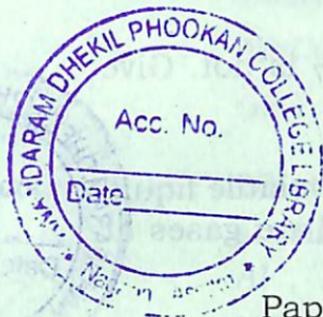


Total number of printed pages-7

3 (Sem-3/CBCS) CHE HC 1

2025



CHEMISTRY

(Honours)

Paper : CHE-HC-3016

(Inorganic Chemistry-II)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

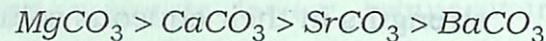
1. Answer the following questions : $1 \times 7 = 7$
 - (i) SbF_5 is much stronger Lewis acid than $SbCl_5$. Give reason.
 - (ii) Why are Group 1 hydroxides more corrosive than Group 2 hydroxides ?
 - (iii) $Fe(OH)_3$ is much less soluble than $Fe(OH)_2$. Explain with the help of Fajans' rules.

- (iv) Name the polyhedral shape of $B_{12}H_{12}^{2-}$.
- (v) IF_7 is stable whereas ClF_7 is not. Give the probable reason.
- (vi) Give reasons why HF is a volatile liquid whereas HCl , HBr and HI are gases at room temperature.
- (vii) Why is the electron affinity of F ($328 kJ mol^{-1}$) smaller than that of Cl ($349 kJ mol^{-1}$), although F is more electronegative than Cl ?

2. Answer the following questions: $2 \times 4 = 8$

- (i) The first organoxenon (IV) compound was synthesised by reaction between XeF_4 and the $C_6F_5BF_2$. Write the chemical equation.
- (ii) Ionization energy of cesium is much less than that of lithium. However, both have similar standard reduction potentials. ($E_{M^+/M}^\circ$ for Li and Cs are $-3.04V$ and $-3.03V$ respectively). Why is it so?

- (iii) The aqueous solubilities of alkaline earth carbonates are



Give reason.

- (iv) What is inert-pair effect? Arrange the stability of +1 oxidation states of Ga^+ , Al^+ , In^+ and Tl^+ in their increasing order.

3. Answer **any three** of the following questions: $5 \times 3 = 15$

- (i) Discuss **any one** of the following metal refining processes:

(a) Van Arkel-de Boer process

(b) Mond's process

- (ii) Write the contrasting properties of the borazine (inorganic benzene) and benzene.

- (iii) Discuss how the viscosity of sulfur changes within the temperature range of around $119^\circ C$ to $300^\circ C$.

(iv) Arrange the following oxyacids of chlorine in order of descending acid strengths in their aqueous solution and also give explanation :

$HClO_4$, $HOCl$, $HClO_3$ and $HClO_2$.

(v) Show that structures of XeF_4 and XeF_6 are consistent with VSEPR theory. Why is the geometry of XeF_6 not a perfect octahedron ?

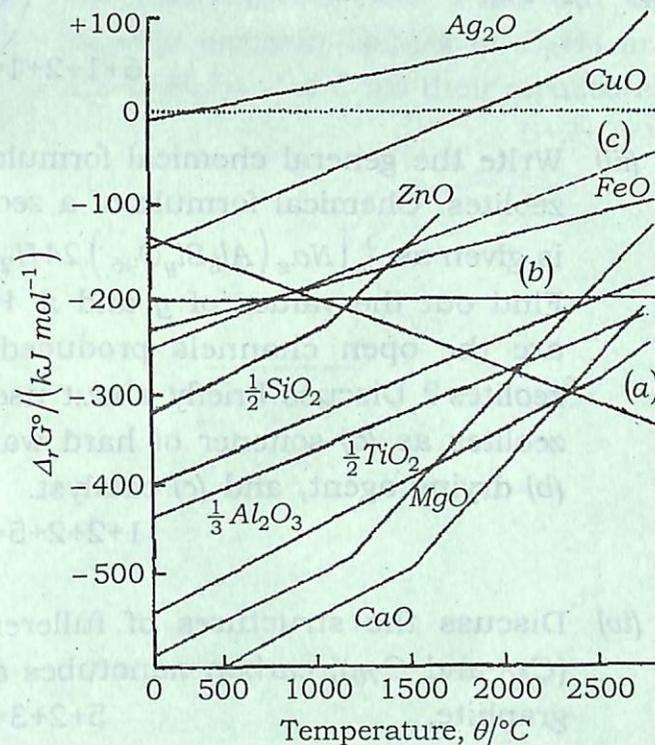
$$2+2+1=5$$

4. Answer **any three** of the following questions : $10 \times 3 = 30$

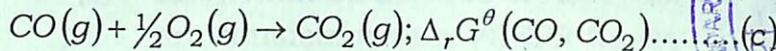
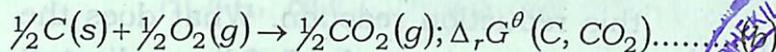
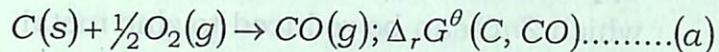
(i) (a) What are silicones? Give *one* method of preparation of silicones. What are desirable properties of silicone polymers ? $1+2+2=5$

(b) What are silicates? Draw the structures of *four* different types of silicates and give the name and formula of each type. $1+4=5$

(ii) Discuss about Ellingham diagram. From the following diagram, find the approximate lowest temperature at which ZnO can be reduced to zinc metal by carbon. Write the overall reaction of this reduction reaction. What does the inflection point in the ZnO line indicate ?



Reactions represented by (a), (b) and (c) lines, in the diagram, are given as



$$6+1+2+1=10$$

(iii) Write the general chemical formula of zeolites. Chemical formula of a zeolite is given as ${}^z_\infty [Na_z (Al_x Si_y O_{96}) \cdot 24H_2O]$. Find out the values of y and z . How are the open channels produced in zeolites? Discuss briefly about use of zeolites as (a) softener of hard water, (b) drying agent, and (c) catalyst.

$$1+2+2+5=10$$

(iv) Discuss the structures of fullerenes (C_{60} and C_{70}), carbon nanotubes and graphite.

$$5+2+3=10$$

(v) Write *five* dissimilarities in the properties (physical and chemical) of *Li* with those of other Group I elements. What is the origin of diagonal relationship? Write *three* chemical properties of *Be* that resemble with those of *Al*.

$$5+2+3=10$$

(vi) Discuss Wade's rule. Find out the skeletal electron counts of B_5H_9 and $1,2-C_2B_4H_6$ and draw their structures.

$$6+2+2=10$$

