

Mock Advanced Test-2 Paper-1

TIME : 3 hrs

M.M. : 180

Read the following Instructions very carefully before you proceed.

A. General

1. This booklet is your Question Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.
2. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.
3. **Using a black ball point pen, darken the bubbles on the upper original sheet.** Apply sufficient pressure so that the impression is created on the bottom sheet.
4. DO NOT TAMPER WITH/MUTILATE THE OMR OR THE BOOKLET.
5. Read carefully the Instructions printed at the beginning of each section.

B. Filling the Right Part of the OMR

6. 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.

C. Question Paper Format :

The question paper consists of **3 Subjects** (Physics, Chemistry and Mathematics). Each subject consists of two sections i.e., Section 1 & 2.

9. **Section I** contains two Types of questions. In **Type 1**, there are 10 Multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. In **Type 2**, there are 5 Multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** choices may be correct.
10. **Section II** contains 5 questions. The answer to each question is a Single Digit Integer, ranging from 0 to 9 (both inclusive).

D. Marking Scheme :

11. **Section-I** : For each question in **Type-1**, you will be awarded **2 marks** if you darken the bubble corresponding to the correct answer **ONLY** and zero marks if no bubbles are darkened. **No negative marks will be awarded for incorrect answers in this section.**
13. **Section-I** : For each question in **Type-2**, you will be awarded **4 marks** if you darken ALL the bubble(s) corresponding to the correct answer(s) **ONLY** and zero marks if no bubbles are darkened. In all other cases, **minus one (-1) mark will be awarded in this section.**
14. **Section-II** : For each question, you will be awarded **4 marks** if you darken the bubble corresponding to the correct answer **ONLY** and zero marks if no bubbles are darkened. In all other cases, **minus one (-1) mark will be awarded in this section.**

PART - I (PHYSICS)

60 MARKS

SECTION - I/TYPE-1

SINGLE CORRECT ANSWER

This section contains 10 Single Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct.

1. A bubble is formed of a conducting liquid of surface tension ' T ' and radius of bubble is ' a '. Now charge ' q ' is given to bubble such that radius of bubble increases to ' b '. Assuming the addition of charge to be instantaneous, the new radius b is given by :

(A) $\sqrt{\frac{q^2}{64\pi^2 \epsilon_0 T a} + \frac{a^2}{4}} - \frac{a}{2}$

(B) $\sqrt{\frac{q^2}{32\pi^2 \epsilon_0 T a} + \frac{a^2}{4}} - \frac{a}{2}$

(C) $\sqrt{\frac{q^2}{8\pi^2 \epsilon_0 T a} + \frac{a^2}{4}} - \frac{a}{2}$

(D) 2

2. In one dimensional motion, a 1.0 kg object starting from rest experiences a force, which is a linear function of time t as $F = 2t$ acting in the direction of motion. The work done by the force in first 4 seconds is :

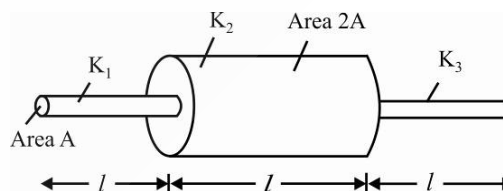
(A) 16 J

(B) 32 J

(C) 64 J

(D) 128 J

3. What is the equivalent thermal conductivity of the rods in figure given below, if the length of each cylinder be ℓ and area of cylinder having thermal conductivities K_1 and K_3 be A while that of the middle cylinder having thermal conductivity K_2 be $2A$?



(A) $\frac{5}{2 \left[\frac{1}{K_1} + \frac{1}{2K_2} + \frac{1}{K_3} \right]}$

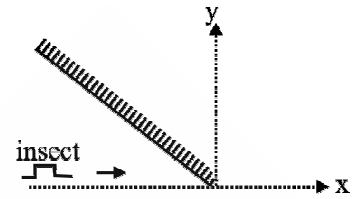
(B) $\frac{1}{\left[\frac{1}{K_1} + \frac{1}{2K_2} + \frac{1}{K_3} \right]}$

(C) $\frac{2}{5 \left[\frac{1}{K_1} + \frac{1}{2K_2} + \frac{1}{K_3} \right]}$

(D) None of these

SPACE FOR ROUGH WORK

4. A plane mirror of length 9.0 m is kept along the line: $y = -x$ as shown. An insect having velocity of $3\sqrt{2}\hat{i}$ m/sec is moving along x -axis. Find the time in (sec) for which insect can see its image if the insect was coming from a large distance.



