

**FACULTY OF SCIENCE**  
**M. Sc. I - Semester Examination, December 2014**

**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 4 marks in Part - A and 12 marks in Part - B.**

**PART - A (4 x 8 = 32 Marks)**  
**(Short Answer Type)**

- 1 (a) What are the factors effecting on magnitude of crystal field splitting in octahedral complexes?  
 (b) Explain Spectrochemical series with examples.
- 2 (a) Discuss outer sphere electron transfer mechanism of transition metal complexes.  
 (b) Give an account of the factors effecting on acid hydrolysis.
- 3 (a) Explain Jahn-teller effect with suitable examples.  
 (b) What is cryptate effect? How it effects the stability of metal complexes?
- 4 (a) Draw the molecular orbital diagram of  $N_2$  and indicate its donor and acceptor energy levels.  
 (b) Discuss the structural aspects of  $[IrCl(PPh_3)_2CO(NO)]^+$  and  $[RuCl(PPh_3)_2(NO)_2]^+$ .

**PART - B (4 x 12 = 48 Marks)**  
**(Essay Answer Type)**

- 5 (a) Explain the splitting of d-orbitals in square planar, tetrahedral and square pyramidal geometries.  
 (b) What are the salient features of CFT?  
 OR  
 (c) Calculate the magnetic moments of  $[Fe(CN)_6]^{4-}$ ,  $[Fe(H_2O)_6]^{2+}$ ,  $[Fe(CN)_6]^{3-}$ .  
 (d) Mention the applications of magnetic moment data for the determination of bond type.
- 6 (a) Discuss the theories of trans effect.  
 (b) Compare and contrast between  $S_N1$  and  $S_N2$  mechanism of substitution reaction of transition metal complexes.  
 OR  
 (c) What are the cross reactions and explain Marcus-Hush theory?  
 (d) Explain  $S_N1CB$  reaction mechanism with example.
- 7 (a) Discuss the principle involved in the determination of stability constants by polarographic method  
 (b) Explain the metal ion related factors which effect the stability of metal complexes.  
 OR  
 (c) Discuss macrocyclic and chelate effect with reference to stability of metal complexes.  
 (d) Write a note on stepwise and overall stability constants.
- 8 (a) Explain spectrochemical control of valence in  $[Co(diars)_2(NO)]^{2+}$  and  $[(Co(diars)_2(NO)(SCN))]^+$ .  
 (b) Draw the molecular orbital diagram of CO and indicate its HOMO and LUMO levels.  
 OR  
 (c) Discuss the structural aspects of dinitrogen metal complexes.  
 (d) What is 18 valence electron rule? Discuss with respect to  $Co_2(CO)_8$ ,  $Fe_2(CO)_9$  and  $Mn_2(CO)_{10}$ .

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