CHEMISTRY 250:
Introductory Organic Chemistry I

Spring Semester, 2015
Professor Felix A. Carroll

Chemistry 250 is the first half of Chemistry 250–350, a two-course introduction to the science of organic chemistry. Most students who elect this course do so because it is required for a science major or for entrance into a professional school. However, at Davidson ***organic chemistry should be viewed as a liberal arts course***.

⇒ As a systematic body of knowledge that explains the properties of substances in the world around us, organic chemistry provides the foundation for understanding both inanimate materials and living organisms.

⇒ As an educational experience that enhances life-long learning, no matter what the career objective of the student may be, organic chemistry is a valuable means to acquire critical thinking skills. Sydney Harris wrote, "You don't learn to think by thinking about thinking. You learn to think by thinking about something." In CHE 250–350, one learns "organic thinking." This term was defined by Nicholas Turro as follows:

> "The beginning student of organic chemistry is often bewildered by what appears to be an enormous maze of random structural variations and reactions that can be mastered only by tedious memorization. To the organic chemist, however, the same subject is often a beautifully ordered discipline of elegant simplicity. An important value of learning organic chemistry is the mastering of 'organic thinking', an approach to intellectual processing whereby the 'sameness' of many families of structures and reactions is revealed."
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> – N. J. Turro, *Angew. Chem., Int. Ed. Engl.* **1986**, *25,* 882.

⇒ As an experimental science that requires theories to be correlated with observations, organic chemistry teaches both the logical use of evidence and an appreciation of the inherent uncertainty in human knowledge, both of which are essential components of a liberal arts education. The importance of understanding the limits of human knowledge was articulated by Bronowski (quoted here with the original British spelling).

> "The Principle of Uncertainty, or, in my phrase, the Principle of Tolerance fixed once (and) for all the realisation that all knowledge is limited. It is an irony of history that at the very time when [the uncertainty principle] was being worked out there should rise, under Hitler in Germany and other tyrants elsewhere, a counter-conception: a principle of monstrous certainty..."
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> "It is said that science will dehumanise people and turn them into numbers. That is false, tragically false. Look for yourself... [at the] concentration camp and crematorium at Auschwitz. This is where people were turned into numbers... And that was not done by gas. It was done by arrogance... When people believe that they have absolute knowledge, with no test in reality, this is how they behave."
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> – Jacob Bronowski, *The Ascent of Man* (Little, Brown, Boston, 1973).

As Turro noted, beginning students sometimes think that memorization is the key to doing well in organic chemistry, but that should not be the case. Certainly the recall of specific facts is essential in CHE 250, as is also the case in other disciplines. However, students should seek first to understand the fundamental models of structure and bonding that provide a coherent framework for the facts. In the course of using these fundamental models, students will be able to expand their base of knowledge about organic substances and their reactions more easily than would be possible through memorization alone. More important, they also will develop critical thinking skills that are applicable to other areas of life.

The study of organic chemistry is especially relevant for the development of logical thinking skills by students interested in medical careers. Not only is biochemistry founded upon organic chemistry, but also the ability to think through medical problems is honed in organic chemistry class. For example, identifying an unknown substance on the basis of spectra or functional group tests can be considered a kind of "differential diagnosis." This benefit of studying organic chemistry was emphasized by Ronald Breslow:

> "For physicians, the course in organic chemistry is the base on which their education in biochemistry and pharmacology can build. It prepares them to grow intellectually as the practice of medicine becomes increasingly scientific and chemical during their careers...
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> "Currently, medical school admission committees not only require a course in organic chemistry, but they put unusual emphasis on the performance of the applicants in such a course. This is because organic chemistry courses require the mastery of a lot of new material, and the ability to use that material in new ways to solve new problems. The famous 'synthesis' problems teach more than organic synthesis—they teach intellectual synthesis. They teach how to think through what students have learned to find the facts that will solve a problem they have not seen before. The result is that the ability to do well in such courses is an excellent predictor of the ability to do well in medical school."
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> – Ronald Breslow, *Chem. Eng. News* (March 16, 1998, p. 5.)

