

PHYSICS, CHEMISTRY & MATHEMATICS**QP CODE: 100894****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 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.
- (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: _____

BATCHES – PANINI426-G1, A1, A2 & B1_PT-3

SECTION – I: PHYSICS

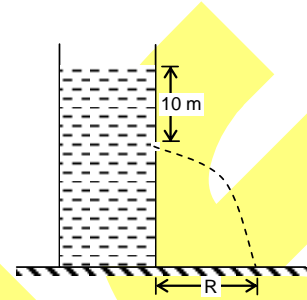
(PART – A)

(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 range of water flowing out of a small hole made at a depth 10 metre below water surface in a large tank is R . Find the extra force per unit area applied on water surface so that range becomes $2R$. (in atm an approximate value).

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

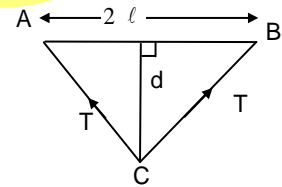


2. A particle of mass m is transferred from infinity to the centre of the base of a uniform solid hemisphere of mass M and radius R . Work done by gravitational force is

(A) $\frac{3GMm}{8R}$ (B) $\frac{3GmM}{R}$
(C) $\frac{3GMm}{4R}$ (D) $\frac{3GMm}{2R}$

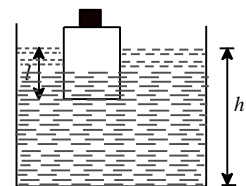
3. A wire of radius r stretched without tension along a straight line is lightly fixed at A and B. What is the tension in the wire, when it is pulled into the shape ACB. Take $Y =$ young's modulus and $d \ll \ell$

(A) $\frac{Y^2 d^2}{2\pi r^2 \ell^2}$ (B) $\frac{Y\pi r^2 d^2}{2\ell^2}$
(C) $\frac{Y\pi r^2}{2\ell^2 d^2}$ (D) $\frac{Y\pi r^2 \ell^2}{2d^2}$



4. A wooden block, with a coin placed on its top, floats in water as shown in figure. The distance l and h are shown there. After sometimes the coin falls into the water. Then:

(A) l decreases and h increases
(B) l increases and h decreases
(C) both l and h increase
(D) both l and h decrease

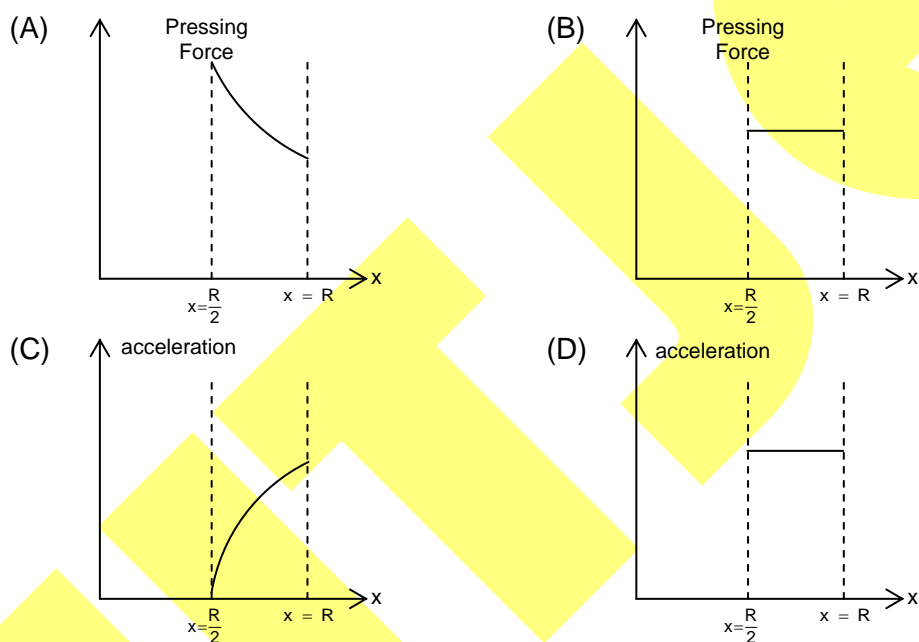


Space For Rough Work

(One or More Than One Options Correct Type)

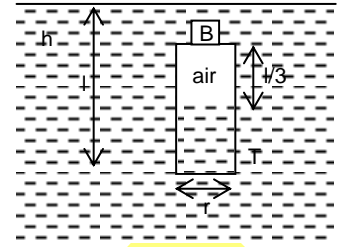
This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE or MORE THAN ONE is correct**.