- (A) 1 sec (B) 2 sec
(C) 3 sec (D) 1.5 sec

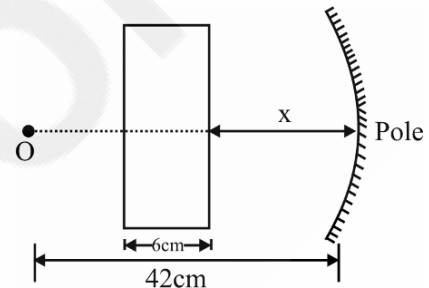
5. Vernier callipers has 20 divisions on its vernier scale which coincide with 19 divisions on the main scale. Least count of the instrument is 0.1 mm. The main scale division is :

- (A) 1 mm (B) 4 mm (C) 2 mm (D) - 2 mm

6. The quantity of gas in a closed vessel is halved and the velocities of its molecules are doubled. The final pressure of the gas will be

- (A) P (B) $2P$ (C) $P/2$ (D) $4P$

7. There is a concave mirror of focal length 10 cm and a glass slab having thickness 6 cm and refractive index $\mu = \frac{3}{2}$ is placed in front of concave mirror on shown. A point object is placed at 42 cm from pole towards left as shown. If $x = 5$ cm then final image will be :



- (A) Real and formed at $\frac{40}{3}$ cm towards left from pole
(B) Real and formed at $\frac{46}{3}$ cm towards left from pole
(C) virtual and formed at $\frac{40}{3}$ cm towards left from pole
(D) virtual and formed at $\frac{46}{3}$ cm towards left from pole

8. A plano-convex lens has a thickness of 4 cm. When placed on a horizontal table with curved surface in contact with it, the apparent depth of the bottom most point of the lens is found to be 3 cm. If the lens is inverted such that the plane face is in contact with the table, the apparent depth of the centre of plane face is found to be $\frac{25}{8}$ cm. The radius of curvature of the curved surface is :

- (A) 50 cm (B) 75 cm (C) 100/53 cm (D) 25 cm

SPACE FOR ROUGH WORK

9. A ball is projected at an angle of 45° so as to just pass a wall at a distance ' a ' from the point of projection and falls at a distance ' b ' on the other side of the wall. If ' h ' is the height of the wall then:
- (A) $h = a\sqrt{2}$ (B) $h = b\sqrt{2}$ (C) $h = \frac{\sqrt{2}ab}{a+b}$ (D) $h = \frac{ab}{a+b}$
10. A parallel beam of light of flux density 30 kWm^{-2} is incident normally on a 100 mm^2 completely absorbing screen. If P is the pressure exerted on the screen and Δp is the momentum transferred to the screen during a 1000 s interval then,
- (A) $P = 10^{-3} \text{ Nm}^{-2}$ (B) $P = 10^{-10} \text{ Nm}^{-2}$
(C) $\Delta p = 10^{-4} \text{ kgms}^{-1}$ (D) $\Delta p = 10^{-5} \text{ kgms}^{-1}$

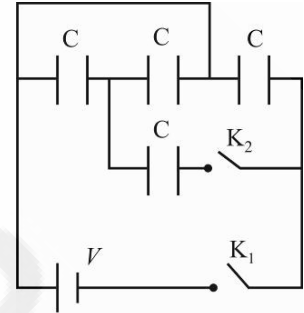
SPACE FOR ROUGH WORK

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:

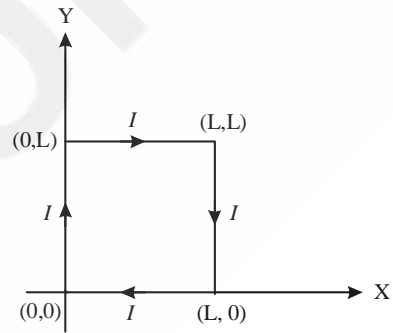
11. How does the total energy stored in the capacitors in the circuit shown in the figure change when first switch K_1 is closed (Process 1) and then switch K_2 is also closed (Process 2). Assume that all capacitors were initially uncharged.

