

# Inorganic Chemistry Laboratory

## Chem 3520, Spring 2008

Section 001  
Tues 2:30-5:20 pm  
Widtsoe 107

Professor Lisa M. Berreau

Teaching Assistant: Katarzyna Rudzka (W316; 797-0365)

Office: ESLC 245J (primary), Widtsoe 339 (secondary)

Office Hours: R/F 1:30-2:20 pm and by appointment (preferable)

(\*\*Check in Widtsoe 316 (797-0365) if I'm not in my office)

Phone: 797-3509 (primary office), 797-1625 (secondary office)

Email: [lisa.berreau@usu.edu](mailto:lisa.berreau@usu.edu) (best way to contact me)

**Text:** None; Materials are available via Blackboard prior to lab sessions. Each student should purchase a non-spiral notebook for use as a laboratory notebook.

**Corequisites:** Chem 3510

**Lab Fee:** \$55 required to cover expenses of chemicals and supplies for the experiments.

**Grading:** A total of 1200 points is possible in Chem 3520. Points are distributed as follows:

10 pre-lab quizzes @ 10 points:	100 pts
10 lab notebook checks @ 20 points:	200 pts
8 lab reports @ 100 points:	800 pts
One final Exam @ 100 points:	100 pts
"Gain-Score" Assessment Tests (extra credit)	20 pts

Tentative Letter grade brackets (brackets could be lowered- they **will not** be raised):

A-/A	90-100%
B-/B/B+	80-89%
C-/C/C+	70-79%
D/D+	60-69%

**Course Objectives/ Goals:**

Chemistry 3520 should be taken concurrently with the Chem 3510 lecture course. Students conduct experiments to synthesize and characterize a variety of main group and transition metal compounds. UV-visible absorption spectroscopy, infrared spectroscopy, solution conductivity, and nuclear magnetic resonance spectroscopy are important tools used in the class. Students are required to develop skills in maintaining lab notebooks and preparing laboratory reports.

**Blackboard:**

I will be utilizing a Blackboard Vista management system for Chem 3520. Laboratory descriptions and other materials will only be available via Blackboard. All registered students will have access to Blackboard using the following process:

- 1) Using a web browser from any location go to [bb.usu.edu](http://bb.usu.edu)
- 2) Log on using your Blackboard identity. This is you Banner ID/Pin (Access)

Details of Blackboard use will be introduced as we proceed into the term as needed.

**\*\*You must print out the laboratory description from your Blackboard account each week prior to coming to lab.**

**Important Dates:**

Jan. 11, 2008: Last day to add course without instructor signature  
Jan. 28, 2008: Last day to add course  
Last day to drop course without notation on transcript  
Feb. 19, 2008: Attend Monday classes  
March 7, 2008: Last day to change to P/D+/D/F option  
March 10-  
14, 2008: Spring Break  
April 24, 2008 Last day of class

**Prelab Quizzes:** The prelab quiz each week will be developed from the laboratory description. Therefore prior to coming to lab each week you should read this

description, carefully analyze the experiments to be performed, and make sure that you understand the chemistry. You will be given a maximum of 10 minutes each week to complete the quiz. A model quiz is available on the Blackboard site for the class.

**Notebook Checks:** At the end of each lab period, you must have your notebook reviewed by Dr. Berreau for clarity and completeness. A possible total of 20 points will be awarded for each laboratory. You are expected to keep a clear notebook for each laboratory including at least the following items:

1. Title
2. Reactions clearly written and balanced
3. Description of procedure including amounts of reagents used **IN YOUR OWN WORDS.**
4. Detailed observations and comments **IN YOUR OWN WORDS.**
5. Answers to all questions/directions put forth in the experimental section of the laboratory description (Note: There are additional questions for each laboratory that must be answered in the discussion portion of your report).

**Required Lab Report Format (see model report on Blackboard):**

1. Type-written, 2-3 page length (not including attached spectra, supporting information)
2. Abstract (25 words maximum) (~10%)
3. Introduction with stated purpose of experiment (~10%)
4. Experimental Outline- reaction(s) carried out, apparatus sketch(es), special experimental details (~20%)
5. Results (not conclusions) (~20%)
6. Discussion of results and conclusions (~30%)
7. Attached copies of spectra, raw data, etc. (~10%)

**\*\*Spectra, data must be clearly labeled and documented as referenced in Results and Discussion sections.**

**NOTE: The lowest two lab report scores will be dropped.**

**Final Exam:** The final laboratory exam will be comprehensive and may be expected to cover aspects from all portions of the class.

**"Gain-Score" Assessment Tests:** Two short tests (~10 min) will be given - one at the beginning of the semester and one at the end. These short tests are given to assess your ability to apply, analyze, and synthesize information that is delivered throughout the course. These questions are not designed to test your specific knowledge of the subject, but rather how to apply this knowledge. You will receive 10 extra credit points for simply taking each "gain-score" assessment test, regardless of performance.