The emphasis on critical thinking skills that can be acquired through mastery of organic chemistry can have a more immediate value to students preparing for the new MCAT. An Ohio State University website reported that the Kaplan director of MCAT 2015 said:

> "The biggest misconception among pre-medical students when it comes to the MCAT is that they think that it is a science test… In reality, the MCAT is a critical thinking test that also happens to include quite a bit of scientific content… The point is that students can't simply expect to memorize as much scientific content as possible and then regurgitate it on test day… It just doesn't work that way."
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> (Excerpts from http://osu.uloop.com/news/view.php/101230/mcat-success-tips-from-kaplan-director-of-mcat-2015-owen-farcy, viewed June 9, 2014.)

The critical thinking skills developed in CHE 250–350 are valuable no matter what may be the career choice of the student, but these skills are especially useful for students who choose careers in chemistry. As it was put by a Nobel Prize winner in chemistry, Donald Cram:

> "No other profession is endowed with such a rich landscape, draws inspiration from so many fields of science, exercises the hand and mind in so many different ways, offers such opportunities to employ creative instincts, and mixes ideas, theory, and experiment on a daily basis."
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> – Donald J. Cram, with Jane M. Cram, in the preface to
> *Container Molecules and their Guests* (Royal Society of Chemistry and CRC Press)

Texts and Class Schedule

"Teachers open the door… You enter by yourself." – Chinese Proverb

The lecture text for Chemistry 250 is *Organic Chemistry, Eighth Edition* by L. G. Wade, Jr. The laboratory text is *Experiments in Organic Chemistry, Third Edition* by R. K. Hill and J. Barbaro. Students will also need the *Study Guide* for *Organic Chemistry, Eighth Edition* and a set of molecular models, such as the Prentice Hall *Molecular Model Set for Organic Chemistry* or the *HGS Molecular Model Set* for organic chemistry.

During the first six weeks of CHE 250, students will have free access to *Sapling Learning*, an online homework and tutorial system. Unless *Sapling* proves to be unsuitable for this course, students will need to purchase a license to use the system for the rest of the semester (~$40) or through the next semester also (price TBA).

Because CHE 250 will cover selected topics from most of the chapters in the textbook, a detailed listing of course topics and dates is too lengthy to include here. A partial schedule is given below. A more complete schedule will be provided on *Moodle*, and students should check *Moodle* regularly to see any changes in that schedule. The material to be covered on each review will include lectures, readings (in both lecture *and laboratory* texts), *PowerPoint* presentations, and *Moodle* material assigned prior to the review. Reviews are cumulative over the entire semester. That is, each review will cover material presented in earlier parts of the semester, not just since the previous review.

Date(s)	Chapter(s)	Topics
Jan. 12		Introduction to Organic Chemistry
Jan. 12 –21	1	Principles of Structure and Bonding
Jan. 21 – 26	2	Bonding and Properties of Organic Molecules
Jan. 26 – Feb. 6	3, 6.2	Structure and Conformation of Alkanes and Cycloalkanes
Feb. 9	1-3, 6.2	Review I
Mar. 13	see Moodle	Review II
Apr. 20	see Moodle	Review III
May. 4	see Moodle	Mini-Review
May. 6		Course Evaluation and Comments about Final Examination

Due to holidays and spring break, class will not meet on Jan. 19; Mar. 2, 3, 5; April 6.

The date of a review will not be delayed at the request of a student who has other reviews or assignments on the same day. However, a student who encounters ***unforeseeable*** circumstances (such as the unexpected illness of a close family member) that interfere with academic work may be granted an extension. Also, the schedule may be adjusted in case of conflict with a religious holiday.

Some students may have access to files of reviews given in this course in previous years. The use of such "spots" is permitted, and studying old reviews may give an indication of what material is most important and what question formats might be used. Some reviews from previous semesters will be made available on *Moodle* for the first review.

