

## Chemistry F202: Basic Inorganic Chemistry, 3.0 Credits Spring Semester, 2009

Instructor: Dr. William A. Howard  
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Lecture Meetings: Tuesday, Thursday, 9:45 AM – 10:45 AM, NSF 204  
Lab Meetings: Thursday, 3:00 – 6:00 PM, NSF 245, 241  
Office Hours: By appointment

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**Required Texts:** Inorganic Chemistry, 3<sup>rd</sup> Ed. Housecroft & Sharpe; Pearson / Prentice Hall; Harlow, England: 2008.

**Suggested Materials:** Molecular Symmetry and Group Theory, 2<sup>nd</sup> Ed. Vincent, Alan; John Wiley & Sons: 2002.

Ball-and-stick molecular model kit, calculator

**Prerequisites:** Successful completion of Chemistry F105X and F106X is required.

**General Information:** There are two semesters of instruction in inorganic chemistry available for undergraduate students. Chemistry F202 serves as an introduction to inorganic chemistry, while Chemistry F402 goes into more depth. Chem F202 has a laboratory component as well as a lecture component. One grade covering both the lab and the lecture is given.

The lecture will cover the first ten chapters of the text book. The lab will cover (1) synthesis of transition metal complexes, (2)  $^1\text{H}$ ,  $^{13}\text{C}$ ,  $^{19}\text{F}$ , and  $^{31}\text{P}$  NMR spectroscopies, (3) infrared spectroscopy, (4) electronic absorption spectroscopy, (5) cyclic voltammetry, (6) HyperChem calculations, (7) SciFinder Scholar searches, and (8) poster presentations of research at the end of the semester.

**Lecture Component:** A schedule of reading assignments is given at the end of this syllabus. Lectures will be conducted with the assumption that the student has read the textbook before coming to class. Not all of the material described in the textbook will be covered in each lecture; nevertheless, the student is responsible for all material described in the reading assignments.

**Examinations:** Three examinations will be given, and each exam will be worth 100 points. (The third exam is the final examination.) The first two exams are in-class, with closed notes and closed books. The final exam is non-cumulative, but the knowledge learned from earlier portions of this course will be vital for success on the final examination. The final exam is also closed-book and closed- notes. Each exam will

consist of 10 – 15 problems, and most or all of the problems will be taken from the homework assignments.

**Make-up Exams and Absences:** 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 and quizzes can be given for excused absences. Homework deadlines can be extended 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 and quizzes 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.

The same policy for excused / unexcused absences applies to the laboratory component of this course as well.

**Homework:** A homework assignment consisting of five questions or problems will be assigned every day of class. The problems are based on that day's lecture. All homework will be due on the Tuesday after it is assigned.

Each homework problem is worth 2 points. The student receives 2 points if the student's answer is totally correct, with no errors at all; the student receives a 0 on a problem if the student has neglected to do the problem or if the student's answer is completely wrong; all other answers receive a score of 1 point. Since there are five homework problems per homework set, each set is worth 10 points.

There will be a total of 25 homework sets given throughout the semester. Only the top 20 homework scores will be counted toward the grade. The total number of points from the homework is 200 points.

Late homework assignments will be accepted, regardless of how late they are. However, no homework will be accepted after 5:00 PM on Monday, May 4, the last day of instruction.

**Laboratory Component:** The lab experiments will involve real research work that is to be published in professional scientific journals. The students will be named as co-authors on the publications. Because the experiments involve original research work, there will be a degree of uncertainty in planning the lab experiments.

Each student will be given a schedule of experiments during the first lab period. The schedule shows what experiment will be done each lab period, and when the lab reports will be due. During each lab period, the instructor will give each student a lab report which the student will use for recording data and observations. Upon completion of each laboratory experiment, the student will submit the completed lab report on the due date, as shown in the lab syllabus that is included with the lab manual.

Each student is expected to construct and present a poster at the end of the semester. The poster will summarize the results obtained by the student, and the student will present his or her poster during the end-of-the-semester potluck held by the Department of Chemistry & Biochemistry. During this potluck, various chemistry professors will question each student about his or her research results in inorganic lab, and the student's

responses will be graded. The total grade for the poster is obtained by averaging the scores given by the professors, and these scores are on a one-to-ten scale, with ten being a perfect score and one being the lowest possible score.

**Grades:** Grades are assigned WITHOUT the +/- indicators and are determined as shown in the following table.

Work to be Graded	Possible Points
20 homework assignments	20 x 10 points = 200 points
Exam 1	100 points
Exam 2	100 points
Lab Reports	7 x 20 points = 140 points
Poster Session	10 points
<b>Total</b>	550 points

Point Ranges and Letter Grades:	550 – 495	A
	494 – 440	B
	439 – 385	C
	384 – 330	D
	329 or less	F

**Help:** If the student has difficulty understanding concepts or solving homework problems, the student may make an appointment to see Dr. Howard or the TA (Ashley Anderson). Appointments can be scheduled by telephone or email or in person.