5. A body totally immersed in water is raised in the water by a height h . The density of the body is d and the density of water is d_0 while the volume of the body is V and $d > d_0$. Which of the following statement will be true?
- (A) The net work done on raising the body is $Vdgh$.
 (B) The increase in the potential energy of the body is $Vgh(d - d_0)$
 (C) The potential energy of water is not changed by raising the body.
 (D) The work done on the body by gravitational force is equal and opposite to the work done by the hydrostatic forces so that the net work done is zero.
6. A tunnel is dug along a chord of the earth at a perpendicular distance $\frac{R}{2}$ from the earth's center. The wall of the tunnel may be assumed to be frictionless. A particle is released from one end of the tunnel. The pressing force by the particle on the wall and the acceleration of the particle varies with x (distance of the particle from the centre of the earth) according to



Space For Rough Work

7. A light cylindrical tube T of length l and radius r containing air is inverted in water (density d). One end of the tube is open and the other is closed. A block B of density $2d$ is kept on the tube as shown in figure. The tube stays in equilibrium in the position shown (Assume the atmosphere pressure is to be P_0) Pick up the correct statement



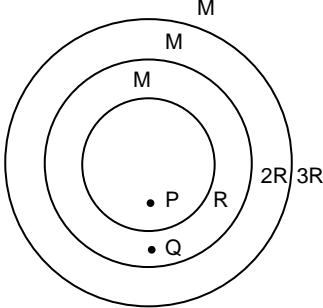
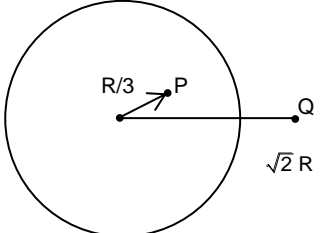
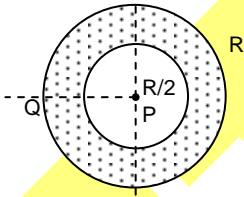
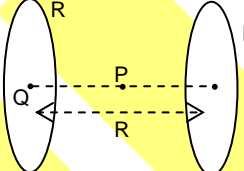
- (A) The volume of block B is $\frac{\pi r^2 l}{3}$ m
- (B) The volume of block B is $\frac{2\pi r^2 l}{3}$
- (C) The pressure of air trapped in the tube is $P_0 + dg\left(h + \frac{l}{3}\right)$
- (D) The pressure of air trapped in the tube is $P_0 + dg\left(h + \frac{2l}{3}\right)$ 3

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. E and V are the gravitational field and potential respectively.

| List - I | | List - II | |
|----------|---|-----------|-----------------------|
| (P) |  <p>Concentric spherical shells</p> | (1) | $\frac{V_p}{V_Q} < 1$ |
| (Q) |  <p>Solid sphere</p> | (2) | $\frac{E_p}{E_Q} < 1$ |
| (R) | <p>A spherical having inner radii $R/2$ and outer radii R</p>  | (3) | $\frac{V_p}{V_Q} > 1$ |
| (S) |  <p>Two identical co axial rings</p> | (4) | $\frac{E_p}{E_Q} > 1$ |
| | | (5) | $E_p = 0$ |

The correct option is:

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

Space For Rough Work

9. A person in a lift is holding a water jar, which has a small hole at the lower end of its side. When the lift is at rest, the water jet coming out of the hole hits the floor of the lift at a distance d of 1.2 m from the person. In the following, state of the lift's motion is given in List I and the distance where the water jet hits the floor of the lift is given in List II. Match the statements from List I with those in List II and select the correct answer using the code given below the lists.

| List-I | | List-II | |
|--------|---|---------|-------------------------------|
| (P) | Lift accelerating vertically up. | (1) | $d = 1.2$ m |
| (Q) | Lift is accelerating vertically down with an acceleration less than the gravitational acceleration. | (2) | $d > 1.2$ m |
| (R) | Lift is moving vertically up with constant speed. | (3) | $d < 1.2$ m |
| (S) | Lift is falling freely. | (4) | No water leaks out of the jar |
| | | (5) | $d = 1.5$ m |

The correct option is:

