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Sl. No.

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M.Sc. I Semester Degree Examination, April/May - 2023

Industrial Chemistry

Paper No. : DSC 1 : Concepts in Inorganic Chemistry

Time : 3 Hours Maximum Marks : 70

Note : *Answer* ***any five*** *of the following questions with question No.* ***1 (Q1) compulsory.*** *Each question carry* ***equal*** *marks.*

1. (a) Explain the postulates of VSEPR theory with an illustration. **5+5+4**

(b) Predict the shapes of the following molecules along with their structures :

(i) XeF_6 (ii) $SbCl_6^{3-}$ (iii) TaF_8^{3-}

(c) Write the following equations and mention their significance :

(i) Born-Lande equation (ii) Kapustinskii equation

2. (a) Explain the conductivity mechanism in semi-conductors with an illustration.

(b) Describe Frenkel and Schotky defects in solids with suitable examples. **5+5+4**

(c) Discuss the mechanism of BCS theory of super conductivity.

3. (a) Explain the steric effects on acid-base strength with suitable examples. **5+5+4**

(b) Write a note on HSAB concept.

(c) Which would you expect to be better Lewis acid BCl_3 or $B(CH_3)_3$ and why ? Explain.

4. (a) Define 18 electron rule. Explain electron counting by neutral atom and oxidation state methods with illustrations. **5+5+4**

(b) Predict the metal-metal bond order for neutral complexes having the formula:

$[(OC)_4M(\mu\text{-}PR_2)_2M(CO)_4]$ where M = V, Cr and Mn.

(c) Substitution reactions of polynuclear metal carbonyls with tertiary phosphines often induce the formation of bridging carbonyls. Explain.

5. (a) Explain the mechanism of reductive elimination reactions of carbonyl complexes with examples. **5+5+4**

(b) Describe the Wacker process of addition of molecular oxygen to an alkene.

(c) Write a note on water gas shift reactions.

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6. (a) Explain the solution effects of the following solvents : **5+5+4**

(i) liquid NH_3 (ii) SO_2

(b) Briefly discuss the Irwing-Williams series of acids and bases. Write its importance.

(c) Discuss the applications of super conductors.

7. (a) Discuss the structure and bonding in metallocenes. **5+5+4**

(b) Explain the mechanism of hydrogenation of olefins using cobalt and rhodiumoxo catalysts.

(c) Briefly discuss Isobolality and Fluxionality in organo metallic compounds.

8. (a) Write the synthesis, structure and bonding in alkyls of lithium. **5+5+4**

(b) Describe the catalytic behavior of organo metallic compounds with an example.

(c) Discuss the polymerization of olefins and acetylenes.

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