Class Policies

Chemistry 250 will meet on Monday, Wednesday, and Friday this semester, and students will also attend one laboratory session each week. Although some classes may be "flipped," most class periods will be lectures. As a column in the journal *Science* noted,

> "Science is about things—objects and their relations—that must be known before process can be applied to problems of real interest... It just may be that counterrevolutionary, old-time lecture hall education is still with us after all these centuries because—although everyone agrees it is a terrible way for students to learn—it is still the best thing anyone has invented."
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> —Stephen Arch, *Science*, **1998**, *279*, 1869.

CHE 250 classes, prelab sessions, and laboratory periods are protected by intellectual property and privacy laws and may not be transmitted or recorded in any form unless i) the Dean of Students has authorized recording as an academic accommodation for a qualified student with a disability and has notified the instructor of that authorization *and* ii) the student has received prior, written approval from the professor and also from any class member(s) who might be identifiable in a recording or transmission. Such recordings are for the sole use of the individual student while enrolled in this course. They may not be reproduced, sold, posted online, or otherwise distributed and must be destroyed at the end of the course.

It is important to note that lectures in CHE 250 are intended to ***complement*** the textbook**,** not to repeat it. Students should read a chapter before the first class period when that chapter will be discussed, work the in-chapter problems while reading the chapter, and then work as many as possible of the end-of-chapter problems. The textbook problems constitute the "homework" for this course. In all cases it is important to actually ***work*** the problems and ***write*** the answers, not just read the problems and then look at the answers in the solutions manual. *Sapling Learning* assignments will count as part of the course grade. There may be afternoon or evening problem sessions several times during the semester so that students may ask for clarification of problem solutions, but students are urged to come by for help during office hours whenever questions arise instead of waiting for the problem sessions. Office hours will be posted on my office door and on *Moodle*, but I will generally be available to answer student questions at any time I am in the office.

There is a Chemistry Department policy requiring professors to keep a roll of class attendance for chemistry courses. Students are expected to attend all class meetings, and the college policy regarding attendance will be followed. That is, a student who misses 25% of the classes will not receive a passing grade except in case of extenuating circumstances.

Letter grades will be computed from numerical averages according to the following scale: 93–100 = A, 90–93 = A-, 87–90 = B+, 83–87 = B, 80–83 = B-, *etc*.). The term grade will be based on the following components:

Reviews	275 possible points
Sapling Learning and other assignments	35 possible points
Laboratory	75 possible points
Final Examination	15 possible points
TOTAL	400 possible points

The ability to write clearly and correctly is important for scientists, physicians and other professionals. Therefore, ***grammar, spelling, and punctuation will be graded in all writing related to this course.***

Chemistry 250 Study Suggestions

"As might be expected, a correlation does exist between passing rate and the number of hours per week reading or studying." —P. G. Jasien, "Factors Influencing Passing Rates for First-Semester Organic Chemistry Students" in *The Chemical Educator*, **2003**, 8.

"It's not that I'm so smart. I just stay with problems longer." —Albert Einstein

Chemistry is an "intensive" as opposed to an "extensive" discipline, and the organization is "vertical" rather than "horizontal". The knowledge gained in each part of Chemistry 250–350 builds on that gained earlier. Students must learn the fundamental principles developed in each part of the course so that they can understand the material presented in the next part of the course. ***Students who attempt to memorize facts without developing an understanding of the scientific principles that are the foundation for those facts will find—especially in the latter part of the course—that they are unable to keep pace.*** Therefore, students should plan a **regular study schedule** for organic chemistry and follow it faithfully. "Cramming" for reviews in CHE 250 is generally unproductive. As *Science News* (*146*, 244) reported:

> "Every wonder why cramming for a test can result in a passing grade but no recollection 6 months later of the material you studied? … Two reports… in *Cell* indicate that **permanent recall results only when learning occurs with rests between** … **study sessions**… In contrast to short-term memory, permanent recall involves the production of new proteins".

