

# Chemistry 241 Laboratory – Fall 2018

**Instructors:** Jeff Katz, Keyes 216/210, x5754, [jlkatz@colby.edu](mailto:jlkatz@colby.edu)  
Ed Klinkerch, Keyes 308, x5762, [ejklinke@colby.edu](mailto:ejklinke@colby.edu)

**Location:** Keyes 305

<b>Meeting Times:</b>	Section A	Mon. 1:00 to 4:30 pm	Jeff Katz
	Section B	Tues. 1:00 to 4:30 pm	Ed Klinkerch
	Section C	Wed. 1:00 to 4:30 pm	Jeff Katz
	Section D1	Thurs. 8:00 to 11:30 am	Ed Klinkerch
	Section D2	Thurs. 1:00 to 4:30 pm	Ed Klinkerch
	Section E	Fri. 1:00 to 4:30 pm	Ed Klinkerch

**Website:** <https://wiki.colby.edu/display/CH241Katz/CH241+Laboratory>

**Required Materials:** (a) Bound laboratory book with duplicate tear-out pages  
(b) Experiment handouts (see below)  
(c) Approved safety goggles

## Lab Safety:

We have several policies in place to help keep you and your labmates safe in lab. Please be sure to read, understand, and adhere to these policies, which are provided on pages 5-7 of this handout.

## Lab Lecture:

Each week there will be a brief lecture on important information related to the lab. Specific safety information, changes to procedures, and demonstrations will be provided as necessary. This information supplements what is in the lab handout. As such, **punctuality is an inflexible requirement each and every week** (see grading consequences below).

## Attendance:

You are required to attend your assigned lab section and complete every experiment. If you cannot attend your lab due to illness or athletic competition, you must make PRIOR arrangements with Ed Klinkerch, unless it is a health emergency, for which your health care provider must contact your advising dean, who will notify your instructor that you will be making arrangements shortly after your lab. Unexcused absences will earn a zero for that lab. However, you must complete all the labs in order to complete and pass the course. Therefore, even if you've received a zero for a missed lab, you must still complete the assignment at a passing level. Please refer to the attendance and exam policy on the Chemistry web page (<http://www.colby.edu/chem/about/chemistry-attendance-and-exam-policy/>).

## Experiments:

Lab experiments will be available on the Chemistry 241 course web page several days before each lab (usually by Wednesday the week before the experiment begins). These documents will include a detailed description of the experiment as well as instructions for what work to complete prior to your lab section. You are expected to download the experiment and bring a printed copy to lab with

you each week. A full schedule of the experiments is also provided on page 4.

### **Pre-laboratory Preparation:**

Well before each lab, prepare yourself by carefully reading the laboratory handout. Most labs have required pre-laboratory preparations, so it is important that you download the experiment as soon as it is posted to give yourself ample time to complete them (some require that you find information not provided in the handout itself). Write your prelab preparations in your laboratory notebook (use separate pages for each week and also different pages than entries made in lab for the week). Write your name and lab section on all prelab pages. These preparations will ensure your time in lab is most productive and will also be needed for the prelab quizzes at the beginning of lab each week, to which you will attach the carbon copies of that week's prelab preparations.

### **Pre-laboratory Quizzes:**

At the beginning of each lab there will be a short pre-lab quiz (~5 min) that will be open notebook. Thus, you can use anything in your notebook that you have written yourself (i.e., no photocopies or computer-printed items). We hope that this quiz will provide you with the incentive to do ample preparations before lab (when the benefit for doing so is the greatest). The quiz will ask questions that you should be able to answer if you have done a good job completing the required prelab preparation for that week (see each experiment for details). In addition, important information that you should have recorded the previous week in lab may appear on the quiz, to give you the motivation to keep a reasonably detailed notebook. **If you are late to lab, you will receive a score of zero for the quiz. Please be punctual, as the quiz will not be given to late arrivals.**

### **Notebook:**

Your laboratory notebook is the primary record of all work done in lab. Everything relevant to the experiments you perform should be entered into your notebook as you proceed. It is not appropriate to fill in your notebook after the fact; this would make your entries recollections, not a primary record. Your notebook will never look exactly like anyone else's, but others should be able to duplicate your experiment based on the procedure and notes you've recorded.

