Instructor: Rory Waterman
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Lecture: MWF 12:00–12:50, Innovation 430

Office hours: Mondays and Thursdays from 1:00–2:30 pm. That is your time, but if you have conflicts, feel free to make appointments.

Course description: Molecular symmetry and group theory with an emphasis on application to molecular orbital theory and bonding, basic transition-metal chemistry, introductions to bioinorganic, solids state, main group, and related special topics.

Inclusion in science: In the Department of Chemistry, we have agreed that sharing our thoughts on inclusive science is important as a part of our on-going commitment to equity in access and diversity throughout our field.

Here are my thoughts: First, you are welcome and belong in this class and in chemistry. Science *should* be inclusive because the activity itself is identity independent. Sadly, that is not true because people do science, and our disciplines have been built on privilege that has impacted access to education, information, resources, opportunity, and voice.

My education is a result of privilege and came at a time when science successfully dismissed inclusion (i.e., 'science is blind' baloney). Therefore, I am on a steep learn curve for creating and supporting an inclusive scientific enterprise. Nevertheless, I value all identities including race, ethnicity, sex, gender identity, ableness, nationality, sexual orientation, religion, economic status, age, among others, and I value how diverse groups of people and perspectives enrich our lives and, more germane, science.

I am committed to doing right by you and making this class welcoming and supportive of all. Please share with me directly or through an ally, if you need to be anonymous, if that is not the case. I am prepared to learn and do better, and I will not tolerate deliberate exclusion. UVM provides us a starting point about what an inclusive environment looks like in Our Common Ground.

Course objective: My goal is that students who complete this course should be able to understand a typical seminar presentation on the field of inorganic chemistry, broadly defined. To meet that goal, one should have a basic idea about the bonding across inorganic systems, the interplay of symmetry and physical properties, transition metals, main group elements, biological systems, and the solid state.

Learning outcomes: The course is broken into several parts (up to seven, if all goes well—see outline below). Each section will have a set of specific objectives associated with it. Those documents for a roadmap for the course. If you *understand* what the objectives are discussing

and can *perform* the skills, then you are learning the course material. We will get to that point by using class time to review concepts and for you to do exercises and activities that reinforce those ideas and practice skills. That plan will work if you engage in course materials (the book, homework, or other provided materials) before or after a given class, as prescribed.

Course outline: I. Molecular symmetry and group theory
II. Applications of group theory
III. Main group chemistry
IV. Transition-metal chemistry
V. Organometallic chemistry
VI. Solid state chemistry
VII. Bioinorganic and electron transfer

Individual leaning goals: As we move through parts of the course, I will communicate various learning objectives. Some will be simple and some more complex. In all cases, reflecting on your ability to meet those objectives is the best way to know if your are understanding course content as well as prepare for exams. All coursework should be building your skills in meeting those objectives. If the objective is unclear or the path to understand it is unclear, please seek help with me.

Web content: Course materials are available at Blackboard (bb.uvm.edu).

Communication: I lean on email. That is, I will say something in class, post materials on Blackboard, but will also send a reminder via email. There is a team for the class in MS Teams. I do not have plans to use it, but it may become a resource for the course as well. You can contact me by email, message on Teams, or phone

Important dates: Wednesday, September 29, paper draft due
Wednesday, October 6, exam 1
Wednesday, October 16, final paper due
Friday, November 12, exam 2
Friday, December 10, last class
Thursday, December 16 at 10:30 AM, final exam

No class: Monday 9/7 (Labor Day), Friday October 8 (fall recess), and Monday – Friday 11/22–11/27 (Thanksgiving recess).

Text: *Inorganic Chemistry* by Miessler, Fischer, and Tarr (ISBN-13: 978-0-321-81105-9). Additional readings/resources will be assigned and distributed in class or on line.

Grading: There will be two semester exams (20% each), a final exam (20%), homework and miscellaneous course work (20%), and a short (≤ 2 page) research proposal (20%).

Homework: Homework will be assigned approximately weekly and is due at the *beginning* of class on the date noted. Homework turned in within 24 hours of the due date will be given 50% credit and after 48 hours, no credit. I will accept and correct homework after 48 hours: Practicing

the concepts presented in class is more important than the grade on an individual assignment. Any additional in-class or outside work that is graded will be included in the homework score.

Proposal: The task here is to write a brief (2 page) proposal on a research area of interest to you, which may or may not include inorganic chemistry. The proposal format should follow the guidelines for the NSF GRFP (https://www.nsfgrfp.org/). We will discuss the activity in class. What a strong coincidence that you'll be done with that proposal prior to the chemistry submission deadline…

Exams: There will be two semester exams on content covered to date. I will make every effort to respect your time and timing, but I also think we can be flexible with the exact dates depending on the other demands on the group and our exact place with respect to course content. The final exam is cumulative in that ideas from the earliest days of the course impact the later content, but it will not be cumulative in asking very specific questions on content covered in the semester exams.

Academic Honesty: As students of the University of Vermont, you are expected to conduct yourself in this class in accordance with the Code of Academic Integrity (http://www.uvm.edu/~uvmppg/ppg/student/acadintegrity.pdf).

