

CHEM 5111: Advanced Inorganic Chemistry

Spring 2021

Instructor Information

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Office Hours: TBD — Online

Class Information

Dates: Jan 22nd – May 5th, 2021
Time: 11:00 – 11:50 AM (Mountain Daylight Time) · Monday/Wednesday/Friday
Classroom: N/A Online
Platform: Zoom
Credits: 3 credit hours

Course Description

Roughly speaking, inorganic chemistry concerns the properties and behavior of inorganic compounds, i.e., chemicals that lack carbon–hydrogen bonds, and organometallic compounds. In practice, the lines between organic and inorganic chemistry are rather blurry. As indicated in the course catalog, this is a *graduate-level course on theoretical and descriptive inorganic chemistry*. *Topics will include molecular symmetry, spectroscopy, electronic structure/bonding, magnetism, electron transfer, and catalysis*. Solid-state chemistry and, if time permits, organometallic chemistry will also be briefly discussed. Where appropriate, emphasis will be placed on the relationship between structure and reactivity.

Prerequisites: CHEM 2420, CHEM 4110 and CHEM 3550 or 4507, or graduate standing, and basic knowledge of thermodynamics and atomic theory.

Student Learning Outcomes

After this course, you should be able to:

- Improve your ability to engage in critical thinking, reasoning, and communication in the field of inorganic chemistry.
- Formulate and test ideas through analysis and interpretation of data.
- Develop a matured perspective on how to approach chemistry problems using scientific and quantitative logic.
- Gain a practical understanding of the basic principles of structure, bonding and reactivity of inorganic compounds.

Textbook

The chapter designations correspond to the textbook *Inorganic Chemistry* by Miessler, Fischer and Tarr (5th Ed.), but you can use any other textbook covering the same content.

Grading

There are 4 exams, each worth 15% of your grade. Homework assignments are 40% of the grade. In class quizzes will also be graded and added to your grade for a maximum of 5% *bonus* (i.e., extra-credit) points.

If you need an extension for any reason, **contact the instructor in a timely fashion**, as permitted by the need. There is no guarantee that you will receive an extension on any assignment, so plan accordingly. Finally, you are welcome (encouraged, even) to work with others *provided you can do so safely*. You are, however, expected to submit your own work.

Class Methodology & Tentative Schedule

This is an online synchronous course, meaning you are expected to attend class at the time it is offered. **You are asked to keep your camera on during class whenever possible. This is helpful to the instructor, and to improve the overall class experience.** Lectures will be recorded.

Tentative schedule and list of topics for the course:

- Weeks of 01/25 and 02/01:

Chapters 2 & 3: Electronic structure overview: quantum mechanics, atomic orbitals, Lewis dot structures, octet “violations”; molecular structure (VSEPR), and periodic trends.

- Weeks of 02/08, and 02/15:

Chapter 4: Molecular symmetry and group theory: operations, elements, point groups and representations. **Exam 1**

- Weeks of 02/22, 03/01, and 03/08:

Chapter 5: Molecular orbital theory: linear combination of atomic orbitals. SALCs, 3-center-4-electron bonding, and implications for chemical reactivity.

- Week of 03/15, and 03/22:

Chapter 6: Chemistry of highly polar interactions: acid/base theories. **Exam 2**

- Weeks of 03/29 and 04/05:

Chapters 9 & 10: Bonding with transition metals: ligands, the 18-electron rule, magnetism.

- Week of 04/12:

Chapter 11: Electronic states and spectra. **Exam 3**

- Weeks of 04/19 and 04/26:

Chapter 7: Chemistry of the solid state.

- Week of 05/03:

Review and **final exam**.

Disability Support

The University of Wyoming is committed to providing equitable access to learning opportunities for all students. If you have a disability, including but not limited to physical, learning, sensory or psychological disabilities, and would like to request accommodations in this course due to your disability, please register with and provide documentation of your disability as soon as possible to Disability Support Services (DSS), Room 128 Knight Hall. You may also contact DSS at (307) 766-3073 or udss@uwyo.edu. It is in the student's best interest to request accommodations within the first week of classes, understanding that accommodations are not retroactive. Visit the DSS website for more information at: www.uwyo.edu/udss.

