

Chemistry F402: Inorganic Chemistry, 3.0 Credits Fall Semester, 2019

Instructor: Dr. William A. Howard
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Course Type: In Person
Lecture Meetings: Monday, Wednesday, Friday, 11:45 – 12:45 PM, Reichardt 203
Office Hours: Monday, Wednesday, Friday, 2:00 – 3:00 PM

Prerequisites: Successful completion (letter grade of C- or better) of Basic Inorganic Chemistry F202, Organic Chemistry F322, and Physical Chemistry F332 is required.

Required Text: Inorganic Chemistry, 7th Ed. Weller, Overton, Rourke, Armstrong;
Oxford University Press: 2018. ISBN-13: 978-0-19-876812-8

Suggested Materials: Ball-and-stick molecular model kit, non-programmable calculator

Catalog Description:

CHEM F402 **Inorganic Chemistry** (n)

3 Credits

Offered Fall

Symmetry and group theory, molecular orbital theory, solid state chemistry, acids and bases, redox reactions, non-aqueous solvents, descriptive chemistry of some main group elements.

Prerequisites: CHEM F202; CHEM F325

Lecture + Lab + Other: 3 + 0 + 0

Course Overview: Inorganic Chemistry F402 is an advanced undergraduate course in inorganic chemistry that prepares students for more advanced studies in this field. We will cover parts of chapter 2, all of chapter 3, and chapters 20, 21, 22, 26, and 27 of the text book, plus extra, more advanced material given by Prof. Howard. Your attendance at lecture is expected and required for success.

Inorganic Chemistry F402 as a Requirement: Understanding the topics covered in Inorganic Chemistry F402 is essential for any student majoring in chemistry and who wishes to pursue chemistry-related research as a career objective. Chemistry F402 is a required course for a BS Chemistry degree, a BS Environmental Chemistry degree, and a BS Forensics Chemistry degree. (However, another course may be substituted in the case of the Forensics concentration, with the approval of the dept. head.) Chemistry F402 is not required for the BA Chemistry degree, or the BS Biochemistry/Molecular Biology degree.

Approximate Course Calendar (Subject to Modification if Necessary):

Inorganic Chemistry F402: Schedule of Lectures		
Fall, 2019 Professor William A. Howard		
Week of ...	Classroom Activity	Reading
8/26 to 8/30	Point symmetry, group theory, character tables	Chapter 3
9/2 to 9/6	Reducible & irreducible representations, Molecular vibration	Chapter 3
9/9 to 9/13	Molecular orbital diagrams, polyatomics with σ and π bonds	Chapters 2 & 3
9/16 to 9/20	Crystal Field Theory	Chapter 20
9/23 to 9/27	Crystal Field Theory and Ligand Field Theory	Chapter 20
9/30 to 10/4	Optical & magnetic properties of transition metal complexes	Chapter 20
10/7 to 10/11	Ligand Field Theory and Reaction Mechanisms	Chapter 21
10/14 to 10/18	Organometallic Chemistry, MLXZ Formulas	Chapter 22
10/21 to 10/25	Phosphine, Carbonyl, Arene Complexes, Reactions	Chapter 22
10/28 to 11/1	Organometallic Mechanisms, Catalytic Cycles	Chapter 22
11/4 to 11/8	Inorganic Oncology	Chapter 27
11/11 to 11/15	Biological Inorganic Chemistry, Cells, Metals in Transport	Chapter 26
11/18 to 11/22	Natural Biochemical Catalytic Processes	Chapter 26
11/25	Metals in Genetics	Chapter 26
12/2 to 12/6	Medicinal Inorganic Chemistry	Chapter 27
FINAL EXAM – either December 11 at 1:00 – 3:00 PM, or December 13 at 10:15 – 12:15 PM		

Student Learning Outcomes: As a result of successfully passing Inorganic Chemistry F402, students will be very familiar with the role of symmetry in understanding chemical bonding and will be able to create qualitative molecular orbital diagrams for molecules. Students will be able to predict some features of the infrared and Raman spectra of molecules and will understand how to determine Δ_o , the crystal field splitting parameter in octahedral compounds. Furthermore, students will be able to propose mechanisms intelligently for organometallic catalytic cycles. Finally, students will gain some understanding of the roles of transition metal compounds in biology and medicine.

Grades: Assignments in this class will be ...