The following guidelines should help you understand what is expected:

- The notebook must be bound and have tear-out carbon copy pages.
- All entries must be permanent, i.e. use non-erasable ink, not pencil.
- Every entry need not be perfectly neat, but it must be legible, even errors. Cross out mistakes with a single line so that the original entries are still easy to read.
- If your lab notebook does not have a Table of Contents already in place, save and label the first two pages for a Table of Contents.
- Record the title of each experiment and the date the work on that page was performed.
- Label each experiment with name and your partner(s) name(s), when applicable.
- Detailed procedure, data (including units), graphs, calculations, and observations should be in your notebook.
- Cite references and sources directly in your notebook whenever appropriate.
- **Turn in your laboratory "carbon" blue sheets to your lab instructor at the end of each lab session.**

### **Lab Reports:**

Unless indicated otherwise by your instructor, lab reports are due at the very beginning of your

particular lab section one week following the completion of the experiment. Lab reports must be typed and copies of spectra (if any) should be attached. **In addition**, send by email a copy of your lab report (**without attachments**) to [CH241Lab@colby.edu](mailto:CH241Lab@colby.edu). Structures and reactions must be drawn with ChemBioDraw for laboratory reports. A copy of this software is available to you for no charge – see the Laboratory Website for download and installation instructions. Instructions on what to include in your report will be provided in the handout for each experiment. This semester you will work with a partner when carrying out experiments in lab, and **each student team will turn in a single lab report**. The success of such a partnership will depend very much on both of you pulling your weight and working well together. **Both members of the group will contribute to the writing of reports, and both will receive the same grade.**

### **Citations:**

Please follow the guidelines in the ACS Style Guide that is available in the lab and Olin library. An example sheet is provided on the last page of this handout and the information is also here: <https://libguides.williams.edu/citing/acs>

### **Intellectual Honesty:**

Honesty, integrity, and personal responsibility are cornerstones of a Colby education and provide the foundation for scholarly inquiry, intellectual discourse, and an open and welcoming campus community. These values are articulated in the Colby Affirmation and are central to this course. Students are expected to demonstrate academic honesty in all aspects of this course. Academic dishonesty includes, but is not limited to: plagiarism (including quoting sources without quotation marks around the borrowed words and a citation); presenting another's work as one's own; buying or attempting to buy papers or projects for a course; fabricating information or citations; knowingly assisting others in acts of academic dishonesty; violating clearly stated rules for taking an exam or completing homework; misrepresentations to faculty within the context of a course; and submitting the same work, including an essay that you wrote, in more than one course without the permission of instructors. Academic dishonesty is a serious offense against the college. Sanctions for academic dishonesty are assigned by an academic review board and may include failure on the assignment, failure in the course, or suspension or expulsion from the College. For more on recognizing and avoiding plagiarism, see the library guide: [libguides.colby.edu/avoidingplagiarism](http://libguides.colby.edu/avoidingplagiarism)

### **Grading:**

Your laboratory grade represents 20% of your overall course grade. For each experiment you will receive discretionary points for being on time, being prepared (notebook, pen, printed experiment, proper lab attire, etc.), and observant of proper laboratory procedures (safety and cleanup, etc.). Coming late to lab will result in an immediate loss of some those points as well as the possibility of missing the pre-lab quiz, which will earn you a zero grade for it. If you arrive after the pre-lab lecture or quiz begins, you are late. Points will be taken away for a minor safety violation that occurs again after the instructor has issued you one warning. Major safety violations can result in the loss of all discretionary points and/or dismissal from the lab.

**Resources:** In addition to the help the lab instructors can provide, there are many resources in the Olin Science Library and in the Organic laboratory (Keyes 305). You are encouraged to take advantage of the variety of laboratory manuals, textbooks, and other reference materials. It is especially important for you to become familiar with the *Merck Index* and the *CRC Handbook of Chemistry and Physics*. Catalogs published by chemical companies such as Acros and Sigma-Aldrich are also useful sources of information, and are available in the lab and Olin library.

