

Lewis & Clark College
Advanced Inorganic Chemistry, Chemistry 420
Spring 2017

Professor: Anne Bentley; Olin 221; x7579; bentley@lclark.edu

Lecture: MWF 11:30 am – 12:30 pm in Olin 306

Office Hours: Tuesday 9-10 am, 2-3:30 pm; Wednesday 4-5 pm; Friday 2-3 pm

Class Listserve: 17SP-CHEM-420-01@lclark.edu

Class Website: via <http://moodle.lclark.edu>

Required Materials

The course textbook, *Inorganic Chemistry*, 5th Ed. by Gary L. Miessler, Paul J. Fischer, and Donald A. Tarr, is available at the campus bookstore. A copy of the 4th edition of the text is on reserve at Watzek Library.

Student Learning Outcomes

By the end of this course, students will be able to:

1. Use concepts from quantum theory and atomic orbitals to explain periodic trends in atomic properties and relate these to inorganic chemistry.
2. Predict the structure and using an appropriate model, describe the bonding in main group molecules.
3. Identify the symmetry operations and the point group of a molecule.
4. Apply tools from symmetry and group theory to solve problems involving vibrational spectroscopy and molecular orbital theory.
5. Extend acid-base concepts to inorganic systems and use different models to predict chemical reactivity.
6. Use Latimer, Pourbaix, and Frost diagrams to predict the electrochemical activity of a system.
7. Describe the structures and properties of common crystalline and ionic solids.
8. Use crystal field or MO theory to explain the electronic structure and magnetism of transition metal complexes.
9. Read and discuss an article from the inorganic chemistry primary literature.

Course Website

A website for Chemistry 420 has been created at <http://moodle.lclark.edu>. First log in to moodle using your LC username and password. Then, choose Chemistry 420 from the menu of courses displayed. You should be automatically enrolled in the course on moodle. I will post problem assignments, problem solutions, journal articles, lecture notes and handouts on the moodle page.

Grading

Midterm exams (3)	45%
Final exam	20%
Problems	20%
Journal article assignment	15%

Exams

Three midterm exams are tentatively scheduled for February 17, March 10, and April 19. Credit on midterm exams will be given as 90% for individual effort and 10% for group effort. Each group will complete the exam together in the week following the in-class exam. The comprehensive final exam will be Wednesday, May 3 from 1:00 – 4:00 pm.

Problems

So that you can apply what you are learning as you learn it, this class will use a frequent small problem format in place of longer graded problem sets. Problems will be posted to moodle in advance, with one problem due at lecture each day. (Late problems can earn only half credit – one “free” late problem is allowed.) Problems will be graded and returned to your chemistry department mailbox before the next lecture. Incorrect problems can be re-done and handed back in at the third lecture following the original due date.

In addition, I will provide longer sets of recommended problems for further study. Solutions to both the required short problems and optional longer problem sets will be posted to the course website on moodle.

Journal Article Discussions

The inorganic chemistry that you study in a textbook was all discovered by research. As review at the end of the semester, you will each prepare a discussion of a journal article that develops and applies the course content. Before our in-class discussions, each student will be expected to read the journal articles.

Festival of Scholars

The college-wide Festival of Scholars is Friday, April 14. Attendance and participation are expected.

Academic Integrity

I encourage you to study with classmates; however, all homework, exams, and classroom activities you turn in should be your own work. Violations of Lewis & Clark's academic integrity policy will be taken seriously.

Academic Accommodations

If you have a disability that may impact your academic performance, you may request accommodations by submitting documentation to the Student Support Services Office in Albany Quadrangle (x7191). That office will notify me of the accommodations for which you are eligible.

Tentative Course Schedule

Date	Material Covered	Reading
Wed., Jan. 18	Introductions, Orbital Shapes	2.1 – 2.2.2
Fri., Jan. 20	Shielding and Slater's Rules	2.2.3 – 2.2.4
Mon., Jan. 23	Periodic Trends	2.3
Wed., Jan. 25	Valence Shell Electron Pair Repulsion (VSEPR) Theory and Electronegativity	3.1 – 3.2.3
Fri., Jan. 27	Symmetry Elements and Operations	4.1
Mon., Jan. 30	Point Groups	4.2
Wed., Feb. 1	Properties and Representations of Groups	4.3
Fri., Feb. 3	Properties and Representations of Groups	4.3
Mon., Feb. 6	Symmetry and Vibrational Spectroscopy	4.4
Wed., Feb. 8	Symmetry and Vibrational Spectroscopy	4.4
Fri., Feb. 10	Molecular Orbital Formation, Homonuclear Diatomic Molecules	5.1 – 5.2.3
Mon., Feb. 13	Heteronuclear Diatomic Molecules	5.3, 5.4.1
Wed., Feb. 15	MO's for Larger Molecules	5.4.2 – 5.4.5
Fri., Feb. 17	Exam 1 (Ch 2–4)	
Mon., Feb. 20	MO's for Larger Molecules	5.4.2 – 5.4.5
Wed., Feb. 22	Major Acid/Base Systems	6.2 – 6.2.4
Fri., Feb. 24	Acid/Base Strength	6.4

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Mon., Feb. 27	Hard Soft Acids and Bases	6.3
Wed., March 1	Oxidation / Reduction Chemistry	supplemental readings
Fri., March 3	Oxidation / Reduction Chemistry	supplemental readings
Mon., March 6	Oxidation / Reduction Chemistry	supplemental readings
Wed, March 8	Types of Crystalline Structures	7.1.1
Fri., March 10	Exam 2 (Ch 5-6 and redox)	
Mon., March 13	Types of Crystalline Structures	7.1.2 – 7.1.4
Wed., March 15	Experimental and Theoretical Approaches to Lattice Enthalpy	7.2.1
Fri., March 17	Thermal Stability and Solubility	7.2.2
Mon., March 20	Metals and Semiconductors	7.3
Wed, March 22	Journal Article Projects	
Fri, March 24	Journal Article Projects	
	Spring Break	
Mon., April 3	Coordination Chemistry: Structures and Isomers	9.1 – 9.2
Wed., April 5	Coordination Chemistry: Structures and Isomers	9.3 – 9.3.5, 9.3.7
Fri., April 7	Coordination Chemistry: Bonding	10.1 – 10.2
Mon., April 10	Coordination Chemistry: Bonding	10.3
Wed., April 12	Coordination Chemistry: Bonding	10.4
Fri., April 14	<i>Festival of Scholars</i>	
Mon., April 17	Coordination Chemistry: Bonding	10.5 – 10.7
Wed., April 19	Exam 3 (Ch 7-9)	
Fri., April 21	Coordination Chemistry: Electronic Spectra	11.1 – 11.2
Mon., April 24	Coordination Chemistry: Electronic Spectra	11.3.1 – 11.3.3
Wed., April 26	Coordination Chemistry: Electronic Spectra	11.3.4 – 11.3.7
Wed., May 3	Final Exam , 1:00 – 4:00 pm	