Chemistry 4:125 (CHEM:3250:0001) Inorganic Chemistry

Spring 2020

Prof. Lou Messerle

Office: E457 Chemistry Building; Prof. Messerle is often working in his lab with undergraduate and graduate student researchers in his group, or on his own research, or with responsibilities for the Department, CLAS, and College of Medicine (his secondary faculty appointment). He will generally leave notes on his door stating where he is and how to contact him by phone.

Course eMail: chemcourse@uiowa.edu (please put “Chem 4-125” in title) checked twice/week or, in emergency, lou-messerle@uiowa.edu (please put “Chem 4-125” in title)

Lecture: Tuesday and Thursday 11:00-12:15, 106 Gilmore Hall or CB 55

Teaching assistant/Grader: Grant Forsythe; office hours: TBD

Discussion section/Review (no new material; review of concepts from Principles I/II and this course; Wednesdays 5:00-6:00, CB W228 (across from, down hall from Chemistry Center)

Course credit: 3 s.h.: homework, surprise quizzes, midterm and comprehensive final exams

Walk-in times: CB E427 conference room: TBD after class survey

or by appointment arranged by email


Course website: [https://icon.uiowa.edu/](https://icon.uiowa.edu/); site under construction, will post the course syllabus, announcements, lecture slides (missing some text, as PDF files), handouts, problem set assignments and solutions, copies of old exams, and a list of your grades.

Course reserves: optional textbooks and treatises will be on reserve at Science Library

An interesting and fun autobiography of a budding young chemist in WW II Great Britain and later a famous neurologist, naturalist, and author, of relevance to all chemists and experimental scientists; highly recommended for leisure reading (not for this course): Oliver Sacks, “Uncle Tungsten”, 2001, Knopf

Recommended molecular models: Molecular models can help you understand and visualize three-dimensional molecules, their various isomers, and molecular symmetries. A molecular model kit of the type used in organic chemistry doesn’t cover the more diverse structures and isomers found in inorganic and organometallic compounds. An inexpensive framework molecular model set (Darling Models), supplemented with additional parts recommended by Prof. Messerle for greater versatility, is better for constructing models of inorganic molecules, which exhibit far-greater structural / geometrical diversity than organic molecules. Contact the Alpha Chi Sigma (AXE) local Chemistry and allied sciences fraternity to order this kit and additional parts; approximate cost for the set plus extra parts is $30. AXE will have a table outside of the Chemistry Center during early part of the semester.

Course Objectives

This course builds on the descriptive chemistry taught in introductory Chemistry courses (such as UI’s Principles of Chemistry I and II) to introduce students to the concepts, principles, and fascinating contemporary aspects and utility of non-hydrocarbon molecules. The Periodic Table (greatest cheat sheet in science!), trends in periodicity of various properties of the elements and their ions, bonding, and molecular symmetry will be used as unifying principles for a survey of the structures, stereochemistry, solid-state chemistry, uses, and chemistry of main group elements, transition metals, and, depending on time, lanthanides and actinides. Contemporary areas of research, including organometallic chemistry, catalysis, bioinorganic chemistry, inorganic/organometallic chemistry applied to medicine, materials chemistry, and nanochemistry will be surveyed.
Course Grading

Final grades will be based approximately on:

- One midterm exam, Thursday March 12 (in class) 20%
- Final Exam (comprehensive; date and room to be announced by Registrar) 40%
- Homework assignments 25%
- In-class quizzes, class participation 15%

Graded exams may be picked up at the Chemistry Center.

Make-up exams will be given for documented cases of illness, family emergencies, mandatory religious obligations, and authorized University activities (e.g., participation in intercollegiate sports, when accompanied by a request from the Athletics Department). Please contact Prof. Messerle by email before the missed work or exam.

General discussion with classmates on the concepts in problem set exercises is encouraged, but all problem set submissions must be independent work and in your own words.

