

## **CHEMISTRY 141 Fall 2009: LABORATORY SYLLABUS**

**Instructors:** Jeff Katz (Keyes 216, x5754, [jlkatz@colby.edu](mailto:jlkatz@colby.edu)) will teach lab sections A (Mon) and C (Wed); Lisa Miller (Keyes 310, x5752, [lmiller@colby.edu](mailto:lmiller@colby.edu)) will teach lab sections B1 (Tue-AM), D1 (Thur-AM), D2 (Thur-PM), and E (Fri); Tara Kraus (Keyes 314, x5766, [tjkraus@colby.edu](mailto:tjkraus@colby.edu)) will teach lab section B2 (Tue-PM).

**Lab schedule:** The first lab sessions will meet in the first full week of classes (Sept. 14-18). Be prepared to begin promptly at the scheduled start of your session in Keyes 405. Please make sure that you have brought a copy of this syllabus as well as your bound laboratory notebook. During the first week's session we will also go over safety and procedures.

**Lab rules and safety:** Sensible clothes must be worn to lab. No open-toed shoes or sandals are allowed. Long hair must be tied back. Backpacks and other personal belongings must be left outside of lab. Food, drinks, and gum are never allowed in the laboratory. Please read the additional safety information at the end of this document. During your first lab meeting you will be assigned a lab drawer to use for the semester and be provided with safety glasses. You are expected to wear them each week throughout the scheduled lab, including time spent writing in lab books or doing computer work. At the end of each lab you may store your glasses in your assigned lab drawer.

**Lab exercises:** Lab exercise documents are available on the Chemistry 141 laboratory web page (<https://wiki.colby.edu/display/CH141AB/CH141+Home>) at least several days in advance of each lab. These documents will include a detailed description of the week's experiment as well as instructions for what work to complete prior to your lab section. You are expected to bring a printed copy to lab with you each week.

**Pre-lab assignments:** Before each lab, prepare yourself by thoroughly reading the laboratory handout. All laboratory exercises have a pre-lab assignment that can be found at the beginning of the experiment document. These assignments will consist of a few questions/exercises relevant to the experiment. In your lab notebook clearly label which experiment you are working on then label the pre-lab section. Answer the pre-lab questions in your lab notebook showing all of your work, units, any literature source used (complete reference), and be sure that final answers have an appropriate number of significant figures. You will receive credit for doing this assignment on a weekly basis. This is primarily graded based on effort. No effort or weak effort earns no credit. The other task to complete before coming to do the lab experiment is to write a simple procedure in your notebook. This should include the most essential information such as amounts needed, concentrations, which reagents, how long to heat or dry a sample, size of sample to be injected into an instrument, which instrument will be used, etc.. Data analysis is not part of the experimental procedure, so you do not need to write that in your lab procedure.

**Lab lecture:** Each week there will be a brief lecture on important information related to the lab. Any changes to the procedures will be explained and equipment will be demonstrated. This information supplements what is in the lab handout. As such, punctuality is an inflexible requirement each and every week (see grading consequences below).

**Lab notebook:** Buy a bound composition book (no carbon copy or spiral notebooks) and bring it to the first lab. This can be a lined or graph paper notebook. On the inside front cover put your name, lab section, and the contact information for your instructor (refer to the syllabus). Number the pages in your notebook before using it (it would be okay to number just the front side of each page as 1, 3, 5 etc.). The first TWO pages of your notebook will be for the Table of Contents, which must be kept up to date. This notebook will be used to record data and observations for every lab exercise.

**A CH141 notebook entry should include the following features:**

**Title:** Summarize the chemical concept being explored.

**Name and date:** Your name and the name of your partner(s), and the date.

**Objective:** In your own words, write one or two sentences that give a description of the goal(s) of the experiment. Always include mention of unique instrumentation or a method that was part of your experimental approach.

**Procedure / Data / Observations:** Describe the steps you follow during the experiment in thorough but concise terms. Write down what you do – as you do it – integrating your data and observations as you go. Record all data and observations, attach graphs (once graded) and other data analysis (such as an example calculation for each formula used in your Excel spreadsheet), summarize results into tables, literature cited, etc. It is required to include copies of all graphs, printouts, etc. in your notebook (i.e., make photocopies or extra copies if working in groups). First you attach this to your discussion, then it is graded, then it is returned to you for attaching to the lab notebook. It is not acceptable to cite your partner's notebook for any table, graph, calculation etc. **It is not acceptable to write on pieces of non-notebook paper and later copy "neatly" into the lab notebook!** All data entries must be securely and neatly attached to a notebook page. Please don't layer attachments nor fold them when placing each into the notebook. For example, just tape one graph across two open notebook pages. Attachments that hangout of your notebook can get torn, tattered or destroyed, so please keep each attachment within the notebook. Thanks.

