



UTTARAKHAND OPEN UNIVERSITY, HALDWANI (NAINITAL)  
उत्तराखण्ड मुक्त विश्वविद्यालय, हल्द्वानी (नैनीताल)

**M.Sc. First Year Chemistry**

*Last Date of Submission:*

*15 May, 2014*

**Course Title: Inorganic Chemistry**

**Course Code: CHE501**

**Year: 2013-14**

**Maximum Marks: 40 Marks**

**Section 'A'**

**Section 'A' contains 08 short answer type questions of 5 marks each. Learners are required to answer 4 questions only. Answers of short answer-type questions must be restricted to 250 words approximately.**

Briefly discuss the following:

1. What are Elements of symmetry? Describe their types.
2. What is Point group symmetry? Give detail  $C_{3v}$  and  $D_{3d}$  Symmetry.
3. Determine the Point groups of the following compounds;  $H_2O$ ,  $NH_3$ ,  $C_6H_6$ ,  $C_2H_4$  and  $ClO_4^-$ .
4. Discuss the factors that affect the magnitude of Crystal field splitting.
5. Construct the molecular orbital diagram for the tetrahedral complex and explain its factor.
6. Construct an Orgal diagram for the  $d^5$  and  $d^3$  weak field octahedral complex.
7. How do you define labile complexes in term of Valence Bond Theory? Explain.
8. Explain the following:
  - (a) Trans-effect
  - (b) Chelate effect
  - (c) Structures of Hemerythrin and hemoglobin.

**Section 'B'**

**Section 'B' contains 04 long answer-type questions of 10 marks each. Learners are required to answer 02 questions only.**

1. (a) What is the sulphur protein? Describe their typical characteristics.  
(b) Define metal cluster. Explain the structural bonding aspect of iron carboxyl cluster.  
(c) State HSAB principle and explain the application of this rule.

2. What is Crystal Field Theory (CFT)? Write the various postulates of CFT. What are the limitations of Crystal Field Theory?
3. State the following:
  - (a) L-S coupling.
  - (b) Explain CO is both  $\sigma$ -donor and  $\pi$ - acceptor.
  - (c) Symmetry selection and Spin selection rule.
  - (c) Crystal field stabilization energy ( $\Delta_t$ ) is less than ( $\Delta_o$ ).
  - (d) Jahn-Teller effect.
4. What is Acid hydrolysis? What are the factors which affect the Acid hydrolysis?  
Discuss the mechanism of  $S_N1$  reaction.

