

# General Inorganic Chemistry

## Laboratory II

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\* Indicates Experiment Number

# **Chemistry Department Chemistry 1221 Spring 2009 General Inorganic Chemistry Laboratory II**

This course is designed to complement and expand the material being covered in Chemistry 1223. Experiments will be performed either individually, with a lab partner, or in a collaborative learning group. The concepts and procedures of the laboratory experiments are constructed to enable the student to...

- ◆ Illustrate the basic concepts of chemistry by using descriptive laboratory chemistry.
- ◆ Promote critical thinking both independently and in group collaboration through laboratory exercises.
- ◆ Learn methods of collection, organization, analysis, and data presentation effectively.
- ◆ Learn numerous laboratory techniques and procedures that are utilized daily by professional chemists.
- ◆ Develop an understanding of correct scientific writing for the purpose of explaining experimentally determined data.

**CHEMISTRY 1221--Spring 2009**  
**General Inorganic Chemistry Laboratory II**  
 (CHEM 1223 + 1221 satisfies Core 7 or 9.)

	Monday	Tuesday	Wed. & Thurs.
<b>Prof.</b>	Dr. Lee Lewis	Mrs. Cori Ciaccio	Dr. Jim Purser
<b>Phone</b>	974-1409	974-1403	974-1370
<b>Office</b>	Olin 169	Olin 117	Olin 133
<b>E-Mail</b>	lewisll@millsaps.edu	ciaccog@millsaps.edu	pursejm@millsaps.edu
<b>Office Hours</b>	MWF 9:00 – 10:00 or by app'ment	MWF 9:30 – 11:00	MWF 10:00 – 11:00 or by app'ment

**TEXT** Laboratory Manual for Chemistry 1221, Spring 2009  
 Available for purchase the first week of classes from 12:30 to 1:00 PM in Olin 120 Wed. – Fri.

**LABS** 1:00 - 4:00 p.m. in Olin

**LOCATION** Olin 120 (pre-laboratory lecture) and Olin 172 (laboratory)

### CORE INFORMATION

This course plus General Inorganic Chemistry (Chem 1223) fulfills the requirements for either Core 7 or Core 9. This introductory course places chemistry, the central science, in the perspective of an experimental science and its unique relationships to other scientific disciplines.

### REQUIREMENTS

Safety goggles are to be worn for all times spent in the Laboratory. Goggles are packaged with the lab notebooks for purchase. A non-graphing scientific calculator (TI-30X) is required (and supplied) for both in-class exercises and exams. If more familiarity with the calculator is desired, you may purchase one for approximately \$10 to 14 from either the bookstore or a local discount store.

### LIBERAL ARTS ABILITIES

**Reasoning.** the ability to analyze and synthesize arguments, to question assumptions, to evaluate evidence, to argue positions, to draw conclusions, and to raise new questions. The two types of reasoning most used in this class are: *Scientific*-the ability to use inductive reasoning to interpret and classify facts by a general statement, formulation of a hypothesis about how to explain the facts, and the deductive reasoning to test the hypothesis with carefully designed experiments. *Quantitative*-the ability to use mathematical reasoning as a tool of analysis and as a means of conveying information.

Students will enhance their comprehension skills through solving theoretical and practical problems of chemical principles. Tables, graphs, diagrams, and mathematical equations will be used extensively to demonstrate the quantitative relationships among experimental variables.

**Communication.** the ability to express ideas, arguments, and information coherently and persuasively orally and in writing. Students will enhance their writing and communications skills through post-laboratory assignments, quizzes, laboratory writing assignments, and in-lab discussions.

**Historical Consciousness.** the ability to understand the achievements, problems, and perspectives of the past and to recognize their influence upon the course of events. Students will enhance their knowledge of history through learning concepts such as gas laws, thermochemical concepts, periodic table trends, acid-base theories, etc. and how they are viewed from the perspective of their historical development.

**WRITING REQUIREMENT**

There will be a writing assignment for the class sequence of CHEM 1221 and 1223. This assignment will be discussed and assigned in the laboratory portion of this course, and the grade from this assignment will count towards the student's grade in CHEM 1221. Failure to turn in this writing assignment will lead to an incomplete in this course (CHEM 1221) AND in 1223). This writing assignment is suitable to include in the student's Writing Portfolio if desired.