- (A) Increases in process 1
(B) Increases in process 2
(C) Decreases in process 2
(D) Magnitude of change in process 2 is less than that in process 1



12. Figure shows a square loop in x, y plane carrying current I present in the magnetic field which is given by $\vec{B} = \frac{B_0 z}{L} \hat{j} + \frac{B_0 y}{L} \hat{k}$ where B_0 is positive constant. Which of the following statement(s) is(are) correct?

- (A) Force on side $(0, 0)$ to $(0, L)$ is $\left(\frac{B_0 IL}{2}\right) \hat{i}$
(B) Force on side $(0, L)$ to (L, L) is $-B_0 IL \hat{j}$
(C) Net magnetic force on loop is zero
(D) Force on side $(L, 0)$ to $(0, 0)$ is zero



13. A wave pulse moving to the right along the x -axis is represented by the wave function $Y(x,t) = \frac{2.0}{(x-3.0t)^2 + 1}$, where x and y are in centimetre and t is in second. (The maximum pulse height is defined as maximum displacement along y -axis). Then

- (A) The maximum pulse height is decreasing with time
(B) The maximum pulse height is constant with time
(C) The speed of the pulse is 3.0 cm/s
(D) The speed of the pulse is 0.33 cm/s

SPACE FOR ROUGH WORK

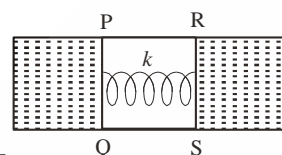
14. Two identical straight wires PQ and RS each of mass m and length ℓ can move smoothly on a fixed rectangular frame. Two thin films of a liquid of surface tension T are formed between each wire and the frame. The two wires are connected by a massless spring of stiffness k and initially in natural length position and released then choose the correct option(s).

(A) maximum elongation of spring, $\Delta x_m = \frac{2T\ell}{k}$

(B) maximum elongation of spring, $\Delta x_m = \frac{4T\ell}{k}$

(C) Each wire executes SHM with time period, $T_0 = 2\pi\sqrt{\frac{m}{2k}}$

(D) None of these



15. A dielectric cylinder of radius a is infinitely long. Its volume charge density ρ varies directly as the distance from the cylinder. If ρ is zero at the axis and is ρ_s on the surface, the electric intensity due to it is (Assume dielectric constant $K = 1$)

(A) $\frac{\rho_s a^2}{3\epsilon_0 r}$ at a point distant ' r ' outside it (B) $\frac{\rho_s r^2}{3\epsilon_0 a}$ at a point distant ' r ' inside it

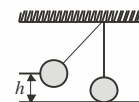
(C) $\frac{\rho_s a}{3\epsilon_0}$ at a point on its surface (D) $\frac{\rho_s}{3\epsilon_0 a^2}$ at a point on its surface

SPACE FOR ROUGH WORK

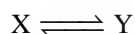
SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 5 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.

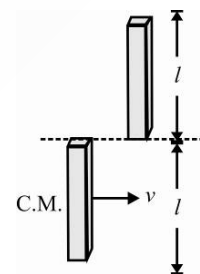
1. In the arrangement shown, the pendulum on the left is pulled aside to a height h . It is then released and allowed to collide with other pendulum which is at rest. A perfectly inelastic collision occurs and the system rises to a height $\frac{1}{4}h$. If the ratio of the masses of the pendulums is $x : 1$, find x .



