St. Joseph's School Maharajganj
Summer Holiday Homework
Class –XII Mathematics

PHYSICS

Part A: Conceptual Questions

1. What is the principle of superposition of electric forces?
2. Define electric field. What are its units?
3. Explain the concept of electric dipole and dipole moment.
4. Define equipotential surface. Why are electric field lines always perpendicular to them?.
5. Explain the significance of the term 'dielectric constant'.
6. Define electric flux. What does positive and negative flux signify?

Part B: Numerical Problems

1. Two point charges +3 μC and -3 μC are placed 5 cm apart. Calculate the electric field at a point on the axial line 10 cm away from the center of the dipole.
2. A charge of 5 μC is placed at the center of a cube. Calculate the electric flux through one face of the cube.
3. A parallel plate capacitor is charged to 100 V. If the plates are separated by 2 mm and the area is 0.02 m^2, calculate: - Capacitance - Charge stored - Electric field between the plates
4. Calculate the potential energy of a system of two charges +2 μC and -2 μC placed 0.2 m apart in air.

Part C: Activities & Diagrams

1. Draw neat and labeled diagrams of the following:
   - Electric field lines of a dipole
   - Electric field lines for two like charges
   - Equipotential surfaces for a point charge and a uniform electric field
2. Make a chart showing all formulae and graphs related to electric field, potential and capacitance

Part D: Case-Based Question

Case Study:

1. A student sets up a parallel plate capacitor with a dielectric slab inserted between the plates. He notices that the capacitance increases when the dielectric is present.
2. Why does the capacitance increase when a dielectric is introduced?
3. How does the energy stored in the capacitor change when the dielectric is inserted, keeping the voltage constant?

CHEMISRTY

Solutions & Electrochemistry

Part A: Conceptual Assignments

Chapter: Solutions

1. Define the following with examples:
   a) Ideal and non-ideal solutions
   b) Raoult's Law
   c) Colligative properties
2. Differentiate between:
   a) Molarity and Molality
   b) Osmotic pressure and Vapour pressure lowering

Chapter: Electrochemistry

1. Define the following:
   a) Electrolytic cell and Galvanic cell
   b) Standard electrode potential
   c) Cell notation
2. Differentiate between:
   a) Electrolytic and galvanic cells

b) Conductance and conductivity

Part B: Numerical Practice

1. Calculate the molality of a solution containing 18 g of glucose ($C_6H_{12}O_6$) in 250 g of water.
2. A solution containing 1.8 g of a compound in 100 g of water gave a depression in freezing point of 0.372 K. Calculate the molar mass of the compound. (Kf for water = 1.86 K kg/mol)

MATHEMATICS

Chapter 1: Relations and Functions

1. Definition of relation and types of relations (reflexive, symmetric, transitive).
2. Definition of function types of function (one-one, onto, into).
3. Solve problems on inverse functions.
4. (a) Show that the relation R in the set R of real numbers, defined as $R = \{(a, b): a \leq b^2\}$ is neither reflexive nor symmetric nor transitive.

   (b)Check whether the relation R is defined in the set {1, 2, 3, 4, 5, 6} as $R = \{(a, b): b = a + 1\}$ is reflexive, symmetric or transitive.

   (c) Show that the relation R in R is defined as $R = \{(a, b): a \leq b\}$ is reflexive and transitive but not symmetric?

   (d)Check whether the relation R in R Defined by $R = \{(a, b): a \leq b^3\}$ is reflexive, symmetric or transitive.

5. Check the injectivity and surjectivity of the following functions:

   (i) $f: N \rightarrow N$ given by $f(x) = x^2$

   (ii) $f: Z \rightarrow Z$ given by $f(x) = x^2$

   (iii) $f: R \rightarrow R$ given by $f(x) = x^2$

Chapter 2: Inverse Trigonometric Functions

1. Write inverse Trigonometrical function (principal value branches) along with their domains and ranges.
2. Find the value of the following:

3. Prove that

   (a) $2\sin^{-1}(3/5) = \tan^{-}(24/7)$

   (b) $\sin^{-1}(8/17) + \sin^{-1}(3/5) = \tan^{-1}(77/36)$

   (c) $\cos^{-1}(4/5) + \cos^{-1}(12/13) = \cos^{-1}(33/65)$

Homework Exercises:

4. Find the inverse of a function.

Sample Questions:

(a).Evaluate $\cos^{-1}(-1/2)$.

(b) Solve $\sin^{-1}(3/5) - \sin^{-1}(8/17) = \cos^{-1}(84/85)$

PROJECT WORK

1) - Draw a graph of $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$ on chart paper.

ENGLISH:

Prepare the Author's Directory for the text book, VISTAS and FLAMINGO.

1 whereabouts of the writer
2. Works and years of publication
3. Awards won
4. Birth and Death

Minimum one FULL PAGE content for each writer.

No text should be identical with anybody elses'

PHYSICAL EDUCATION

1. Activity-Based Question:

Prepare a Personal Fitness Plan

Design a 3-week fitness plan for yourself based on your current fitness level. Include exercises for flexibility, strength, endurance, and balance. Track your weekly progress and attach photos or a video (optional) as evidence of your practice.

2. Assignment-Based Question:

Research and Write an Article on: "Importance of Yoga in Daily Life"
Include the following points:

1. Definition and origin of Yoga
2. Benefits of Yoga for physical and mental health
3. Role of Yoga in managing stress and improving concentration
4. Conclusion with your personal opinion or experience with Yoga.