

CHEMISTRY 2400, Inorganic Chemistry

University of Vermont, Spring Semester, 2024

General Information

Instructor: Prof. Christopher Landry
E-mail: christopher.landry@uvm.edu
Meeting Time: Tues/Thurs, 8:30-9:45 am
Office Hours: Tuesday and Wednesday, 10:00-11:30am

Office: Innovation E356
Phone: 656-0270
Meeting room: Innovation Hall E432

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

Course Description

Course content: From the UVM course catalogue: "Symmetry, group theory, molecular structure; electronic structure of atoms; bonding models including MO, crystal field, and ligand field; solid state, acid-base, and simple organometallic systems".

Learning goals: From the Chemistry Department B.A. and B.S. learning goals:

- Demonstrate general knowledge in chemistry across all subdisciplines and be able to apply chemical and physical principles in the solution of qualitative and quantitative chemical problems.
- Solve qualitative and quantitative problems by developing a rational strategy, including the ability to estimate the solution and test the validity of the solution.

Learning outcomes: Inorganic chemistry deals with the properties of all the elements in the periodic table, ranging from metals to nonmetals. The differences in physical properties and reactivities of the elements implies that inorganic chemistry bridges many areas of study, from materials science and spectroscopy to biochemistry. In this course, our primary interest will be to develop a basic understanding of bonding that can be applied to a variety of inorganic molecules. This will allow us to explore selected areas in more detail, such as solid-state chemistry, organometallics and catalysis, and bioinorganic chemistry.

Course structure: This course meets on Tuesdays and Thursdays each week, with the following exceptions: Tuesday, March 5 (Town Meeting Day), Tuesday, March 12, and Thursday, March 14 (Spring Break). There are two mid-term exams and a semi-cumulative final exam. There are also six in-class, graded, skill-building exercises. Homework is generally not assigned, but of course it's a good idea to keep up with the reading as much as possible. Problems from the textbook will be recommended but not required, and not graded, and readings will be assigned ahead of time for each class.

Assessment: The mid-term exams and the final exam will each be worth 25% of the overall grade, and the in-class exercises will total another 25% of the grade. There will be some flexibility with respect to make-up exams, to a point. If you are aware of a conflict with a particular test date, please notify me an advance and we will arrange a time before the specified exam date.

Exams: Mid-term exams are taken during class on **Thursday, February 15** and **Thursday, April 4**. The final exam (7:30 am on **Tuesday, May 7**) will operate as a third one-hour exam; it will not be cumulative. The intention of mid-terms is to mainly test concepts rather than skills. There may be some simple calculations required, but the emphasis will be on multiple choice, short answer, and short essay questions, not on extensive quantitative methods.

Graded in-class work: In-class exercises are primarily used to help guide your learning of quantitative techniques and abstract thinking—skills that underpin the basic concepts in inorganic chemistry. These will involve group work, and I anticipate that they will take about 45 minutes of the class time. Dates of these graded exercises will be announced as the class progresses, based on the pace of the course. Your lowest grade will be dropped; only your highest five scores will be used to calculate this portion of your overall grade.

Textbook: Miessler & Tarr, *Inorganic Chemistry*, 5th Edition. This is available either in hardcopy (ISBN 0-321-81105-4) or as an e-book (ISBN 978-0-13-355894-4).

Online content: This course will use Brightspace as a central location for posting course materials. These will include lecture notes, answer keys for exams, and answer keys for group skill-building exercises. Other materials, including links to online resources such as videos, handouts, and photocopied readings, will be posted as necessary and available.

Communication: I guarantee that I will be available during office hours. If for some reason I cannot be available, I will send a message to the class. Outside of office hours, e-mail is generally the best way to get in touch with me. I am available by e-mail from 8am to 6pm Monday – Thursday, and from 8am to 3pm Friday. If you send me a message during this time, I will try to respond within one business day.

Course Outline:

- I. Atomic structure and periodicity
- II. Molecular bonding models
 - a. Lewis and VSEPR molecular structures
 - b. Basic molecular orbital (MO) theory
- III. Molecular symmetry
 - a. Fundamental concepts
 - b. Applications of symmetry to MO theory
- IV. Acid-Base Chemistry
- V. Solid State Chemistry
- VI. Transition metal chemistry
 - a. Coordination complexes
 - b. Crystal Field and Ligand Field theories
 - c. Electronic spectroscopy
 - d. Organometallic chemistry
 - e. Bioinorganic chemistry

Diversity, Equity, and Inclusion

While the field of chemistry has not always been inclusive and diverse, our current chemistry community increasingly reflects the world outside of the laboratory. Science and scientists are not immune to bias, but we can make ourselves aware of it and actively work against it in our everyday lives. In this class, we will discuss ways to find out the track record of a company on diversity, equity, and inclusion (DEI) issues and how to think about those issues when considering whether to accept a job. Several of our alumni speakers are from groups traditionally underrepresented in chemistry on the basis of race, gender, or other reasons, and I would encourage you to ask them about their own experiences in the workplace. Finally, it is my intention to create an environment where all beliefs are valued. No one should feel afraid to state their opinion, and everyone should feel confident and supported by the group. If you experience any form of bias in our class or at UVM, please feel free to use me as a resource. A list of other resources focused on DEI are included on the next page of this syllabus.

Division of Diversity, Equity, and Inclusion

<https://www.uvm.edu/diversity>

The Division of Diversity, Equity, and Inclusion believes excellence should be inclusive of the entire University of Vermont (UVM) community and is steadfastly committed to this belief. Every day, our Division strives to make our work accessible, affirming, and action-oriented to help ensure excellence is inclusive of everyone.

UVM Prism Center

<https://www.uvm.edu/prism>

The Prism Center serves the diverse queer and trans communities at the University of Vermont. We support and empower lesbian, gay, bisexual, transgender, and queer students, as well as students whose identities fall in between or expand beyond those categories, and work to create a campus community where people of all sexual and gender identities can thrive.

Interfaith Center

<https://www.uvm.edu/interfaithcenter>

Each of us engages questions about life differently, perhaps through a religious tradition, philosophy, or spiritual practice. No matter how you make meaning of your life, you are welcome at the Interfaith Center for reflection, spiritual practice, education, and community building.

Mosaic Center for Students of Color

<https://www.uvm.edu/mcsc>

The Mosaic Center for Students of Color (MCSC) Vision is to create a diverse and rich community of empowered, engaged, and enthusiastic students of color at UVM. We fully support the holistic development of self-identified students of color so that they can obtain their goals for academic achievement, personal growth, identity formation, and cultural development.

Women & Gender Equity Center

<https://www.uvm.edu/wagecenter>

The UVM Women & Gender Equity Center cultivates joyful community while advancing gender equity across identities. We envision a brave, diverse, and equitable learning environment for all members of the UVM community. We provide advocacy services for those in our community who have experienced sexual or intimate partner violence, and strive to provide programming, education, and events that ask our community to explore the intersections of their gender and other identities.

University 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 <https://www.uvm.edu/registrar/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.

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

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

Grading <https://www.uvm.edu/registrar/grades>: This policy contains information on grading and GPA calculation.

Code of Student Conduct <http://www.uvm.edu/policies/student/studentcode.pdf>: This policy reaffirms the principle of student freedom coupled with personal responsibility and accountability for individual action and the consequences of that action so that UVM students can be healthy, successful and engaged.

FERPA Rights Disclosure <http://catalogue.uvm.edu/undergraduate/academicinfo/ferparightsdisclosure/>: 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.

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):** (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 <https://www.uvm.edu/registrar/final-exams>: The University final exam policy outlines expectations during final exams and explains timing and process of examination period.