<b>Spring 2009 GRADE ASSESSMENT</b>
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Experiments	Data/Worksheets (9)	540 points
	Ch. 12 lecture problem set	20 points
On-line Computer Quizzes	Pre -lab quizzes* (9)	70 points
	Post -lab quiz** (1)	30 points
Tests***	Test I	120 points
	Test II	120 points
Writing Requirement	10% of final grade	100 points
	<b>Total</b>	<b>1000 points</b>

- \* Each lab **experiment** will have a computer-administered pre-lab that must be taken **BEFORE 1:00 P.M. on the day of your regularly scheduled laboratory section**. The weeks in which lectures on Chapter 12 are given will have one computer-administered post-lab. This post-quiz must be taken by 1 PM of the following week (week of Feb. 9) *on the day of your regularly scheduled laboratory section*. (Thus, there is one week when you will have two quizzes (Ch. 12 postlab + Exp. 2 prelab) due before lab.)
- \*\* Attendance for the Ch. 12 lecture is mandatory. The post-lab quiz grade will not be accepted if the student fails to attend the corresponding lecture.
- \*\*\* Tests must be taken on the day designated for each lab section. All tests are scheduled to begin at 1:00 p.m. unless otherwise noted

<b>COURSE GRADE DESIGNATIONS</b>
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A	A-	B+	B	B-	C+	C	C-	D+	D	F
100-94%	93-90%	89-86%	85-	84-80%	79-76%	75-73%	72-70%	69-66%	65-60%	<60%
1000-940 points	939-900 points	899-860 points	859-830 points	829-800 points	799-760 points	759-730 points	729-700 points	699-660 points	659-600 points	<600 points

If a student thinks that a mistake has been made in the grading of his/her paper, the student must speak to his professor within one week of having the assignment returned to him/her (or one week after having viewed his/her test) for the matter to be considered.

**COURSE OBJECTIVES**

This is a laboratory-based course that has been carefully coordinated with the lecture segment. It will emphasize qualitative and quantitative chemical techniques, methods, and fundamental laboratory skills utilized in collecting and analyzing scientific data. Various working formats will be utilized for the experiments to help prepare the student for real-world situations, and these formats will include working individually, with one lab partner, and in a small cooperative learning group.

**DISABILITY**

It is the responsibility of any student with a disability or disabilities to 1) contact Patrick Cooper to register for disability services (You can reach him via e-mail at [coopeap@millsaps.edu](mailto:coopeap@millsaps.edu) or by calling extension 1228. It is school policy that accommodations will not be granted until a meeting with Mr. Cooper has taken place each semester and until the appropriate paperwork has been received by the instructor.) and 2) to notify his/her professor **within the first three weeks of the semester**. A request for an appointment with his/her professor is recommended so a viable plan may be developed to meet the special need(s) of the student.

## CHEMISTRY 1221 LAB SCHEDULE Spring 2009

WEEK OF	EXPERIMENT #	EXPERIMENT TITLE
Jan. 12-15	First week of classes.	<b>Labs will not meet this week.</b>
Jan. 19-22	1* (Chapter 11)	Classification of Chemical Substances → <b>CHEM 1221-01 (Monday's lab) will perform this lab on Friday 1/23 due to the holiday on 1/19.</b>
Jan. 26-29	Lecture, Chapter 12	Chapter 12 in Chang (Bring your textbook to class.)
Feb. 2-5	Lecture, Chapter 12**	Chapter 12 in Chang (Bring your textbook to class.)
Feb. 9-12	2* (Chapter 13)	Chemical Kinetics
Feb. 16-19	3* (Chapter 12)	Colligative Properties: Freezing-Point Depression and Molecular Weight
Feb. 23-26	Midterm--TEST I	
March 2-5	4* (Chapter 14)	Properties of Systems in Chemical Equilibrium
March 9-12	5* (Chapters 4 & 15)	Titration of Acid and Base
March 16-19	Spring Break	<b>Labs will not meet this week.</b>
March 23-26	6* (Chapters 4 & 16)	Qualitative Analysis Using Winqual®
Mar. 30- April 2	7* (Chapters 4 & 16)	Qualitative Analysis of Group I Cations, Known and Unknown
April 6-9	8* (Chapters 4 & 16)	Qualitative Analysis of Group II Cations, Known and Unknown
April 13-16	9* (Chapters 4 & 16)	Qualitative Analysis of Selected Anions, Known and Unknown
April 20-23	TEST II	

