

CHEMISTRY 413
ADVANCED INORGANIC CHEMISTRY
SYLLABUS

Semester: Spring 1998
Venue, Time: CNSB 211, 9:30 am - 10:45 am, TTh
Instructor: Dr. Stephen Fox
office: CNSB 205, telephone: 342-1838, e-mail: chfox@alpha.nlu.edu
Office Hours: 9:00 am - 11:00 am, MW; 2:00 pm - 5:00 pm, WTh, or by appointment
Text: *Inorganic Chemistry* by Shriver, Atkins and Langford
Second Edition, 1994, W. H. Freeman: New York

Topics to be covered:

Introduction/Review:

Free energy, entropy, equilibrium, electrode potentials, elementary kinetics, activation energy, nuclear reactions

Bonding in representative elements/Review: (Chapter 2)

Lewis structures, VSEPR, electronegativity, oxidation numbers, hybridization, valence bond theory, molecular orbitals, bond order, electronic configuration

Symmetry: (Chapter 3)

Elements of symmetry, molecular symmetry, point group identification

Solids: (Chapter 4)

Close packing, ionic solids, unit cells, empirical formulae, classical structures

Solvents: (Chapter 5)

Auto-dissociation, acids-bases (Brønsted, Lewis, Lux-Flood, Soft-Hard), leveling effect, electronic effects and relative acid-base strength

Coordination Chemistry: (Chapter 6)

Transition-metals, crystal-field theory, *d*-orbital splitting, ligand-field geometries, valence-bond approach, π -bonding (*p-p*, *p-d*), δ -bonding, M.O. theory of complexes

Spectrochemical series: (Chapters 6, 14)

Spin states, magnetic susceptibility, electronic spectroscopy, LFSE, Jahn-Teller effect, ligands, chelate effect, steric effects, isomers, *3d/4d, 5d* comparisons

Organometallics: (Chapter 16)

Soft ligands, 18-electron rule, oxidation numbers, back-bonding, carbonyl stretching frequency, oxidative addition, β -hydrogen migration, olefin metathesis, migratory insertion

Oxidation/Reduction: (Chapter 7)

Electrochemical reactions, Latimer diagrams

Kinetics of coordination complexes: (Chapters 6, 15)

Inert/labile complexes, mechanisms, volume of activation, electron-transfer

Bioinorganic chemistry: (Chapter 19)

Proteins, enzymes, utilization of transition-metals, spectroscopic methods, structure-function relationships, synthetic models, porphyrins, iron-sulfur cubes, electron-transfer

Tests/Grading: There will be *two* mid-term tests, each comprising 20% of the total grade, and a *comprehensive final* exam worth 40% of the total; the proposed schedule for these exams is given below. The remaining 20% of the grade will consist of a number (ca. 10) of quizzes, which will be given at regular intervals throughout the semester. The grading scheme is as follows:

90.0 - 100%	A
80.0 - 89.9%	B
70.0 - 79.9%	C
60.0 - 69.9%	D
0.00 - 59.9%	F

Test 1: Thursday, February 19th, 9:30 am - 10:45 am

Test 2: Tuesday, April 7th, 9:30 am - 10:45 am

Final: Friday, May 8th, 10:00 am - 11.50 am

Objectives:

To present and discuss the fundamental concepts of structure, symmetry, bonding, and reactivity central to Inorganic Chemistry (which includes Organometallic and Bioinorganic sub-disciplines).