2. A pump motor is used to deliver water at a certain rate from a given pipe. To get η times water from the same pipe in the same time the power of the motor must be increased η^x times. Find the value of x .
3. A hydrogen-like atom of atomic number Z is in an excited state of quantum number $2n$. It can emit a maximum energy photon of 204 eV . If it makes a transition to quantum state n , a photon of energy 40.8 eV is emitted. Find Z .
4. At radioactive equilibrium, the ratio between the number of nuclei of two radioactive elements (X) and (Y) was found to be $3.2 \times 10^9 : 1$ respectively. If half-life of the element (X) is 1.6×10^{10} years, then half-life of the element (Y) would be m year. Find the value of m .



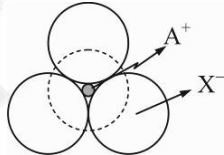
5. A bar of mass m , length l is in pure translatory motion with its centre of mass velocity v . It collides with and sticks to another identical bar at rest as shown in figure. Assuming that after collision it becomes one composite bar of length $2l$, the angular velocity of the composite bar is $\frac{kv}{4l}$ in anticlockwise direction. Find the value of k .



SPACE FOR ROUGH WORK

SECTION - I/TYPE-1
SINGLE CORRECT ANSWER

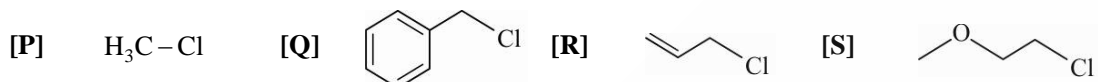
This section contains 10 Single Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct.

- Consider the following complex P, Q, R : [Atomic Number of Mn = 25, Ni = 28]
 $P = [\text{Mn}(\text{CO})_5]$ $Q = [\text{Ni}(\text{CO})_4]$ $R = [\text{Ni}(\text{CN})_6]^{4-}$
 The correct order of the spin only magnetic moment values (in B.M.) is :
 (A) $P = Q = R$ (B) $R > P > Q$ (C) $P > Q > R$ (D) $R > Q > P$
- The arrangement of X^- ions around A^+ ion in solid AX is given in the figure (not drawn to scale). If the radius of X^- is 100 pm, the radius of A^+ is :
 (A) 22.5 pm (B) 41.4 pm
 (C) 73.2 pm (D) 100 pm
 
- Oxide ores are common for the metals :
 (A) Ag, Cu and Pb (B) Ag, Cu and Sn (C) Fe, Mn and Sn (D) Al, Cu and Pb
- The standard enthalpy of combustion of C, H_2 and sucrose(s) at 25°C are -400kJ/mol , -300kJ/mol and -5660kJ/mol respectively. The standard enthalpy of formation per mole of sucrose at 25°C is :
 (A) $+2440\text{kJ/mol}$ (B) -2440kJ/mol (C) -20kJ/mol (D) $+20\text{kJ/mol}$
- Upon treatment with hot dil. HCl, the metal ion that precipitates as a chloride is :
 (A) Hg_2^{2+} (B) Al^{3+} (C) Mg^{2+} (D) Pb^{2+}

SPACE FOR ROUGH WORK

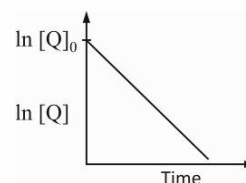
6. CO_2 gas is adsorbed on activated charcoal, for this process, the correct statement is :
 (A) The adsorption is endothermic
 (B) Adsorption increases with increase in pressure and decrease in temperature
 (C) Adsorption increases with decrease in pressure and increase in temperature
 (D) Adsorption is irreversible

7. NaI in acetone, undergoes $\text{S}_{\text{N}}2$ reaction with each of P, Q, R and S.



The correct order of rate of reaction is :

- (A) $\text{S} > \text{Q} > \text{P} > \text{R}$ (B) $\text{P} > \text{Q} > \text{R} > \text{S}$ (C) $\text{P} > \text{R} > \text{Q} > \text{S}$ (D) $\text{Q} > \text{P} > \text{R} > \text{S}$
8. In the reaction : $\text{P} + \text{Q} \longrightarrow \text{R} + \text{S}$, the time taken for 75% completion of reaction of P is twice the time taken for 50% completion of reaction of P. The concentration of Q varies with reaction time as shown in graph. The overall order of the reaction is :
 (A) 2 (B) 3
 (C) 0 (D) 1