\* Experiments have computer administered pre-labs

\*\* Lectures have computer administered post-lecture questions

### ATTENDANCE REQUIREMENT

- Since this is a laboratory course designed for hands-on, inquiry-based learning activities, attendance is necessary for a student to obtain the maximum benefit. An effort will be made to work with any student with a problem due to legitimate conflict with attendance during the scheduled lab time if the student contacts the professor as soon as possible to make arrangements. (Contacting your professor well in advance of the scheduled lab time aids this process. If you contact your professor after the week's labs are completed, there is NO possibility of a make-up assignment.) Legitimate conflicts include illness (only with doctor's excuse), official college activities such as athletic team travel (with advanced notification from both the student AND the coach/sponsor), or an unusual personal crisis. Students are expected to be in lab on time and prepared for the experiment.
- **THERE ARE NO MAKE-UP LABS!!!!** Any student who fails to notify the professor *in advance* of a legitimate need to attend another lab section will be given a grade of zero.
- Computer pre-labs are to be completed by 1:00 p.m. on the day of your scheduled lab section, regardless of whether or not you have permission to attend another lab section.
- Any missing grades for any category will be treated as a **ZERO** when all laboratory grades are computed.
- *It is your responsibility to turn in any missed assignments due to your absence.*

### HONOR CODE

All quizzes, tests, pre-laboratory questions, and tests are to be done **individually** by the student under the College's Honor Code. Submission for grading, whether in printed, handwritten or electronic format, carries with it the student's implied personal Honor Pledge. (Please see the last page of this syllabus for a copy of the Honor Code.)

All experiments are to be done in the lab by the student. Data should be recorded with results calculated and reports submitted as directed by the professor. Students may seek assistance at any time with lab reports during the lab period from the professor, the lab assistants, lab partners, and/or lab groups. **Your post-laboratory questions should reflect your own individuality:** Data and calculated results may be the same within each lab group; however, the lab reports and post-laboratory questions submitted **SHOULD NOT HAVE A TWIN**. If this occurs, appropriate action will be taken. Your pledge statement on your data sheets, post-lab assignments, and lab reports indicate the stipulations in this paragraph.

During exams, cell phones are not permitted. Use of a cell phone even to check the time, is a violation of the Honor Code.

During exams, the student may not leave the room except in the case of an emergency. Leaving the room without the professor's consent is a violation of the Honor Code.

After taking a lab exam, discussion of an exam with other individuals who have not taken the exam is a violation of the Honor Code.

### Special Hints for Success in the Lab

- ◆ Check your e-mail several times a week. E-mails will be sent usually once a week by Thursday or Friday with general lab information and reminders. Individual sections may receive e-mails at other times during the week.
- ◆ Use e-mail to contact your professor with questions, problems, etc.
- ◆ Need help from your professor in person? Best way: Drop by during posted Office Hours. Next best way: e-mail a request for an appointment or just drop by the professor's office. (Dropping by your professor's office does not guarantee that he/she will be there.)
- ◆ Begin review and preparation for tests well in advance. Use each lab's objectives, computer pre-lab questions, experimental data sheets, and post-lab questions to help prepare you for tests.
- ◆ Pay attention to the smallest details such as charges on ions, units, and significant figures.
- ◆ Remember to balance all chemical equations.
- ◆ Remember to balance both charges and masses in net ionic equations.
- ◆ Use correct chemical formulas and indicate physical states in all chemical equations.
- ◆ Include appropriate units with all measurements.
- ◆ Apply significant figure rules consistently and correctly, ALWAYS.
- ◆ Use of correct spelling and subscripts is very, very important, e.g. nitrate or nitrite ( $\text{NO}_3^-$  or  $\text{NO}_2^-$ ); sulfide, sulfite, or sulfate ( $\text{S}_2^{2-}$ ,  $\text{SO}_3^{2-}$ , or  $\text{SO}_4^{2-}$ ).

**ACADEMIC HONOR CODE of MILLSAPS COLLEGE**

Millsaps College is an academic community dedicated to the pursuit of scholarly inquiry and intellectual growth. The foundation of this community is a spirit of personal honesty and mutual trust. Through their Honor Code, the students of Millsaps College affirm their adherence to these basic ethical principles.

An Honor Code is not simply a set of rules and procedures governing students' academic conduct. It is an opportunity to put personal responsibility and integrity into action. When students agree to abide by an Honor Code, they liberate themselves to pursue their academic goals in an atmosphere of mutual confidence and respect.

The success of the Code depends on the support of each member of the community. Students and faculty alike commit themselves in their work to the principles of academic honesty. When they become aware of infractions, both students and faculty are obligated to report them to the Honor Council, which is responsible for enforcement.

