

**FACULTY OF SCIENCE**  
**M. Sc. I – Semester Examination, December 2013**

**Subject: Chemistry**

**Paper – I : Inorganic Chemistry**

**Time: 3 Hours**

**Max. Marks: 80**

**Note :** Answer all questions from Part–A and Part–B. Each question carries 8 marks in Part–A and 12 marks in Part – B.

**PART – A (4 x 8 = 32 Marks)**

(Short Answer Type)

- 1.(a) Draw the splitting of d-orbitals in square planar metal complexes.
- (b) What is CFSE? Calculate the CFSE values in the following molecules.  
 (i)  $[\text{Fe}(\text{CN})_6]^{3-}$  (ii)  $[\text{Co}(\text{NH}_3)_6]^{3+}$
- 2.(a) Explain  $\text{S}_\text{N}1$  CB mechanism with a suitable example.
- (b) How the trans effect is useful in the preparation of cis and trans isomers of  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ ?
- 3.(a) Write a note on thermodynamic and kinetic stability constants of metal complexes.
- (b) What is HSAB principle? Explain its applications with reference to stability of metal complexes.
- 4.(a) Explain the different modes of NO coordinated to a metal.
- (b) Draw molecular orbital diagram of CO and indicate which lone pair could be donated to a metal.

**PART – B (4 x 12 = 48 Marks)**

(Essay Answer Type)

- 5.(a) What is Jahn-Teller effect? Describe its importance in predicting the structure of Cu(II) complexes.
- (b) Describe the Gouy's method for determination of the magnetic susceptibility of a metal complex.

**OR**

- (c) Discuss the factors that influence the magnitude of crystal field splitting.
- (d) Write a note on quenching of orbital angular momentum.

- 6.(a) Explain the inner sphere electron transfer mechanism with suitable examples.
- (b) Compare  $\text{S}_\text{N}1$  and  $\text{S}_\text{N}2$  reaction mechanisms in octahedral geometry.

**OR**

- (c) Discuss the mechanistic aspects of nucleophilic substitution reactions without breaking metal-ligand bond.
- (d) Explain theories of trans effect.

- 7.(a) Draw the structure of  $\text{Fe}_3(\text{CO})_{12}$  and  $\text{Co}_4(\text{CO})_{12}$  and substantiate with spectral evidences.
- (b) What is  $18e^-$  rule? Explain the salient features.

**OR**

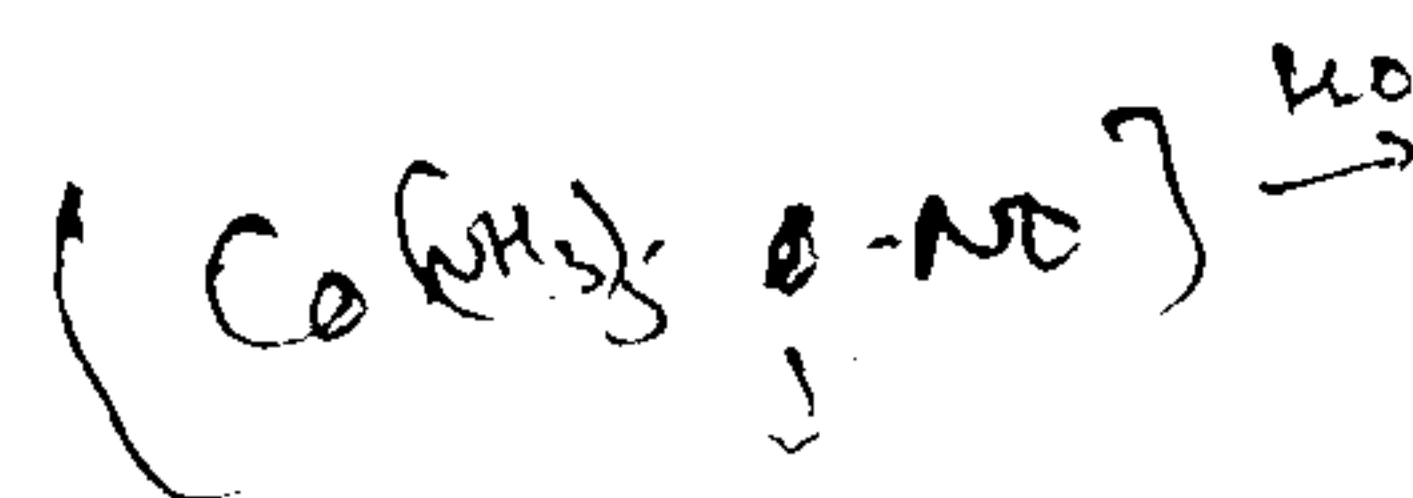
- (c) Discuss the stereochemical valence in  $[\text{Co}(\text{diars})_2(\text{NO})]^{+2}$  and  $[\text{Co}(\text{diars})_2(\text{NO})(\text{SCN})]^+$ .
- (d) Explain the structure and bonding of dinitrogen metal complexes.

- 8.(a) Discuss the effects of metal ion on the stability of metal complexes.
- (b) How the stability constant of a metal complex is determined by pH metric method?

**OR**

- (c) Write a note on ternary metal complexes.
- (d) Discuss the macrocyclic and cryptate effects on the stability of metal complexes.

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12

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12  
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