**AND HRA UNIVERSITY**

**DEPARTMENT OF INORGANIC AND ANALYTICAL CHEMSITRY**

**M.Sc. Previous Chemistry Syllabus, Semester - II**

**Paper- II: Inorganic Chemistry - II**

**UNIT-I**

**Metal cluster compounds -** definition – evidences for existence of M-M bonds - conditions favorable for formation of M-M bonds – preparation, structure and bonding of the following metal cluster compounds.

Re2Cl82-, Mo2Cl84-, Re2(RCOO)4X2, Mo2(RCOO)4(H2O)2, Cr2(RCOO)4(H2O)2, Cu2(RCOO)4 (H2O)2, Cr2Cl93-, Mo2Cl93-, W2Cl93-, Re3Cl9, Re3Cl123-, Mo6Cl84+, Nb6X122+ and Ta6X122+.

Polyatomic clusters – Zintle ions, Chevrel phases.

**UNIT-II**

**Organometallic compounds -** 16 and 18 electron rules.

Isoelectronic relationship - Synthesis, structure, bonding and reactions of carbon monoxide, dinitrogen and nitric oxide complexes.

Isolobal relationship – H, Cl, CH3, Mn(CO)5; S, CH2, Fe(CO)4; P, CH, Co(CO)3

Synthesis, structure, bonding and reactions of metallocenes with special reference to ferrocene

**UNIT-III**

**Metal Ligand equilibria in solution:**

Step wise and overall formation constants and their interaction – trends in stepwise constants – factors affecting the stability of metal complexes – Pearson’s theory of hard and soft acids and bases (HSAB), chelate effect and its thermodynamic origin, determination of stability constants of complexes – spectrophotometric method and pH –metric method.

Reactivity of metal complexes – inert and labile complexes. Explanation of lability on the basis of valence bond and crystal field theories.

**UNIT- IV**

**Inorganic Reaction Mechanisms:**

Substitution reactions of metal complexes – D, Id, Ia and A mechanisms – Ligand replacement reactions of metal complexes – Acid hydrolysis – factors affecting acid hydrolysis – Anation and Base hydrolysis of Cobalt(III) complexes. Ligand displacement reactions of square planar complexes of platinum (II). Factors affecting square planar substitution – trans effect (theories).

Electron transfer reactions of complexes – concept of complementary and non-complementary reactions with examples. Inner and outer sphere mechanisms.

**Text books**:

1. Advanced Inorganic Chemistry by F.A. Cotton and R.G. Wilkinson, IV Edition, John, John Wiley and Sons, New York, 1980.
2. Inorganic Chemistry by J.E. Huheey, III edition, Harper International Edition, 1983.
3. Organometallic Chemistry-A unified approach by A. Singh and R.C. Mehrotra, Wiley Eastern Ltd.
4. Inorganic Chemistry by Shriver and Atkins, Oxford University Press (1999)
5. Theoretical Inorganic Chemistry, II Edition by M.C. Day and J. Selbin, Affiliated East-West press Pvt. Ltd., New Delhi.
6. Mechanisims of Inorganic reactions in solution by D.Benson, MCgraw Hill, London, 1968.
7. Inorganic chemistry by K.F. Purcell and J.C.Kotz, W.B. Saunders company, New York, 1977.

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MODEL QUESTION PAPER

M.Sc. Previous Chemistry Syllabus Semester II

**Paper- II: Inorganic Chemistry-II**

(Effective from 2011-2012 admitted batch)

Time: 3 hours Max. Marks: 80

**SECTION-A**

**ANSWER ALL QUESTIONS 4x5=20 Marks**

1. a) Discuss the structure and magnetic property of Cu2(RCOO)4 (H2O)2.

Or

b) Write a note on Chevrel phases.

2. a) Explain Isolobal relationship with suitable examples.

Or

b) What is 18 electron rule? Illustrate with suitable examples.

3. (a) Describe the pH – metric method for the determination of stability constants.

Or

(b) What are inert and labile complexes? How are they explained by using crystal

field stabilization energies?

4. (a) What is trans effect? Distinguish between the trans effect and trans influence.

Or

(b) What are anation reactions? Discuss the mechanism of anation reactions.

**SECTION-B**

**ANSWER ALL QUESTIONS 4x15=60 Marks**

5. a) Discuss the preparation of, structures of and bonding in Re2Cl82-.

OR

b) Describe the structures of hexanuclear metal clusters.

6. a) Explain the synthesis, structure and reactions of metal carbonyls.

OR

b) Describe the preparation of, structure of and bonding in ferrocene.

7. (a) (i) Discuss a spectrophotometric method for the determination of binary formation constant of a

complex.

(ii) Distinguish between stepwise and overall stability constants.

Or

(b) Explain the factors affecting the stability of coordination compounds.

8. (a) Explain the mechanisms of redox reactions of metal complexes.

Or

(b) (i) Give an account of base hydrolysis of Cobalt(III) complexes.

(ii) Discuss the various factors affecting the rates of substitution reactions of octahedral

complexes.