

PHYSICS, CHEMISTRY & MATHEMATICS**QP CODE: 100891****Paper – 1****Time Allotted: 3 Hours****Maximum Marks: 180**

- 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. All the section can be filled in **PART-A & B** of OMR.
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 **Blue/Black Ball Point Pen** 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 (01-04)** – Contains Four (04) 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-A (05-07)** contains **(3) Multiple Choice Questions** which have **One or More Than One Correct** answer.
Full Marks: +4 If only the bubble(s) corresponding to all the correct option(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.
- (iii) **Part-A (08-11)** – This section contains Four (04) Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: **List-I** and **List-II**. **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question. Each question carries **+3 Marks** for correct answer and **-1 marks** for wrong answer.
- (iii) **Part-B (01-06)** This section contains **SIX (06)** questions. The answer to each question is a **NON-NEGATIVE INTEGER**. For each question, enter the correct integer corresponding to the answer. Each question carries **+4 marks** for correct answer. **There is no negative marking.**

Name of the Candidate: _____

Batch: _____ Date of Examination: _____

Enrolment Number: _____

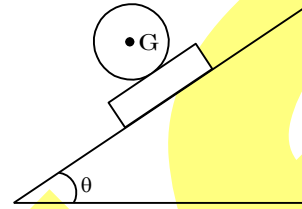
SECTION – I: PHYSICS

(PART – A)

(Single Correct Answer Type)

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

1. The acceleration a of the supporting surface (see Figure) required to keep the centre G of the circular cylinder in a fixed position during the motion if there is no slipping between the cylinder and support will be

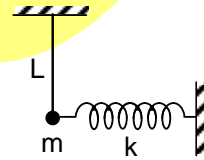


- (A) $g \sin \theta$ (B) $\frac{(g \sin \theta)}{2}$ (C) $2g \sin \theta$ (D) $4g \sin \theta$

2. A rectangular block has a square base measuring $a \times a$, and its height is h . It moves on a horizontal surface in a direction perpendicular to one of its edge. The coefficient of friction is μ . It will topple if

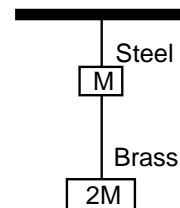
- (A) $\mu > h/a$ (B) $\mu > a/h$ (C) $\mu > \frac{2a}{h}$ (D) $\mu > \frac{a}{2h}$

3. A bob of mass ' m ' is attached a light rigid rod as shown in figure. When displaced, the pendulum will undergo SHM with a period T equal to



- (A) $2\pi\sqrt{\frac{L}{g}}$ (B) $2\pi\sqrt{\frac{m}{k}}$
 (C) $\frac{2\pi}{\sqrt{\frac{g}{L} + \frac{k}{m}}}$ (D) $2\pi\sqrt{\frac{L}{g} + \frac{m}{k}}$

4. If the ratios of lengths, radii and Young's modulus of steel and brass wires in the adjacent figure are a , b and c , respectively, then the corresponding ratio of increase in their lengths would be



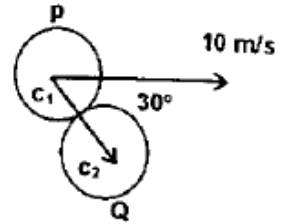
- (A) $\frac{2a^2c}{b}$ (B) $\frac{3a}{2b^2c}$
 (C) $\frac{2ac}{b^2}$ (D) $\frac{3c}{2ab^2}$

Space For Rough Work

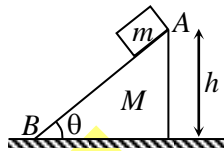
(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

5. A ball P collides elastically with another identical ball Q at rest with velocity 10 m/s at an angle of 30° from the line joining their centres c_1 and c_2 . Select the correct alternative(s)
- (A) Velocity of ball P after collision is 5 m/s
 (B) Velocity of ball Q after collision is $5\sqrt{3}$ m/s
 (C) both the balls move at right angle after collision
 (D) kinetic energy will not be conserved since collision is not a head-on collision.