**General comments on recording data:** Your notebook serves as a record and proof of each experiment that you do in the laboratory, no matter what the outcome! Because your notebook is to be filled in as you do each experiment (you are not allowed to write it first on another paper and then recopy it into your notebook later), it need not be perfect. However, it must be legible. Your notebook will never look exactly like anyone else's, but others should nevertheless be able to duplicate your experiment from what is written in your notebook.

Use a non-erasable ballpoint pen (water impervious). When you make a mistake, put a neat line or "X" through it (NOT multiple lines or squiggles or scribbles that make the error unreadable). Correctional fluids are not allowed. It is not acceptable to rip out pages. All pages should be used, do not leave pages blank. Your overall record keeping skills will be part of the notebook grade, and therefore, part of the final lab grade.

**Lab notebook evaluation:** Your lab notebooks will receive a general evaluation after each lab session. It is your responsibility to ensure the instructor sees your lab notebook before you leave K405. You will be given a check minus, check, or check plus depending on how complete your notebook format is for the recorded experiment of the day. Notebooks will be graded for completeness and legibility at the discretion of your laboratory instructor on a weekly basis, and then at the end of the semester (Dec 7<sup>th</sup>-11<sup>th</sup>) there will be a more formal notebook evaluation. You will turn in the lab notebook on your last day of lab.

**Weekly lab write-ups of the Discussion:** Each week, you will turn in a post-lab write-up 24 hours after the completion of your laboratory session. For example, if your lab ends at 11AM Tuesday, then the Discussion is due before 11AM Wednesday. The Discussion will typically address such questions as: What was the experimental objective? What were the results? What conclusions can you make relative to your original objective? Were your results expected or unexpected? What were the random sources of error in the experiment and how might each influence the resulting reported value(s)?

Avoid making judgments as to the “success” of the experiment. Be THOROUGH AND CONCISE in your responses to thought-type questions found within the experimental handout. Your discussion needs to fit on one page and to be typed. Type it, print it, and then place it in the white bookcase outside Keyes 310 (you’ll see a labeled shelf for your lab section). A 25% penalty per day will be assessed for Discussions turned in late (this penalty occurs one minute after the scheduled deadline). Your submitted work will be returned to you during your next lab meeting.

All applicable graphs, Excel tables, worksheets, and instrumental printouts must be attached to your discussion. When the graded work is returned to you, pull the sheets apart and attach each one individually to your lab notebook. For example, a full-page graph would be taped across two empty notebook pages.

**Grading:** Your laboratory grade represents 25% of your overall grade in CH141. Each of the 10 experiment grades will be weighted equally. For each experiment you will receive discretionary points by being on time, prepared (notebook, pen, pre-lab assignment in lab notebook and procedure outlined in notebook, proper lab attire, etc.), and observant of proper laboratory procedures (safety and cleanup, etc.). Coming late to lab (in most cases) will result in an immediate loss of these points. Once the lab lecture begins, you are late. Points will be lost for safety violations if more than one reminder is given by the instructor. For very serious, blatant or repeated violations after a warning, you will be dismissed from the laboratory and receive a zero for that lab exercise. We are required to enforce proper safety practices and appreciate your cooperation.

\*Each experiment grade will be derived from the following items:  
A) on time, prepared, follow safety & clean up procedures  
B) discussion & applicable attachments

\*Your notebook grade will be a summation of all the weekly spot-checks and the more formal final check.

**Missed labs:** You are required to attend your assigned lab and to complete every experiment. If you cannot attend your lab due to illness or athletic competition, you must make PRIOR arrangements with your laboratory instructor. If you are sick and go to the Health Center, you can ask your care provider to call your instructor. Laboratory work made up after an unexcused absence will be given a grade that is AT A MAXIMUM, 50% of the grade the work would have otherwise earned. If you do not make immediate arrangements with your instructor after an unexcused absence, you may be given a grade of zero for that experiment. Remember, you must complete all the labs in order to complete course. Therefore, even if you've received a zero for a missed lab, you must still complete the assignment to pass the course. Please refer to the attendance and exam policy on the Chemistry Web page ([www.colby.edu/chemistry/Attend\\_Exam.html](http://www.colby.edu/chemistry/Attend_Exam.html)).