+/- Grading system will be used. Final grade distribution will approximate that recommended by the College of Liberal Arts and Sciences for an intermediate level course (A, 18%; B, 36%; C, 39%; D, 5%; F, 2%; average course GPA = 2.63). Any questions about grades and scores received for exams and assignments should be directed first to Prof. Messerle. Federal privacy rules mandate that your scores and grades cannot be posted publicly. General class grade distributions will be posted as soon as feasible on the ICON web site after each exam, quiz, and homework assignment, and individual cumulative scores and an estimated midterm grade may be obtained directly from Prof. Messerle.

Tentative Lecture Schedule, subject to change in order to accommodate student questions:

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Tuesday January 21</td>
<td>course overview, definitions of inorganic chemistry</td>
</tr>
<tr>
<td>Thursday January 23</td>
<td>relationships to other branches of chemistry; applications of inorganic chemistry; molecular structures, electronic structure</td>
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<tr>
<td>Tuesday January 28</td>
<td>electronic structure, molecular orbital theory, chemical bonding</td>
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<tr>
<td>Thursday January 30</td>
<td>heteronuclear diatomic, polyatomic MO bonding</td>
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<tr>
<td>Tuesday February 4</td>
<td>polyatomics</td>
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<tr>
<td>Thursday February 6</td>
<td>point group symmetry</td>
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<tr>
<td>Tuesday February 11</td>
<td>point group symmetry</td>
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<tr>
<td>Thursday February 13</td>
<td>point group symmetry</td>
</tr>
<tr>
<td>Tuesday February 18</td>
<td>point group symmetry</td>
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<tr>
<td>Thursday February 20</td>
<td>acid-base chemistry</td>
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<tr>
<td>Tuesday February 25</td>
<td>acid-base chemistry</td>
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<tr>
<td>Thursday February 27</td>
<td>experimental methods</td>
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<tr>
<td>Tuesday March 3</td>
<td>experimental methods</td>
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<tr>
<td>Thursday March 5</td>
<td>experimental methods</td>
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<tr>
<td>Tuesday March 10</td>
<td>hydrogen, and where it should be placed in Periodic Table</td>
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<tr>
<td>Thursday March 12</td>
<td><strong>Midterm Exam</strong> (covers up to/inclusive of March 5 lecture)</td>
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SPRING BREAK (March 16-22)

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<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Tuesday March 24</td>
<td>s-block elements</td>
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<tr>
<td>Thursday March 26</td>
<td>p-block elements</td>
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<tr>
<td>Tuesday March 31</td>
<td>p-block elements</td>
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<tr>
<td>Thursday April 2</td>
<td>p-block elements; ligands</td>
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<td>Tuesday April 7</td>
<td>transition metal electronic, periodic properties</td>
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<td>Thursday April 9</td>
<td>crystal field and ligand field theories, high spin vs low spin, magnetism, angular overlap model for understanding metal-ligand bonding</td>
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<td>Tuesday April 14</td>
<td>transition metal chemistry: first period</td>
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<td>Thursday April 16</td>
<td>transition metal chemistry: second, third periods</td>
</tr>
<tr>
<td>Tuesday April 21</td>
<td>inorganic reaction mechanisms</td>
</tr>
<tr>
<td>Thursday April 23</td>
<td>main group, transition metal organometallic chemistries</td>
</tr>
<tr>
<td>Tuesday April 28</td>
<td>transition metal organometallic chemistry, homogeneous catalysis</td>
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<tr>
<td>Thursday April 30</td>
<td>solid-state, material, and nanomaterial chemistries</td>
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</tbody>
</table>
Tuesday May 5  bioinorganic chemistry: metalloenzymes, transport proteins;
inorganic chemistry in medicine: diagnostics, therapeutics
Thursday May 7  lanthanide and actinide chemistries
Review sessions:  mutually convenient days and times during final week of class
                 and/or during final exam period, depending on date of final
                 exam, and not overlapping with other Chemistry exams