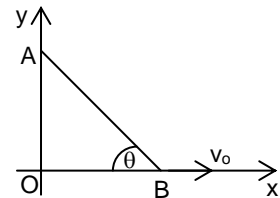
6. A block of mass m is resting at point A on a wedge of mass M which is kept on a smooth surface as shown in figure. Now the block is set free to move. After some time the block reaches point B with respect to wedge. Then



- (A) momentum of block-wedge system remains conserved in horizontal direction.
 (B) momentum of block-wedge system remains conserved in vertical direction.
 (C) displacement of wedge till this moment will be $\frac{mh \cot \theta}{M + m}$.
 (D) displacement of wedge till this moment will be $\frac{mh \tan \theta}{M + m}$.

7. The end B of the rod AB which makes angle θ with the floor is being pulled with a constant velocity v_0 as shown. The length of the rod is l . At the instant when $\theta = 37^\circ$

- (A) velocity of end A is $\frac{4}{3} v_0$ downward
 (B) angular velocity of rod is $\frac{5 v_0}{3 l}$
 (C) angular velocity of rod is constant
 (D) velocity of end A is constant



Space For Rough Work

(Matching List Sets)

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

8. When two objects undergo impact, the speed with which they separate after impact is either less or equal to their speed of approach before impact.

Experimental evidence suggest that the ratio of their relative speeds is constant for a given set of two objects. This property is given by Newton's law of restitution and can be written in the form

$$e = \frac{\text{Relative velocity of separation along common normal}}{\text{Relative velocity of approach along common normal}}$$

Hence e is coefficient of restitution and is constant for two particular objects. The value of e lies in the range 0 to 1.

For $e = 0$, the collision is completely inelastic as both the objects move with same speed in the direction of collision.

For $e = 1$, the collision is completely elastic collision and in this case approach speed = separation speed (along the common normal).

List-I		List-II	
(P)	It will rise back to a maximum height of	(1)	5
(Q)	The ratio of magnitude of vertical component of velocity just before collision to that of just after the collision	(2)	1
(R)	Change in momentum	(3)	2
(S)	Average force exerted on the ball in infinite time	(4)	2.5
		(5)	3

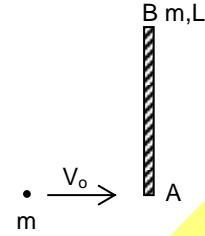
A ball is dropped from a height 20 m, and collides with the horizontal floor, if the value of

$e = \frac{1}{2}$ and mass of the ball is 0.1 kg, then ($g = 10 \text{ m/s}^2$)

- (A) P → 1 ; Q → 4 ; R → 3 ; S → 2 (B) P → 4 ; Q → 5 ; R → 3 ; S → 4
 (C) P → 1 ; Q → 3 ; R → 5 ; S → 2 (D) P → 3 ; Q → 1 ; R → 4 ; S → 5

Space For Rough Work

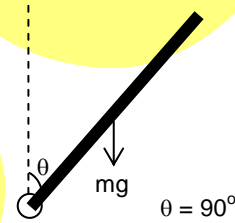
9. A uniform rod of mass m and length L placed on a smooth horizontal surface is struck by a particle of mass m moving horizontally and perpendicular to its length with velocity v_0 . The particle sticks to end A of the rod. Then match the following.



List-I		List-II	
(P)	Velocity of centre of mass of rod + particle system	(1)	$0.8 v_0$
(Q)	Velocity of end A of the rod immediately after collision	(2)	$\frac{v_0}{2}$
(R)	Angular speed of the rod immediately after collision	(3)	$\frac{5\pi L}{12v_0}$
(S)	Time take by the rod to turn through 90°	(4)	$\frac{6 v_0}{5 L}$

The correct option is:

- (A) $P \rightarrow 2$; $Q \rightarrow 1$; $R \rightarrow 3$; $S \rightarrow 4$ (B) $P \rightarrow 2$; $Q \rightarrow 1$; $R \rightarrow 4$; $S \rightarrow 3$
 (C) $P \rightarrow 3$; $Q \rightarrow 4$; $R \rightarrow 2$; $S \rightarrow 1$ (D) $P \rightarrow 3$; $Q \rightarrow 1$; $R \rightarrow 4$; $S \rightarrow 2$
10. A uniform rod of mass 1 kg length $10/3$ m is free to rotate in the vertical plane about a horizontal axis passing through its lower end. The rod is released from rest in the position slightly displacing it clockwise. When the rod turns through 90° then match the following options.



