

6. (a) Why is HF anomalous among hydrogen halides? Discuss its hydrogen bonding, acidic strength, and thermal stability.
- (b) Arrange the following in order of increasing thermal stability and justify your answer:
- (i) H_2O , H_2S , H_2Se , H_2Te
- (ii) N_2O , NO , N_2O_3 , N_2O_5
- (c) Discuss the structure and oxidation states of chlorine in its oxoacids: HOCl , HClO_2 , HClO_3 , and HClO_5 . How does their thermal stability and oxidizing power vary with the number of oxygen atoms? $5+5+5=15$

This question paper contains 4 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **2963** **I**

Unique Paper Code : 2173552001

Name of the Paper : DSE: Main Group
Chemistry

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

Semester : IV/VI

Time : 2 Hours **Maximum Marks : 60**

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt any **four** questions in **all**.
- (c) **All** questions carry equal marks.
1. (a) What is Ellingham diagram? Give the salient features and drawbacks of Ellingham diagram for metal oxide.
- (b) Explain why most of the lines slope upward from left to right in Ellingham diagram for metal oxides, why the lines change in slope and what happens when a line crosses the $\Delta G=0$ axis.

- (c) Why carbon is used as most common reducing agent? What are the drawback of using carbon as reducing agents?

5+5+5=15

2. Write a short note on following (**any three**):

5+5+5=15

- (a) Van Arkel-de Boer process
- (b) Zone refining
- (c) Hydrometallurgy with reference to cyanide process for silver
- (d) Electrolytic reduction

3. (a) Why and in what ways does the Lithium show the anomalous behavior than the rest of elements in each group 1 ?

- (b) What is diagonal relationship in the periodic table? What factors are responsible for diagonal relationship between elements?

- (c) What are silicones? Describe their structure and applications. 5+5+5=15

4. (a) Explain the structure, hydrolysis, and thermal stability of PCl_3 and PCl_5 . Why does solid PCl_5 behave as an ionic conductor?

- (b) Discuss the structure and bonding in crown ethers. Explain with suitable examples how they show selectivity for different alkali metal ions.

- (c) Describe the structure and bonding of diborane (B_2H_6) using the three-center two-electron (3c-2e) bond model. Why is diborane unstable towards hydrolysis?

5+5+5=15

5. (a) Discuss the structure, basicity (acid strength), and thermal stability of the following oxoacids of phosphorus: H_3PO_2 , H_3PO_3 , and H_3PO_4 .

- (b) Discuss the structure of Caro's and Marshall's acids.

- (c) Compare the thermal stability and reducing nature of hydrides (CH_4 , SiH_4 , GeH_4 , SnH_4 , PbH_4). Explain the trend.

5+5+5=15