

PHYSICS, CHEMISTRY & MATHEMATICS

CPT - 1

CODE: 123043

PAPER - 1

Time Allotted: 3 Hours

Maximum Marks: 183

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains **Three Sections**.
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. Each **Section** is further divided into **Two Parts: Part-A & C** in the OMR. Part-B of OMR to be left unused.
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with HB pencil for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Two Parts.

- (i) **Part-A (01-07)** – Contains seven (07) multiple choice questions which have **One or More** correct answer.
Full Marks: +4 If only the bubble(s) corresponding to all the correct options(s) is (are) darkened.
Partial Marks: +1 For darkening a bubble corresponding to **each correct option**, provided **NO** incorrect option is darkened.
Zero Marks: 0 If none of the bubbles is darkened. *Negative Marks: –1* In all other cases.
For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **–1 marks**, as a wrong option is also darkened
- (ii) **Part-A (08-13)** – Contains six (06) multiple choice questions which have **ONLY ONE CORRECT** answer. Each question carries **+3 marks** for correct answer and **-1 marks** for wrong answer.
- (ii) **Part-C (01-05)** contains five (05) Numerical based questions with single digit integer as answer, ranging from 0 to 9 (both inclusive) and each question carries **+3 marks** for correct answer. **There is no negative marking.**

Name of the Candidate : _____

Batch : _____ Date of Examination : _____

Enrolment Number : _____

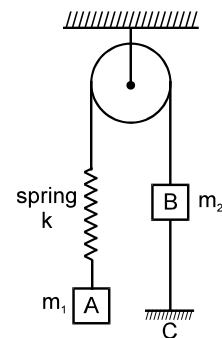
SECTION – I: PHYSICS

PART – A : (One or more than one Options Correct Type)

This section contains **7 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

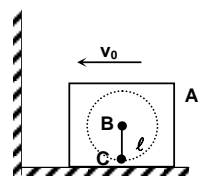
1. A motor boat is to reach at a point 30° upstream on other side of a river flowing with velocity 5 m/s. Velocity of motor boat with respect to water is $5\sqrt{3}$ m/sec. The driver should steer the boat at an angle of
 (A) 30° up w.r.t. the line of destination from the starting point
 (B) 60° up w.r.t.. normal to the bank
 (C) 120° w.r.t. stream direction
 (D) None of these

2. In the system shown in the figure $m_1 > m_2$. System is held at rest by thread BC. Just after the thread BC is burnt :
 (A) acceleration of m_2 will be upwards
 (B) magnitude of acceleration of both blocks will be equal to g
 (C) acceleration of m_1 will be equal to zero
 (D) magnitude of acceleration of both the blocks will zero.



3. A particle moves along positive branch of the curve $y = \frac{x}{2}$ where $x = \frac{t^3}{3}$, x and y are measured in metres and t in seconds, then
 (A) the velocity of particle at $t = 1$ s is $\hat{i} + \frac{1}{2}\hat{j}$
 (B) the velocity of particle at $t = 1$ s is $\frac{1}{2}\hat{i} + \hat{j}$
 (C) the acceleration of particle at $t = 1$ s is $2\hat{i} + \hat{j}$
 (D) the acceleration of particle at $t = 2$ s is $\hat{i} + 2\hat{j}$

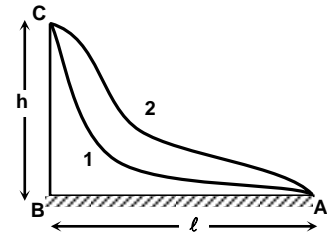
4. A Block 'A' is placed on a smooth horizontal surface and a particle C is suspended with the help of light rod from point B of the block as shown. Now both the block A and the particle C are given velocity v_0 towards left. The block A strikes a fixed wall and suddenly stops. Then, (The rod BC is free to rotate about B)



- (A) the smallest velocity v_0 for which the particle C will swing in a full circle about the point B is $\sqrt{4gl}$.
 (B) the smallest velocity v_0 for which the particle C will swing in a full circle about the point B is \sqrt{gl} .
 (C) velocity of point C at the highest point of the circle (for the smallest value of v_0) is zero.
 (D) velocity of point C at the highest point of the circle (for the smallest value of v_0) is \sqrt{gl} .

