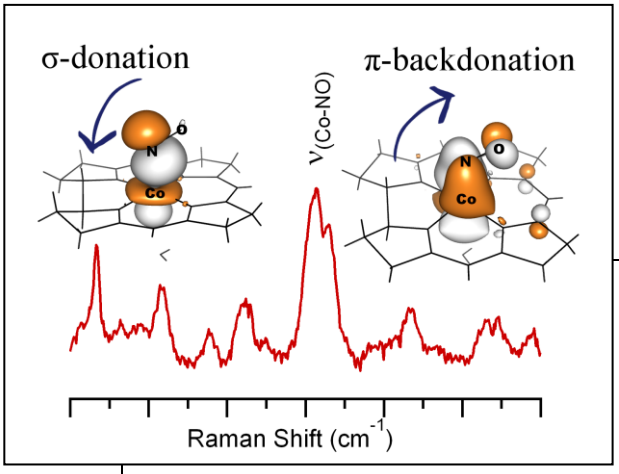
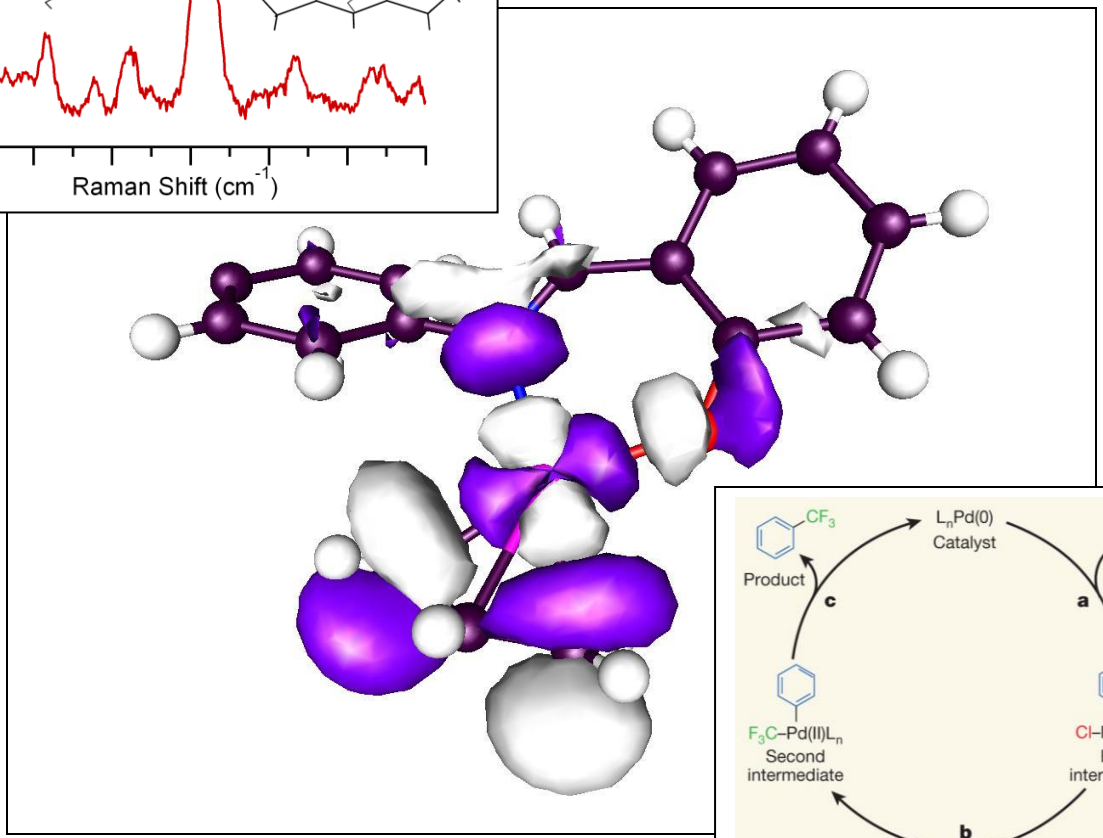
Chemistry 511

Advanced Inorganic Chemistry





SPRING 2017 **THOMAS C. BRUNOLD**

ADVANCED INORGANIC CHEMISTRY
Chemistry 511 – Spring 2017

Instructor: Thomas Brunold; 6211 Chemistry; 265-9056; brunold@chem.wisc.edu

Lectures: MWF 1:20 – 2:10 pm; 2373 Chemistry; 3 credits

Office Hours: M 2:25 – 3:15 pm (or by appointment); 6211 Chemistry

Prerequisites: Junior standing or content of instructor

Course Objectives: Recognize molecular symmetry and understand the concepts of group theory
Generate qualitative bonding descriptions for inorganic chemical compounds
Explore connections between chemical composition, geometric structure, bonding, and reactivity
Establish relationships between spectroscopic data and geometric/electronic structures of inorganic chemical compounds

Textbook: Miessler, G. L.; Fischer, P. J.; Tarr, D. A. *Inorganic Chemistry*; 5th Ed., Prentice Hall (2013); older editions are perfectly acceptable (and much cheaper). Not required, but recommended.