List-I		List-II	
(P)	Angular speed of the rod	(1)	3
(Q)	Angular acceleration of the rod	(2)	4.5
(R)	Vertical component of hinge reaction	(3)	2.5
(S)	Velocity of centre of mass	(4)	5

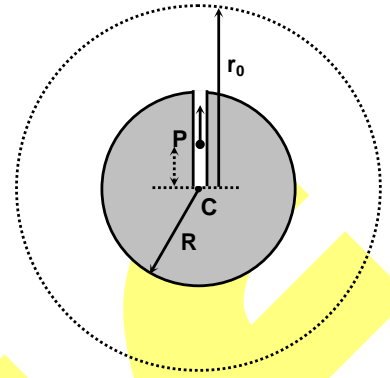
The correct option is:

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

Space For Rough Work

11. Answer the following by appropriately matching the list based on the information given in the paragraph.

A satellite is to be launched in a circular orbit of radius r_0 around a planet of radius R . For this two stage rocket is to be used. First stage rocket is used to lift the satellite vertically up to the desired height r_0 (measured from the center C of the planet), after launching it from a launch point P . Distance of launch point P from centre of the planet is r_L . Launch point P lies inside the tunnel as shown in the figure. Second stage rocket is used to impart it a tangential velocity so as to put it in a circular orbit. Let E_1 and E_2 are the energies delivered by the first and second stage of the rocket. Assume that the mass of the rocket is negligible with respect to the mass of the planet and atmospheric resistance to be zero. List-I gives 4 values of r_0 and r_L and List-II gives magnitude of some quantity.



List-I		List-II	
(P)	$r_0 = R$ $r_L = \frac{R}{\sqrt{2}}$	(1)	$\frac{1}{2}$
(Q)	$r_0 = \frac{3R}{2}$ $r_L = R$	(2)	1
(R)	$r_0 = 4R$ $r_L = R$	(3)	$\frac{11}{6}$
(S)	$r_0 = 4R$ $r_L = \frac{R}{\sqrt{2}}$	(4)	$\sqrt{2}$
		(5)	8

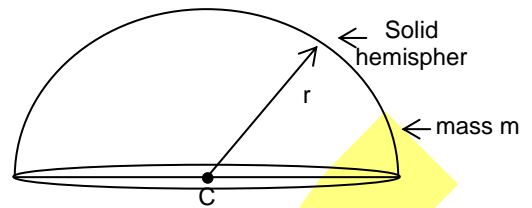
The correct match for the time period of the satellite for the values of r_0 given in List-I in terms of T_0 is: (Take $T_0 = \frac{2\pi}{\sqrt{GM}} R^{3/2}$ and $\sqrt{6} = \frac{22}{9}$ if required)

- (A) P \rightarrow 2 ; Q \rightarrow 3 ; R \rightarrow 1 ; S \rightarrow 4
 (B) P \rightarrow 2 ; Q \rightarrow 1 ; R \rightarrow 5 ; S \rightarrow 5
 (C) P \rightarrow 2 ; Q \rightarrow 3 ; R \rightarrow 4 ; S \rightarrow 1
 (D) P \rightarrow 2 ; Q \rightarrow 3 ; R \rightarrow 5 ; S \rightarrow 5

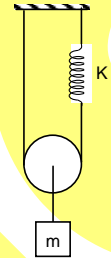
Space For Rough Work

(PART – B)**(Non – Negative Integer)**

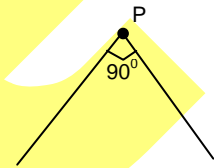
1. A solid hemisphere has a mass m and radius r . Its centre of mass is at a distance of $\frac{xr}{8}$ from its centre C . Find the value of 'x'.



