}r(r+1)}=\frac{\ell}{m}$, where ℓ, m are coprime natural numbers then $\ell+m$ is _____.

7. Let $a=3^{\frac{1}{223}}+1$ and $\forall\ n\ge 3$, let $f(n)={}^nC_0\,a^{n-1}-{}^nC_1\,a^{n-2}+{}^nC_2\,a^{n-3}-.....+(-1)^{n-1}\,{}^nC_{n-1}\,a^0$ if $f(2007)+f(2008)=3^7k, k\in N$ then $k=$ _____.

8. An ellipse has semi-major axis of length 2 and semi-minor axis of length 1. It slides between coordinate axis in first quadrant, while maintaining contact with both x-axis and y-axis, then locus of its foci is $x^2+y^2+\frac{1}{x^2}+\frac{1}{y^2}=k^2$, then k is _____.