The pledge signed by all students upon entering the College is as follows:

**As a Millsaps College student, I hereby affirm that I understand the Honor Code and am aware of its implications and of my responsibility to the Code. In the interests of expanding the atmosphere of respect and trust in the College, I promise to uphold the Honor Code and I will not tolerate dishonest behavior in myself or in others.**

Each examination, quiz, or other assignment that is to be graded will carry the written pledge: "**I hereby certify that I have neither given nor received unauthorized aid on this assignment. (Signature)**" The abbreviation "Pledged" followed by the student's signature has the same meaning and may be acceptable on assignments other than final examinations.

It is the responsibility of students and faculty to report offenses to the Honor Code Council in the form of a written report. This account must be signed, the accusation explained in as much detail as possible, and submitted to the Dean of the College.

**The Honor Council, 2008-2009**

## Students:

David Butler, Chair  
Joey Quillin, Vice-Chair  
Brooke Furrh, Sergeant-at-Arms  
Stephen Butler  
Mark Herndon  
Amanda Smith

## Faculty:

Mr. Harvey Fiser, Senior Faculty Secretary  
Dr. Rachel Heard  
Ms. Ashleigh Powers

Four graduate student positions and one non-voting freshman position will be filled at the beginning of the fall term.

## Chemistry 1221--Pre-Laboratory Assignments & Lecture Information

The pre-lab assignments for the experiments this semester are all computer administered. You need to complete the pre-lab assignments by 1:00 p.m. on the day of your scheduled lab section. The pre-lab grades returned to the professor have a time and date stamp associated with them. Failure to complete the pre-lab assignments by 1:00 p.m. will result in a grade of zero for that week's pre-lab score. The post-lecture computer quiz for Chapter 12 must be completed by 1:00 PM of the lab period the week after the second lecture. (For example, if you have lab on Tuesday, you will have the lectures on Ch. 12 on 1/27 and 2/3. Thus, your Chapter 12 post-lab quiz must be completed by 1 P.M. on 2/10. In addition, you must complete your pre-lab for Exp. 2 (the experiment to be performed on 2/10) by 1 P.M. on 2/10. *You may always do them early.* (You will only have this one week during the semester where you have two quizzes due at the same time.)

To access the computer administered pre-labs for General Chemistry Lab:

1. Go to computer lab in the ***Library (Basement)***. (This is the only computer lab on campus that has the appropriate program. Classes are sometimes scheduled in the computer lab. Thus, plan accordingly.)
2. Log onto the computer using your log-in name and password.
3. The "applications" folder should appear on the screen. Open it and select the "chemistry" folder.
4. In the chemistry folder, choose "Chemlab" folder.
5. In the Chemlab folder, there is an icon with a large "Q" in the middle. (This software is Question Mark Software® that distributes the pre-labs.)
6. Click on the Question Mark software icon.
7. A menu of quizzes will appear. Choose the correct one for the week and click on it.
8. Take the pre-lab quiz:
  - a) The program will ask for your "name", type in your login id.
  - b) To select an answer, click on the answer or type in the appropriate number in the blank provided.
  - c) When you have selected an answer, click on "CONTINUE" or "OK."
9. When you have finished the questions, the program should allow you to review your answers. (Do NOT hit the red button in the upper left corner until you are ready for your score.)
  - a) You must answer all of the questions before the program will allow you to review your answers. Otherwise, the program will only allow you to view the questions you haven't answered.
  - b) While reviewing, you may change your answers. Click "continue" or "ok" when you are ready to go to the next question.
10. When you finish with the review, click on the red square at the upper left-hand corner of the screen to obtain your score.
11. Normally, the program will ask you if you wish to see the questions you missed. If you want to look at the missed questions, it will allow you to view the question and the answer that you selected. Click "continue" in the box in the upper right-hand corner of the screen to go to the next questions. Select "finish" when you wish to stop viewing the questions. (The program will continue to cycle through the questions until you select "finish.")
12. If there are any problems with the software (computer glitches (e.g. the program shuts down before you have finished taking the quiz, the computer shows you a score different from what you earned) or incorrect questions) please notify Dr. Lewis (X1409 or lewisll@millsaps.edu) and your lab professor immediately via email and explain the situation.
13. You may take each computer quiz as many times as you would like, but your score will be based on the higher of the **first TWO** times that you take the quizzes. Thus, if you take the quiz three times and score 75 %, 85 %, and 90 %, your score will be 85 %.
14. **There is a practice quiz that you may take as many times as you would like to help you get used to the program.**

Chapter 12 will be lectured on during two laboratory periods. There will be a post-lab quiz for this chapter on the computer after these lectures.