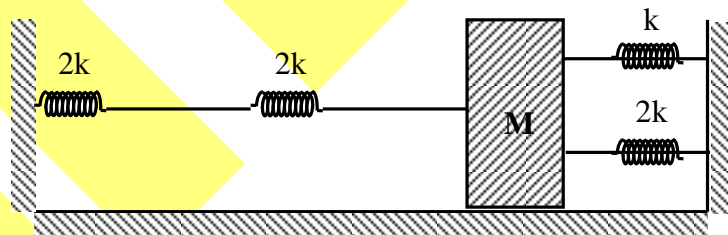
2. Figure below shows a massless pulley, a spring of constant $K = 250 \text{ N/m}$ and a mass 1 kg . On displacing the mass slightly, find its frequency (approximate) of its vertical oscillation



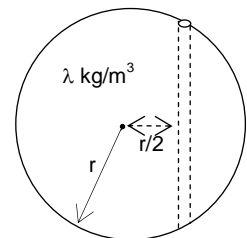
3. A system of two identical rods (L shaped) of mass m , length L . System rest on a peg p as shown in the fig period of oscillations $T = 2\pi\sqrt{\frac{n\sqrt{2}L}{3g}}$ then $n = ?$



4. Three particles, each of mass m , are situated at the vertices of an equilateral triangle of side length a . The only forces acting on the particles are their mutual gravitational forces. It is desired that each particle moves in a circle while maintaining the original mutual separation a . Find the initial velocity that should be given to each particle. (take $a = \frac{GM}{16}$)
5. Four massless springs whose force constants are $2k$, $2k$, k and $2k$ respectively are attached to a mass M kept on a frictionless plane (as shown in figure). If the mass M is displaced in the horizontal direction, then the frequency of the system is [Take $K = \pi^2 \text{Nm}^{-1}$, $M = 1 \text{kg}$]



6. Consider a planet of radius r having density λ . A tunnel is dug inside it at a distance $r/2$ from its centre as shown in figure. An object of mass m is left in the tunnel at the surface at $t = 0$, if the magnitude of velocity of object at the centre of the tunnel is $\sqrt{n\pi G\lambda r^2}$, then find the value of n .



Space For Rough Work

SECTION – II: CHEMISTRY

(PART – A)

(Single Correct Answer Type)

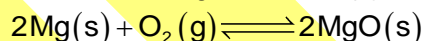
This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

- What is the relation between K_{a_1} , K_{a_2} and K_{a_3} of H_3PO_4 ?
 (A) $K_{a_3} = K_{a_1} + K_{a_2}$ (B) $K_{a_1} > K_{a_2} > K_{a_3}$
 (C) $K_{a_1} \times K_{a_2} \times K_{a_3} = 1$ (D) $K_{a_3} = K_{a_1} - K_{a_2}$
- For the reaction
 $2Al_2O_3(s) \longrightarrow 4Al(s) + 3O_2(g); \Delta H_R^\circ = 3352 \text{ kJ}$
 What is enthalpy of formation of Al_2O_3 in kJ?
 (A) -6704 (B) -3352
 (C) -1676 (D) +1676
- K_P has the value of 10^{-6} atm^3 and 10^{-4} atm^3 at 298 K and 323 K respectively for the reaction.
 $CuSO_4 \cdot 3H_2O(s) \rightleftharpoons CuSO_4(s) + 3H_2O(g)$
 $\Delta_r H^\circ$ for the reaction is:
 (A) 7.7 kJ/mol (B) -147.41 kJ/mol
 (C) 147.41 kJ/mol (D) None of these
- The concentration of the saturated solution of a salt AX_2 is 0.01 mol L^{-1} . Choose incorrect statement regarding the solution?
 (A) The solubility product of the salt is 4×10^{-6}
 (B) The concentration of X^- ions is twice that of A^{2+} ion
 (C) More solute can be dissolved in the solution by heating if the heat of solution is positive
 (D) The pH of the solution must be seven

(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

- Which of the following statement(s) is/are correct for the following reversible reaction?



