[This question paper contains 3 printed pages.]

Unique Paper Code	:	42174404
Name of the Paper	: and	Chemistry of s and p Block Elements, States of Matter Chemical Kinetics
Name of the Course	:	<b>B.Sc. (P)</b>
Semester	:	IV
Duration	:	2 Hours
Maximum Marks	:	75

## **Instructions for the Candidates**

- 1. Write your Roll No. on the top immediately on receipt of this question paper.
- 2. Use of Scientific calculators and log tables is allowed.
- 3. Use Separate sheets for Section A and Section B.

# SECTION A

# (INORGANIC CHEMISTRY)

## Attempt any two questions

## **Question No. 1 is compulsory**

- 1. (a) Give the structures and oxidation state of the central atom of any *three* of the following:
  - (i) P<sub>4</sub>O<sub>10</sub>
  - (ii) NH<sub>2</sub>OH
  - (iii)  $H_2S_2O_8$
  - (iv) HClO<sub>4</sub>
  - (b) Define electronegativity. What are the different scales of electronegativity? Explain briefly.

- (c) In contrast to diamond, graphite conducts electricity. Explain.
- (d) Give reasons for the following:
  - (i) PbCl<sub>4</sub> is a strong oxidizing agent in comparison to PbCl<sub>2</sub>.
  - (ii) In Ellingham diagram, the graphs for metal to metal oxide all slope upwards.

 $(4.5, 4.25, 4, 3 \times 2)$ 

2. (a) Describe multicenter bonding using diborane as an example.

- (b) Explain the trend in solubility of hydroxides of alkali metals.
- (c) (i) Fluorine always exhibit an oxidation state of -1. while other halogens also show positive oxidation states. Give reason.

(ii) Why solutions of alkali metals in liquid ammonia are conducting, paramagnetic and blue in color?

- (d) (i) Why PCl<sub>5</sub> is a Lewis acid and not a Lewis base while PCl<sub>3</sub> is both?
  - (ii) Among alkali metals halides lattice energy for LiF is greatest and smallest for CsI. Discuss.

 $(4.75, 4, 2 \times 2, 3 \times 2)$ 

- 3. (a) Carbon can be used to reduce any metal oxide if a sufficiently high temperature is used. Justify this statement using Ellingham diagram.
  - (b) Discuss the following statements.

(i) BeCl<sub>2</sub> is the most covalent alkaline earth metal chloride.

(ii) Nitrogen exists as diatomic molecule, N<sub>2</sub>, whereas phosphorous exists as tetratomic molecule.

- (b) Write short notes on any **two** of the following:
  - (i) Mond's Process
  - (ii) Allotropes of Sulphur
  - (iii) Hydrometallurgy

 $(4.75, 3 \times 2, 4 \times 2)$ 

## **SECTION B**

### (PHYSICAL CHEMISTRY)

#### Attempt any two questions in this section.

### **Question No. 1 is compulsory**

- 1. Attempt the following questions briefly:
  - (a) What is the effect of temperature on viscosity of gases and liquids?
  - (b) How many element of symmetry present in NaCl crystal, explain them?
  - (c) Differentiate order and molecularity of a reaction.
  - (d) Explain law of rational indices.
  - (e) Calculate the activation energy of a reaction whose reaction rate at  $27^{0}$  C gets doubled for  $10^{0}$  C rise in temperature. 3.5
  - (f) Derive Bragg's Equation.
- 2. (a) Derive integrated rate expression for second order reaction assuming concentration of reactants to be different.

(b) The half-life period of a substance is 50 minutes at a certain concentration. When the concentration is reduced to one half of the initial concentration, the half-life period is 25 minutes. Calculate order of the reaction.

- (c) Calculate the miller indices for following crystal planes
  - i. 2a,-3b,-3c
  - ii. 6a, 3b,3c

(6, 6, 6)

3

3

3

3.5

3.5

- 3. (a) Calculate the interplanar spacing (d<sub>hkl</sub>) for a cubic system between the set of planes 111 and 222. Assuming the edge length of the unit cell is a.
  - (b) Explain various defects in crystals.
  - (c) Write short notes on any two-
    - (i) Andrews Isotherms of CO<sub>2</sub>,
    - (ii) Collision Frequency (Z11),
    - (iii) Viscosity of liquids and its determination.

(6, 6, 6)