

**Instructor**

Prof. Matt Liptak  
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**Lecture**

MWF 12:00 – 12:50, Rowell 115

**Office Hours**

TF 2:00 – 3:00, Discovery W112

**Exams**

F Sep. 29, 12:00 PM, Rowell 115  
F Nov. 3, 12:00 PM, Rowell 115  
M Dec. 11, 10:30 AM, Rowell 115

**Course Description**

Chem 231 will cover the fundamentals of inorganic chemistry within the frameworks of molecular symmetry and molecular orbital theory. All areas of inorganic structure, bonding, and reactivity will be covered, with an emphasis on transition metal complexes.

**Textbook**

Miessler, G.L. and Tarr, D.A. *Inorganic Chemistry*, 5<sup>th</sup> Ed., Prentice Hall, 2013

**Web Content**

Lecture notes, problem sets, and problem set answer keys will be available through Blackboard (bb.uvm.edu). These materials are available for all current, UVM-affiliated, students, but they may not be shared off-campus without permission of the instructor.

**Course Goals**

Upon completion of Chem 231, it is anticipated that you will:

1. Understand the relationship between molecular symmetry and bonding.
2. Appreciate the use of molecular orbital theory as a *general* approach that can explain the chemical properties of inorganic and organic molecules.
3. Recognize why transition metal complexes can have structures and properties unique from those of main group compounds.

**Academic Honesty**

As UVM students, you are expected to conduct yourself in accordance with the Code of Academic Integrity: <http://www.uvm.edu/policies/student/acadintegrity.pdf>

**Accommodations**

All exam accommodations must be requested via e-mail at least two weeks prior to the scheduled exam time in order to receive consideration.

## Course Outline

### ***Unit #1 – Fundamentals of Inorganic Chemistry***

- I. Molecular Symmetry
- II. Vibrational Spectroscopy
- III. Molecular Orbital Theory
- IV. Main Group Bonding

### ***Unit #2 – Structure and Bonding of Inorganic Compounds***

- V. Acid-Base Chemistry
- VI. Solid State Chemistry
- VII. Transition Metal Bonding
- VIII. Ligand Field Theory

### ***Unit #3 – Spectroscopy and Reactivity of Coordination Complexes***

- IX. Electronic Spectroscopy
- X. Coordination Chemistry
- XI. Organometallic Chemistry
- XII. Bioinorganic Chemistry

## Problem Sets

Problem sets will be handed out approximately once a week throughout the course of the semester. These problem sets are intended to solidify your understanding of the major course concepts and challenge you to think critically using your new-found knowledge. Please follow a “no writing utensil” rule when discussing these assignments with your classmates. Problem sets are due at the **beginning** of class. Late Problem sets will not be accepted, but the two lowest scores will be dropped.

## Exams

Three exams are scheduled for Chemistry 231, which will cover units 1 – 3 separately. In other words, the exams will not be cumulative. Exams #1 and #2 are scheduled for 12 PM on **September 29** and **November 3**. Exam #3 will use our final exam time: **December 11** at 10:30 AM.

## Grading

Your grade will be based upon problem sets (25%) and three exams (25% each). I strive to be as accurate as possible when grading problem sets and exams, but will occasionally make a mistake. You may request a complete regrade of an assignment, plus a clear explanation for any lost points, at any point prior to administration of the final exam.

**Tentative Course Schedule**

	<b>Monday</b>	<b>Wednesday</b>	<b>Friday</b>
Aug. 28	Course Overview	Proper Rotations (4.1)	Improper Rotations (4.1)
Sep. 4	<b>Labor Day</b> <b>No Class</b>	Point Groups (4.2)	Character Tables (4.3) <b>PS #1 Due</b>
Sep. 11	Molecular Vibrations (4.4)	IR and Raman Spectra (4.4)	Molecular Orbitals (5.1) <b>PS #2 Due</b>
Sep. 18	Homonuclear Diatomics (5.2)	Heteronuclear Diatomics (5.3)	Main Group $\sigma$ Bonding (5.4) <b>PS #3 Due</b>
Sep. 25	Main Group $\pi$ Bonding (5.4)	Walsh Diagrams <b>PS #4 Due</b>	<b>Exam #1</b> <b>12:00 PM</b>
Oct. 2	Lewis Acid-Base (6.4)	Intermolecular Forces (6.5)	Hard-Soft Acid-Base (6.6)
Oct. 9	<b>Fall Recess</b> <b>No Class</b>	Solid State Structure (7.1) <b>PS #5 Due</b>	Lattice Energy (7.2)
Oct. 16	Band Structure (7.3)	Coordination Complexes (9.3) <b>PS #6 Due</b>	Metal $\sigma$ Bonding (10.3)
Oct. 23	Metal $\pi$ Bonding (10.3)	Ligand Field Splitting (10.3) <b>PS #7 Due</b>	Angular Overlap Model (10.4)
Oct. 30	Jahn-Teller Effect (10.5)	UV/Vis Abs Spectra (11.1) <b>PS #8 Due</b>	<b>Exam #2</b> <b>12:00 PM</b>
Nov. 6	Electronic States (11.2)	Ligand Field Transitions (11.3)	$O_h$ Substitution (12.1-12.5) <b>PS #9 Due</b>
Nov. 13	$D_{4h}$ Substitution (12.6-12.7)	Oxidation-Reduction (12.8)	Oxidative Addition (14.1) <b>PS #10 Due</b>
Nov. 20	<b>Thanksgiving Recess</b> <b>No Class</b>	<b>Thanksgiving Recess</b> <b>No Class</b>	<b>Thanksgiving Recess</b> <b>No Class</b>
Nov. 27	Insertion/Elimination (14.2)	Catalysis (14.3)	Tetrapyrroles (16.1) <b>PS #11 Due</b>
Dec. 4	Metalloproteins (16.2)	Nitrogen Fixation (16.3)	Course Summary <b>PS #12 Due</b>
Dec. 11	<b>Exam #3</b> <b>10:30 AM</b>		

*The instructor reserves the right to change everything, with notice*