**Missed Laboratory Policy:** If a student misses, or will miss a lab period, due to illness, family emergency, or other another appropriate reason, the student should speak to Dr. Berreau as soon as possible. A make-up lab will only be offered if the absence is supported by appropriate documentation (e.g. note from physician or parent).

**Missed Exam Policy:** If a student misses, or will miss the final lab exam, due to illness or family emergency, the student should speak to Dr. Berreau as soon as possible. A make-up exam will be offered if the absence is supported by appropriate documentation (e.g. note from physician or parent).

**Withdrawal Policy and "I" Grade Policy:** The administration of Chem 3520 will adhere strictly to the academic regulations stipulated in the most recent Schedule of Classes and the USU General Catalog. Withdrawal from the course will follow official USU procedures. Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. The term 'extenuating' circumstances includes: (1) incapacitating illness which prevents a student from attending classes for a minimum period of two weeks, (2) a death in the immediate family, (3) financial responsibilities requiring a student to alter a work schedule to secure employment, (4) change in work schedule as required by an employer, or (5) other emergencies deemed appropriate by the instructor.

**University Standards of Academic Integrity - "The Honor System":** Each student has the right and duty to pursue his or her academic experience free of dishonesty. The Honor System is designed to establish the higher level of conduct expected and required of all Utah State University students.

**The Honor Pledge.** To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the

following Honor Pledge: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lived by the Honor Pledge espouses academic integrity as an underlying and essential principle of the Utah State University community; understands that each act of academic dishonesty devalues every degree that is awarded by this institution; and is a welcomed and valued member of Utah State University.

**Grievance Process (Student Code):** Students who feel they have been unfairly treated (in matters other than (i) discipline or (ii) admission, residency, employment, traffic, and parking - which are addressed by procedures separate and independent from the Student Code) may file a grievance through the channels and procedures described in the Student Code:

<http://www.usu.edu/studentservices/pdf/StudentCode.pdf#Article7>

(Article VII. Grievances, pp. 25-30)

**Plagiarism:** Plagiarism includes knowingly "representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials." The penalties for plagiarism are severe. They include warning or reprimand, grade adjustment, probation, suspension, expulsion, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

**\*\*Plagiarism has been a problem in written lab reports in prior years in Chem 3520. There is a zero tolerance policy for plagiarism. Identification of plagiarism in a lab report will result in the student receiving a zero for that portion of the report.**

**Sexual Harassment:** Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any "unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature." If you feel that you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266.

**Students with Disabilities:** The *Americans with Disabilities Act* mandates that reasonable accommodation will be made for students with disabilities in order to assure equal participation in Chem 3520. Students requesting such accommodation must meet with Dr. Berreau during the first week of classes and must coordinate such accommodations with the Disabilities Resource Center.

**Chem 3520  
Laboratory Schedule, Spring 2008**

<b>Da Y</b>	<b>Date</b>	<b>Lab Day</b>	<b>Experiment</b>	<b>What's Due</b>
T	1/8	1	Check-in; Syllabus	
T	1/15	2	<b>#1</b> Synthesis and Characterization of $Al(acac)_3$	
T	1/22	3	<b>#2</b> Multinuclear NMR	Report #1
T	1/29	4	<b>#3</b> Synthesis of $[Co(NH_3)_6]Cl_3$	Report #2
T	2/5	5	<b>#4</b> Synthesis of $[Co(NH_3)_5Cl]Cl_2$	
T	2/12	6	<b>#5</b> Synthesis of $[Co(NH_3)_4(CO_3)]NO_3$	Report #3
T	2/19	<No Lab>	<No Lab>	
T	2/26	7	<b>#6</b> Conductivity of Cobalt complexes	Report #4
T	3/4	8	<b>#7</b> Acylation of Ferrocene	Report #5
T	3/11	Spring Break	Spring Break	
T	3/18	9	<b>#8</b> Magnetic Susceptibility by NMR	Report #6
T	3/25	10	<b>#9</b> Geometry of Cu(II) complexes	Report #7
T	4/1	11	<b>#10</b> Synthesis and Titrimetric Analysis of $[Zn(NH_3)_4](BF_4)_2$	Report #8
T	4/8	12	<No Lab>: Professor Berreau and Katarzyna Rudzka at professional meeting	
T	4/15	13	Final Exam, Check out	Reports #9 and #10

## Learning Objectives:

Students emerging from Chem 3520 should be able to:

- 1) Prepare neutral, organic chelate complexes of Group 13 metals and use spectral data to describe the structures.
- 2) Predict the structure of simple compounds from multinuclear NMR data.
- 3) Prepare and characterize simple octahedral cobalt complexes containing ligands like ammonia, halide, and carbonate.
- 4) Evaluate the solution properties of cobalt(III) complexes using conductance measurements.
- 5) Functionalize the cyclopentadienyl ligand of ferrocene and separate the products using chromatography.
- 6) Determine the magnetic moment of a metal complex using NMR.
- 7) Use spectroscopic methods to determine the geometry of Cu(II) complexes.
- 8) Use titration methods to determine the number of zinc-coordinated ammonia ligands in a coordination complex.