

Chemistry F402: Inorganic Chemistry (3.0) **Fall Semester, 2008**

Instructor: Dr. William A. Howard
Office: Reichardt 190
Laboratory: Reichardt 241
Telephone: 474-6019 (Office)
Email: ffwah@uaf.edu
Lecture Meetings: MWF 11:45 AM – 12:45 PM, Reichardt 136
Office Hours: By Appointment, Reichardt 190

Prerequisites:

Successful completion (Grade of 'C' or better) of Basic Inorganic Chemistry F202, Organic Chemistry F322, and Physical Chemistry F332 is required.

Required Texts:

Inorganic Chemistry, 2nd Ed. Housecroft & Sharpe; Pearson / Prentice Hall; Harlow, England: 2005.

Molecular Symmetry and Group Theory, 2nd Ed. Vincent, Alan; John Wiley & Sons: 2002.

Other Materials:

Non-programmable calculator. A molecular model kit is suggested.

General Information:

There are three semester-length courses in inorganic chemistry offered at UAF: Basic Inorganic Chemistry F202, Inorganic Chemistry F402, and Advanced Inorganic Chemistry F602. The instructor's goal for teaching inorganic chemistry is that each student will master the material and obtain excellent results on standardized tests in inorganic chemistry. In order to achieve this goal, it is recommended that students take all three courses.

Emphasized in Inorganic Chemistry F402, a 3.0 credit course, are Molecular Symmetry and Group Theory, Molecular Orbital Theory, Covalent and Ionic Bonds, Solid State Structures, Coordination Chemistry and Organometallic Chemistry, Electronic Absorption Spectroscopy, and Descriptive Chemistry of Some Main Group Elements. After successful completion of Chem F402, students are expected to be familiar with the topics listed above and to be able to solve related chemical problems.

There is a web page for this class. Go to the web page for the UAF Department of Chemistry & Biochemistry, at <http://www.uaf.edu/chem>. On the left side of the screen, there will be a group of links. Select the "Course Homepages" link. There will be a table of courses taught by chemistry faculty in the Fall 2008 semester. Simply find the link for Chemistry F402 and click on that link to go to the home page for this course. The syllabus, class schedule, and solutions to homework problems will be posted on this web page.

Grades: Grades are determined as shown in the following table.

Assignment	Possible Points
Best 35 homework assignments	$35 \times 10 = 350$
3 HyperChem assignments	$3 \times 10 = 30$
3 Examinations	$3 \times 100 = 300$
Final Examination	100
Total Possible Points	780

<u>Point Range</u>	<u>Letter Grade</u>
702 or higher	A
701 – 624	B
623 – 546	C
545 – 468	D
467 or lower	F

This grade scale is tentative. The instructor reserves the right to discount quizzes, homework assignments, and test scores from the grade calculation. If the grade calculation is changed, the grade cutoff marks will NOT be set higher.

NOTE: The +/- system for grading will **NOT** be used for this course.

Examinations, Make-up Exams, and Absences:

There will be three regular examinations followed by a cumulative final examination. Some of the examinations (including the final exam) may be take-home exams, in order to give each student sufficient time to complete the exam. Some of the examinations may be in-class. Professor Howard will announce in class which are take-home and which are in-class.

If a student misses a class due to sickness, personal injury, bad weather, transportation problems, or a family emergency, then that student should notify Professor Howard as soon as possible, preferably BEFORE class. That student will receive an excused absence. Make-up exams can be given for excused absences.

If the student does not notify Professor Howard within a week of the missed class period, then that student will receive an unexcused absence, regardless of the reason for missing the class. Make-up exams will NOT be issued for unexcused absences, such as sleeping too late, over-extended vacations, not being prepared, disputes with friends or acquaintances, or simply not coming to class.

Homework Problems:

Each homework assignment shall consist of five problems based on the lecture given on the day the assignment was given. The homework assignment will be due the next class period. Late homework will not be accepted. There will be 38 homework assignments given throughout the semester, and only the top 35 scores will count toward the final grade. Each assignment will be worth a total of 10 points, with each individual problem worth 2 points. If the student answers the homework problem correctly - with no

mistakes at all, the student will be awarded 2 points for the problem. If the student has made an error but the answer is mostly correct, one point will be given for the problem. If the student's answer is completely wrong or if the student did not do the problem, then the student will receive a 0 for that problem. After collecting each homework assignment, Professor Howard will post the solutions on the web page for this class. The examinations shall consist of modified homework problems or problems that are very similar to the homework problems.

HyperChem Projects:

There will be a total of 3 mini-projects that involve HyperChem calculations. More information concerning these projects will be given throughout the course of the semester. Each student must have an account with the computer lab in the Department of Chemistry & Biochemistry in order to complete these HyperChem assignments.

Classroom Activities:

Students should read the material assigned according to the class schedule before class in order to be as prepared for class as possible.

Help:

In order to receive out-of-class help, students should contact Prof. Howard by phone or email in order to set up an appointment.

The student should seek help if: (1) the student clearly does not understand the concepts presented in the reading assignments, (2) the student performs poorly on the homework problems, or (3) the student receives a lower-than-expected grade on an examination.

Academic Honesty: 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."*

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."