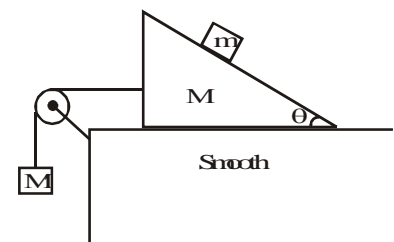
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5. A body is lifted quasi statically to the top of a mountain through path 1 and path 2 by applying a tangential force from bottom in the figure. Coefficient of friction between the body and surface is μ then
- (A) Work done by gravity and friction is less through path 1 than 2.
 (B) Work done by gravity and friction is more through path 1 than 2.
 (C) Work done by gravity is same in both path.
 (D) Work done by friction is same in both path.



6. Two particles A and B are projected from the same point with the same speed of projection but at different angles α and β of projection, such that the maximum height of A is two-third of the horizontal range of B. Then which of the following relations are true :
- (A) range of A = maximum height of B
 (B) $3(1 - \cos 2\alpha) = 8 \sin 2\beta$
 (C) maximum value of β is $\sin^{-1}(3/4)$
 (D) maximum horizontal range of A = u^2/g and this occurs when $\beta = \frac{1}{2} \sin^{-1}\left(\frac{3}{8}\right)$

7. The figure shows a block of mass m placed on a smooth wedge of mass M . Calculate the value of M' and tension in the string, so that the block of mass m will move vertically downward with acceleration 10 m/s^2 (Take $g = 10 \text{ m/s}^2$)

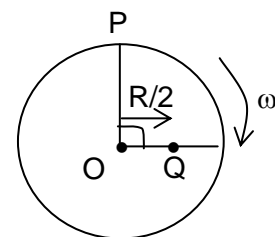


- (A) the value of M' is $\frac{M \cot \theta}{1 - \cot \theta}$
 (B) the value of M' is $\frac{M \tan \theta}{1 - \tan \theta}$
 (C) the value of tension in the string is $Mg \cot \theta$
 (D) the value of tension is $M'g(1 - \cot \theta)$

Single Correct Answer Type

This section contains **6 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**.

8. A circular disc of radius R is rotating about its axis through O with a uniform angular velocity ω rad/s as shown in the figure. P and Q are two points on the disc. At any instant of time the magnitude of the relative velocity of P with respect to Q is

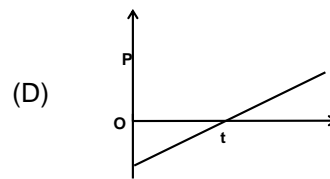
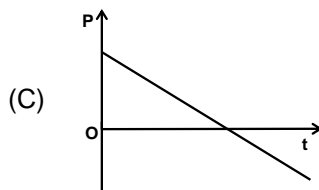
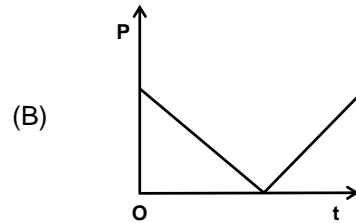
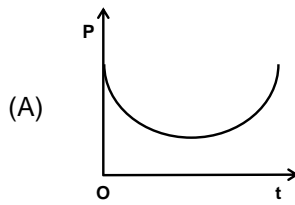


- (A) 0
 (B) $\frac{R\omega}{2}$
 (C) $\sqrt{3} \frac{R\omega}{2}$
 (D) $\frac{\sqrt{5}R\omega}{2}$

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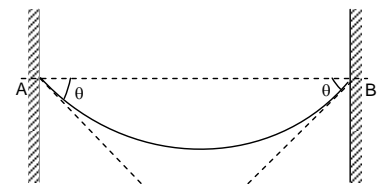
9. A car accelerates from rest at a constant rate of 2 m/s^2 for some time. Then, it retards at a constant rate of 4 m/s^2 and comes to rest. What is the maximum speed attained by the car if it remains in motion for 3 seconds?
 (A) 2 m/s (B) 3 m/s (C) 4 m/s (D) 6 m/s

10. A stone is projected at time $t = 0$ with a speed v_0 at an angle θ with the horizontal in a uniform gravitational field. The rate of work done (P) by the gravitational force plotted against time (t) will be as