**Millsaps College Chemistry Department  
Safety Policy****(This copy stays in your lab manual)**

Note: Work in the Olin Hall laboratory facilities will not be permitted unless a signed copy of this statement is on file in the Chemistry Department Stockroom for the duration of this course. (A copy will be provided in the laboratory for you to sign. Thus, do not tear this copy out of your lab notebook. *This copy should stay in your laboratory book.*)

1. Eye protection is required and will be worn at all times in the laboratory and wherever reagents are stored. Your goggles are to be put on as you enter the laboratory and not removed until you leave. Anyone not wearing safety goggles in the lab will be required to leave the lab.
2. No eating, drinking, or smoking is allowed in any chemistry laboratory.
3. The suggested attire is a pair of cotton jeans or slacks and a short or long sleeve shirt. No sandals, clogs, open-toed shoes, tank tops, halter tops, bare midriffs, etc. are allowed in the laboratory.
4. Long hair should be confined behind the neck and shoulders in a manner that prevents it from falling forward at any point during the lab.
5. Never work in the laboratory without the supervision of a laboratory instructor or lab assistant.
6. Read the entire laboratory procedure BEFORE the beginning of lab and BEFORE the prelab lecture.
7. No unauthorized or unscheduled experiments are to be performed.
8. Anyone removing reagents or equipment from the lab will be held in violation of the Millsaps Honor Code.
9. Locate and be familiar with the proper use of eyewashes, safety showers, fire extinguishers, and secondary exits.
10. Any special medical condition (for example, pregnancy, diabetes, epilepsy) should be reported to your lab instructor for proper response to possible needs.
11. Reagents should never be tasted.
12. Never smell reagents directly; waft (fan) the fumes toward your nose.
13. Proper handling of equipment and reagents used in an experiment is an individual's own responsibility.
14. Reading labels and using only those specific reagents in proper concentrations for the experiment is an individual's own responsibility.
15. Proper disposal of waste reagents is the user's responsibility. Your lab instructor or lab assistants will give specific directions for disposal of hazardous waste materials.
16. NEVER return excess reagents to the original container or dispose of any SOLIDS in the trough and/or sinks
17. Proper clean up is important to lab safety. Bench tops must be wiped clean, individual equipment should be replaced in drawers so as to avoid breakage. Shared or one day checkout equipment should be returned clean at the end of the laboratory period. Your "mess" is your responsibility, not that of your instructor.
18. Any accident or injury, however minor it may seem, must be reported to your instructor immediately.
19. When pouring liquids from a bottle, place hand over label and pour from the opposite side. This will result in fewer reagent contact incidents. Immediately clean up all spills as soon as they occur.
20. Always add acid to water.
21. Dispose of broken glass in the bins/boxes marked "Broken Glass," never the trash cans.
22. Never look directly down the end of a container that is being heated. Never direct the open end of a container that is being heated or shaken toward your neighbor.
23. ALWAYS wash your hands before leaving laboratory.
24. Be aware of your actions. Any accident you may have is just as likely to injure your neighbor as it is to injure you.

I have read and understand these standard safety policies of the Millsaps College Chemistry Department and agree to abide by them.

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Student Signature

Date

Course & Sec. #

Desk #

**Spring 2009 CHEMISTRY 1221 EQUIPMENT INVENTORY LIST**

NAME: \_\_\_\_\_ DESK NUMBER: \_\_\_\_\_

SECTION NUMBER: \_\_\_\_\_

*(NOTE: If equipment is ok in condition, place a check-mark (✓). If items are missing, ask a lab assistant or your professor to provide a replacement for them from the stockroom.)***DESK INVENTORY SPRING 2009**

QTY.	EQUIPMENT	CHECK-IN	CHECK-OUT	COMMENTS
1	spatula			
1	glass stirring rod with rubber policeman			
1	50mL beaker			
1	100 mL beaker			
1	250mL beaker			
1	600mL beaker			
1	watchglass, large			
1	watchglass, small			
1	10mL graduated cylinder			
1	100mL graduated cylinder			
10	10x75 test tubes (small)			
8	13x100 test tubes (large)			
1	test tube rack			
1	test tube clamp			
1	crucible tongs			

**CABINET INVENTORY**

QTY.	EQUIPMENT	CHECK-IN	CHECK-OUT	COMMENTS
1	wash bottle			
1	gas burner with rubber tubing			
1	iron tripod			
1	wire gauze			
1	wire triangle			
2	250mL Erlenmeyer flasks			
2	125 mL Erlenmeyer flasks			

*I agree that all items checked are clean, acceptable, and present. I understand that any equipment missing and/or damaged at CHECK-OUT will be my responsibility to replace.*

	CHECK-IN	CHECK-OUT
<b>Student's Signature</b>		
<b>Date</b>		
<b>Instructor's Signature</b>		