I encourage a high degree of collaboration on in-class work, and I recommend discussing your proposals with colleagues and faculty. Collaboration on homework is permitted, but you must indicate the collaborating partner or group members on your assignment.

Tentative weekly schedule

date	Topic/*readings*
8/30	Start of symmetry & group theory: *Chapter 4 (4.1 & 4.2)*
9/6	(no class on 9/6) Group theory/character tables: *4.2–3*
9/13	Applied group theory spectroscopy & MO: *4.4, 5.1*
9/20	MO & bonding: *5.2–3*
9/27	Main group bonding & acid/base: *5.4, Chapter 6*
10/3	(no class on 10/8) **Exam 1 on 10/6**, wrap up acid/base
10/11	Solid state and band structure: *7.1–3*
10/18	Magnetism and metal bonding: *10.1–3*
10/25	Metal binding, cont'd: *10.3–5*
11/1	Metal spectroscopy: *Chapter 11*
11/8	**Exam 2 on 11/12**, wrap up spectroscopy
11/15	Coordination compound reactions: *Chapter 12*
11/22	No class—Thanksgiving recess
11/29	Organometallic reactions and catalysis: *14.1–3*
12/8	Bioinorganic: *16.1–4*

Miscellaneous: For those issues not explicitly noted in these documents, the instructor may set policies during the semester. However, no part of this course does or is meant to supersede the policies of the University of Vermont and the College of Arts and Sciences.

Learning Goals: The Department of Chemistry has a set of learning goals for all chemistry majors. The specific learning objectives of this class are meant to directly address some of these goals as part of the broader program.

1. Students will demonstrate general knowledge in chemistry and will be able to apply chemical and physical principles in the solution of qualitative and quantitative chemical problems.
2. Students will understand the interplay of observational data, hypotheses, and hypothesis-driven experimentation through application of the scientific method.
3. Students will become proficient in chemical laboratory techniques and be able to apply these to practical and current problems in research.
4. Students will be able to read and critically evaluate the chemical and scientific literature.
5. The students will learn to present scientific data clearly and effectively through both written and verbal communication.

Parts of CHEM 231 specifically addresses goals 1, 2, 4, and 5.

The instructor reserves the right to make changes, with notice

CHEM 231 Supplement: Support information and policies

Fall 2021

Technical support for students

Please read this technology check-list to make sure you are ready for classes.
https://www.uvm.edu/it/kb/student-technology-resources/
Our class does not use specialty software, but routine internet access on an updated browser and MS Teams are essential.
Students should contact the Helpline (802-656-2604) for support with technical issues.

Attendance Policy and Classroom Environment Expectations:

Students are active participants in class. Those who chose not to attend or participate suffer in their learning, which typically translates to lower performance in the course. Therefore, I do not measure active participation in class or attendance. However, if significant absence or non-participation occurs or those choices adversely impact the learning environment, I reserve the right to impose academic penalty.

Attendance and illness/isolation/quarantine:

I fully support you in taking care of yourself and supporting the health of the community. In-person students may need to quarantine, and any student may be unable to attend in-person or virtual class due to illness. I have some mechanisms in place to accommodate for this, but for me to fully accommodate, I need to you to contact me in advance with any challenges in attendance or coursework.

Intellectual Property Statement/Prohibition on Sharing Academic Materials:

Students are prohibited from publicly sharing or selling academic materials that they did not author (for example: class syllabus, outlines or class presentations authored by the professor, practice questions, text from the textbook or other copyrighted class materials, etc.); and students are prohibited from sharing assessments (for example homework or a take-home examination). Violations will be handled under UVM's Intellectual Property policy and Code of Academic Integrity.

Tips for Success:

Course-specific study/preparation tips
Here are a few resources for students on remote/online learning:

- Checklist for success in https://learn.uvm.edu/about/support-for-students/checklist-online-credit-courses/
- Academic support for online courses: https://www.uvm.edu/academicsuccess/online-learning-student-resources-remote-instruction
- 30-minute webinar on online learning success (Mar 2020): https://www.youtube.com/watch?v=Xp_MYsqQyvE

Helpful resources other than the professor (e.g., Undergraduate/Graduate Writing Center, Supplemental Instruction, Learning Co-op tutors, supplemental course materials)

Student Learning Accommodations:

In keeping with University policy, any student with a documented disability interested in utilizing ADA accommodations should contact Student Accessibility Services (SAS), the office of Disability Services on campus for students. 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 recommended to discuss with their faculty the accommodations they plan to use in each course. Faculty who receive Letters of Accommodation with Disability Related Flexible accommodations will need to fill out the Disability Related Flexibility Agreement. Any questions from faculty or students on the agreement should be directed to the SAS specialist who is indicated on the letter.

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

Important UVM Policies

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

Alcohol and Cannabis Statement:

The Division of Student Affairs has offered the following statement on alcohol and cannabis use **that faculty may choose to include, or modify for inclusion,** in their syllabus or Blackboard site:

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.