(A) $K_P < K_C$

(B) $K_P = \frac{1}{p_{O_2}}$

(C) $K_C = [O_2]$

(D) $\frac{K_P}{K_C} = \frac{1}{RT}$

Space For Rough Work

6. The correct statement(s) regarding Arrhenius equation $k = Ae^{-E_a/RT}$ is /are
- (A) 'k' attains the maximum value when $E_a = 0$
 (B) E_a will be zero when $T \rightarrow \infty$
 (C) $e^{-E_a/RT}$ represents the fraction of molecules that cross the energy barrier
 (D) it represents the relation, $k \propto \frac{1}{T}$
7. Which of the following is/are intensive properties?
- (A) Density (B) Vapour density
 (C) Relative density (D) Refractive index

(Matching List Sets)

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

8. Match the following & answer accordingly:

List – I		List– II	
(P)	Activation energy(E_a)	(1)	is the maximum value of rate constant
(Q)	Transition state	(2)	the most energetic position attained by reactant molecules of an elementary reaction
(R)	Frequency factor(A)	(3)	has variable units depending on order of reaction
(S)	Rate constant(k)	(4)	rate of reaction becomes maximum if it is zero
		(5)	Is inversely proportional to half-life of first order reactions

- (A) P \rightarrow 3; Q \rightarrow 2; R \rightarrow 4; S \rightarrow 1
 (B) P \rightarrow 4; Q \rightarrow 2; R \rightarrow 1; S \rightarrow 3
 (C) P \rightarrow 3; Q \rightarrow 4; R \rightarrow 2; S \rightarrow 1
 (D) P \rightarrow 4; Q \rightarrow 2; R \rightarrow 5; S \rightarrow 1

9. Match the following & answer accordingly:

List – I (Thermodynamic variables)		List– II (Characteristics)	
(P)	ΔH	(1)	Related to randomness of a system
(Q)	ΔG	(2)	Zero for isothermal process
(R)	$\Delta S(\text{system})$	(3)	Becomes zero at equilibrium state
(S)	$\Delta E(\text{or } \Delta U)$	(4)	Becomes negative for exothermic reactions
		(5)	Zero for all kind of reactions

- (A) P \rightarrow 2; Q \rightarrow 1; R \rightarrow 3; S \rightarrow 4
 (B) P \rightarrow 3; Q \rightarrow 4; R \rightarrow 2; S \rightarrow 1
 (C) P \rightarrow 4; Q \rightarrow 3; R \rightarrow 1; S \rightarrow 2
 (D) P \rightarrow 5; Q \rightarrow 2; R \rightarrow 1; S \rightarrow 3

Space For Rough Work

10. Match the following & answer accordingly:

List – I (Salts having solubility s mol L^{-1})		List– II (K_{sp} in terms of s)	
(P)	AgCl	(1)	$27s^4$
(Q)	BeF ₂	(2)	$256 s^5$
(R)	Al(OH) ₃	(3)	$4s^3$
(S)	SiF ₄	(4)	s^2
		(5)	$8s^4$

(A) P → 3; Q → 4; R → 2; S → 1

(B) P → 2; Q → 3; R → 4; S → 5

(C) P → 3; Q → 1; R → 4; S → 2

(D) P → 4; Q → 3; R → 1; S → 2

11. Match the following & answer accordingly:

List – I (Application of the factors on the reaction, $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$ [at constant temperature])		List– II (Effects according to Le-Chatelier's principle)	
(P)	Increase of pressure	(1)	No change is observed
(Q)	Increase in the volume of reaction container	(2)	Concentration of NO ₂ will increase
(R)	Addition of inert gas at constant volume	(3)	Concentration of NO will increase
(S)	Addition of inert gas at constant pressure	(4)	Partial pressure of O ₂ will increase
		(5)	Concentration of NO ₂ and O ₂ will increase