Because of the cumulative nature of organic chemistry, material memorized through cramming will be lost, but that knowledge will be essential to do well in later parts of the course. Therefore memorizing and cramming may lead to a pattern of continually declining grades as the semester progresses.

The regular nature of the rest periods is also important. In particular, *students should not vary their sleep patterns from night to night*. An Associated Press report (June 25, 1989) said, in part

> "Students who study Monday through Friday and then party all night on weekends may lose much of what they learned during the week, according to a sleep researcher... (who reported that) retention of new, complex knowledge can be disrupted even by mild sleep deprivation just after learning the information… 'It appears skewing the sleep cycle by just two hours can have this effect,' (he said)…This means, he said, that students who party all night Friday after a tough week in school will lose 30% of the learning they acquired Wednesday and Friday."

Laboratory Notes and Schedule

I hear and I forget. I see and I believe. I do and I understand.
– Confucius

Chemistry is an experimental science, and the chemistry laboratory is a central component of education in chemistry. Some chemistry 250 laboratory experiments are intended to correlate experience with classroom discussion. Some experiments may be "discovery labs," through which students observe important principles in lab and then learn the theoretical basis for the principles in class. In addition, some introductory experiments are designed to teach fundamental laboratory techniques that will be used in more advanced experiments in CHE 350.

The lab grade in CHE 250 will be based on the lab notebook, lab reports, pre-lab quizzes, products submitted for grading, as well as instructor observations of lab technique and impressions of student preparation for lab. Notebooks will be submitted for grading near the end of the semester but may also be evaluated at any other time during the term. Lab reports will be due on dates announced in class or lab.

Lab Days	Experiment
Jan. 23, 26, 27	Read sections G1, G2, and G3 in the lab text. View the materials posted on *Moodle*. Check in to lab. Determine the location of all safety equipment in the laboratory. Carry out the physical properties investigation in small groups, and then prepare a group skit to explain the observations.
Jan. 30; Feb. 2, 3	Read section T3 in the lab manual and view the material posted on *Moodle* for this week. Begin the melting range experiment. (You may continue the experiment in following weeks.) Also begin the molecular mechanics experiment.
Feb. 6, 9, 10	View the material posted on *Moodle* for this week. Carry out the optical activity experiment according to the handout and continue the molecular mechanics experiment.
Feb. 13, 16, 17	Before coming to lab, read sections T1, T2F, T5D, and T9 and view the material on *Moodle*. Carry out the hydrolysis of methyl salicylate according to the handout on *Moodle*. Store the salicylic acid in the desiccator so that it will be dry and can be weighed before recrystallization next week.
Feb. 20, 23, 24	Read section T2. Weigh the salicylic acid from the previous week and then recrystallize it from hot water. Collect the recrystallized salicylic acid and dry it in the desiccator for use in a subsequent lab. Use remaining time to complete the melting range experiment. Turn in your melting range lab report at the end of this lab period.
Mar 13, 16, 17	Read experiment E19 and view the material on *Moodle*. Use the indicated quantity of the salicylic acid for the synthesis of aspirin (experiment 19, ***microscale***). Turn in the remaining salicylic acid (labeled as specified in the syllabus) for grading. The mass indicated on the vial should be the *total* yield of salicylic acid, *including the amount used for the synthesis of aspirin.*
Mar. 27, 30, 31	View the materials on *Moodle* and read sections T1, T5 and T6 in the lab manual. Carry out the isolation of caffeine from tea as described on *Moodle*. Save the caffeine for analysis later in the semester. (Also weigh the aspirin product from last week.) ***Have your notebook witnessed*** **by a fellow student** (***as described in the syllabus***) at the end of this lab period.
Arp. 10, 13, 14	Read section T7 and the pages on Experiment 3 and also view the material posted on *Moodle* for this week. Carry out the thin layer chromatography (TLC) experiment *as described in the handout on Moodle.* Use **only a *small* portion** of your aspirin for TLC; turn in the rest for grading (labeled as specified in the syllabus). Also turn in the TLC lab report before leaving lab.
Apr. 17, 20, 21	Clean all equipment and check out of lab. Turn in notebooks *at the end of the lab period*
Apr. 24, 27, 28	Attend a workshop on reaction mechanisms and potential energy surfaces.