## CH241 LABORATORY SCHEDULE FALL 2018\*

WEEK	EXPERIMENT	WEEK REPORT IS DUE IN LAB
Sept 10	Experiment #1: Separation and Recovery of Organic Compounds	
Sept 17	Experiment #1: continued	
Sept 24	Experiment #1: continued	Oct 1
Oct 1	Experiment #2: Molecular Modeling I	Oct 8
Oct 8	Experiment #3: Resolution of Enantiomers	
Oct 15	<b>Week of Fall Break; No Lab</b>	
Oct 22	Experiment #3: Continued	Oct 29
Oct 29	Experiment #4: Molecular Modeling II	Nov 5
Nov 5	Experiment #5: Nucleophilic Substitution Reactions	Nov 12
Nov 12	Experiment #6: Dichlorocarbene Addition to Alkenes	
Nov 19	<b>Week of Thanksgiving Break; No Lab</b>	
Nov 26	Experiment #6: continued	Dec 3
Dec 3	Lab Cleanup	

**\*If you have a CH241 exam on the day your lab report is due, then you are eligible for a one day extension of the deadline to turn in your report.**

## **GENERAL SAFETY RULES FOR THE CHEMISTRY LABORATORY FOR YOUR PROTECTION WE HAVE TO ENFORCE ALL SAFETY RULES**

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 preparations 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 open-toed footwear** is allowed because your feet need a protective cover over them in case of spills, broken glass, 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. If you choose to wear contact lenses against this advice, please let your lab instructor know in writing at least one hour before lab begins.
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. All wrappers must be placed in waste receptacles outside of the lab.
5. Mobile phone conversations and texting are not allowed in the laboratory. **Remove gloves** before using any device, such as a phone or calculator, to minimize contamination of that device.
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 cleanup on your own.
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.

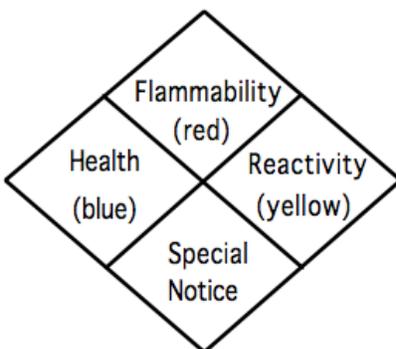
## SAFETY RULES FOR EVERYONE WORKING IN THE ORGANIC CHEMISTRY LAB

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. Avoid breathing dusts and vapors. Keep powders in covered containers and work with volatile liquids in the fume hood.
4. Wash away solutions splashed onto your skin by flushing with plenty 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 a solution has been splashed into your eyes. Rinse for 10-15 minutes.
5. When diluting concentrated acid, add the acid slowly to water. **Not** the other way around.
6. Label any container to which you have added chemicals and you are not going to use immediately.
7. Transfer reagents needed for your own use into a container to measure from, taking only about what you need. Never return unused reagents back into the original container.
8. 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.
9. 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.
10. Use common sense. Practical jokes, unnecessary noise, loud music downloaded from the Web, etc. are not acceptable. **You may not use headphones/earphones in the lab or sit on top of lab benches.**

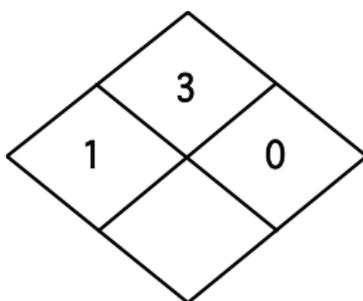
## MORE INFORMATION: MATERIAL SAFETY DATA SHEETS

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 in 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.

## Sample Citations

### Citing a book:

Brown, T. L.; LeMay, H. E., Jr.; Bursten, B. E. *Chemistry: The Central Science*, 10 ed.; Pearson: Upper Saddle River, 2006; p 24.

### Citing a web page:

NIST Chemistry WebBook. <http://webbook.nist.gov/chemistry> (accessed Sept 3 2013)

### Citing a journal article:

DeMoura, J. M.; Marcello, J. A. *J. Chem. Ed.* **1987**, *64*, 452.

### Citing a periodic table:

*Periodic Chart of the Elements* Fisher Scientific, 1997.

### Citing a lab mate or instructor:

Klinkerch, E. Personal Communication

Additional examples are available at: <https://libguides.williams.edu/citing/acs>