9. Concentrated nitrous acid appears blue due to :
 (A) NO (B) NO_2 (C) N_2O (D) N_2O_3
10. The compound that does not give red brown precipitate with Fehling solution:
 (A) CO (B) CH_3CHO (C) $\text{OHC}-\text{CHO}$ (D) PhCHO

SPACE FOR ROUGH WORK

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:

11. For the reaction $R - X + Nu^- \longrightarrow R - Nu + X^-$, rate is expressed as,

$$\text{Rate} = k_1 [RX] + k_2 [RX][Nu^-].$$

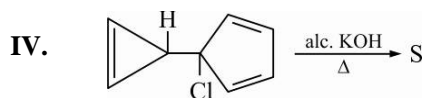
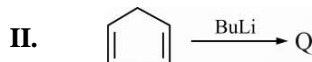
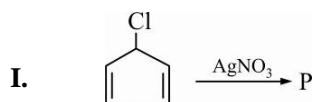
The percentage of reaction going through uni-molecular reaction mechanism will be :

(Given : $k_1 = 2 \times 10^{-5} \text{ min}^{-1}$; $k_2 = 6 \times 10^{-4} \text{ Lit mol}^{-1} \text{ min}^{-1}$, $[Nu^-] = 0.1M$)

- (A) 30 (B) 25 (C) 50 (D) 75
12. For the synergic bond in metal carbonyl, the bond between metal and carbon of CO is :
- (A) sigma bond between filled molecular orbital of CO and vacant d orbital of metal
 (B) pie bond between filled d-orbital of metal and vacant anti-bonding molecular orbital of CO
 (C) sigma bond between filled orbital of carbon and vacant anti-bonding d orbital of metal
 (D) pie bond between filled orbital of metal and vacant bonding molecular orbital of carbon
13. The pair of coordination complex/ion exhibiting same type of hybridization is(are) :
 [Atomic number of Ni = 28, Co = 27, Cu = 29, Cr = 24]
- (A) $[Ni(CO)_4]$, $[Co(CO)_4]$ (B) $[Ni(CN)_4]^{2-}$, $[Cu(NH_3)_4]^{2+}$
 (C) $[Cr(NH_3)_6]^{3+}$, $[Cr(H_2O)_6]^{3+}$ (D) $[Ni(NH_3)_6]^{2+}$, $[Co(NH_3)_6]^{3+}$

SPACE FOR ROUGH WORK

14. Among organic compounds P, Q, R and S the aromatic compound(s) is(are) :



The correct choice is :

- (A) P (B) Q (C) R (D) S

15. For the process $\text{H}_2\text{O}_{(l)}(1\text{bar}, 373\text{K}) \longrightarrow \text{H}_2\text{O}_{(g)}(1\text{bar}, 373\text{K})$, the correct set of thermodynamic parameters is(are) :

- (A) $\Delta G = 0$ (B) $\Delta S_{\text{system}} > 0$ (C) $\Delta S_{\text{surrounding}} < 0$ (D) $\Delta G < 0$

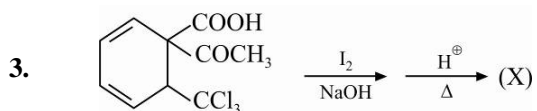
SPACE FOR ROUGH WORK

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 5 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. The value of de-Broglie wavelength of He gas at -73°C is 5 times that of the de-Broglie wavelength of monoatomic gas (X) at 727°C . The atomic mass of gas X is M times of atomic mass of He. M is _____. [Atomic mass of He = 4]

2. Total number of unpaired electrons in complex ion $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$ are equal to_____.



Number of carbon atoms in product (X), formed in above sequence of reaction are_____.

4. Consider the reaction : Lactose $\xrightarrow[\text{H}_2\text{O}]{\text{H}^+}$ (X) + (Y)

Number of compounds that reduce Tollen's reagent in above reaction are _____.

5. Total number of lone pairs in urotropine are _____.

SPACE FOR ROUGH WORK

SECTION - I/TYPE-1
SINGLE CORRECT ANSWER

This section contains 10 Single Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct.

