

**Chemistry 0500**

**Prof. Wesley Bernskoetter**  
**GC 343; 3-3365**

**Lab Instructor: Dr. Kathleen Hess**  
**GC 347; 3-1193**

Description: The course conducts a systematic survey of topics required for a basic understand of inorganic chemistry. The course discusses fundamental features such as synthesis, structure, bonding and reactivity as well as the applications of inorganic, organometallic, and solid-state compounds. The desired learning outcomes for the course include the understanding of simple relationships between electronic structure and bonding/reactivity in transition metal and main group compounds, predicting/interpreting basic vibrational spectroscopy and critically evaluating catalytic mechanisms/processes which use inorganic coordination compounds.

Primary Text: Miessler and Tarr. *Inorganic Chemistry*. Fourth Edition. (other editions will work, but problems assigned are out of 4<sup>th</sup> Ed)

Other Resources: *Canvas*: Please note there are separate *Canvas* sites for the lecture and laboratory sections of this course.

Office Hours: Each Monday and Thursday from 3-4p in GC 343, unless otherwise announced.

Other Textbooks: The resources below are excellent references should you require additional reading. See library reserves or the instructor to access copies.

Shriver and Atkins. *Inorganic Chemistry*. Fifth Edition

Cotton and Wilkinson. *Advanced Inorganic Chemistry*. Any Edition.

Carter, *Molecular Symmetry and Group Theory*. Any Edition.

Collman, J. P.; Hegedus, L.S.; Norton, J.R.; Finke, R.G. *Principles and Applications of Organotransition Metal Chemistry*, Any Edition.

Grading:

2 Preliminary Exams 20% (each)

Final Exam 20% (comprehensive but weighted to last third of course)

Problem Sets 20% (6-8: Tardiness excused only under University policy)

Lab Grade 20%

Problems Sets will be collected at the beginning of class on the assigned day. Students are encouraged to discuss these assignments, but the material submitted must be their own.

Two preliminary exams are tentatively scheduled for: February 21st and April 4th. The final is scheduled by the registrar for Wednesday, May 14<sup>th</sup> at 2pm.

Academic Honesty:

All Brown students are expected to be cognizant of and adhere strictly to the Guidelines for Academic Honesty. These can be found on the website of the Dean of the College.

Those students with disabilities requiring additional accommodations should discuss their needs with the instructor and Student and Employee Accessibility Services.

### **Tentative Outline**

- I. Introduction to Basic Bonding Theories (**Chapter 3**)
  - A. Classic Models
  - B. VSEPR
  - C. Hyperconjugation/Natural Resonance Theory
  - D. Highlights of Molecular Orbital Theory
- II. Symmetry and Group Theory (**Chapter 4**)
  - A. Symmetry Operations, Elements and Point Groups
  - B. Character Tables
  - C. Symmetry of Molecular Orbitals
  - D. Other Applications of Group Theory
- III. Molecular Orbitals in Main Group Chemistry (**Chapter 5**)
  - A. Diatomics
  - B. Simple Main Groups Compounds
- IV. Coordination Chemistry of Transition Metals (**Chapters 10 & 12**)
  - A. Trends in the Transition Metals
  - B. Coordination & Electronic Structures
  - C. Ligand Substitution Reactions and Mechanisms
  - D. Organometallic Chemistry (**parts of Chapters 13 & 14**)
- V. Solid State Inorganic Chemistry (**Chapter 7**)
  - A. Crystalline Structures
  - B. Band Structure and related properties
  - C. Synthesis of Materials and Applications