- (A) $P \rightarrow 2$; $Q \rightarrow 3$; $R \rightarrow 2$; $S \rightarrow 4$ (B) $P \rightarrow 2$; $Q \rightarrow 5$; $R \rightarrow 1$; $S \rightarrow 4$
 (C) $P \rightarrow 1$; $Q \rightarrow 1$; $R \rightarrow 1$; $S \rightarrow 4$ (D) $P \rightarrow 2$; $Q \rightarrow 3$; $R \rightarrow 5$; $S \rightarrow 1$
10. Density of a sphere of radius R with concentric spherical cavity of radius $r = \frac{2R}{3}$ is given by, $\rho = \frac{\rho_0}{R}(R - x)$, where x is distance from its centre and $\left(\frac{2R}{3} \leq x \leq R\right)$, then

| List - I | | List - II | |
|----------|---|-----------|----|
| (P) | If potential on its outer surface is $\frac{-a\pi\rho_0GR^2}{81}$ then $a =$ | (1) | 11 |
| (Q) | Potential at its inner surface is $\frac{-b\pi\rho_0GR^2}{81}$ then $b =$ | (2) | 0 |
| (R) | Field on its surface is $\frac{c\pi\rho_0GR}{81}$, then $c =$ | (3) | 12 |
| (S) | Field at a distance $\frac{R}{2}$ from its centre is $\frac{d\pi\rho_0GR}{81}$, then $d =$ | (4) | 14 |
| | | (5) | 10 |

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

Space For Rough Work

11. Assume all the liquid drop or air bubble have surface tension T and radius R .

| List-I | | List-II | |
|--------|---|---------|--------------------------|
| (P) | Excess pressure of liquid drop in air is | (1) | $\frac{4T}{R} + \rho gh$ |
| (Q) | Excess pressure of bubble in air is | (2) | $\frac{2T}{R} + \rho gh$ |
| (R) | Excess pressure of air bubble in liquid at its free surface is | (3) | $\frac{4T}{R}$ |
| (S) | Excess pressure of air bubble in liquid at depth h from free surface is | (4) | $2\frac{T}{R}$ |
| | | (5) | $\frac{2T}{R} - \rho gh$ |

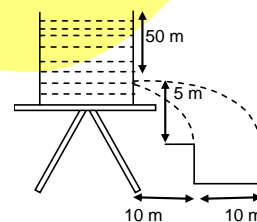
The correct option is:

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

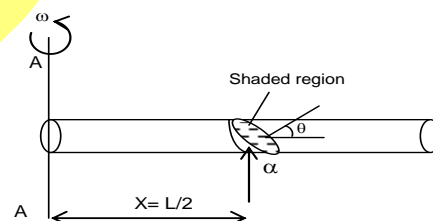
(PART – B)

(Non – Negative Integer)

1. A small hole made in to a cylindrical vessel of base area 1 m^2 and height 50 m above the efflux. Another cylindrical vessel of base diameter 10 m is put 10 m away from the base of the first cylinder. Find the volume of water 'V' (in m^3) that will be collected in to the second vessel if water is filled into the first (up to the brim) and then let fell out through the hole. If $V = 3k \text{ m}^3$ what is the value of k ?

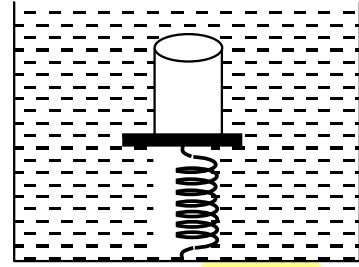


2. A thin uniform metallic rod of mass m , length L , Young modulus of elasticity Y and cross-sectional area A is rotated by angular velocity ω about extreme end AA' . Consider a section on the rod at midpoint of rod. The normal stress in N/m^2 on the shaded region is $\frac{3m\omega^2 L^2 \cos^2 \theta}{KA}$. Find the value of 'K'.



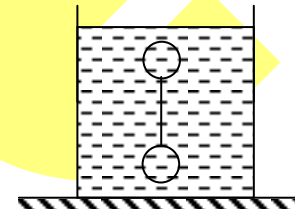
Space For Rough Work

3. A cylindrical block of area of cross section A and of material of density ρ is placed in a liquid of density one third of density of block. The block compresses a spring and compression in the spring is one third of the length of the block. If acceleration due to gravity is g , the spring constant of the spring is $n \rho Ag$. Find n .