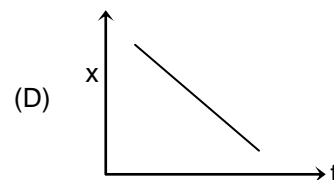
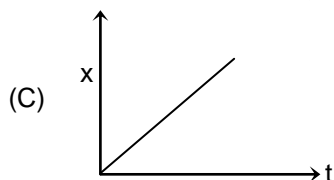
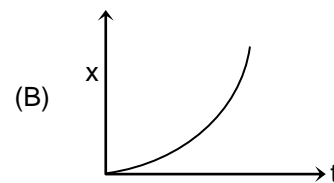
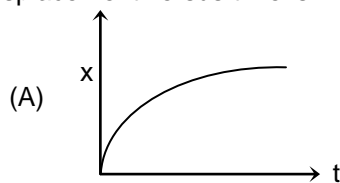
11. A projectile is projected at an angle α ($>45^\circ$) with an initial velocity u . The time t , at which its horizontal velocity will equal the vertical velocity, is
 (A) $t = \frac{u}{g} (\cos \alpha - \sin \alpha)$ (B) $t = \frac{u}{g} (\cos \alpha + \sin \alpha)$
 (C) $t = \frac{u}{g} (\sin \alpha - \cos \alpha)$ (D) $t = \frac{u}{g} (\sin^2 \alpha - \cos^2 \alpha)$

12. A heavy string of mass m hangs between two fixed points A and B at an angle θ with the horizontal as shown in the figure. The tension at the lowest point in the string is



- (A) $mg/(2 \sin \theta)$ (B) $mg/(2 \cos \theta)$ (C) $mg/(2 \tan \theta)$ (D) $mg/(2 \cot \theta)$

13. The velocity of a particle moving in the positive direction of x -axis varies as $v = A\sqrt{x}$. The graph of displacement versus time is:

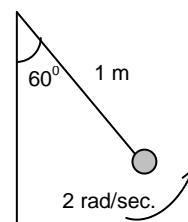


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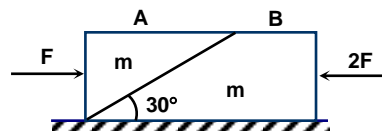
PART-C
Integer Answer Type

This section contains **5 questions**. The answer to each of the questions is a single digit integer, ranging from **0 to 9**.

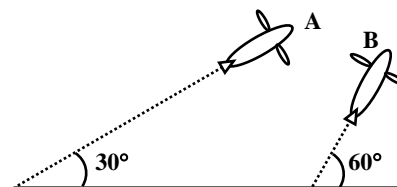
1. A simple pendulum of mass 0.5 kg, during its swing in the vertical plane, is observed to have an angular velocity of 2 rad/s in the position shown. The instantaneous tension in the string is given by $n \times 1.5$, then n is (take $g = 10 \text{ m/s}^2$)



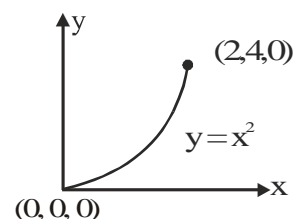
2. Two blocks A and B each of mass m are placed on a smooth horizontal surface. Two horizontal force F and $2F$ are applied on both the blocks A and B, respectively, as shown in the figure. If the block A does not slide on block B, then the normal reaction acting between the two blocks is found to be $n \times F$. Then n is



3. Airplanes A and B are flying with constant velocity in the same vertical plane at angles 30° and 60° with respect to the horizontal respectively as shown in the figure. The speed of A is $100\sqrt{3} \text{ ms}^{-1}$. At time $t = 0 \text{ s}$, an observer in A finds B at a distance of 500 m. This observer sees B moving with a constant velocity perpendicular to the line of motion of A. If at $t = t_0$, A just escapes being hit by B, t_0 in seconds is



4. A force $\vec{F} = (3xy - 5z)\hat{j} + 4z\hat{k}$ is applied on a particle. The work done by the force when the particle moves from the point $(0,0,0)$ to the point $(2,4,0)$ as shown in the figure is $n \times \frac{32}{5}$, then n is



5. The potential energy of a particle is determined by the expression $U = \alpha (x^2 + y^2)$, where α is a positive constant. The particle begins to move from a point with the coordinates $(3, 3) \text{ (m)}$, only under the action of potential field force. The kinetic energy of the particle at the point $(1, 1) \text{ (m)}$ is $n \times 8\alpha$, then n is