(A) P → 1; Q → 5; R → 3; S → 2

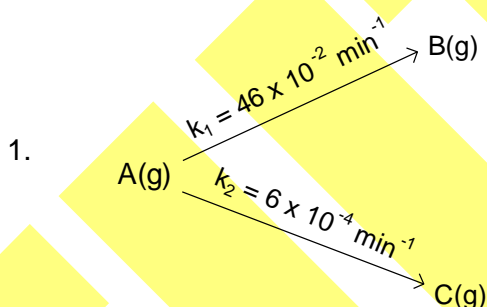
(B) P → 3; Q → 5; R → 2; S → 4

(C) P → 2; Q → 3; R → 1; S → 4

(D) P → 3; Q → 4; R → 1; S → 2

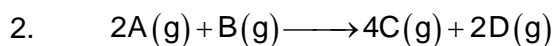
(PART – B)

(Non – Negative Integer)



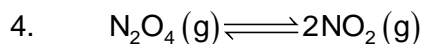
In above reaction the initial concentration of reactant A is 4 M. The concentration of A after 10 min of the reaction is expressed as $y \times 10^{-2}$ M. What is the value of 'y'?

Space For Rough Work



If the rate of formation of C is $0.16 \text{ mol L}^{-1} \text{ s}^{-1}$ the overall rate of reaction in $\text{mol L}^{-1} \text{ s}^{-1}$ unit will be x, what is the value of $100x$?

3. What is the pH of 10^{-3} M aqueous solution of NH_4OH ?
[K_b of $\text{NH}_4\text{OH} = 10^{-5}$]



One mole of N_2O_4 is taken in a one litre container. The degree of dissociation of N_2O_4 is 0.5 at equilibrium. What is the equilibrium constant K_C of the reaction?

5. 12 joule of heat was supplied to a thermodynamic system, which did 6 joule of expansion work. What will be the value of change in internal energy (ΔU) of the system in joule unit?

6. The half-life of a first order reaction is 2 min. In how much time in minute the ratio of $[A]_t : [A]_0$ will be 1 : 16?

Space For Rough Work

SECTION – III: MATHEMATICS

(PART – A)

(Single Correct Answer Type)

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

1. The value of $\sec^{-1}\left(\frac{1}{4}\sum_{k=0}^{10}\sec\left(\frac{7\pi}{12}+\frac{k\pi}{2}\right)\sec\left(\frac{7\pi}{12}+\frac{(k+1)\pi}{2}\right)\right)$ in the interval $\left[-\frac{\pi}{4},\frac{3\pi}{4}\right]$ equals

(A) 0	(B) $\frac{\pi}{3}$
(C) π	(D) none of these

2. If $\frac{1+3+5+\dots\text{to } n \text{ terms}}{4+7+10+\dots\text{to } n \text{ terms}} = \frac{20}{7\log_{10} x}$ and $n = \log_{10} x + \log_{10} x^{1/2} + \log_{10} x^{1/4} + \log_{10} x^{1/8} + \dots + \infty$, then $x =$

(A) 10^3	(B) 10^5
(C) 10^6	(D) 10^7

3. All the values of m for which both the roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than -2 but less than 4 , lie in the interval

(A) $m > 3$	(B) $-1 < m < 3$
(C) $1 < m < 4$	(D) $-2 < m < 0$

4. If $\min(2x^2 - ax + 2) > \max(b - 1 + 2x - x^2)$ then roots of the equation $2x^2 + ax + (2 - b) = 0$, are

(A) positive and distinct	(B) negative and distinct
(C) opposite sign	(D) imaginary

(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

5. If two distinct chords of a parabola $y^2 = 4ax$ passing through the point $(a, 2a)$ are bisected by line $x + y = 1$, then the length of the latus rectum can not be:

(A) 2	(B) 4
(C) 5	(D) 7

Space For Rough Work

6. Tangents are drawn from point P (8, 6) on parabola $y^2 = 4x$ to touch it at Q and R, then which of the following is/are true.
 (A) Area of triangle PQR is 4 (B) Circumcentre of triangle PQR is (19, -21)
 (C) Length of chord PQ $4\sqrt{10}$ (D) PQ is a focal chord
7. The value of x in $\left(0, \frac{\pi}{2}\right)$ satisfying the equation $\frac{\sqrt{3}-1}{\sin x} + \frac{\sqrt{3}+1}{\cos x} = 4\sqrt{2}$ is
 (A) $\frac{\pi}{12}$ (B) $\frac{5\pi}{12}$
 (C) $\frac{7\pi}{24}$ (D) $\frac{11\pi}{36}$

(Matching List Sets)

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

8. Match each entry in **List – I** to the correct entry in **List – II**.

	List – I	List – II	
(P)	One of the roots of the quadratic equation $(\sin^2 \theta)x^2 - x + \cos^2 \theta = 0$ is given by	(1)	5
(Q)	The number of real roots of the equation $2^{2x^2-7x+5} = 1$ is	(2)	4
(R)	Sum of real roots of the equation $7^{\log_7(x^2-4x+5)} = (x-1)$ is	(3)	3
(S)	If the roots of the equation $x^2 + px + q = 0$ differ from the roots of the equation $x^2 + qx + p = 0$ by the same quantity, then $(-p - q)$ is equal to	(4)	1
		(5)	2

The correct option is

- (A) P→(4) Q → (2) R→(5) S→(1) (B) P→(4) Q → (5) R→(1) S→(2)
 (C) P→(4) Q → (3) R→(1) S→(2) (D) P→(1) Q → (5) R→(3) S→(4)

Space For Rough Work

9. Match each entry in **List – I** to the correct entry in **List – II**.

List – I		List – II	
(P)	If the distance between directrix and latus rectum of a parabola is 4 units, then length of its latus rectum is	(1)	1
(Q)	If the vertex of a parabola be at origin and directrix be $x + 5 = 0$, then its latus rectum is	(2)	6
(R)	The tangents at the points $(at_1^2, 2at_1)$, $(at_2^2, 2at_2)$ on the parabola $y^2 = 4ax$ are at right angles then $t_1^2 t_2^2$ is equal to	(3)	7
(S)	If the slope of focal chord of $y^2 = 16x$ which is tangent to $(x - 6)^2 + y^2 = 2$ is m then $m^2 + 5$ is	(4)	20
		(5)	8

The correct option is

- (A) P→(5) Q → (4) R→(1) S→(2) (B) P→(2) Q → (4) R→(1) S→(5)
 (C) P→(3) Q → (3) R→(4) S→(4) (D) P→(5) Q → (4) R→(2) S→(1)

10. Match each entry in **List – I** to the correct entry in **List – II**.

List – I		List – II	
(P)	The sum of the first 10 terms of a certain G.P. is equal to 244 times the sum of the first 5 terms. Then the common ratio is	(1)	9
(Q)	If S_1, S_2, S_3 are the sums of first n natural numbers, their squares, their cubes respectively, then $\frac{S_3(1+8S_1)}{S_2^2}$ is equal to	(2)	6
(R)	If S_r denotes the sum of the first r terms of an A.P., such that $S_{2n} = 3S_n$, then $\frac{S_{3n}}{S_n}$ is equal to	(3)	3
(S)	The next term of the sequence 10, 17, 28, 43, is	(4)	91
		(5)	62

The correct option is

- (A) P→(4) Q → (2) R→(5) S→(1) (B) P→(4) Q → (1) R→(2) S→(5)
 (C) P→(3) Q → (1) R→(2) S→(5) (D) P→(1) Q → (5) R→(3) S→(4)