4. A large tank is filled with water to a height H . A small hole is made at the base of the tank. It takes T_1 time to decrease to height of water to H/η , ($\eta > 1$) and it takes T_2 time to take out the rest of water. If $T_1 = T_2$, then find value of η .
5. Consider the hypothetical planet which is very long and cylindrical. The density of the planet is ρ and its radius R , the possible orbital speed of the satellite in moving around the planet in circular orbit in a plane which is perpendicular to the axis of the planet is $2R \sqrt{\frac{\pi G \rho}{\alpha}}$. Then find value of α .

6. Two spheres of volume 250 cc each but of specific gravity densities 0.8 and 1.6 are connected by a string and the combination is immersed in a liquid and the system is in equilibrium as shown in figure. Find the tension (In N) in the string? $g = 10 \text{ m/s}^2$



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**.

- $$\text{MO(s)} + \text{CO}_2(\text{g}) \longrightarrow \text{MCO}_3(\text{s}) + \Delta H$$

M belongs to group-2 of the periodic table. If the reaction evolves the maximum quantity of heat then M should be

| | |
|--------|--------|
| (A) Be | (B) Ca |
| (C) Mg | (D) Ba |
- Pure H_2 is obtained by the reaction of Zn with

| | |
|-------------------------|----------------------------------|
| (A) conc.HCl | (B) dil. H_2SO_4 |
| (C) dil. HNO_3 | (D) conc. HNO_3 |
- $$\text{A(g)} + \text{B(g)} \rightleftharpoons \text{C(g)}$$

The equilibrium constant (K_P) of above reaction is expressed as:

$$\log K_P = \frac{-4000}{T} + \frac{40}{R}$$

Where K_P is the equilibrium constant at temperature TK and R is the gas constant which is $8 \text{ JK}^{-1}\text{mol}^{-1}$. What is the enthalpy change of the reaction in KJ mol^{-1} unit?

| | |
|------------|------------|
| (A) -73.69 | (B) +73.69 |
| (C) +32 | (D) -32 |
- Reaction of one mole of H_2SiO_3 with two moles of NaOH produces H_2O and sodium salt of

| | |
|----------------------|------------------------|
| (A) metasilicate ion | (B) orthosilicate ion |
| (C) pyrosilicate ion | (D) sheet silicate ion |

(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**.

- The decomposition temperature of BaSO_4 is higher than that of BeSO_4 . This is due to

| |
|---|
| (A) higher polarizing power of Be^{2+} ion than Ba^{2+} ion |
| (B) higher basic nature of BaO than BeO |
| (C) higher ionization energy of Be than Ba |
| (D) higher hydration energy of Be^{2+} than Ba^{2+} |

Space For Rough Work

6. $B_2O_3 + 3H_2O \longrightarrow 2H_3BO_3$
The intermediate species which are formed in the above reaction is/are
(A) HBO_2 (B) $H_2B_4O_7$
(C) $H_3B_4O_4$ (D) HBO_3
7. Which of the following reaction(s) is/are accelerated by adding acids?
(A) $CN^-(aq) + H_2O(\ell) \rightleftharpoons HCN(aq) + OH^-(aq)$
(B) $NH_4^+(aq) + H_2O(\ell) \rightleftharpoons NH_4OH(aq) + H^+(aq)$
(C) $FeSO_4(aq) + H_2O(\ell) \rightleftharpoons Fe(OH)_2(aq) + H_2SO_4(aq)$
(D) $CH_3COO^-(aq) + H_2O(\ell) \rightleftharpoons CH_3COOH(aq) + OH^-(aq)$

(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 lists.

| List – I (Equal volume and equal concentration of solution mixtures) | | List– II (pH) | |
|---|-------------------------|------------------|--|
| (P) | CH_3COOH and NH_4OH | (1) | $\frac{1}{2}(p^{K_{a_1}} + p^{K_{a_2}})$ |
| (Q) | HCN and $NaOH$ | (2) | $\frac{1}{2}(p^{K_{a_2}} + p^{K_{a_3}})$ |
| (R) | H_2CO_3 and $NaOH$ | (3) | $\frac{1}{2}(p^{K_w} + p^{K_a} - p^{K_b})$ |
| (S) | NaH_2PO_4 and $NaOH$ | (4) | $\frac{1}{2}(p^{K_w} + p^{K_a} + \log C)$ |
| | | (5) | $\frac{1}{2}(p^{K_w} - \log C)$ |