1. If z_1, z_2, z_3 are any three roots of the equation $z^8 = (z+1)^8$, then the number of different principle value(s) of $\arg\left(\frac{z_1 - z_3}{z_2 - z_3}\right)$ can be :
 (A) 0 (B) 1 (C) 2 (D) Infinite
2. The probability for which $\lim_{x \rightarrow 0} \frac{\ln((\cos x)^a)}{x^b}$ exists finitely, where (a, b) is the possible outcome of throwing a pair of normal dice, is :
 (A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{3}{4}$
3. The number of integral values of y for which

$$\left(y^4 - 4y^2\right) \left[\int_{-\sin^{-1}x}^{\sin^{-1}x} e^{\cos t} \sin^3 t \, dt + x^2 - 4x + 8 \right] < 65 \quad \forall x \in [-1, 1],$$
 is :
 (A) 4 (B) 5 (C) 6 (D) 7
4. Let $\vec{a} = f(x)\hat{i} - f'(x)\hat{j}$ and $\vec{b} = g(x)\hat{i} + g'(x)\hat{j}$ be any two non-zero vectors and $h(x)$ be anti-derivative of $f(x)g(x)$. If $h(1) = 1, h(2) = 3, h(4) = 7$ then vectors \vec{a} and \vec{b} are linearly dependent for :
 (A) at least one $x \in (1, 2)$ (B) at least one $x \in (2, 4)$
 (C) at least two $x \in (1, 4)$ (D) at least one $x \in (1, 4)$
5. If $y = g(x)$ is the inverse of a bijective mapping $f: R \rightarrow R$ such that $f(x) = 6x^5 + 4x^3 + 2x$ then the area bounded by $g(x)$, x -axis and ordinate at $x = 12$ is :
 (A) 3 (B) 6 (C) 9 (D) 12

SPACE FOR ROUGH WORK

6. Consider a curve passing through (1, 1) such that perpendicular distance of normal drawn at any point P from origin is equal to ordinate of the point P . Then which of the following statement is incorrect?
- (A) The curve passes through origin
 (B) The equation of tangent at (2, 0) is $x = 2$
 (C) The differential equation for the curve is $\frac{dy}{dx} = \frac{y^2 - x^2}{2xy}$
 (D) Equation of curve is $x^2 + y^2 = 2y$
7. If the equation $x^3 + px^2 + qx + 1 = 0$, ($p < q$) has only one real root x_0 , then value of $2\tan^{-1}(\operatorname{cosec} x_0) + \tan^{-1}(2 \sin x_0 \sec^2 x_0)$ is :
- (A) $-\pi$ (B) π (C) $\frac{\pi}{2}$ (D) 0
8. If two mutually perpendicular lines meets the curve $C : y^2 = 4(x + y)$ at P and Q orthogonally, then locus of point of intersection of tangents to the curve C at P and Q is :
- (A) $x + 1 = 0$ (B) $x + 2 = 0$ (C) $x^2 + y^2 + 4x = 0$ (D) $x^2 + y^2 + 4y = 0$
9. If $P(1, 7, \sqrt{2})$ be a point and line L is $2\sqrt{2}(x - 1) = y - 2, z = 0$. If PQ is distance of plane $\sqrt{2}x + y - z = 1$ from P measured along a line inclined at an angle of 45° with L and is minimum then PQ is :
- (A) 2 (B) 3 (C) 4 (D) 5
10. If the angles between the vectors \vec{v}_1 and \vec{v}_2, \vec{v}_2 and \vec{v}_3, \vec{v}_3 and \vec{v}_1 be $\frac{\pi}{3}, \frac{\pi}{4}$ and $\frac{\pi}{6}$ respectively, then the angle which vector \vec{v}_1 makes with the plane containing \vec{v}_2 and \vec{v}_3 is :
- (A) $\sin^{-1} \sqrt{1 - \sqrt{\frac{2}{3}}}$ (B) $\sin^{-1} \sqrt{\sqrt{\frac{3}{2}} - 1}$ (C) $\cos^{-1} \sqrt{1 - \sqrt{\frac{2}{3}}}$ (D) $\cos^{-1} \sqrt{\sqrt{\frac{3}{2}} - 1}$

SPACE FOR ROUGH WORK

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:

11. Let $\langle a_n \rangle$ be an infinite $G.P.$ such that arithmetic mean of first three terms $= \frac{7}{6}$ of their geometric mean and the first term of the GP is a natural number satisfying $[a_1 + a_2 + a_3] = 5$. Identify which of the following statement(s) is(are) correct ?

