

# Minnesota State University Moorhead

## CHEM 420: Inorganic Chemistry II

### A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: 0

OJT Hours/Week: \*.\*

Prerequisites:

CHEM 300 - Inorganic Chemistry I AND CHEM 450 - Physical Chemistry I

Corequisites: CHEM 425

MnTC Goals: None

Transition metal chemistry, valence bond, molecular orbital, crystal field, and ligand field theory, molecular symmetry. Bio-inorganic models.

**B. COURSE EFFECTIVE DATES:** 06/01/1995 - Present

### C. OUTLINE OF MAJOR CONTENT AREAS

1. Crystal field theory: magnetic properties, spectra and other consequences of CFT
2. Crystal field theory of octahedral, tetrahedral, square planar and distorted geometries
3. Symmetry operations and elements and molecular point groups
4. Character tables
5. Infrared and Raman spectra
6. Alkyls and aryls of the elements: synthesis, reactions and uses
7. Isolobal analogy
8. Polysilicates and aluminosilicates: structure and chemistry
9. Close packed anions and crystal lattices
10. Dinuclear and polynuclear organometallics
11. Electron deficient, electron precise and electron rich hydrides: synthesis and reactions
12. Metal complexes of p donor ligands and other ? and bridging ligands
13. Molecular orbitals for higher order point groups
14. Molecular orbitals: homonuclear diatomics, heteronuclear diatomics, linear and cyclic molecules
15. Organometallic compounds: 18 electron rule, mononuclear metal carbonyls
16. Rate laws and mechanisms for ligand substitution reactions
17. Reaction types of d-block organometallic compounds and catalytic cycles
18. Redox reaction mechanisms: inner and outer-sphere processes
19. Spinel, perovskites and superconductors
20. States, structures and chemistry of covalent oxides

#### **D. LEARNING OUTCOMES (General)**

1. Determine the symmetry of simple molecules and will understand and be able to predict the consequences of symmetry on various types of experimental spectra.
2. Explain the variables that control the rates and mechanisms of ligand substitution and redox reactions in inorganic complexes.
3. Predict the periodic trends in the physical states of oxides of the elements using radius ratios.
4. Understand the theoretical models used in inorganic chemistry including crystal field theory and molecular orbital theory and will be able to use these models to explain the bonding and chemistry of simple inorganic and organometallic compounds and main group clusters.
5. Use the isolobal analogy to predict plausible but unknown inorganic compounds.

#### **E. Minnesota Transfer Curriculum Goal Area(s) and Competencies**

None

#### **F. LEARNER OUTCOMES ASSESSMENT**

As noted on course syllabus

#### **G. SPECIAL INFORMATION**

None noted