



I Semester M.Sc. Degree Examination, November/December 2019

(CBCS)

INDUSTRIAL CHEMISTRY

Inorganic Chemistry

Time : 3 Hours]

[Max. Marks : 70

Instructions : Answer any **five** from Part A and any **five** question from Part B. Figures to the right indicate marks.

PART – A

Answer **any five** questions :

(5 × 2 = 10)

1. (a) What are zeolites? Mention any two applications of them.
- (b) Complete the following reactions :
 - (i) $\text{ClF}_3 + \text{SbF}_5 \rightarrow$
 - (ii) $\text{XeF}_6 + \text{H}_2\text{O} \rightarrow$
- (c) Define the terms-pyrometallurgy and hydrometallurgy.
- (d) Indicate which of the following reactions is thermodynamically favourable and justify your answer :
 - (i) $\text{Fe(s)} + \text{Cl}_2(\text{aq}) \leftrightarrow \text{Fe}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \quad \Delta G^\circ = -347 \text{ kJ/mol}$
 - (ii) $\text{Fe(s)} + 3\text{Cl}_2(\text{aq}) \leftrightarrow 2\text{Fe}^{3+}(\text{aq}) + 6\text{Cl}^-(\text{aq}) \quad \Delta G^\circ = -405 \text{ kJ/mol}$
- (e) Bis arenes of Cr, Mo or W are readily oxidized but not ferrocene. Explain.

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- (f) How many stretching modes are present in CO_2 and NO_2 molecules?
- (g) Find the result of the operation, S_n^n when (i) n is odd and (ii) n is even.
- (h) What are the essential symmetry elements present in one and missing in another of the pair D_{4h} and C_{4h} ?

PART - B

Answer **any five** full questions :

(5 × 12 = 60)

2. (a) Write briefly on preparation and structures of oxyacids of sulphur.
- (b) Borazine is called as inorganic benzene. Substantiate this statement with appropriate reactions.
- (c) Give the importance of alkali metal complexes of cryptands and calixarenes. (5 + 3 + 4)
3. (a) How are $(\text{NPCl}_2)_3$ and $(\text{NPCl}_2)_4$ prepared? Discuss the bonding in the tricyclic compound.
- (b) What are pseudohalogens? Give the preparation and properties of any two.
- (c) Explain the bonding and possible structures for B_5H_9 on the basis of 'STYX' number. (5 + 3 + 4)
4. (a) Draw the Ellingham diagrams showing the standard energies for the formation of different metal oxides and explain the salient features.
- (b) With the aid of Latimer diagrams, explain the redox chemistry of manganese in aqueous solution. (6 + 6)
5. (a) What oxidation state change does each metal undergo in the following reactions or half reactions?
- (i) $[\text{Cr}_2\text{O}_7]^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$
- (ii) $2\text{K} + 2\text{H}_2\text{O} \rightarrow 2\text{KOH} + \text{H}_2$
- (iii) $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow 2\text{Fe} + \text{Al}_2\text{O}_3$
- (iv) $[\text{MnO}_4]^- + 2\text{H}_2\text{O} + 3\text{e}^- \rightarrow \text{MnO}_2 + 4[\text{OH}]^-$