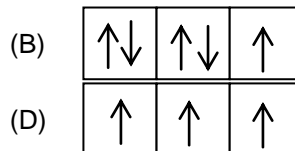
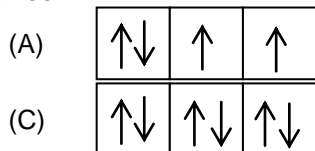
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SECTION – II: CHEMISTRY

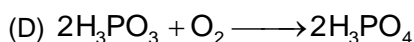
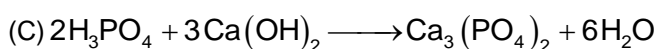
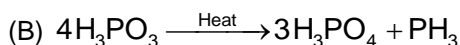
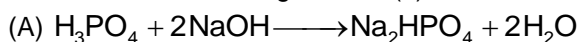
PART – A : (One or more than one Options Correct Type)

This section contains **7 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

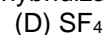
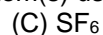
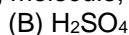
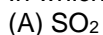
1. In which of the following configuration(s) the number of possible exchange pairs is greater than three?



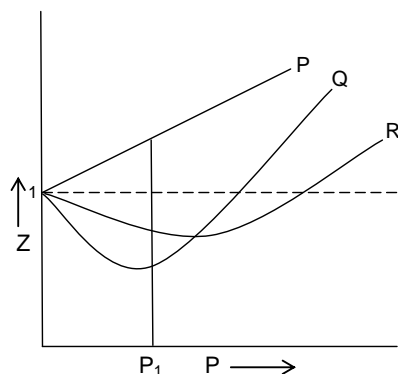
2. In which of the following reaction(s), the n-factor of H_3PO_4 is greater than one?



3. In which of the following molecule, the central atom(s) uses d-orbitals in hybridization?



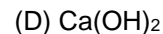
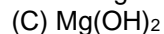
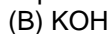
- 4.



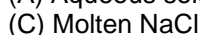
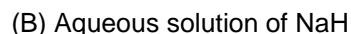
Above graph is given at 0°C . Which of the following properties of the gases P, Q and R are correct?

- (A) Order of compression at P_1 : $Q > R > P$ (B) Extent of positive deviation: $P > Q > R$
 (C) Extent of negative deviation: $Q > R > P$ (D) van der Waal's constant 'a' at P_1 : $Q > R > P$

5. Which of the following compound(s) dehydrates on heating?



6. Electrolysis of which of the following compound(s) results in evolution of gases at cathode and anode?



space for rough work

7. The electron gain enthalpy of which of the following substance(s) is/are higher than that of oxygen atom?
 (A) Sulphur (B) Fluorine (C) Nitrogen (D) Chlorine

Single Correct Answer Type

This section contains **6 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**.

8. If the radius of the first orbit of hydrogen atom is 0.529 \AA . What will be the approximate wavelength of the electron motion along the third orbit?
 (A) 25 \AA (B) 10 \AA (C) 30 \AA (D) 20 \AA
9. Which of the following molecule has the maximum amount of covalent character?
 (A) CaF_2 (B) CaCl_2 (C) CaBr_2 (D) CaI_2
10. Which of the following has the highest value of hydration energy?
 (A) Li^+ (B) Na^+ (C) K^+ (D) Rb^+
11. In which case both the gases have same average kinetic energy and R.M.S velocity at 400°C ?
 (A) N_2 and CO (B) O_2 and F_2 (C) CO_2 and CH_4 (D) PH_3 and CH_4
12. Which of the following is a comproportionation reaction?
 (A) $3\text{Cl}_2 + 6\text{NaOH} \longrightarrow \text{NaClO}_3 + 5\text{NaCl} + 3\text{H}_2\text{O}$
 (B) $\text{NO} + \text{NO}_2 \longrightarrow \text{N}_2\text{O}_3$
 (C) $2\text{H}_2\text{O}_2 \longrightarrow 2\text{H}_2\text{O} + \text{O}_2$
 (D) $4\text{Al} + 3\text{O}_2 \longrightarrow 2\text{Al}_2\text{O}_3$
13. The most water soluble gr-2 sulphate is
 (A) BeSO_4 (B) MgSO_4 (C) CaSO_4 (D) BaSO_4

