Chem131: Inorganic Chemistry, 3.0 credits

Spring 2020 Lecture

MWF 12:00 – 12:50, Innovation E105

Instructor

Prof. Matt Liptak
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Office Hours

M, 2-3 pm Innovation E340
W, 1-2 pm Innovation E340
F, 3-4 pm, Innovation E340

All other times by appointment only (matthew.liptak@uvm.edu). If you are requesting an appointment, it should be because you have a scheduling conflict with office hours.

Teaching Assistant / Tutor

N/A

Prerequisites

Chem047, Chem141, or Chem143 (one semester of organic chemistry)

General Education Requirements

This course does ***not*** satisfy any general education requirements

Chem131 does partially satisfy the *College of Arts and Sciences* **Natural Sciences** distribution requirement.

Chem131 does ***not*** satisfy any requirements of the **Chemistry majors**.

Chem131 is an acceptable *advanced elective* for the **Biochemistry major**.

Chem131 is an acceptable *elective* for the **Chemistry minor**.

Course Description

Chem 131 will cover the fundamentals of inorganic chemistry within the frameworks of molecular symmetry and qualitative molecular orbital theory. All areas of inorganic structure, bonding, and reactivity will be covered. This course is lecture-based, there is no associated laboratory.

Course Learning Objectives

Upon completion of Chem 131, it is anticipated that you will:

1. Understand the relationship between molecular symmetry and bonding.
2. Appreciate how molecular orbital theory provides a general explanation for all main group chemistry, including organic chemistry.
3. Recognize why transition metal complexes can have structures and properties unique from those of main group compounds.

Textbook

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

The 3rd and 4th edition of this textbook are acceptable alternatives.

Web Content

Lecture notes, quizzes, and quiz 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.

Attendance Policy

I do not take attendance in Chem131, but you are responsible for all material covered in lecture. If you miss lecture for any reason, it is ***your*** responsibility to catch-up on missed material either through reviewing lecture notes posted to Blackboard or by meeting with another student in the course.

Grading

Your grade will be based upon quizzes (25% total) and exams (25% each). I strive to be as accurate as possible when grading quizzes 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. I will retain your graded final exams for one year after completion of the course.

Quizzes

A total of 12 open-book, open-notes quizzes will be administered via Blackboard throughout the semester. Quizzes 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 quizzes, but your lowest two grades out of the 12 quizzes will be dropped to accommodate excused and unexcused absences.

Exams

Three 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 7**, **March 6**, and **April 8**. Exam #4 will use our final exam time: **10:30 am on May 7** in Innovation E105. ***Make-up exams will not be administered, but I will drop your lowest exam grade to accommodate all excused and unexcused absences.***

Course Evaluations

All students are expected to complete course evaluations in-class on **May 1**. The evaluations will be anonymous and confidential. The information gained from these evaluations will be used to iteratively improve Chem131 for future *UVM* students.

Tips for Success

Chem131 is a 3.0 credit course. As such, you are expected to spend 3 hours per week attending lecture and devote 6-9 hours per week to Chem131 outside of class. This breaks down to 2-3 hours per lecture.

I strongly recommend devoting one of these hours to reading the textbook section noted in the syllabus for the *next* lecture, and working through any examples or exercise in this section. We will regularly devote lecture time to working in small groups on these examples and exercises. So, if you attempt these before lecture you are in an excellent position to either: (a) help others that are struggling with the topic or (b) ask others/me about the topic.

I also recommend that you devote one of these hours to working on assigned quizzes located on Blackboard. There will be 3-4 questions clearly associated with each lecture. Quizzes are posted in three lecture increments and due approximately once a week to give you scheduling flexibility. But, I think the most effective strategy is devote an hour after each lecture to quizzes instead of waiting to devote three hours just before the due date.

The pace of new course material will lessen prior to exams to give you time to review/study.

E-mail

I will respond to all e-mails within one working day (weekdays that are not official UVM administrative holidays). Please do not expect an immediate response to e-mail. In general, the fastest way to get in touch with me is to attend office hours.

University-wide Policies and Procedures

Student Learning Accommodations

In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course. A student's accommodation letter lists those accommodations that will not be implemented until the student meets with their faculty to create a plan.

