

LABORATORY GOGGLES AT ALL TIMES IN THE LABORATORY. THERE ARE NO EXCEPTIONS. Any student who must be repeatedly warned to put on his/her goggles will be told to leave the class. **Contact lenses should never be worn in a chemistry laboratory.**

Experiments: The experiments to be performed this semester are listed below in the approximate order in which they will be carried out, along with the point values for each experiment. Points for each experiment are based on your data obtained in lab, data analysis, report sheets and your notebook.

Points Experiment and Reading Assignment

- 30 Thermometer Calibration and Melting Points, with Unknown
Read: **Text:** pp. 1-22, 213-221, 39-48, and **Lab Manual:** Experiment #1 and Appendix VI
- 50 Recrystallization, with Unknown
Read: **Text:** pp. 23-38, and **Lab Manual:** Experiment #2
- 30 Micro Boiling Points, with Unknown
Read: **Text:** p. 90, and **Lab Manual:** Experiment #3
- 50 Distillation (simple and fractional) and Gas Chromatography (GC)
Read: **Text:** pp. 71-75, 77-92, 93-97, 107-110, 141-152,
Lab Manual: Experiment #4 and Appendix III
- 50 Thin Layer Chromatography (TLC), with Unknown
Read: **Text:** pp. 133-140, and **Lab Manual:** Experiment #5
- 50 Column Chromatography/Synthesis
Read: **Text:** pp. 119-131, 153-162 and **Lab Manual:** Experiment #6
- 50 Liquid-Liquid Extraction/Synthesis
Read: **Text:** pp. 49-76, 163-178, 206-7, **Lab Manual:** Experiment #7, Appendix IV and V
- 70 Qualitative Analysis of Carbonyl Compounds, with Unknown
Read: **Lab Manual:** Experiment #8, Appendix I, II, IV and V
- 70 Grignard Synthesis of Benzoic Acids
Read: **Lab Manual:** Experiment #9, Appendix IV and V
- 50 Nitration of Methyl Benzoate
Read: **Lab Manual:** Experiment #10, Appendix IV and V
- 50 Aldol Condensation
Read: **Lab Manual:** Experiment #11, Appendix IV and V

Attendance: Students are expected to attend all laboratory lectures (attendance will be taken). Students missing two or more lectures will lose 10% of the corresponding experiment grade for every lecture missed. Students who miss two or more lab sessions without an excuse will fail the class. Students will work only during their assigned lab time, and may NOT work during another

lab time without prior permission of all instructors affected by the scheduling change. No materials, chemicals or supplies, may be removed from the lab without permission of the instructor.

Experiment Points: Your points for each experiment will be based on a completed pre-lab and post-lab report sheet, spectral data, graphs and purity/quantity of chemicals synthesized in the lab turned-in in a properly labeled vial (student name, compound name, experiment title, weight, mp range). The pre-lab reports are due at the beginning of each experiment while the post-lab reports are due one week after the posted end date for that lab experiment. All lab reports are due at the **beginning** of the laboratory period in which they are due. Late materials will be accepted only within one week of the due date unless prior permission of the instructor is obtained, and late material will lose 10% of its assigned value with each day it is late.

Exams: There will be two exams given. The first will be given half way through the course during the discussion hour, tentatively planned for the week of 10/30. There will also be an exam given during finals week (see schedule below).

Grading: Your grade for the course will be based on your experiment points, exams, your laboratory notebook, including a hazard table, and your laboratory technique throughout the course of the semester (see below for instructions on keeping a laboratory notebook).

Lab book and technique	50
Hazard Table	50
Experimental points	550
Exams (2)	300
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Total	950 pts.

Letter grades are assigned based on a range of: A to A- = 90.0% and above, B+ to B- = 89.9-80.0%, C+ to C- = 79.9-70.0%, D+ to D- = 69.9-60.0%, F = below 60.0%

Cheating: Cheating in any form is not tolerated in this class. A student caught cheating will receive a zero on that experiment/exam. If a student is caught a second time, the student will fail this course. Cheating includes: copying from another student's report (yes, even lab partners must have their own unique answers), copying material or data from a previous report (your own or someone else's), turning in lab work done during a previous semester, reporting data for an experiment you did not perform, using extra materials during testing, programming data into a calculator, having other people take tests for you, altering exams after they have been graded, etc.

Laboratory Notebook: Read text **pp. 8-22, 197-202**. The correct notebook for the lab is a hardcover, bound notebook containing lined pages. A loose-leaf or spiral notebook is not satisfactory because pages are easily removed and lost. A separate notebook should be used for each laboratory course. If the pages are not numbered, number them before using the book. Make sure you write your name, address, and telephone number on the inside cover, in case it is lost. Record your locker number and combination of your locker in your lab book or in some convenient place. Leave two pages at the front of the lab book for a table of contents. Then enter your experiments consecutively. All data will be recorded in permanent ink as it is collected. NEVER ERASE IN A NOTEBOOK. If an error is made, ONE line is drawn through the mistake. DO NOT SCRATCH OUT ERRORS AND DO NOT RIP OUT PAGES FROM THE LAB BOOK. Points will be deducted for illegible notebooks, however we do understand

that the only "perfect" lab book is one that has been copied. Make sure your work is neat and easily followed.