(A) P \rightarrow 1; Q \rightarrow 4; R \rightarrow 2; S \rightarrow 3(B) P \rightarrow 3; Q \rightarrow 4; R \rightarrow 1; S \rightarrow 2(C) P \rightarrow 3; Q \rightarrow 2; R \rightarrow 4; S \rightarrow 1(D) P \rightarrow 2; Q \rightarrow 3; R \rightarrow 1; S \rightarrow 5*Space For Rough Work*

9. Match the lists.

| List – I (Application of Le-Chatelier's principles on $2\text{SO}_3(\text{g}) \rightleftharpoons 2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}), \Delta H = +ve$) | | List– II (Effects of Le-Chatelier's principle) | |
|---|--|---|---|
| (P) | Increasing pressure | (1) | Dissociation of SO_3 is favoured |
| (Q) | Decreasing pressure | (2) | Partial pressure of oxygen increases |
| (R) | Addition of inert-gas at constant pressure | (3) | Concentration of SO_2 increases |
| (S) | Increase in temperature | (4) | Concentration of SO_3 increases |
| | | (5) | Partial pressure of O_2 is higher than that of SO_3 |

(A) P → 5; Q → 2; R → 1; S → 3

(B) P → 3; Q → 2; R → 1; S → 4

(C) P → 2; Q → 3; R → 1; S → 4

(D) P → 4; Q → 1; R → 2; S → 3

10. Match the lists.

| List – I (Compounds of sodium) | | List– II (Chemical reactions) | |
|-----------------------------------|--------------------------|----------------------------------|---|
| (P) | NaOH | (1) | CO_2 gas is produced on heating |
| (Q) | Na_2CO_3 | (2) | O_2 gas is produced by heating |
| (R) | NaNO_3 | (3) | Solidified if saturated solution is kept under atmosphere |
| (S) | NaHCO_3 | (4) | Does not decompose on simple heating |
| | | (5) | Salt of strong acid and base |

(A) P → 3; Q → 2; R → 1; S → 5

(B) P → 4; Q → 2; R → 5; S → 3

(C) P → 3; Q → 4; R → 2; S → 1

(D) P → 4; Q → 3; R → 1; S → 2

11. Match the lists.

| List – I (Chemical substances) | | List– II (Characteristics) | |
|-----------------------------------|-------------------------|-------------------------------|---|
| (P) | B_2O_3 | (1) | More soluble in acid and base than in water |
| (Q) | Al_2O_3 | (2) | Is an acidic anhydride of a monobasic acid |
| (R) | CO_2 | (3) | Is a basic anhydride |
| (S) | Ti_2O | (4) | Acid anhydride of a dibasic acid |
| | | (5) | Reacts with HI forming salt of I_3^- ion |

(A) P → 4; Q → 2; R → 1; S → 3

(B) P → 2; Q → 1; R → 4; S → 3

(C) P → 4; Q → 1; R → 2; S → 5

(D) P → 3; Q → 2; R → 5; S → 1

Space For Rough Work

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

- 400 mL of 0.5 M aqueous solution of CH_3COOH was added to 600 mL of 0.1 M aqueous solution of NaOH . If the pH of the resulting solution is x , what is the value of $10x$? (K_a of $\text{CH}_3\text{COOH} = 10^{-5}$, $\log 3 = 0.4$, $\log 7 = 0.8$)
- $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$
One mole of N_2O_4 was taken in a one litre container. The degree of dissociation of N_2O_4 is 0.2 at equilibrium which exists at 0.96 atm and 298 K. If the equilibrium constant of the reaction is x , what is the value of $100x$?
- Addition of NH_3 to B_2H_6 forms a salt. How many total number of hydrogen atoms are present in the salt?
- Calcium $\xrightarrow[\Delta]{\text{O}_2 + \text{N}_2}$ (P) $\xrightarrow{\text{H}_2\text{O}}$ Q(solution) + R(gas)
(Solid residue)
If x is the number of total atoms present in (P) and y is the number of hydrogen atoms present in (Q) and (R), then the value of $(x + y)$ is
- The atomic number of thallium (Tl) is 81. It forms monovalent compounds due to inert-pair effect. How many electrons of one Tl atom are inert in the oxide Tl_2O ?
- What is the pOH of 0.001 M solution of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) at 298 K?