Contact SAS:
A170 Living/Learning Center;
802-656-7753;
access@uvm.edu
www.uvm.edu/access

Religious Holidays

Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time. https://www.uvm.edu/registrar/religious-holidays

Academic Integrity
The policy addresses plagiarism, fabrication, collusion, and cheating.
https://www.uvm.edu/policies/student/acadintegrity.pdf

Grade Appeals
If you would like to contest a grade, please follow the procedures outlined in this policy:
https://www.uvm.edu/policies/student/gradeappeals.pdf

Grading
For information on grading and GPA calculation, go to https://www.uvm.edu/registrar/grades

Code of Student Conduct
http://www.uvm.edu/policies/student/studentcode.pdf

FERPA Rights Disclosure
The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974.
http://catalogue.uvm.edu/undergraduate/academicinfo/ferparightsdisclosure/

Promoting Health & Safety
The University of Vermont's number one priority is to support a healthy and safe community:

Center for Health and Wellbeing
https://www.uvm.edu/health

Counseling & Psychiatry Services (CAPS)
Phone: (802) 656-3340

C.A.R.E.
If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at https://www.uvm.edu/studentaffairs

Final Exam Policy
The University final exam policy outlines expectations during final exams and explains timing and process of examination period. https://www.uvm.edu/registrar/final-exams

Statement on Alcohol and Cannabis in the Academic Environment

As a faculty member, I want you to get the most you can out of this course. You play a crucial role in your education and in your readiness to learn and fully engage with the course material. It is important to note that alcohol and cannabis have no place in an academic environment. They can seriously impair your ability to learn and retain information not only in the moment you may be using, but up to 48 hours or more afterwards. In addition, alcohol and cannabis can:

Cause issues with attention, memory and concentration
Negatively impact the quality of how information is processed and ultimately stored
Affect sleep patterns, which interferes with long-term memory formation

It is my expectation that you will do everything you can to optimize your learning and to fully participate in this course.

Course Outline

Unit #1 – Fundamentals of Inorganic Chemistry

I. Atomic Structure
II. Molecular Structure
III. Molecular Symmetry

Unit #2 – Main Group Chemistry

IV. Molecular Orbital Theory
V. Acid-Base Chemistry
VI. Solid State Chemistry

Unit #3 – Coordination Chemistry

VII. Coordination Complexes
VIII. Ligand Field Theory
IX. Electronic Spectroscopy

Unit #4 – Transition Metal Chemistry

X. Substitution Reactions
XI. Organometallic Chemistry
XII. Bioinorganic Chemistry

***Tentative* Course Schedule**

	Monday	**Wednesday**	**Friday**
Jan. 13	Atomic Theory (2.1)	Schrödinger Equation (2.2)	Periodic Trends (2.3)
Jan. 20	***Martin Luther King Day*** ***No Class***	Lewis Structures (3.1) ***Quiz #1 Due***	VSEPR (3.2)
Jan. 27	Polarity (3.3)	Symmetry Elements (4.1) ***Quiz #2 Due***	Point Groups (4.2)
Feb. 3	Group Theory (4.3-4.4)	Exam #1 Review ***Quiz #3 Due***	***Exam #1***
Feb. 10	Homonuclear Diatomics (5.1-5.2)	Heteronuclear Diatomics (5.3)	Polyatomics (5.4)
Feb. 17	***Presidents' Day*** ***No Class***	Brønsted Acid-Base (6.3) ***Quiz #4 Due***	Lewis Acid-Base (6.4)
Feb. 24	Hard-Soft Acid-Base (6.6)	Solid State Structure (7.1) ***Quiz #5 Due***	Lattice Enegy (7.2)
Mar. 2	Band Structure (7.3)	Exam #2 Review ***Quiz #6 Due***	***Exam #2***
Mar. 9	***Spring Recess*** ***No Class***	***Spring Recess*** ***No Class***	***Spring Recess*** ***No Class***
Mar. 16	Nomeclature (9.2)	Isomerism (9.3)	Coordination Structures (9.4)
Mar. 23	Magnetism (10.1) ***Quiz #7 Due***	Ligand Field Theory (10.3)	Angular Overlap Model (10.4)
Mar. 30	UV/Vis Spectroscopy (11.1) ***Quiz #8 Due***	Electronic States (11.2)	Selection Rules (11.3)
Apr. 6	Exam #3 Review ***Quiz #9 Due***	***Exam #3***	O_h Substitution (12.3)
Apr. 13	D_{4h} Substitution (12.7)	Inner Sphere ET (12.8)	Oxidative Addition (14.1) ***Quiz #10 Due***
Apr. 20	Insertion (14.2)	Catalysis (14.3)	Metal Tetrapyrroles (16.1) ***Quiz #11 Due***
Apr. 27	Metalloproteins (16.3)	Iron-Sulfur Clusters (16.4)	Exam #4 Review ***Quiz #12 Due***

The instructor reserves the right to change everything, with notice