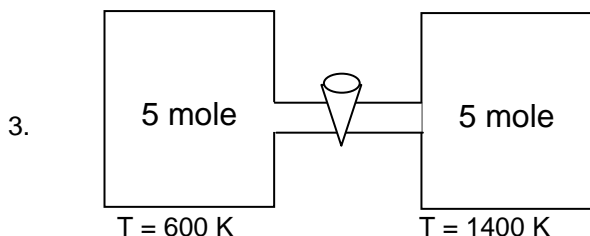
PART-C

Integer Answer Type

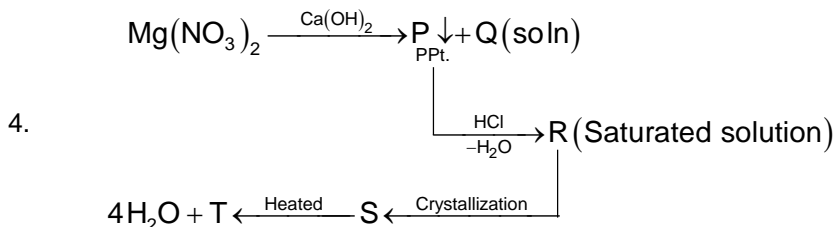
This section contains **5 questions**. The answer to each of the questions is a single digit integer, ranging from **0 to 9**.

1. The de-Broglie wave length of helium atom at 1000 K is λ_1 and that of neon at 800 K is λ_2 . If the ratio of λ_1 to λ_2 is expressed as $x : y$, then $(x + y)$ is
 [At mass $\text{He} = 4$, $\text{Ne} = 20$]
2. How many electrons is/are present in the pi-antibonding molecular orbitals of F_2 ?

space for rough work



Two containers of equal volume contains 5 mole of an ideal gas each at 600 K. If one of the container is heated to 1400 K, what will be the number of moles of the gas in the container which is at 600 K?



How many total number of atom(s) is/are present in one molecule of (T)?

5. An aqueous solution contains 200 g of NaOH and 212 g of Na_2CO_3 . How many moles of HCl is needed for titration of the solution in presence of phenolphthalein indicator?

SECTION – III: MATHEMATICS

PART – A : (One or more than one Options Correct Type)

This section contains 7 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE** is correct.

1. The solution of equation $3^{\log_a x} + 3x^{\log_a 3} = 2$ is given by
 (A) $a^{\log_3 a}$ (B) $\left(\frac{2}{a}\right)^{\log_3 2}$ (C) $a^{-\log_3 2}$ (D) $2^{-\log_3 a}$
2. Consider circles $C_1 = x^2 + y^2 - 2x - 4y - 4 = 0$, $C_2 = x^2 + y^2 + 2x + 4y + 4 = 0$ and Line $L = x + 2y + 2 = 0$ then
 (A) L is radical axis of C_1 and C_2
 (B) L is common tangent of C_1 & C_2
 (C) L is common chord of C_1 and C_2
 (D) L is perpendicular to the line joining centers of C_1 & C_2
3. If $\cos \alpha = \frac{3}{5}$ and $\cos \beta = \frac{5}{13}$ then
 (A) $\cos(\alpha + \beta) = \frac{33}{65}$ (B) $\sin(\alpha + \beta) = \frac{56}{65}$ (C) $\sin^2\left(\frac{\alpha - \beta}{2}\right) = \frac{1}{65}$ (D) $\cos(\alpha - \beta) = \frac{63}{65}$

space for rough work

4. If circle passes through $\left(3, \sqrt{\frac{7}{2}}\right)$ and touches $x + y = 1$ and $x - y = 1$, then the centre of circle is
 (A) (4, 0) (B) (4, 2) (C) (6, 0) (D) (7, 9)
5. If $b > 1$, $\sin t > 0$, $\cos t > 0$ and $\log_b(\sin t) = x$ then $\log_b(\cos t)$ is equal to
 (A) $\frac{1}{2}\log_b(1 - b^{2x})$ (B) $2\log_b(1 - b^{x/2})$ (C) $\log_b\sqrt{1 - b^{2x}}$ (D) $\sqrt{1 - x^2}$
6. The line $3x + 2y = 24$ meets the y - axis at A and the x - axis at B. C is a point on the perpendicular bisector of AB such that the area of the triangle ABC is 91 sq. units. The coordinates of C are
 (A) $\left(\frac{29}{2}, -1\right)$ (B) $\left(\frac{29}{2}, 13\right)$ (C) $\left(\frac{-13}{2}, \frac{-3}{2}\right)$ (D) $\left(\frac{-13}{2}, 13\right)$
7. The points on the line $x=2$ from which the tangents drawn to the circle $x^2 + y^2 = 16$ are at right angles is (are)
 (A) $(2, 2\sqrt{7})$ (B) $(2, 2\sqrt{5})$ (C) $(2, -2\sqrt{7})$ (D) $(2, -2\sqrt{5})$

Single Correct Answer Type

This section contains **6 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE is correct**.

