

Chemistry 2040L, *Fundamental Organic Chemistry I Lab* Syllabus, Fall 2011

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Required Materials: *Organic Chemistry 2040 Laboratory Manual*
The Student's Lab Companion: Laboratory techniques for organic chemistry 2nd ed, by Lehman
Permanently bound laboratory notebook preferably with duplicate sheets
Approved safety glasses or goggles

Grades:

Grades will be assigned on a weighted scale. Lab reports will be 50%, notebooks will be 20%, quizzes will be 15%, the final exam will be 10%, and the instructor's evaluation of your lab technique/safety will be 5% of the course grade. Lab reports and notebooks will be worth 20 points each.

90 %, **A** 80 %, **B** 70 %, **C** 60 %, **D** < 60 %, **F**

Example: A student with an average of 85% on lab reports, 82% on the notebook, a quiz average of 80%, a final exam average of 87%, and a technique score of 90% would receive a grade of: $(85*0.5) + (82*0.2) + (80*0.15) + (87*0.1) + (90*0.05) = 84.1$, a B

Late assignments will receive a 5% deduction per day late. Assignments over a week late will receive a score of 0.

Laboratory Procedures:

Laboratory is an integral component of chemistry. You will be performing experiments designed to assist in the retention and understanding of material covered in lecture. Techniques important to the organic chemist will be presented initially followed by synthesis experiments.

You will be assigned a drawer and a glassware kit for the semester. You are expected to clean your bench area at the end of each lab period. It is always a good idea to clean your glassware at the end of the lab period so it will be ready when you begin. Water is often detrimental to organic preparations and separations. Do not attempt to use wet or dirty glassware in lab.

You will learn techniques early in lab that you will use throughout the year. Learn to do things correctly and your year in lab will be much easier. These are techniques that "real" chemists, biologists, and other professionals use. I will assume that you know how to do a technique if you have previously been introduced to it.

You should learn to manage your time in lab. It will become very important if you are to finish in the allotted time. Organic experiments are frequently long and have waiting periods built in. Do not waste this time. Work on your notebook, prepare for the remainder of the experiment, or do other tasks. Come to lab prepared for a couple of experiments.

Know what you are doing and how you are going to do it. If you have questions, ask during the pre-lab time. I will usually give a pre-lab lecture to orient you, but it is your responsibility to make sure everything is clear before starting.

For many experiments there are assigned questions that should be answered in the report. In all cases, the questions refer to those associated with the given experiment NOT the techniques. The technique questions are good review but are not required for the report. You may work cooperatively on reports and questions. However, **your report and question answers are to be in your words. Reports with identical discussion and question answers will receive no credit for those sections.** The goal is your learning; copying answers is NOT learning.

If it is absolutely necessary to miss lab, the instructor should be notified **before** the lab period to schedule a make-up. Each student will be allowed a maximum of one make-up.

Notebooks:

In the lab notebook, students should write up a **detailed** procedure describing the operations **as performed in lab**. The lab notebook should be written such that a reasonably trained organic chemist can duplicate the exact procedure that you followed. All lab data should be recorded **directly in the lab notebook**, not on separate sheets of paper. I will confiscate those sheets. You will then prepare a typed report from the procedure and data in your lab notebook. **Notebooks (or duplicate sheets) will be collected on September 23, October 28, and December 2 for grading.**

You will be required to maintain a research-style notebook using the following guidelines:

1. The notebook must be bound.
2. A table of contents should be placed at the beginning of the notebook. Your notebook should contain page numbers **on the right-hand pages only**. Do not remove pages from the notebook.
3. Use only pen to record entries.
4. When making corrections, place a single line through the error and continue. The error should be legible. For example, "Then, ~~40 mL~~ 8 mL of ethanol was ..."
5. The notebook should remain in order. Do not unnecessarily skip pages. Do not remove pages from the notebook except for perforated pages, if your notebook has duplicate pages.
6. Record exactly the procedures performed in lab as they happen. Record all observations and raw data (masses, mp, bp, etc.) directly in the lab notebook. If calculations are necessary, they should be included in the notebook.

Notebook format:

1. TITLE and DATE.
2. REFERENCE – be complete.
3. INTRODUCTION – tell the purpose of the lab. Write out the reactions, using structures, performed in the experiment, if appropriate.
4. PRELIMINARY INFORMATION – make a table containing the reagents used and pertinent analytical data such as MW, mp, bp, etc. This should include known hazards for the materials used. For syntheses, include the product(s) data and theoretical yield. Include references to this data.
Diagram equipment set-up if it is too complex to be easily described or understood in a few words (*i.e.* a distillation set-up should be diagramed the first time used).