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 condition that the line $lx + my = n$ may be a normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is
- (A) $\frac{n^2}{(a^2 - b^2)^2} \left(\frac{a^2}{l^2} + \frac{b^2}{m^2} \right) = 1$ (B) $\frac{n^2}{(a^2 + b^2)^2} \left(\frac{a^2}{l^2} + \frac{b^2}{m^2} \right) = 1$
- (C) $\frac{n^2}{(a^2 - b^2)^2} \left(\frac{a^2}{l^2} + \frac{b^2}{m^2} \right) = 2$ (D) none of these
2. The asymptotes of the hyperbola $xy = 2x + 3y$ are
- (A) $x - 3 = 0; y - 2 = 0$ (B) $x - 2 = 0; y - 3 = 0$
- (C) $x = 0; y = 0$ (D) none of these
3. The most general value of x satisfying the equation $\tan x = \frac{1 + \sin\left(\frac{\pi}{5}\right) - \cos\left(\frac{2\pi}{5}\right)}{\cos\left(\frac{\pi}{5}\right) + \sin\left(\frac{2\pi}{5}\right)}$, is:
- (A) $n\pi + \frac{\pi}{5}$ (B) $n\pi - \frac{\pi}{5}$
- (C) $2n\pi + \frac{\pi}{5}$ (D) $2n\pi - \frac{\pi}{5}$
4. If $y = |\cos x| + |\sin x|$, then $\frac{dy}{dx}$ at $x = \frac{2\pi}{3}$ is
- (A) $\frac{1}{2}(\sqrt{3} + 1)$ (B) $2(\sqrt{3} - 1)$
- (C) $\frac{1}{2}(\sqrt{3} - 1)$ (D) none of these

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. If the normal at an end of a latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through an extremity on the minor axis, then
- (A) eccentricity of the ellipse $\sqrt{\frac{\sqrt{5}-1}{2}}$
- (B) ratio of the major and minor axes is $\frac{\sqrt{5}-1}{2}$
- (C) square of the eccentricity is equal to the ratio of the minor and major axis
- (D) all of these
6. A straight line touches the rectangular hyperbola $9x^2 - 9y^2 = 8$ and the parabola $y^2 = 32x$. The equation of the line is
- (A) $9x + 3y - 8 = 0$ (B) $9x - 3y + 8 = 0$
- (C) $9x + 3y + 8 = 0$ (D) $9x - 3y - 8 = 0$
7. If the roots of cubic $x^3 - 6x^2 - 4x + c = 0$ are the first 3 terms of an A.P. then sum to first 10 terms of the A.P. is
- (A) -250 (B) -190
- (C) 230 (D) 290

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. Match the following List:

| List – I | | List – II | |
|----------|--|-----------|---|
| (P) | For an ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ with vertices A and A', tangent drawn at the point P in the first quadrant meets the y – axis in Q and the chord A' P meets the y – axis in M. If O is the origin then $OQ^2 - MQ^2$ equals to | (1) | 2 |
| (Q) | If the product of the perpendicular distances from any point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ of eccentricity $e = \sqrt{3}$ from its asymptotes is equal to 6, then the length of the transverse axis of the hyperbola is | (2) | 3 |
| (R) | The locus of the point of intersection of the lines $\sqrt{3}x - y - 4\sqrt{3}t = 0$ and $\sqrt{3}tx + ty - 4\sqrt{3} = 0$ (where t is a parameter) is a hyperbola whose eccentricity is | (3) | 4 |
| (S) | If F_1 and F_2 are the feet of the perpendiculars from the foci S_1 and S_2 of an ellipse $\frac{x^2}{5} + \frac{y^2}{3} = 1$ on the tangent at any point P on the ellipse, then $(S_1F_1) \cdot (S_2F_2)$ is equal to | (4) | 6 |
| | | (5) | 7 |

(A) P → 1, Q → 2, R → 3, S → 2

(B) P → 1, Q → 2, R → 1, S → 4

(C) P → 4, Q → 2, R → 1, S → 3

(D) P → 3, Q → 4, R → 1, S → 2

9. Match the following List:

| List – I | | List – II | |
|----------|---|-----------|------|
| (P) | In an A.P. the series containing 99 terms, the sum of all the odd numbered terms is 2550. The sum of all the 99 terms of the A.P. is | (1) | 5010 |
| (Q) | F is function for which $f(1) = 1$ and $f(n) = n + f(n-1)$ for each natural $n \geq 2$. The value of $f(100)$ is | (2) | 5049 |
| (R) | Suppose $f(n) = \log_2(3) \cdot \log_3(4) \cdot \log_4(5) \dots \log_{n-1}(n)$, then the sum $\sum_{k=2}^{100} f(2^k)$ equals | (3) | 5050 |
| (S) | Concentric circles of radii 1, 2, 3, 100 cms are drawn. The interior of the smallest circle is coloured red and annular regions are coloured alternately green and red, so that no two adjacent regions are of the same colour. The total area of the green regions in sq. cm is $k\pi$ then 'k' equals | (4) | 5100 |
| | | (5) | 5000 |