Space For Rough Work

11. Match each entry in **List – I** to the correct entry in **List – II**.

	List – I	List – II	
(P)	If $\sin \left[\sin^{-1} \left(\frac{1}{5} \right) + \cos^{-1} x \right] = 1$ then x is equal to $\frac{k}{5}$ then k is	(1)	4
(Q)	$\cos^{-1} \left(\cos \frac{5\pi}{4} \right)$ is equal to $\frac{3\pi}{k}$ then k is	(2)	8
(R)	The value of $\sin \left[\sin^{-1} \left(\frac{\sqrt{5}}{4} \right) + \tan^{-1} \left(\sqrt{\left(\frac{5}{11} \right)} \right) \right]$ is equal to $\frac{\sqrt{55}}{k}$ then k is	(3)	3
(S)	The principal value of $\sin^{-1} \left[\sin \left(\frac{2\pi}{3} \right) \right]$ is equal to $\frac{\pi}{k}$ then k is	(4)	5
		(5)	2

The correct option is

- (A) $P \rightarrow (4)$ $Q \rightarrow (1)$ $R \rightarrow (2)$ $S \rightarrow (3)$
 (C) $P \rightarrow (3)$ $Q \rightarrow (3)$ $R \rightarrow (4)$ $S \rightarrow (4)$

- (B) $P \rightarrow (4)$ $Q \rightarrow (5)$ $R \rightarrow (2)$ $S \rightarrow (3)$
 (D) $P \rightarrow (1)$ $Q \rightarrow (5)$ $R \rightarrow (3)$ $S \rightarrow (4)$

(PART – B)

(Non – Negative Integer)

- For the equation $3x^2 + px + 3 = 0$, if one of the real roots is the square of the other, then the value of $-p$ is _____
- From a point A common tangents are drawn to the circle $x^2 + y^2 = \frac{a^2}{2}$ and the parabola $y^2 = 4ax$. If the area of the quadrilateral formed by the common tangents, the chords of contact of the point A , w.r.t. the circle and the parabola is λ square unit, then the value of $\frac{15a^2}{\lambda}$ is _____

3. PN is the ordinate of the parabola $y^2 = 4ax$ where P lies on the parabola. A straight line is drawn parallel to its axis which bisects PN and intersects the curve at Q. If NQ meets the tangent at the vertex at the point T; then the value of $\frac{(2PN)}{AT}$ is (where A is the vertex)
4. If $S = \frac{1}{(1 \times 3 \times 5)} + \frac{1}{(3 \times 5 \times 7)} + \frac{1}{(5 \times 7 \times 9)} + \dots \infty$, then the value of $36S$ is ...
5. Number of integral values of m for which both the roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ lies in $(-2, 4)$ is
6. $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{k}$ then k is _____

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES – Two Year CRP426-B & C-lot_PT-2

Paper – 1

Code: 100891

JEE ADVANCED LEVEL

ANSWER KEY

ANSWER KEYS

Physics

PART – A

- | | | | |
|--------|-------|-------|------|
| 1. C | 2. B | 3. C | 4. B |
| 5. ABC | 6. AC | 7. AB | 8. C |
| 9. B | 10. D | 11. D | |

PART – B

- | | | | |
|------|------|------|------|
| 1. 3 | 2. 5 | 3. 2 | 4. 4 |
| 5. 1 | 6. 1 | | |

Chemistry

PART – A

- | | | | |
|--------|--------|---------|------|
| 1. B | 2. C | 3. C | 4. D |
| 5. ABD | 6. ABC | 7. ABCD | 8. B |
| 9. C | 10. D | 11. C | |

PART – B

- | | | | |
|------|------|-------|------|
| 1. 4 | 2. 4 | 3. 10 | 4. 2 |
| 5. 6 | 6. 8 | | |

Mathematics

PART – A

- | | | | |
|--------|--------|-------|------|
| 1. A | 2. B | 3. B | 4. D |
| 5. BCD | 6. ABC | 7. AD | 8. B |
| 9. A | 10. C | 11. A | |

PART – B

- | | | | |
|------|------|------|------|
| 1. 6 | 2. 4 | 3. 3 | 4. 3 |
| 5. 3 | 6. 2 | | |