The format for writing experiments in your laboratory notebook is as follows:

Date-date experimental work performed. NEVER FORGET TO DATE YOUR WORK—in the real world this can mean the difference between getting a patent and losing it to someone else.

Title – name of experiment

Equations – you should write a complete and balanced equation for any reaction taking place in the experiment performed. Under each of the starting materials you should list the molecular weight of each compound, the amount you intend to use in the experiment, and space to write in the actual amount used.

Procedure Outline – the outline should include sufficient detail to carry out the experiment without referring to the original experiment in the book. DON'T COPY WORD FOR WORD, (it's a waste of time!!) and long paragraphs make it hard to quickly determine your next step.

Your lab instructor will check your lab book for these four sections before you are allowed to begin any experiment.

Observations and Experimental Data – Data describing the experiment: dates, exact weights, color changes, phase changes, nature of the products, sudden volcanic eruptions or lack thereof, observed temperatures, etc. What you did a little differently than the original procedure. Also give any factors that might have influenced the outcome of the experiment, or reasons why you chose one method over another (why one solvent and not another, particularly important in recrystallization and purification experiments). Include any data you collected during the experiment in a form that makes it easy for you to follow, for example, in Experiment #1 a table with seven columns would work well: (1) the name and (2) the structure of the compounds, (3) reagent bottle melting points, (4 & 5) experimental data (two trials), (6) the average melting point, and (7) the correction factor you calculate based on the difference between the real melting point and the average observed melting point.

Conclusions – Brief analysis of the outcome of the experiment, for example: name and structure of the identified unknown, calculation for yield of a product (always show calculations), physical constants measured in an experiment, purity found by analysis, a comparison of observed versus literature values for physical properties written as a 2-3 sentence summary.

Laboratory Safety: Read text pp. 1-8, 213-221. Since most organic compounds are potentially volatile, flammable and toxic either alone or in combination, a student must become familiar with the chemical and physical properties of all the substances with which they work. These properties can be found in the MSDS (Material Safety Data Sheet), which is available on the Internet web sites of many companies (Acros, Baker, Sigma-Aldrich) and Universities (Cornell, Vermont SIRI, Oklahoma State University). Cambridge Scientific sponsors a ChemFinder web

site. The MSDS's are on file in the service center, and there is a computer kiosk at the end of the 5th floor near the ice machine where you may also look up your MSDS data. In the CSUS Library web page under the Chemistry databases you will find a link to many of these on-line MSDS sites.

You will devote the last 10-15 pages of your lab book to listing the following types of information about chemicals used in the lab. (You only need to list a chemical once, even if it is used in many different experiments - plan for about 80 chemical citations). Turn your book sideways and make a table with the following columns:

1. Chemical name
2. Structure
3. Melting point for solids / Boiling points for liquids
4. Density for liquids
5. An oral LD₅₀ (lethal dose with 50% kill rate)
6. Exposure Dangers – is it a carcinogen or potential carcinogen? Something worse?
7. Incompatibilities
8. Other Notes (if you find something else you want to remember about the compound)

Special Needs: Students requiring special accommodations should see the instructor as soon as possible. Students who are pregnant should consult with the instructor and their physician before undertaking any lab work.

Tentative Laboratory Schedule (Fall 2006)

<u>Week of:</u>	<u>LECTURE</u>	<u>LAB #1</u>	<u>LAB #2</u>
Week 1 (9/4)	Review	NO LAB	Review
Week 2 (9/11)	MP/Recryst.	Check in	MP
Week 3 (9/18)	Recryst.	MP/	Recryst.
Week 4 (9/25)	Recryst./BP/Distill.	Recryst.	Recryst.
Week 5 (10/2)	Distill./GC	BP	BP/Distill.
Week 6 (10/9)	TLC	Distill/GC	Distill/GC
Week 7 (10/16)	Column Chrom.	TLC	TLC/Column Chrom.
Week 8 (10/23)	Extraction	Column Chr.	Column Chr.
Week 9 (10/30)	Exam 1	Extraction	Extraction
Week 10 (11/6)	Carbonyl	Carbonyl Unk.	Carbonyl Unk.
Week 11 (11/13)	Carbonyl	Carbonyl Unk.	Carbonyl Unk.
Week 12 (11/20)	Grignard	Grignard	NO LAB
Week 13 (11/27)	Nitration	Grignard	Nitration
Week 14 (12/4)	Aldol	Nitration	Aldol
Week 15 (12/11)	Review	Aldol	Checkout

FINAL EXAMINATIONS:

Monday Lecture: Monday December 18, 12:45 – 2:45

Tuesday Lecture: Thursday December 21, 12:45 – 2:45