The correct option is

(A) P → (4) Q → (2) R → (5) S → (1)

(B) P → (2) Q → (3) R → (2) S → (3)

(C) P → (3) Q → (3) R → (4) S → (4)

(D) P → (1) Q → (5) R → (3) S → (4)

10. Match the following

| List - I | | List - II | |
|----------|--|-----------|---------------|
| (P) | If $L = \lim_{x \rightarrow -1} \frac{\sqrt[3]{(7-x)} - 2}{(x+1)}$, then $12L =$ | (1) | -2 |
| (Q) | If $L = \lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan^3 x - \tan x}{\cos\left(x + \frac{\pi}{4}\right)}$, then $\frac{-L}{8} =$ | (2) | 2 |
| (R) | If $L = \lim_{x \rightarrow 1} \frac{(2x-3)(\sqrt{x}-1)}{2x^2+x-3}$, then $20L =$ | (3) | $\frac{1}{2}$ |
| (S) | If $L = \lim_{x \rightarrow \infty} \frac{\log x^n - [x]}{[x]}$, where $n \in \mathbb{N}$, (where $[x]$ denotes greatest integer less than or equal to x), then $-2L =$ | (4) | -1 |
| | | (5) | 0 |

The correct option is

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

11. Match the following

| List - I | | List - II | |
|----------|--|-----------|------------------------|
| (P) | $(2 \sin x - \cos x)(1 + \cos x) = \sin^2 x$ | (1) | $\sin x = \frac{1}{2}$ |
| (Q) | $1 + \sin 2x = \cos x + \sin x$ | (2) | $\tan x = -1$ |
| (R) | $4x^4 + x^6 + \sin^2 5x = 0$ | (3) | $x = 0$ |
| (S) | $\sin x + \sin 2x = 0$ | (4) | $\cos x = \frac{1}{2}$ |
| | | (5) | $x = 1$ |

The correct option is

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

Space For Rough Work

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

1. Number of solution of the equation $\frac{3 \sin \theta - \sin 3\theta}{1 + \cos \theta} + \frac{3 \cos \theta + \cos 3\theta}{1 - \sin \theta} = 4\sqrt{2} \cos\left(\theta + \frac{\pi}{4}\right)$ in the interval $(-10\pi, 8\pi]$ is equal to:
2. If a, b, c are non – zero real numbers then the minimum value of the expression $\left(\frac{(a^8 + 4a^2 + 1)(b^4 + 3b^2 + 1)(c^2 + 2c + 2)}{a^4 b^2}\right)$ equals
3. The differentiation of $\sec^{-1}\left(\frac{1}{2x^2 - 1}\right)$ with respect to $\sqrt{1 - x^2}$ at $x = \frac{-1}{2}$ is
4. If $y = 2^{-2^{1/(1-x)}}$, then $\lim_{x \rightarrow 1^+} y$ is
5. $\lim_{x \rightarrow 0} \frac{\log(1+x) + \sin x}{e^x - 1}$
6. If $x = at^2$ and $y = 2at$, then find $\left[\frac{dy}{dx}\right]_{x=2a}$

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES – PANINI426-G1, A1, A2 & B1_PT-3

Paper – 1

Code: 100894

JEE ADVANCED LEVEL

ANSWER KEY

ANSWER KEYS

Physics

PART – A

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

PART – B

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

Chemistry

PART – A

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

PART – B

- | | | | |
|-------|-------|-------|-------|
| 1. 46 | 2. 16 | 3. 12 | 4. 12 |
| 5. 80 | 6. 7 | | |

Mathematics

PART – A

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

PART – B

- | | | | |
|------|-------|------|------|
| 1. 9 | 2. 30 | 3. 4 | 4. 1 |
| 5. 2 | 6. 1 | | |