8. $\int x^2 e^{x^3} \cos(e^{x^3}) dx =$
 (A) $\frac{\sin(e^{x^3})}{3} + C$ (B) $-\frac{\sin(e^{x^3})}{3} + C$ (C) $\frac{\cos(e^{x^3})}{3} + C$ (D) $3\sin(e^{x^3}) + C$
9. The least value of $\operatorname{cosec}^2 x + 25 \sec^2 x$ is
 (A) 10 (B) 26 (C) 28 (D) 36
10. $(-6, 0)$, $(0, 6)$ and $(-7, 7)$ are vertices of $\triangle ABC$. The incircle of triangle has the equation
 (A) $x^2 + y^2 - 9x - 9y + 36 = 0$ (B) $x^2 + y^2 + 9x - 9y + 36 = 0$
 (C) $x^2 + y^2 + 9x + 9y - 36 = 0$ (D) $x^2 + y^2 + 18x - 18y + 36 = 0$
11. If maximum value of $a \sin x + 2 \cos\left(x + \frac{\pi}{3}\right)$ be 1, then the value of a is
 (A) $\sqrt{2}$ (B) 1 (C) $\sqrt{3}$ (D) 2

space for rough work

12. Tangents drawn from the point P (1, 8) to the circle $x^2 + y^2 - 6x - 4y - 11 = 0$ touch the circle at the points A and B. The equation of the circumcircle of the triangle PAB is
- (A) $x^2 + y^2 + 4x - 6y + 19 = 0$ (B) $x^2 + y^2 - 4x - 10y + 19 = 0$
 (C) $x^2 + y^2 - 2x + 6y - 29 = 0$ (D) $x^2 + y^2 - 6x - 4y + 19 = 0$
13. $\lim_{x \rightarrow 0} x \cot 3x$ is
- (A) 3 (B) 1 (C) 0 (D) $\frac{1}{3}$

PART-C**Integer Answer Type**

This section contains **5 questions**. The answer to each of the questions is a single digit integer, ranging from **0 to 9**.

1. If $\frac{x}{\cos \theta} = \frac{y}{\cos(\theta - 120^\circ)} = \frac{z}{\cos(\theta + 120^\circ)}$, then $x + y + z$ is equal to _____
2. Two vertices of triangle (3, -2) and (-2, 3) and its orthocentre is (-6, 1). If third vertex is (-1, k) then k is _____
3. If $n = 2003!$, then $\frac{1}{\log_2 n} + \frac{1}{\log_3 n} + \frac{1}{\log_4 n} + \dots + \frac{1}{\log_{2003} n}$ is _____
4. $\int_0^1 \frac{e^{\sqrt{x}}}{\sqrt{x}} dx = \lambda(e - 1)$ then λ is _____
5. Let ratio of the greatest value of $2 - \cos x + \sin^2 x$ to its least value is k then $4k - 7$ is equal to _____

space for rough work

FIITJEE COMMON TEST

BATCHES: Two Yr CRP C-XI
PHASE TEST – 1 (PAPER - 1)

QP Code: 123043

ANSWER KEY

SECTION – I (PHYSICS)

PART-A

1.	AB	2.	AC	3.	AC	4.	AC
5.	CD	6.	BD	7.	ACD	8.	D
9.	C	10.	D	11.	C	12.	C
13.	B						

PART-C

1.	3	2.	3	3.	5	4.	6
5.	2						

SECTION – II (CHEMISTRY)

PART-A

1.	BC	2.	ABCD	3.	CD	4.	ABCD
5.	CD	6.	AB	7.	ABD	8.	B
9.	D	10.	A	11.	A	12.	B
13.	A						

PART-C

1.	3	2.	4	3.	7	4.	9
5.	7						

SECTION – III (MATHEMATICS)

PART-A

1.	CD	2.	<u>AD</u>	3.	BCD	4.	AC
5.	AC	6.	<u>B</u>	7.	AC	8.	A
9.	D	10.	<u>B</u>	11.	C	12.	B
13.	D						

PART-C

1.	0	2.	6	3.	1	4.	2
5.	6						