

**CHEMISTRY Paper–XVII**

**(Inorganic Chemistry–A)**

**Time Allowed : Three Hours**

**Maximum Marks : 22**

**Note :** Attempt five questions in all, selecting one question from each Unit and Unit V is compulsory. All questions carry equal marks.

**UNIT – I**

**4 each**

1. (a) What are the limitations of Valence Bond Theory ? How does crystal field theory differ from valence bond theory ?
- (b) Discuss the factors affecting the magnitude of Crystal field splitting,  $\Delta_0$ .

2. (a) Explain crystal field splitting in tetrahedral complexes. How will you account for the non-existence of these complexes with low spin ?
- (b) Calculate crystal field splitting energy for following :
- $d^4$  – High spin (octahedral)
  - $d^5$  – Strong field (octahedral)
  - $d^6$  – Tetrahedral
  - $d^9$  – Tetrahedral

#### UNIT – II

4 each

3. (a) Explain in detail the mechanism of substitution reactions in square planer complexes.
- (b) How chelation increases the stability of metal complexes ? Also explain, how the number and size of chelate rings contribute to its stability.
4. (a) What is Trans Effect ? Explain the theories for it.
- (b) What is  $\text{Log } \beta$  ? How is it related to the stability of metal complexes? Explain with examples.

#### UNIT – III

4 each

5. (a) What are metal olefin complexes ? Discuss method of preparation and bonding in these complexes.
- (b) Discuss the different types of organometallic compounds with examples.
6. (a) How does infra-red spectroscopy help in explaining bonding and geometrics of metal carbonyls ?
- (b) Define Homogeneous hydrogenation reaction. Give mechanism of homogeneous hydrogenation of alkenes with Wilkinson's Catalyst.

#### UNIT – IV

4 each

7. (a) Discuss the structures of Myoglobin and Haemoglobin. Also explain the role played by these compounds in biological systems.
- (b) What is  $\text{Na}^+ - \text{K}^+$  Pump ? Explain in detail the biological roles of Na and K ions.
8. (a) What is Nitrogen Fixation ? Discuss briefly Biological and Abiological Nitrogen Fixation.
- (b) Oxygen acts as  $\pi$ -acceptor legand in its interaction with Home, what happen when CO interacts with Home in place of oxygen ?

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UNIT - V

9. Compulsory Question :

- (a) Calculate CFSE of  $[\text{NiCl}_4]^{2-}$ .
- (b) Define stepwise and overall stability constants.
- (c) Why subscript 'g' is not used in Tetrahedral complexes ?
- (d) How stretching frequency of terminal CO differ from that of bridged CO ?
- (e) Name three essential trace elements.
- (f) What is Bohr Effect ?

1×6=6