Instructor Withdrawals:

The instructor reserves the right to withdraw any student from class for any of the following reasons:

- (1) The student has missed an exam without an excused absence;
- (2) At least one half of the homework scores are zeros up to the last day to drop classes, and the student has no excuse for missing class;
- (3) The student has performed poorly on homework with consistency, and the student has not sought help;
- (4) The student appears to be failing as of October 31, the last day for instructor withdrawal.

Incompletes: A grade of “incomplete” is assigned only when a student misses the final exam for a very good reason, such as a medical problem, a death in the family, etc.

Important Dates:

- Last day to drop class with 100% refund Sept. 12
- Last day for withdrawals with class not appearing on record Sept. 19
- Last day to drop class with 50% refund Sept. 19
- Last day for withdrawals with student receiving “W” Oct. 31
- Thanksgiving Break Nov. 27-30
- Last day of class Dec. 12

More Important Information:

Students with a physical or learning disability are required to identify themselves to Mary Matthews (474 – 7043) in the Disability Services office, located in the Center for Health and Counseling (209 Whitaker Building). The student must provide documentation of the disability. Disability Services will then notify Prof. Howard of special arrangements for taking tests, working homework assignments, and doing lab work.

Inorganic Chemistry F402 Schedule			
Professor Howard Fall 2008 Semester			
Week No.	Dates	Reading Assignments	Classroom Activity
1	Sept. 5	Sections 5.2, 5.3, 5.10, and 5.11.	Introduction to course. Packing patterns and ionic crystals.
2	Sept. 8	Section 5.13.	Madelung constants and lattice energy.
	Sept. 10	Sections 5.14, 5.15, and 5.16.	Born-Haber Cycles.
	Sept. 12	Box 5.4, Section 5.17.	Trends in the Properties of Ionic Compounds.
3	Sept. 15	Sections 5.3 through 5.9.	Metals, Band Theory, and Semiconductors.
	Sept. 17	Chapter 3.	Symmetry operations and point groups.
	Sept. 19	Vincent Chapter 3.	Character Tables and irreps.
4	Sept. 22	Vincent Chapter 5.	Orbitals as irreps; hybridization.
	Sept. 24	Vincent Chapter 6.	Molecular orbital diagrams for σ bonded compounds only.
	Sept. 26	First half of Chapter 4.	Molecular orbital diagrams with π bonds.
5	Sept. 29	Second Half of Chapter 4.	Practice Problems in Molecular orbital theory.

	Oct. 1		Exam 1
	Oct. 3	Sections 19.1 through 19.6.	Introduction to d Block coordination chemistry.
6	Oct. 6	Sections 19.7 and 19.8.	Coordination numbers and isomerisms.
	Oct. 8	Sections 20.1 through 20.3.	Valence Bond Theory and Crystal Field Theory.
	Oct. 10	Sections 20.4 and 20.5.	Octahedral and Tetrahedral Geometries: CFT and MOT.
7	Oct. 13	Box 20.6.	Term symbols for atomic states.
	Oct. 15	Section 20.6.	Electronic absorption spectroscopy, Orgel diagrams.
	Oct. 17	Sections 20.6 and 20.7.	Tanabe-Sugano diagrams.
8	Oct. 20	Sections 20.8 through 20.11.	Magnetic properties.
	Oct. 22	Chapter 21.	Survey Chemistry: first row transition metals.
	Oct. 24	Chapter 22.	Survey Chemistry: Second and third row transition metals.
9	Oct. 27	Sections 23.1 through 23.4.	Organotransition metal chemistry: an introduction.
	Oct. 29	Sections 23.5, 23.6, 23.10 through 23.15.	Organotransition metal chemistry, part 2.
	Oct. 31	Chapter 24.	Survey Chemistry: f block metals.
10	Nov. 3		Exam 2
	Nov. 5	Sections 25.1 through 25.3.	Substitution reactions in square planar complexes.
	Nov. 7	Section 25.4.	Substitution reactions in octahedral complexes.
11	Nov. 10	Section 25.4.	Problems in substitution chemistry with octahedral complexes.
	Nov. 12	Section 25.5.	Electron transfer mechanisms.
	Nov. 14	Section 23.7.	Organometallic mechanisms.
12	Nov. 17	Sections 26.1 through 26.4.	Catalytic cycles 1.
	Nov. 19	Sections 26.5 through 26.8.	Catalytic cycles 2.
	Nov. 21	Literature sources.	Contemporary Problems – N ₂ fixation
13	Nov. 24	Literature sources.	Contemporary Problems - Hydrodesulfurization
	Nov. 26		Exam 3
	Nov. 28		Thanksgiving Break – No Class
14	Dec. 1	Chapters 10 and 11.	Alkali and Alkaline Earth Metal Descriptive Chemistry
	Dec. 3	Chapter 12.	Triel Descriptive Chemistry
	Dec. 5	Chapter 13.	Tetrel Descriptive Chemistry
15	Dec. 8	Chapter 14.	Pnictogen Descriptive Chemistry
	Dec. 10	Chapter 15.	Chalcogen Descriptive Chemistry
	Dec. 12	Chapters 16 and 17.	Halogen and Noble Gas Descriptive Chemistry
16	Dec. 15	10:15 AM to 12:15 PM	Final Examination - Cumulative