Special Comments Concerning the Laboratory

Do you know the difference between education and experience? Education is when you read the fine print; experience is what you get when you don't. – Pete Seeger

1) Safety

Safety is of paramount importance in the chemistry laboratory. ***Approved eye protection must be worn at all times*** while you are in the laboratory. The department provides disposable gloves, and you are encouraged to use them in the lab in order to avoid contact with hazardous substances. You must also wash your hands thoroughly at the end of each laboratory period.

All lab work is potentially hazardous, but unsupervised lab work is even more dangerous. Students may work in lab only during their scheduled periods.

2) The Notebook

The notebook is a major component in the evaluation of your work in the organic laboratory. You should read and follow faithfully the comments given in your lab text as well as those given below and those in the *Moodle* posting.

The type of notebook you should use will be discussed in class during one of the first class meetings and is also given on *Moodle*. Note especially that you should *not* use the notebooks with blue squares on white or yellow pages. They may be appropriate for laboratories in which graphs must be drawn on notebook pages, but they are hard to read. The rule of thumb is that if anything cannot be read easily or if it is written on loose-leaf paper, then it is not adequately recorded in your notebook.

Do not write your name on the front of the notebook. Instead write only your lab desk number and the course number. (The purpose of this requirement is to ensure that the grading of the notebook is entirely objective.) You may put your name in the back of the notebook if you are worried about losing it.

Always write in blue or black ***ink***. Number ***all*** pages (page 2 is the back of page 1) ***before*** you begin any lab work, and maintain an up-to-date table of contents at the front of the notebook. Write preliminary entries, data/observations, and conclusions only on the ***right-hand page*** – leaving the page on the left for calculations – because "bleed through" can make the notebook illegible if you write extensively on both sides of a page. (Again, see the example on *Moodle*.) **Never*, ever,* for any reason leave a blank "right-hand" page in the notebook**. **Never tear a page from the notebook.**

Entries into the notebook should be written in ***three distinct stages:***

I. Before you come to the laboratory:

(1) View any assigned material on Moodle and also read the assigned handout and/or sections of the lab text. (Reviews may include questions based on Moodle postings or lab text assignments.) The lab text gives a detailed description of the important techniques to be used in specific experiments as well as other important lab techniques, and these descriptions should be read carefully. It is essential to "think through" the experiment and procedures beforehand so that lab time may be used effectively. The experiments are designed to be completed during the assigned laboratory periods. Students who work late because they did not arrive on time, or who did not use lab time efficiently due to inadequate preparation, demonstrate poor lab technique and will be graded accordingly.

(2) Begin each week's work at the top of a new right-hand page. Give a title and date for each new experiment. Write a short statement indicating the purpose of the experiment.

(3) From library references, prepare a *table* (not just a list) of physical properties of all the materials with which you will be working. A minimum table includes name, mol. formula, mol. weight, mp, bp, density (of liquids), and solubility in water and organic solvents. *List the source(s) for all data.* (For convenience you may note at the beginning of the notebook something like "Unless otherwise noted, all physical property data are obtained from ...") Note that **you should use a printed reference** for all physical data unless the information is available *only* on the web **or** is on the web site of a standard published reference that is available through the Davidson College Library, such as http://www.chemnetbase.com/ or http://www.rsc.org/merck-index. It is essential that you learn to acquire and use data independently, so do not copy any information from notebooks or other notes of current or former students. (See the notebook pledge below.)

