

Chemistry 212L
Organic Chemistry Laboratory
Spring, 2003

Wed./Thu. 1-5 p.m. 207K (pre-lab)
408K (lab work)
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Description: This semester, you will continue to focus on learning some of the techniques necessary to do experimental and synthetic organic chemistry.

Goals: To be successful in this course, the goals that you should work towards are:

1. Continuing to build skills and gaining competence in the various synthetic techniques covered.
2. Gaining competence in the use of modern spectroscopic methods for organic chemical structural and quantitative analysis.
3. Understanding how the experiments relate to the concepts covered in the lecture.

Laboratory manual: Pavia, Lampman, Kriz, and Engel. Introduction to Organic Laboratory Techniques, A Microscale Approach, 3rd ed. Reference books: The Merck Index and The CRC Handbook of Chemistry and Physics and the Aldrich catalogue. These books are also available in 405 Kennedy. You will also need a laboratory notebook with pre-numbered duplicate white/yellow pages (available in the bookstore).

Evaluation: Your laboratory work and reports must be the product of your work and are to be pledged. Although it is permissible to discuss the labs with your colleagues, you may not show your completed report to another person nor just tell them an answer. The final grade will be based on the lab reports or write-ups (100 points each, except Unknown Reaction Product counts 200 points). The grading scale is:

A	930-1000 points
A-	900-929
B+	870-899
B	830-869
B-	800-829
C+	770-799
C	730-769
C-	700-729
D+	670-699
D	630-669
D-	600-629

Policies: The lab and the class are closely intertwined – you will be expected to make connections between the two. The beginning of lab will consist of a discussion covering this connection and the scope of the experiment. If you absolutely *must* miss a lab, please let me know ahead of time by email or phone. You must go to the other section of lab if you miss.

Lab Notebook and Reports: In general, your lab notebook should be written well enough that another scientist could *understand* and *reproduce* your work. Write in ink, and put your name and the date on every page. Record all data in your notebook during lab. The pre-lab report should be written in your notebook. The lab report will be graded according to the following outline, with the pre-lab and section contributing 25 points and the final report accounting for the remaining 75 points.

However, this semester there are a few changes:

- 1) We will conduct the experiments in groups of two. Therefore you must select a partner that you would like to work with throughout the semester. All prelab reports, lab work and lab reports will be a group effort. So **each** group will submit a prelab and each group will do the experiment and then that group will submit one lab report.
- 2) The pre-lab report **will be** handed in weekly. You will record the information required in the pre-lab report (see “Outline for Lab Reports” below), and submit the yellow copies at the beginning of the lab period. Be sure your pre-lab is legible.

The final lab report should be a polished document, written in a word processing program and printed in a standard format (see “Outline for Lab Reports”).

Tardiness of either the lab report or the pre-lab will result in a lowered grade (10% per week for a maximum penalty of 30%). You must have done the lab to receive credit for a lab report. Unexcused absences will result in a loss of that lab day, with no possibility of a make-up lab.

Lab Safety: The most important assignment you will have in any laboratory will be to work without injuring yourself or causing injury to others. This also means that you should not be exposed to any chemical compounds above the permissible exposure limits set by OSHA or other governmental agency. The safety equipment in 408 Kennedy Hall has been checked for safe operation and its use will be demonstrated by your instructor. Material Safety Data Sheets (MSDS) for all materials are available for review of safe handling and disposal procedures. Your apparel in the lab will follow these guidelines:

1. Safety glasses with side shields or goggles are mandatory at all times.
2. No open-toe shoes. Feet must be completely covered. Tennis shoes or other soft uppers are OK.
3. Legs should be covered. If the air conditioning in the lab is down (on a hot day) – this rule could be relaxed to allow shorts or skirts.
4. Preferably, arms should be covered. Short-sleeved shirts are OK.
5. No dangling jewelry that could get caught in equipment.

Outline for Lab Reports:

I. Pre-lab:

- i. Title of lab.
- ii. Purpose: A brief statement will usually suffice. What techniques and/or concepts are being studied?
- iii. Reaction/Reactions to be performed.
- iv. Mechanism: *Include a detailed mechanism when appropriate.*
- iv. Table of reagents and other materials: Make a table listing the reagents you'll be using, such as the following and fill in all areas where you see an "X":

Compound	Mol. Weight	Amount Used	#mMols	m.p. or b.p.	Density/other data	Hazards
Starting material	X	X	X	if needed	if needed	x
Reagent 1, etc.	X	X	X	if needed	if needed	x
Product 1. etc.	X	(amount expected)	(amount expected)	x	if needed	x
Solvent		X		x		x

An "x" indicates that this column should be filled in; an "if needed" should only be filled in if the data is needed to calculate the amounts you'll need. Note that the table requires that reagents needed for the actual reaction only should be filled in - the data for work-up chemicals (such as sodium bicarbonate or extraction solvents) are unnecessary. Note: you MUST calculate an expected or theoretical yield for your product or products.

- v. Intended Procedure: A brief outline of the procedure you will follow.
- vi. Anything else specified in the experiment assignment.

II. Final report:

- i. Cover page: title of experiment, date, your name, pledge.
 - ii. Discussion section: purpose, reactions, mechanisms.
 - iii. Procedure. Include any deviations from procedure and record your observations.
 - iv. Products/Unknowns: Identify any unknowns and products, along with proof of their identity. Give the yields of products in this section. Include all data, including printouts of spectra.
 - v. Conclusions: think critically and analyze your results. Were they what you expected? Why or why not? Rationalize the outcome. If you obtained an unexpected result, try to explain why.
 - vi. Questions: Answer any assigned questions.
- Note:** A sample final report and pre-lab report will be posted on the Academic Volume (Redfearn/Loprete).

Schedule of Experiments: (NOTE: All final lab reports are due the week after experimental work is completed.)

Check-in	Discussion of lab report & notebook formats; check into lab drawer
1/15-16	Assigned reading: none
Expt. 1	Isolation of Essential Oils – Expt. 57 (pp. 487-493)
1/22-23	Assigned reading: Techniques 7.4-7.6; Technique 11; Expt. 57.
Expt. 2	Spectroscopic Identification of an Unknown (special handout)
1/29-30	Assigned reading: Techniques 19.9-19.11.
Expt. 3	The Diels-Alder Reaction of Cyclopentadiene with Maleic Anhydride – Expt. 48 (pp. 402-409)
2/5-6	Assigned reading: Technique 10.6; Expt. 48.
Expt. 4	Zinc Allylation of Benzaldehyde (special handout)
2/12-13	Assigned reading: handout. Begin Unknown reaction Product
Expt. 5	Unknown Reaction Product (special handout) (200 point lab)
2/19-20 2/26-27 3/5-6	Assigned reading: handout.
Expt. 6	The Aldol Condensation Reaction: Preparation of Benzalacetophenones – Expt. 35 (pp. 316-318)
3/19-20	Assigned reading: Expt. 35.
Expt. 7	Friedel-Crafts Alkylation (special handout)
3/26-27	Assigned reading: handout.
Expt. 8	Esterification Reactions of Vanillin – Expt. 62 (pp. 507-509)
4/9-10	Assigned reading: Expt. 62.
Expt. 9	Preparation and Properties of Polymers: Polyester, Nylon, and Poly(styrene) – Expt. 47 (pp. 385-401)
4/23-24	Assigned reading: Expt. 47.
Check-out	All work due and laboratory check-out
4/30-5/1	All lab reports are due. The deadline for late work is 5/1. After this date, reports and/or notebooks will not be accepted.