[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 805 **E** **Your Roll No.....**

Unique Paper Code : 217401

Name of the Course : **B.Sc. (Hons.) Chemistry**

Name of the Paper : Inorganic Chemistry-III (CHHT-408)

Semester : IV

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions.
3. All questions carry equal marks.

1 Explain any **five** of the following, giving suitable reasons:

(a) In spite of the ring strain white phosphorus is stable relative to P_2.

(b) Although iodine has a very low solubility in water it is readily soluble in aqueous solution of potassium iodide.

(c) The reaction, $GeCl_2 + Cl_2 \rightarrow GeCl_4$ is rapid at 25°C,whereas the reaction, $PbCl_2 + Cl_2 \rightarrow PbCl_4$, is reversed at 25°C.

(d) Beryllium forms more complexes than other members of the group.

(e) Graphite cleaves easily between layers.

(f) The single bond energies for the second and third period elements follow the order: C-C>Si-Si, N-N<P-P, O-O<S-S

(g) Borazine readily undergoes addition reactions, but benzene does not.

P.T.O.

(h) NO_2 and ClO_2 are odd electron molecules, but only NO_2 dimerises. (5×3)

2. (a) Name the peroxo acids of sulphur and indicate the oxidation state of sulphur in them. Suggest one method of preparation of these acids using the same reactants and draw their structures. (6)

(b) Write balanced equations for the preparation of XeF_4 and $Xe F_6$ and their reaction with water. (4)

(c) How does H_3BO_3 ionize in water? Can it be titrated with NaOH to get a sharp end point? Explain the effect of cis-diols on the titration. (5)

3. (a) Draw and discuss structures of any **four**:

(i) $Xe OF_4$

(ii) I_3^-

(iii) $[Mg(EDTA)]^{2-}$

(iv) $[B_4O_5(OH)_4]^{2-}$

(v) Basic beryllium acetate

(vi) ClF_3 (4×2)

(b) Complete and balance any **five** of the following equations:

(i) $H_3PO_3 + KMnO_4 + H_2SO_4 \rightarrow$

(ii) $SiCl_4 + LiAlH_4 \xrightarrow{ether}$

(iii) $B_2H_6 + LiH \xrightarrow{ether}$

(iv) $KI + HOCl + HCl \longrightarrow$

(v) $HClO_4 + P_4O_{10} \xrightarrow{-10^\circ C}$

(vi) $NO + NO_2 \xrightarrow{-20^\circ C}$

(vii) $ICl + AlCl_3 \longrightarrow$

(viii) $RbICl_2 \xrightarrow{\Delta}$ (5×1)

(c) Arrange the following in the increasing order of their thermal stability and give a suitable justification

LiH, NaH, KH, RbH and CsH (2)

4. (a) Giving at least three examples, explain how Lithium resembles Magnesium. (4)

(b) Explain the structure of B_2H_6 and give at least two experimental evidences in support of two different types of hydrogen atoms in B_2H_6. (6)

(c) Differentiate between temporary and permanent hardness of water. How can they be estimated by complexometric titrations? (5)

5. (i) (a) Write short notes on any **three**:

(i) Intercalation compounds of graphite

(ii) Silicones and their uses

(iii) Basic properties of halogens

(iv) Interstitial hydrides

(v) Noble gas clathrates (4×3)

(b) Why Ca^{2+} cannot be titrated directly with EDTA using Eriochrome Black T (EBT) as indicator? Then, how can it be estimated complexometrically using EBT as indicator? (3)

6. (a) Giving suitable reasons briefly comment on the comparative behavior of any **five** of the following:

(i)	Acid strengths of:	$HClO_3$ and $HClO_4$
(ii)	Bond angles of:	OCl_2 and OF_2
(iii)	Catenation tendencies of:	Nitrogen & Phosphorus
(iv)	Densities of:	Graphite and diamond
(v)	Reactivities of:	Cl_2 and ICl
(vi)	Structures of:	P_4O_6 and P_4O_{10}
(vii)	Stabilities of:	RbI_3 and CsI_3
(viii)	Solubilities in water of:	Kr and Xe (5×2)

(b) Discuss the allotropes of sulphur and explain the action of heat on sulphur. (5)