5. PROCEDURE – write a concise, but complete, procedure for the experiment.
6. DATA and OBSERVATIONS –Do not rely on your memory or scraps of paper.
7. RESULTS – including yields, interpreted data, calculations, etc. Include a clear summary of what was accomplished.

Notebook Hints:

1. Notebooks will be graded primarily for completeness and overall quality.
2. An easy format is to divide the notebook vertically with two-thirds being your procedure section and one-third designated for data and observations. Then, you can easily add the data, observations, and changes to procedure directly in the notebook close to the written procedure.
3. You may use any format for the procedure section (paragraphs, outline, flow-chart), but the procedure is not to be copied word-for-word from the text.
4. Be sure that your notebook is legible.

Lab Reports:

Reports must be typed and should abide by the following format:

Title: Write the title as given in the schedule

Date:

Author:

Team Members:

Summary: Give a brief summary of the experiment and the concept explored.

Balanced chemical equation(s) for the reaction(s) used (if applicable). Prepare using a computer program. Handwritten reactions will not be accepted.

Procedure: Concisely describe the exact manipulations performed in the experiment; use your notebook as a guide. **Do not copy the procedure as written in the manual or handout.** It is to be written in the **impersonal past tense**. For example, a procedure may be reported as follows: “*t*-pentyl chloride was prepared by adding 15 mL (0.136 mol) of *t*-pentyl alcohol to 30 mL (0.36 mol) of concentrated hydrochloric acid in a separatory funnel. The reaction mixture was swirled for 5 minutes at room temperature. After stirring, the mixture was allowed to settle.” Write out the procedure based on **exactly** what you did using your notebook as a reference. Draw a sketch of the setup, if applicable.

Briefly describe the product you obtained (physical appearance). Indicate the amounts of product obtained (if applicable), in milliliters (for liquids), grams, and moles. Determine the percent yield of your reaction by showing the pertinent calculations and units. This is especially important in preparative experiments. Include any data collected pertinent to your observations.

Discussion: The most important part of the report. Discuss the experiment and your results. For technique experiments, describe a little about the theory and then explain your results in terms of the technique learned—was this expected? What conclusions can you draw? For synthesis experiments, discuss the reaction and mechanism, if known. Comment about the quality &/or quantity of the results

Questions:

Lab reports are due the lab period following completion of the experiment unless prior arrangements are made. Lab reports will be given a grade that reflects the quality of your lab technique (as evidenced by your yield, purity, and other data), your analysis and discussion of the data, the answers to the questions, and the overall quality of the lab report.

Lab Schedule:

	Activity	Required Reading
August 16, 17	Check-in, Safety, Procedures	Student's Lab Companion (SLC) pp. 35-54
Experiment 1	Molecular models	
Experiment 2	Physical property measurements	Quest. 1-4; SLC pp 222-235
Experiment 3	Recrystallization: Preparation of Acetanilide	Quest. 1-3; SLC pp 161-178, 84-93
Experiment 4	Thin layer chromatography: Analysis of Drugs	Quest. 1-4; SLC pp 133-140
Experiment 5	Column chromatography: Isolation of the Active Ingredient of Drugs	Quest. 1-4; SLC pp 120-132
Experiment 6	Resolution of (\pm)- α -phenylethylamine	SLC pp 238-244
Experiment 7	Acid-Base Extraction	Quest. 1; SLC pp 95-107
Experiment 8	Distillation and GC	Quest. 1-2; SLC pp 182-221
Experiment 9	Nucleophilic Substitution Reactions of Alkyl Halides	Quest. 1-3
Experiment 10	The Preparation of Cyclohexene	Quest. 1-3
November 29, 30	Clean-up, check-out, and Final Exam	

Withdrawal Deadline:

The last day to withdraw from this class without academic penalty is October 5, 2011. Before that deadline, a student who withdraws from the class will receive a grade of "W" that does not affect GPA. After October 5, withdrawing results in a "WF" grade that is used for GPA calculation.

This is only a partial syllabus. The general ABAC syllabus for this course can be found at: <http://www.abac.edu/syllabi/CHEM2040L>. Information about the academic dishonesty policy, attendance policy, ADA statement, and course learning objectives can be found on the general syllabus.