Draft Syllabus:

Symmetry and Group Theory
- Symmetry Elements and Operations
- Point Groups
- Character Tables
- Select Applications of Group Theory – Chirality and Molecular Vibrations

Simple Bonding Theories and Molecular Orbital Theory
- Lewis Electron-Dot Diagrams & Valence Bond Theory
- Formation of Molecular Orbitals from Atomic Orbitals
- Homonuclear & Heteronuclear Diatomic Molecules
- Molecular Orbitals for Octahedral and Tetrahedral Transition Metal Complexes

Coordination Chemistry
- Historical Background
- Nomenclature
- Ligand Field Theory & Tanabe-Sugano Diagrams
- Electronic Absorption Spectra of Coordination Compounds

Organometallic Chemistry
- Historical Background
- Organic Ligands and Nomenclature
- The 18-Electron Rule
- Reactions and Catalysis

Bioinorganic Chemistry
- Overview
- Structures & Functions of Representative Metalloproteins
- Spectroscopic & Computational insights into Enzyme Mechanisms

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Grading: The following point scheme will be used:

Midterm Exam	100 pts	(29%)	
Final Exam	150 pts	(43%)	
5 Problem Sets	50 pts	(14%)	⇒ 10 pts per Problem Set
3 Projects	30 pts	(9%)	⇒ 10 pts per Project
4 Quizzes	20 pts	(6%)	⇒ 5 pts per Quiz
Total	**350 pts**	**(100%)**	

Exams: One midterm exam (1½ hours) and one final exam (2 hours). Both exams will be **open book – no memorization required**!

- **Midterm Exam: Thursday, March 9 (Week 8); 5:00 – 6:30 pm**
- **Final Exam: Saturday, May 6 (Week 16); 2:45 – 4:45 pm**

Problem Sets: A total of 5 problem sets will be given out throughout the semester. The problem sets should each take ~2 hours to complete and will be graded on a low-resolution scale: 10 pts maximum and 3 pts minimum (<3 pts for inadequate effort and 0 pts if not turned in). **You are strongly encouraged to solve these problem sets with some of your classmates**, but you must turn in individually prepared answer sheets and provide the names of all your collaborators.

Projects: A total of 3 literature (or computational) projects will be assigned throughout the semester. These projects will involve researching a scientific problem related to the material covered in class. You are encouraged to work on these projects in little groups, but you must turn in individually prepared reports.

Quizzes: A total of 4 quizzes will be held at the beginning of certain Friday lectures throughout the semester. Each quiz is designed to quickly assess your skill in applying the concepts taught in class and will typically take no more than 15 minutes. A maximum of 5 pts can be earned on each quiz. All quizzes will be **open book** but must be completed **individually**.

CHEMISTRY 511 – SPRING 2017

Tentative Course Calendar

Week	Monday	Wednesday	Friday
1	*January 16* Martin Luther King Jr. Holiday	*January 18*	*January 20*
2	*January 23*	*January 25*	*January 27*
3	*January 30*	*February 1* **Problem Set #1 due**	*February 3* **Quiz #1**
4	*February 6*	*February 8*	*February 10*
5	*February 13*	*February 15*	*February 17*
6	*February 20* **Problem Set #2 due**	*February 22*	*February 24* **Quiz #2**
7	*February 27*	*March 1*	*March 3*
8	*March 6* **Problem Set #3 due**	*March 8* *March 9*: **Midterm Exam**	*March 10*
9	*March 13*	*March 15*	*March 17*
10	*March 20* Spring Recess – No Class ☹	*March 22* Spring Recess – No Class ☹	*March 24* Spring Recess – No Class ☹
11	*March 27*	*March 29*	*March 31*
12	*April 3*	*April 5*	*April 7* **Quiz #3**
13	*April 10*	*April 12*	*April 14*
14	*April 17* **Problem Set #4 due**	*April 19*	*April 21*
15	*April 24*	*April 26*	*April 28* **Quiz #4**
16	*May 1* **Problem Set #5 due**	*May 3* Last Class Day – Donuts ☺	*May 5* Study Day *May 6*: **Final Exam**

Exams: - Week 8: Midterm Exam; Thursday, March 9; 5:00 – 6:30 pm
- Week 16: Final Exam; Saturday, May 6; 2:45 – 4:45 pm