Classroom Statement on Diversity

The University of Wyoming values an educational environment that is diverse, equitable, and inclusive. The diversity that students and faculty bring to class, including age, country of origin, culture, disability, economic class, ethnicity, gender identity, immigration status, linguistic, political affiliation, race, religion, sexual orientation, veteran status, worldview, and other social and cultural diversity is valued, respected, and considered a resource for learning.

Academic Dishonesty Policies

Academic dishonesty will not be tolerated in this class. Cases of academic dishonesty will be treated in accordance with UW Regulation 2-114. The penalties for academic dishonesty can include, at my discretion, an "F" on an exam, an "F" on the class component exercise, and/or an "F" in the entire course. Academic dishonesty means anything that represents someone else's ideas as your own without attribution. It is intellectual theft – stealing - and includes (but is not limited to) unapproved assistance on examinations, plagiarism (use of any amount of another person's writings, blog posts, publications, and other materials without attributing that material to that person with citations), or fabrication of referenced information. Facilitation of another person's academic dishonesty is also considered academic dishonesty and will be treated identically.

Classroom Behavior Policy

At all times, treat your presence in the classroom and your enrollment in this course as you would a job. Act professionally, arrive on time, pay attention, complete your work in a timely and professional manner, and treat all deadlines seriously. You will be respectful towards you classmates and instructor. Spirited debate and disagreement are to be expected in any classroom and all views will be heard fully, but at all times we will behave civilly and with respect towards one another. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere. As the instructor, I have the right to dismiss you from the classroom, study sessions, electronic forums, and other areas where disruptive behavior occurs. Electronic devices such as mobile phones should be left at home or turned off.

Duty to Report

UW faculty are committed to supporting students and upholding the University's non-discrimination policy. Under Title IX, discrimination based upon sex and gender is prohibited. If you experience an incident of sex- or gender-based discrimination, we encourage you to report it. While you may

talk to a faculty member, understand that as a "Responsible Employee" of the University, the faculty member MUST report information you share about the incident to the university's Title IX Coordinator (you may choose whether you or anyone involved is identified by name). If you would like to speak with someone who may be able to afford you privacy or confidentiality, there are people who can meet with you. Faculty can help direct you or you may find info about UW policy and resources at <http://www.uwyo.edu/reportit>.

COVID-19 Policies

During this pandemic, you must abide by all UW policies and public health rules put forward by the City of Laramie (or by Natrona County if at UW-Casper), the University of Wyoming and the State of Wyoming to promote the health and well-being of fellow students and your own personal self-care. Please review the current policy: <https://www.uwyo.edu/alerts/campus-return>.

As with other disruptive behaviors, the instructor has the right to dismiss you from the classroom (Zoom and physical), or other class activities if you fail to abide by these COVID-19 policies. These behaviors will be referred to the Dean of Students Office using the UWYO Cares Reporting Form for Student Code of Conduct processes.

Syllabus changes:

You will be alerted to any possible course format changes in response to UW decisions about community safety during the semester.

Online course expectations:

As with all UW coursework, this course will be educational and useful to you. The instructor commits to responding to questions, concerns, and feedback in a timely manner.

Your responsibilities:

- Give and receive feedback from the instructor and your classmates respectfully and constructively in all interactions. This includes in Zoom chats, on WyoCourses boards, and within physical classroom spaces.
- Actively engage in civil discourse in a respectful manner. Use professional language in all course related forums.
- Communicate professionally. Whenever you send class-related email or messages, please include a clear, specific subject line and use the body of the email or message to explain the purpose for the email and any attached materials. Conduct yourself professionally.
- Meet assignment deadlines. We expect that you're interacting with course material multiple times during the week.
- Ask for help when you need it. For academic assistance for this course please contact the instructor for available resources.
- Please let us know if you notice another student who needs help in the University's (anonymous) WyoCares referral option: <https://www.uwyo.edu/dos/students-concern>