(4) Consult the *Merck Index*, appropriate MSDS, or other sources and record toxicity data and any other hazardous properties in the table. List a source for all such data. Again, do not copy any information from notebooks or other notes of current or former students.

(5) **Show the structures of all organic compounds you enter into the table**. If chemical reactions are involved, write equations for them. Indicate for each reactant the molecular weight, quantity used (in grams), and number of moles used. For synthetic reactions (such as the synthesis of aspirin), specify the limiting reagent and calculate the theoretical yield of product in both moles and grams. After the synthesis has been completed, calculate the percent yield of product.

(6) **At the end of all data entered before coming to the laboratory, draw a horizontal line across the page** so that it is clear that anything below the line was added in lab, and then write the date below the line. "Sign" the line and date with your desk number.

Notes: 1) *Do **not** write any descriptions of the procedure into your notebook before lab.*
2) *Again, do **not** leave **any** blank pages between experiments, and **never** tear any page from the notebook.*

II. While you are in the laboratory:

(7) Begin each entry with the date of the laboratory work. Note the source of the experimental procedure to be followed and record any planned deviations from that procedure. Record data and make observations, using **first person, past tense, active voice** and writing in **complete sentences.** (Other instructors may specify use of the passive or third-person for some purposes, but you should use the style specified here for your lab notebook in this course.) Unless you are directed otherwise, determine the yield and the melting range of all products. Do not just copy the procedure from your lab text. You should reference the lab text as the source of the procedure, but you should ***integrate*** procedure with your observations. For example: "I added **0**.8 mL of concentrated hydrochloric acid solution to the beaker and noted the appearance of a voluminous white precipitate." Note the "**leading zero**" before the decimal point. (For the kinetics experiment, you would write "my lab partner and I" or "my lab partner added…") You must write all data **directly** in the notebook, not on other paper. Plan your work so that all data and observations are entered into the notebook properly while you are in the laboratory, not at some later time. **If you make a mistake**, put a **single** line through the error, "initial" (with your lab desk number, not your actual initials) and date the line, and then enter the correct value. Do not obliterate any entry. ***It is a serious error to submit for grading a notebook that has been rewritten or "copied over" outside of lab.***

(8) **At the end of each section of experimental observations**, 1) draw a line across the page just below your last data/observation entry for the day; 2) write the date below the line; 3) "sign" with your desk number. If you need to continue any experiment on a later date, also add "continued on page xx" so that a reader can find the information quickly.

In many academic laboratories and in most industrial and medical research laboratories, a notebook must be prepared and maintained in a precise fashion so as to be admissible as evidence in legal proceedings. In order to provide experience with keeping a notebook in the manner required in such settings, you will have the notebook "witnessed" before you leave the laboratory each day. For most labs, that means having the lab assistant sign and date just below your date and desk number. However, another student should witness your notebook **on the day you isolate caffeine from tea** (***and only on this day***). The procedure for doing so is as follows: 1) Ask another student to read your observations for that date.

2) That student should then write "Read and understood by" below your date and desk number entry (see the first paragraph of this section); and then write his or her desk number and the date of the witnessing. (***You*, not the witness, are responsible for ensuring that this witnessing is done correctly**.)

III. After you leave the lab:

(9) Write a brief summary statement or conclusion, including a statement of the identification of an unknown or another result expected from the lab. ***Do not just insert a lab report***, however. The notebook and lab reports are different entities and each must stand on its own. (Note that graphs or any other items to be included in the notebook must be *stapled or taped into the notebook*, not simply included as loose items.)

(10) **If you have carried out a chemical reaction, calculate the percent yield of the product**. You should have calculated the theoretical yield before coming to the laboratory, so calculating the percent yield will be easy. Show the calculation of the percent yield on the left-hand page opposite the discussion of the result. Be sure to report a reasonable number of significant figures (no more than one decimal place) for the percent yield.

