

**Instructor**

Prof. Matt Liptak  
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**Lecture**

MWF 12:00 – 12:50, Waterman 413

**Office Hours**

TRF 2:00 – 3:00, Discovery W112

**Exams**

F Feb. 9, 12:00 PM, Waterman 413  
F Mar. 9, 12:00 PM, Waterman 413  
W Apr. 11, 12:00 PM, Waterman 413  
T May 8, 10:30 AM, Waterman 413

**Course Description**

Chem 131 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, including bioinorganic chemistry.

**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 131, it is anticipated that you will:

1. Understand the relationship between molecular symmetry and bonding.
2. Recognize why transition metal complexes can have structures and properties unique from those of main group compounds.
3. Appreciate how the reactivity of bioinorganic complexes differs from small molecule coordination complexes.

**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.

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

## Course Outline

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

- I. Atomic Structure
- II. Molecular Symmetry
- III. Vibrational Spectroscopy

### ***Unit #2 – Bonding in Inorganic Compounds***

- IV. Main Group Bonding
- V. Transition Metal Bonding
- VI. Electronic Spectroscopy

### ***Unit #3 – Coordination Complexes***

- VII. Acid-Base Chemistry
- VIII. Coordination Chemistry
- IX. Organometallic Chemistry

### ***Unit #4 – Bioinorganic Chemistry***

- X. Metals in Biology
- XI. Biological Electron Transfer
- XII. Bioorganometallic Chemistry

## Reading Assignments

Reading assignments from the textbook are noted on the *Tentative Course Schedule* below. It is *strongly* recommended that you read the textbook to stay ahead of the *tentative* lecture schedule shown below.

## Problem Sets

A total of 12 open-book, open-notes problem sets will be administered via Blackboard throughout the semester. Problem sets will be due at noon on the date noted below, at which point the answers will be available on Blackboard. Thus, ***no extensions will be granted*** for the problem sets, but your lowest two grades out of the 12 problem sets will be dropped.

## Exams

Four one hour exams are scheduled for Chemistry 131, which will cover units 1 – 4 separately. Exams #1-3 are scheduled for 12 PM on **February 9**, **March 9**, and **April 11**. Exam #4 will use our final exam time: **May 8** at 10:30 AM. ***Make-up exams will only be given for documented, UVM-approved absences.*** However, I will drop your lowest exam grade.

## Grading

Your grade will be based upon problem sets (25%) and 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.

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**Tentative Course Schedule**

	<b>Monday</b>	<b>Wednesday</b>	<b>Friday</b>
Jan. 15	<b>Martin Luther King Day</b> <b>No Class</b>	Hydrogen Atom (2.2)	Periodic Trends (2.3)
Jan. 22	VSEPR (3.2)	Proper Rotations (4.1) <b>PS #1 Due</b>	Improper Rotations (4.1)
Jan. 29	Point Groups (4.2)	Character Tables (4.3) <b>PS #2 Due</b>	Molecular Vibrations (4.4)
Feb. 5	IR and Raman Spectra (4.4)	Exam #1 Review <b>PS #3 Due</b>	<b>Exam #1</b>
Feb. 12	Homonuclear Diatomics (5.2)	Heteronuclear Diatomics (5.3)	Main Group Bonding (5.4)
Feb. 19	<b>Presidents' Day</b> <b>No Class</b>	Transition Metal Bonding (10.3) <b>PS #4 Due</b>	Ligand Field Splitting (10.3)
Feb. 26	Angular Overlap Model (10.4)	Magnetism (10.1) <b>PS #5 Due</b>	Electronic States (11.2)
Mar. 5	UV/Vis Abs Spectra (11.3)	Exam #2 Review <b>PS #6 Due</b>	<b>Exam #2</b>
Mar. 12	<b>Spring Recess</b> <b>No Class</b>	<b>Spring Recess</b> <b>No Class</b>	<b>Spring Recess</b> <b>No Class</b>
Mar. 19	Lewis Acid-Base (6.4)	Intermolecular Forces (6.5)	Hard-Soft Acid-Base (6.6)
Mar. 26	$O_h$ Substitution (12.3) <b>PS #7 Due</b>	$D_{4h}$ Substitution (12.7)	Inner Sphere ET (12.8)
Apr. 2	Oxidative Addition (14.1) <b>PS #8 Due</b>	Insertion/Elimination (14.2)	Catalysis (14.3)
Apr. 9	Exam #3 Review <b>PS #9 Due</b>	<b>Exam #3</b>	Metalloproteins
Apr. 16	Metal Cofactors	Bioinorganic Acid-Base	Redox Potentials <b>PS #10 Due</b>
Apr. 23	Outer Sphere Electron Transfer	Electron Transfer Proteins	Heme Oxygenase <b>PS #11 Due</b>
Apr. 30	Vitamin B <sub>12</sub>	Cofactor F <sub>430</sub>	Exam #4 Review <b>PS #12 Due</b>

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