**Intellectual responsibility:** All written work that you submit (including pre-lab assignments) must be your own. If a lab instructor observes students sharing / copying any lab work, all students involved will receive a zero for that assignment. All answers to questions must be in your own words, and you must perform all calculations yourself, **even when working with a partner.** Academic dishonesty will not be tolerated. If any assignment is found to contain copied work, it will receive a grade of zero and the responsible student(s) will be reported to the Dean of Student's Office. (Please refer to the attendance and exam policy stated on the Chemistry Web Page. ([www.colby.edu/chemistry/Attend\\_Exam.html](http://www.colby.edu/chemistry/Attend_Exam.html))).

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## CHEMISTRY 141 - FALL 2009

### LAB SCHEDULE

<b>Week</b>	<b>Laboratory</b>
1: Sept. 9	No labs
2: Sept. 14	Introduction to Excel
3: Sept. 21	Isotopes
4: Sept. 28	Precipitation Reactions
5: Oct. 5	Strong and Weak Electrolytes
6: Oct. 12 (fall break)	No labs
7: Oct. 19	Redox Reactions
8: Oct. 26	Ideal Gasses
9: Nov. 2	Calorimetry
10: Nov. 9	NO <sub>x</sub> spectroscopy
11: Nov. 16	Molecular Modeling I
12: Nov. 23 (Thanksgiving)	No labs
13: Nov. 30	Molecular Modeling II
14: Dec. 7	Lab cleanup (mandatory attendance!)

## GENERAL CHEMISTRY LABORATORY SAFETY

1. **Read** the experiment before coming to lab. The more prepared you are, the safer and more efficient you will be in lab. Completion of the pre-lab assignment will help you understand what you will be doing before your scheduled lab.
2. Think about what you need to wear to lab before you come to your lab. **No sandals** are allowed because your feet need a protective cover over them in case of spills or excess heat. Arrange long hair so that it won't be accidentally burned, pulled, or fall into chemical containers. **The wearing of contact lenses in the lab is not recommended**, even when wearing safety goggles. Contact lenses do not provide adequate eye protection, and in some cases may complicate or create an emergency situation. For example, caustic liquids splashed into the eyes may form a liquid layer beneath the contact lens; the eyewash will not rinse out the caustic liquid adequately unless the lens is removed. Also, some organic compounds can actually dissolve or be absorbed by the contact lens.
3. All coats and backpacks are to be left in the hallway, outside of the lab.
4. Drinks, food, candy, and **gum** are not allowed in the lab.
5. Mobile phone conversations are not allowed in the laboratory.
6. The lab instructor will indicate when you may begin experimentation each week. No one is to work in the lab alone. You may only work in the lab with authorized supervision.
7. The chemicals needed for each lab assignment will be made available in your work area as needed. Several of the substances used in this laboratory are hazardous, but when used properly and with caution, exposure is avoided. All chemicals will be marked with appropriate hazard labels. If you follow the directions given during lab, the chemicals pose no threat to your health.
8. In the case of an accident, **report any spills or breakage** to your instructor at once, so that the appropriate safety measures can be made. **DO NOT** attempt any chemical clean- up on your own. Immediate corrective measures will remove any danger.
9. In the case of a **fire** involving your clothing use the procedure called **STOP-DROP-and ROLL**. **STOP** what you are doing; **DROP** to the floor, and then **ROLL** over and over to extinguish the flames. Do not run to the fire blanket or safety shower if your clothes are on fire, **STOP-DROP-and ROLL** first. Someone else will get a fire blanket to further assist you.