FINAL EXAM:  day, time, and room to be determined by Registrar at a later date

Miscellaneous
Please feel free to discuss with Prof. Messerle any aspect of the course that is of concern or
causing you difficulties. DON’T HESITATE to come to office hours to ask questions that are
not covered during class. My office hours are designed to help YOU! If you require course
adaptations or accommodations because of a recognized disability, please contact Prof.
Messerle, who will make every effort to accommodate your needs.
Please write down notes on either paper, PDF printouts, or tablets. Notes from ICON will
have missing info that must be added by you during class. Cell phones MUST be put into
silent mode and stored in your pocket, purse, backpack, or other belongings. This rule is for
the sole purpose of keeping you engaged during class, helping you to be an active note taker,
and not disturbing other students. The only exception to cell phone use, to be announced at
certain times by Prof. Messerle, is for recording video of a classroom demonstration for your
own use or, if worthwhile, posting on social media if you wish.

Course Administration
Please go to the Chemistry Center, E225 CB, for drop/add signatures.
M–F, 8:00 AM–12:00, 1:00–5:00 PM (F, 4:30 PM).
Manager: Trent Tappan (335–1341, trent-tappan@uiowa.edu)

Complaints
You can file complaints and appeals regarding the course and instructor with the
Departmental Executive Officer (DEO, Prof. Len MacGillivray) at the Department of
Chemistry administrative office, Room E331 CB (335–1350). I strongly encourage you to first
meet with me with your concerns about course aspects, lectures, or assignments, and I will
make adjustments as appropriate and possible.
COLLEGE OF LIBERAL ARTS AND SCIENCES: POLICIES AND PROCEDURES

Administrative Home of the Course: The course administrative home is the College of Liberal Arts and Sciences, which governs academic matters such as add/drop deadlines, second-grade-only option, academic fraud, and related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Student Academic Handbook: http://www.clas.uiowa.edu/students/handbook/.

Nondiscrimination in the Classroom
The University of Iowa is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, you are invited to optionally share your preferred name and pronouns with your instructor(s) and classmates. The University of Iowa prohibits discrimination and harassment against you on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University’s Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity, diversity@uiowa.edu, or visit diversity.uiowa.edu.

Electronic Communication: University policy specifies that you are responsible for all official correspondences sent to your standard University of Iowa e-mail address (@uiowa.edu). You should check frequently and use this account for your correspondence with Prof. Messerle.

CLAS Final Examination Policies
The final examination schedule is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. You should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar’s web site and will be shared with instructors and you. It is your responsibility to know the date, time, and place of a final exam.

Student Classroom Behavior: The ability to learn is lessened when students engage in inappropriate classroom behavior, distracting others; such behaviors violate the Code of Student Life. When disruptive activity occurs, Prof. Messerle has authority to change classroom seating and possibly to request that a student exit the classroom immediately for the remainder of the period. One-day suspensions are reported to Department, College, and Student Services personnel (Office of the VP for Student Services and Dean of Students).

Academic Honesty
All CLAS or other college students taking classes offered by CLAS have, in essence, agreed to the College’s Code of Academic Honesty: "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).(http://www.clas.uiowa.edu/students/handbook/x/#2).

Prof. Messerle believes strongly in fairness for all students and objective appraisal of your performance and understanding of course material. Your assignments will be checked via web-based resources for plagiarism, as recommended by the University, and visually by instructors.

Making a Suggestion or a Complaint: You have the right to make suggestions or complaints and should first visit Prof. Messerle, and then the Chemistry DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

Accommodations for Disabilities: The University of Iowa is committed to providing an educational experience that is accessible to all students. You may request academic accommodations for a disability (which includes but is not limited to mental health, attention, learning, vision, and physical or health-related conditions). A student seeking academic accommodations should first register with Student Disability Services and then meet with Prof. Messerle privately in order to make arrangements. Reasonable accommodations are established through an interactive process between you, Prof. Messerle, and SDS. See https://sds.studentlife.uiowa.edu/ for information.

Understanding Sexual Harassment: Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Office of the Sexual Misconduct Response Coordinator for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather: In severe weather, you should seek shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Department of Public Safety website.