LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIRST SEMESTER – **NOVEMBER 2024**

UCH 1501 – BASIC CONCEPTS IN INORGANIC CHEMISTRY

Date: 09-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

Section-A

Answer any FOUR questions. **(4 × 10 = 40)**

1. State the postulates and limitations of Bohr's theory.
2. Write a note on disproportionation and double decomposition reactions with suitable examples.
3. Illustrate the classification of solvents and role of liquid ammonia as a solvent in ammonolysis reaction.
4. Describe the following acid-base theories with suitable examples.
   (i) HSAB theory (ii) Bronsted-Lowry theory
5. Write the preparation, properties, and structure of oxygen difluoride and dioxygen difluoride.
6. State the postulates of Sidgwick-Powell and VSEPR theories and explain their role in the prediction of molecular shapes.
7. Outline the nature of conductors, insulators and semiconductors using band theory.
8. Write a note on interhalogen compounds of iodine.

Section-B

Answer any THREE questions. **(3 × 20 = 60)**

9 a. Discuss Pauling's and Mulliken-Jaffe scales of electronegativity with examples. (10)

b. Define the following and explain their trends in a period and group. (10)
   (i) Electron affinity (ii) Ionization energy

10. Explain the postulates of valence bond and molecular orbital theories. Compare and contrast VB and MO theories.

11 a. Write a note on the anomalous behaviour of fluorine. (10)

b. Balance the following redox reactions by oxidation number method. (5+5)
   (i) $MnO_4^- + C_2O_4^{2-} \rightarrow Mn^{2+} + CO_2$ (acidic medium)
   (ii) $Cr_2O_7^{2-}{}_{(aq)} + SO_{2\,(g)} \rightarrow Cr^{3+}{}_{(aq)} + SO_4^{2-}{}_{(aq)}$

12 a. Construct the molecular orbital energy diagram for CO molecule and calculate the bond order. (10)

b. How is bleaching powder prepared? Explain a method of estimating the amount of chlorine present in bleaching powder. (10)

13 a. Methane, ammonia and water are sp^3 hybridised. But bond angles are 109°, 107° and 104°, respectively. Rationalize. (12)

b. Discuss the following reactions in liquid ammonia as solvent (8)
   (i) Acid-base reaction (ii) Complex formation

14 a. Explain in detail about the hybridization and geometry of the following compounds using VSEPR theory. (10)
   (i) SF_4 (ii) ClF_3

b. Construct a qualitative MO energy level diagram for O_2 molecule. Write the MO electronic configuration and bond order for O_2, O_2^+ and O_2^- molecules. (10)