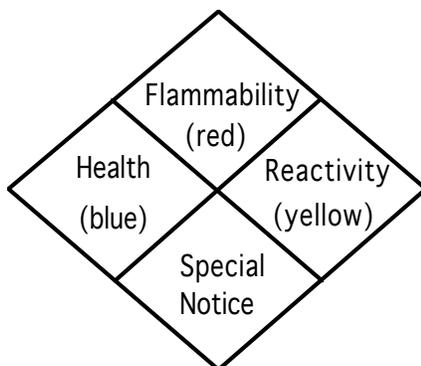
### **SAFETY RULES for everyone working in the general chemistry lab:**

1. Put on safety glasses as soon as you come into the room. They have to be worn the entire duration of lab! Even when you have finished your experiment, keep them on. Other people around you will still be working.
2. Keep your face well away from reactions. Never watch heating solutions from above; look instead from the sides of the container.
3. When smelling the odor of a liquid, do not put your nose or face directly over the container. Rather, fan a little of the vapor toward you with your hand. This will protect your nose and lungs from potentially strong smells and harmful vapors.
4. Avoid breathing dusts and vapors. Keep powders in covered beakers and work with volatile liquids in the fume hood.
5. Wash away solutions splashed onto your skin by flushing with lots of water and notify your instructor. Large corrosive spills on clothing may require use of the safety shower. In such a case, ask for help. The instructor will assist with all contaminated clothing (while you are under the shower). Go to the nearest eye wash station if solution has been splashed into your eyes. Rinse for 10-15 minutes.
6. When diluting concentrated acid, add the **acid** slowly **to the water**.
7. Label any container to which you added chemicals.
8. Transfer reagents needed for your own use into a container to measure from, taking only about what you need. Never return reagents taken out of the original container back into the original source.
9. All waste will be collected in appropriately labeled containers provided for you in the lab. It is against the law to flush many substances down the drain. Ask if you don't know where to put your waste.
10. When your work is completed, **clean your work area**. **Clean used glassware** before putting it away. **Return borrowed items** in better condition than originally found. **Wash your hands** before leaving lab.
11. Use common sense. Practical jokes, unnecessary noise, loud music downloaded from the WEB, etc. are not acceptable. For your protection we have to enforce all safety rules.

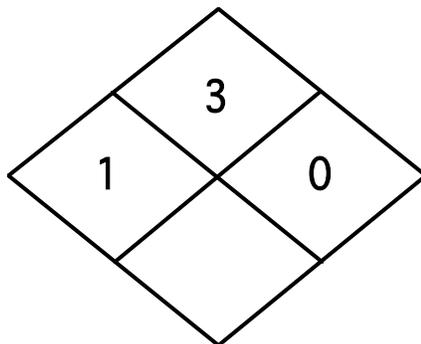
## MORE INFORMATION: MATERIAL SAFETY DATA SHEETS

The Hazard Communication Standard gives workers the right to know the hazards to which they are exposed. In compliance with this standard, Material Safety Data Sheets (**MSDS**) are kept in lab for chemicals you will be handling. Each MSDS sheet includes the name of the chemical (or components of a mixture), common names, physical and chemical characteristics, fire and explosion hazard data, reactivity data, health hazards and precautions for safe handling of that substance. A more comprehensive collection of MSDS for all chemicals located in this building is kept on the third floor corridor of Keyes.

Stock bottles of chemicals also contain safety information. This includes chemical name, manufacturer, health, flammability and reactivity hazards. The label also includes specific hazards unique to that chemical (oxidizer, water reactive, etc.). The diamond on some bottles indicates these hazards also:



The numerals in the boxes of the diamond indicate the severity of the hazard with "0" indicating little or no hazard and "4" indicating severe hazard. For example, acetone (the major component in nail polish remover) has the ratings:



That is, the health rating of 1 means acetone can cause some irritation, but only minor residual injury. The fire rating of 3 means acetone is flammable. The reactivity rating of 0 indicates that acetone is stable under a variety of conditions, including exposure to water.

## CH 141 (2009): CHEMISTRY LABORATORY SAFETY AGREEMENT

During your first lab meeting, you will view a safety video and be shown all of the safety features available in your work area. You will then be **required** to draw a sketch in your lab notebook of your laboratory that indicates the location of the following features:

shower	2 exits	4 eyewash stations
3 fire extinguishers	first-aid kit	phone
fire blanket	2 glass disposal boxes	

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I have watched the Colby College Chemistry Department Safety movie and have read the documents entitled General Chemistry Laboratory Safety and Chemistry 141 Lab Syllabus. I understand and will follow the safety practices and lab policies described therein.

I have been shown where the safety equipment is located in my lab room. I have drawn a map of my lab room in my lab notebook indicating the locations of all safety items to refer to as needed.

**Printed Name:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Lab Section:** \_\_\_\_\_

**Lab Drawer #:** \_\_\_\_\_