3) **Reagents, Products, and Waste**

Whenever you obtain a volatile substance from a dispensing hood or other location, use a piece of Parafilm or a *loose* stopper to ensure that no vapors escape the container as you carry it back to your work hood. At the end of an experiment, use the cup sink at the back of your work hood to wash your glassware before you bring it out of the hood for storage or further cleaning in a large sink. There should *never* be an occasion when a volatile substance can be smelled in the main lab area (outside of the hoods).

Do not discard any substance that you prepare in the laboratory until you are certain that it is not to be turned in for grading. During the semester, store each product in a clean, dry screw-capped vial. ***Label the vial*** (using a label small enough that your product is not hidden) with the following information: product name (*not* experiment number), quantity, melting range or other physical property, percent yield, and lab desk number. Do **not** put your name on the vial. When you are instructed to do so, submit the vial for grading at the designated location in the lab.

Place all laboratory waste in appropriate containers designated by the instructor.

4) **Lab Reports**

Do not write your name on lab reports; instead ***write only your lab desk number***. Each lab report (and all other written work of more than one page) must be ***stapled*** together before submission. Loose pages that become separated from other parts of the report will not be graded. **Pay careful attention to proper units and the calculation of experimental values. You will lose one letter grade for each "power of 10" error in a reported value.**

5) **The Key and Your Equipment**

You will be issued one key at the beginning of the term, and you are responsible for it throughout the semester. If you lose the key, you may obtain a replacement at a *substantial fee*. If you forget to bring your key to lab, you may ask the instructor to unlock your lab desk at the beginning of the period and to lock it at the end of the period, but a poor lab practices penalty will be included in the determination of your lab grade.

Be aware that you are responsible for the equipment that is signed out in your name and that this equipment is quite expensive. Before you leave lab each day, ensure that your equipment has been securely locked away. Be careful in loaning equipment to or borrowing equipment from another student. Under no circumstances will the instructor open your desk for another student to obtain equipment he/she has loaned you, nor will the instructor open another student's desk for you. If you need additional equipment, it is best to sign it out from the stock room and then to return it as soon as possible.

If you sign out equipment (distillation column, digital thermometer, *etc*.) from the organic "prep" room, make sure that you return it to the lab assistant and that he/she signs that you have returned it. Any equipment broken or not signed in will be added to your lab bill just as though you had checked it out from the stock room.

Your assigned workspace and any other areas (such as balance areas or melting range device areas) that you use are also your responsibility. They should be left clean and in good order before you leave the laboratory at the end of each day. Failure to demonstrate good laboratory habits will reflect adversely on your laboratory ability and, thus, on you lab grade. Remind fellow students of the need to maintain good lab order and the purity of reagents, because problems in these areas will reflect adversely on everyone in the lab.

6) **Lab Bills**

After you have checked out of lab, you will receive from the stockroom manager a lab bill for equipment signed out but not returned in good order as well as for the lab notebook and for convenience items, such as paper towels, signed out for use of the entire lab. If you have questions about the lab bill, address them to the stockroom manager.

7) **The Honor Code**

Laboratory notebooks, lab reports, lab problems, and information on products submitted for grading must be pledged. **Pledging a notebook, lab report, or vial label means pledging that all physical properties, yields, and other data have been reported as accurately as possible, that the written sections are your independent work, and that information that was to be obtained from reference works was obtained *directly* from those references** (and not from another current or former student or another notebook)**.**

A notebook pledge is shown below. At the end of the semester, sign this pledge and tape it onto the *back of the last page* of your notebook. If you cannot sign this pledge, write a detailed explanation of why you cannot do so. **Your notebook is incomplete unless the notebook pledge has been signed.**

Organic Chemistry Notebook Pledge

I obtained all entries for physical properties directly from the sources indicated and not from other students. I made all entries in this notebook on the dates indicated. I wrote all experimental observations directly into the notebook while I was in the laboratory. No entries were copied into the notebook from the back of my hand or from another piece of paper. No part of this notebook was "copied over" outside of lab.

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