- (A) $a_1 = 4$ (B) $a_1 + a_2 + a_3 = \frac{21}{4}$
 (C) $S_\infty = 6$ (D) $S_\infty = 8$

[Note : $[k]$ denotes greatest integer less than or equal to k]

12. Let $A = \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}$ be a matrix. If $A^6 = \begin{pmatrix} p & q \\ r & s \end{pmatrix}$, then :

- (A) Number of factors common to 'p' and 's' is 1
 (B) Number of factors of $(p + q)$ is 7
 (C) $(p + q + r + s)$ is an even integer
 (D) The sum of the proper divisors of $(p + q + r + s)$ is 1820

13. Let $f(x) = \int_0^x (5 \ln(1 + y^2) - 10y \tan^{-1} y + 16 \sin y) dy$, then which of the following hold(s) good ?

- (A) $f'(x)$ is increasing for all $x \in (0, 1)$ (B) $f(x)$ is positive for all $x \in (0, 1)$
 (C) $f(x)$ is negative for all $x \in (0, 1)$ (D) $\int_0^x f(y) dy$ is increasing for all $x \in (0, 1)$

SPACE FOR ROUGH WORK

14. If $a \in [-20, 0]$, and the probability that the graph of the function $y = 16x^2 + 8(a+5)x - 7a - 5$ is strictly above the x -axis is p/q (where p and q are coprime positive integers) :
- (A) $q = 21$ (B) $p = 13$
(C) $p + q$ is a multiple of 11 (D) $p = 9$
15. Let $2x + ay + 6z - 8 = 0$, $x + 2y + bz = 5$ and $x + y + 3z = 4$ be three planes, then :
- (A) three planes intersect at a point if $a \neq 2, b \neq 3$
(B) three planes do not have any common point of intersection if $a \neq 2, b = 3$
(C) three planes have infinite points common among them if $a = 2, b \in R$
(D) three planes never intersect at exactly two distinct points

SPACE FOR ROUGH WORK

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 5 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. $\sum_{r=0}^9 \frac{1}{{}^n C_r} = a$ then $\sum_{0 \leq i < j \leq 9} \left(\frac{1}{{}^n C_i} + \frac{1}{{}^n C_j} \right)$ is Ka , then value of K is _____.
2. Three 'a', three 'b' and three 'c' are placed randomly in a 3×3 matrix. The probability that no row or column contain two same letters can be expressed as $\frac{p}{q}$, where p and q are coprime, then find the value of $\left(\frac{280}{q} + 3p \right)$.
3. If the total number of integers between 1000 and 9999 having exactly one pair of same digit such as 4049 or 9902 but not 4449 or 4040 is A888 then 'A' is equal to
4. Consider a circle $C : x^2 + y^2 - 8y + 12 = 0$ and an ellipse $E : \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ($a > b$ and $b < 2$). If the maximum perpendicular distance from the foci of the ellipse upon the tangent drawn to the circle is 7 units, and shortest distance between both the curves is 1 unit, then find the value of $(a^2 - 2b^2)$.
5. Let position vectors of points A, B and C of triangle ABC respectively be $\hat{i} + \hat{j} + 2\hat{k}, \hat{i} + 2\hat{j} + \hat{k}$ and $2\hat{i} + \hat{j} + \hat{k}$. Let l_1, l_2, l_3 be the lengths of perpendiculars drawn from the orthocentre 'O' on the sides AB, BC and CA , then find the value of $4(l_1 + l_2 + l_3)^2$.

SPACE FOR ROUGH WORK