**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.”

Calculators may be used for numerical calculations only. Plan to use a non-programmable calculator for exams. Using qualitative chemical information or quantitative examples preprogrammed on a calculator is not allowed during exams. Prof. Howard reserves the right to give you a simple calculator if you bring a programmable device with you for an exam. Feel free to discuss this on an individual basis with Prof. Howard, well before exam time.

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 Withdrawal Policy:** The instructor reserves the right to withdraw a student from this course for any of the following reasons:

1. The student has refused to wear protective clothing or safety glasses (or goggles) in the laboratory. A student may also be withdrawn for insisting on wearing materials that could compromise safety, such as contact lenses or loose clothing.
2. The student’s manner of lab work is careless and unsafe. Some examples of unsafe lab work include, but are not limited to, (i) horseplay in the lab, (ii) refusing to follow the instructions of the TA or the instructor, and (iii) eating or drinking in the lab.
3. The student has not taken Exam 1 and does not have a valid excuse for missing this exams.
4. The student has missed more than 4 labs as of the end of lab on March 26.
5. The student’s total grade for the course is less than 50%, as of March 26.

**Important Dates:**

- Last day to drop class with 100% refund Jan. 30
- Last day for withdrawals with class not appearing on record Feb. 6
- Last day to drop class with 50% refund Feb. 6
- Freshman Progress Reports due Feb. 27
- Spring Break Mar. 9 – 13
- Last day for withdrawals with student receiving “W” Mar. 27
- UAF Spring Fest Apr. 24
- Last day of class May 4

**More Important Information:** Students with documented disabilities who may need reasonable academic accommodations must provide documentation of the disability to Disability Services in the Center for Health and Counseling, 474-7043, TTY 474-7045. 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.

## Basic Inorganic Chemistry F202: Schedule of Lectures

Spring, 2009,

Professor William A. Howard

Week No.	Date	Reading	Classroom Lecture
1	Jan. 22	pp. 1 - 9	Intro to course. Atomic Theory, Atoms, Particle-in-a-Box.
2	Jan. 27	pp. 9 - 27	Quantum Numbers, Orbitals, Polyelectronic Atoms.
	Jan. 29	pp. 30 - 46	VBT and MOT for Diatomics. Electronegativity.
3	Feb. 3	pp 46 - 55	MOT for Heterodiatomics. VSEPR Theory. Polarity.
	Feb. 5	pp 58 - 62	Radioactivity. Mass Defect. Radiometric Dating.
4	Feb. 10	pp 62 - 72	Fission and Fusion. Uses of Isotopes.
	Feb. 12	handouts	NMR Spectroscopy.
5	Feb. 17	pp 72 - 82	Multi-nuclear NMR Spectroscopy. Practice Problems.
	Feb. 19	pp 88 - 99	Symmetry Operations. Point Groups. Character Tables.
6	Feb. 24	pp 88 - 99	Practice Problems in Molecular Symmetry.
	Feb. 26		<b>Examination 1</b>
7	Mar. 3	pp 100 - 112	Infrared Spectroscopy and Symmetry.
	Mar. 5	pp 100 - 112	Practice Problems in Infrared Spectroscopy.
8	Mar. 10		<b>Spring Break - NO CLASS</b>
	Mar. 12		<b>Spring Break - NO CLASS</b>
9	Mar. 17	pp 115 - 122	VBT for Polyatomics, Hybridization, Resonance Forms.
	Mar. 19	pp 122 - 133	MOT for Polyatomics. $\sigma$ Bonds only.
10	Mar. 24	pp 133 - 144	MOT for Polyatomics with $\pi$ bonds.
	Mar. 26	pp 148 - 162	Packing Patterns, Metal Unit Cells, Band Theory.
11	Mar. 31	pp 162 - 171	Ionic Solids, Unit Cells, Bond Distances, Densities.
	Apr. 2	Pp 171 - 178	Lattice Energies, Born-Haber Cycles.
12	Apr. 7	pp 181 - 191	Bronsted Acids and Bases. Dissociation Energetics.
	Apr. 9	pp 191 - 208	Ionic Solutions, Stability Constants, Hard-Soft Theory.
13	Apr. 14		<b>Examination 2</b>
	Apr. 16	Chapter 8	Redox Reactions, Nernst Equation, Thermodynamics.
14	Apr. 21	handouts	Cyclic Voltammetry. Basic Intro to UV-Vis Spectroscopy.
	Apr. 23	Chapter 9	Non-Aqueous Solvents
15	Apr. 28	handouts	Different Definitions of Acids and Bases, Drago Equation.
	Apr. 30	Chapter 10	Descriptive Chemistry of Hydrogen.
	<b>May 9</b>	8:00 – 10:00 AM	<b>Final Examination</b>