4 Take-home tests	4 x 100 points = 400 points
2 Class Projects	2 x 100 points = 200 points
<u>Final Exam</u>	<u>= 100 points</u>
Total	700 points

630 points or higher	Final letter grade = A
560 to 629 points	Final letter grade = B
490 to 559 points	Final letter grade = C
420 to 489 points	Final letter grade = D
419 or fewer points	Final letter grade = F

More Information about the Assignments: There will be 4 take-home exams, each worth 100 points. Information about these exams is given in the following table:

Exam	Topics Covered	Portion of the Text Book	Due Date
1	Group theory, character tables, reducible and irreducible representations, molecular orbital theory for simple polyatomic ions and molecules, vibrational spectroscopy	Parts of chapter 2, all of chapter 3	9/23
2	Crystal & Ligand Field Theories, electronic and magnetic properties of complexes, reaction mechanisms	Chapters 20 and 21	10/21
3	Organometallic chemistry, mechanisms and catalytic cycles	Chapter 22	11/11
4	Biological inorganic chemistry, inorganic medicinal chemistry, inorganic oncology	Chapters 26 and 27	12/6

Each take home exam will be given to the students approximately one week before the due date, and the student will have approximately one week to complete the exam. The exam is due at the beginning of class on the date specified in the table above. Late take home exams will be accepted, but one point will be deducted for tardiness as long as the exam is turned in within one week of the due date. If the take home exam is turned in after one week later than the due date, then the exam will still be accepted but there will be a 50 point deduction for the extreme tardiness.

Students are free to use their text book, their in-class notes, or any other source of information to solve the problems on the take home exams.

The topics discussed in class lecture during the week of December 2 – 6 will not be covered on take home exam 4, but this material will be covered on the final exam.

There will also be 2 class projects, each worth 100 points. The first project will involve a set of hand-written quantum mechanical calculations pertaining to Crystal Field Theory. The second project will involve computational / molecular modeling calculations pertaining to the anti-cancer properties of some transition metal complexes. More information about these projects will be given later in the semester. The tardiness rules for the take home exams (*vide supra*) will also apply to the class projects.

The final examination will be cumulative, in-class, closed book and closed notes, and worth 100 points.

Saturday, December 7 at 5 PM: All work **MUST** be turned in before 5 PM on Saturday, December 7. Absolutely nothing is accepted for any reason after 5 PM on the last day of classes.

Help: Extra help is available, in case the student is having difficulty with Chem F402. The student should visit Dr. Howard during normal office hours or make an appointment to see Dr. Howard by email or phone.

More Help:

1. UAF Department of Communication's Speaking Center
907-474-5470
speak@uaf.edu
2. UAF English Department's Writing Center (8th Floor, Gruening Building)
907-474-5314
3. CTC Learning Center (604 Barnette Street)
907-455-2860
4. UAF Math Lab (Room 305, Chapman Building)
Department of Mathematics & Statistics 907-474-7332
uafmathstatlab@gmail.com

Disabilities and Special Accommodations: Students with documented disabilities who may need reasonable academic accommodations must provide documentation of the disability to Disability Services in room 208 Whitaker Building, 474-5655, TTY 474-1827. Disability Services will then notify Prof. Howard in writing of the disability and will advise on how the student should be tested and which accommodations should be made.

Veteran Support Services: Walter Crary (wecrary@alaska.edu) is the Veterans Service Officer at the Veterans Resource Center (111 Eielson Building, 474-2475). Fairbanks Vet Center 456-4238. VA Community Based Outpatient Clinic at Ft. Wainwright is 361-6370.

Blackboard: All course documents will be placed on Blackboard. Grades will be updated on Blackboard regularly. Each student will be able to see only his or her own scores and will NOT be able to see the scores of other students. Final letter grades are posted on UAOnline only, not Blackboard.

Instructor Withdrawals: The instructor reserves the right to withdraw any student from class if the student has not participated significantly as of November 1.

Incompletes: The letter "I" (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student's control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an "I" grade.

Ethical Considerations: The Chemistry "Department Policy on Cheating" is this: *"Any student caught cheating will be assigned a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course."*

Some examples of cheating include, but are not necessarily limited to, the following: (1) plagiarism; (2) copying another student's answer while taking an exam; and (3) unauthorized collaborations on projects or exams.

As a UAF student, you are subject to UAF's Honor Code:

“Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.

Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses, and other reports.

No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors.

Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion.”

Important Dates:

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| • Labor Day | Sept. 2 |
| • Last day for registration or for adding classes | Sept. 6 |
| • Last day for withdrawals with class not appearing on record | Sept. 6 |
| • Last day to apply for Fall 2019 graduation | Oct. 15 |
| • Early Progress Reports due | Oct. 7 |
| • Last day for withdrawals with student receiving “W” | Nov. 1 |
| • Thanksgiving Break | Nov. 27 – 29 |
| • Last day of class | Dec. 7 |

Student Protections and Services Statement: Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/