ORGANIC CHEMISTRY LAB
CLASS NOTES

This is a laboratory course designed to develop your skills in dealing with experimental problems. A good experimentalist must have several important qualifications. He/she must have, or develop, the ability to pay strict attention to detail, to reason scientifically, and to master new techniques and manipulate equipment.

Laboratory work is not a jumble of unrelated operations; there must be a good reason for everything that you do. If you DO NOT KNOW WHAT YOU ARE DOING AND WHY YOU ARE DOING IT, YOU DO NOT BELONG IN A LABORATORY.

GRADING

Each experiment will be worth 20 points (with exceptions), with the following breakdown:

I. PRELIMINARY NOTEBOOK INFORMATION
   a. Physical Data 1
   b. Hazard Table 1
   c. Balanced Equation 1
   d. Limiting Reagent Identified 1
   e. Simple Theory and Purpose 2
   \[ 6 \text{ total} \]

II. EXPERIMENT
   a. Procedure (stepwise account of what you really did) 2 \( (4)^* \)
   b. Data (wts, MP, BP) 2 \( (4)^* \)
   c. Observations (color or temp changes, etc.) 2 \( (4)^* \)
   \[ 6 \text{ total} \ (12 \text{ total})^* \]

III. SAFETY EVALUATION 2 total
   a. Following Safety Rules
   b. Proper Waste Disposal
   c. Clean-up
IV. SUMMARY

a. Calculations
   (yield or other) 2
b. Interpretation of Results 2
c. Product
   (appearance, purity or other) 2

\[\text{6 total} \quad (26 \text{ TOTAL})^*\]

A deficiency in any category will result in one point deleted. If a category is not pertinent to a particular experiment, you will still receive points for it.

\(*^*\) denotes 2 week experiment.

In addition, there is a 20 point prelab exercise (Week 1) and a 40 point final quiz (Week 10).

Preliminary Notebook

Some preparation is required before coming into the laboratory. This will include reading the experiment and operations involved, and making some preliminary entries in your notebook.

**NOTE:** You will not be allowed to have your lab manual with you during the laboratory. You may have the experimental procedure and details with you as hand-written notes (not in your notebook, however) but not as a photocopy. You find the laboratory experiments much faster and easier if you are thoroughly acquainted with the experiment beforehand.

An accurate record of your experimental procedure, results, observations, and conclusions is an indispensable part of scientific work. Human memory is faulty and unreliable enough that a written record of results is necessary for future reference. Your notebook should be written so that it is intelligible to anyone conversant with the subject. I call your attention to the excerpt from the Journal of Chemical Education concerning Victor Grignard's notebook posted on the bulletin boards in Room 601. You are to follow the guidelines given there as well as the ones given below.

Rules for Notebooks:

1. It must be hardbound, and written in permanent ink. We prefer a bound notebook with duplicate pages (carbon copies, MTU Bookstore #09-9088). Note: you must use a ball point or other hard-tip pen and write firmly for legible carbon copies. (These will be collected and graded by your instructor.)

2. The cover should have:
   a. your name
   b. course, section, term
   c. locker number and telephone number

3. Include a table of contents with experiment titles, page numbers, and dates.

4. Each page should be numbered and dated as you use it.
5. Entries should be legible and well spaced from one another. Do not crowd data together as there is ample room in the notebook. Leave room for instructors to write grades and comments. Use a margin on left and right sides.

6. Write data into the notebook IMMEDIATELY AND DIRECTLY. Do not use a separate sheet of paper, or pencil.

7. Identify entries with labels like "weight of weighing bottle". The significance of an entry may become useless with the passage of time.

8. If an error is made, simply draw a single line through the material to be deleted and continue with your entry.

9. Pages are not to be torn out of the lab notebook.

10. You are to refer to and use your notebook throughout the experiment. Some care in taking notes is important (written entries should be intelligible), but an immediate record of the experiment - even with spills and blotches - is of prime importance.

Suggested Notebook Format

Again, prior to the lab meeting, you will carefully read over the experiment to be performed, and also read all operations used in the experiment. In your notebook, you will (1) title the experiment; (2) prepare a table of physical data of the organic reagents and products for the experiment. Inorganic reagents should also be included in the table, if pertinent. This will include name, structural formula, molecular weight, boiling point/melting point, density, solubility, color, grams (milliliters) used and moles; (3) prepare a hazard table containing data on all organic and hazardous inorganic reagents used. List the hazards in words. Do not use the hazard sign given in the text book; (4) write balanced reactions for the experiment and define the limiting reagent; (5) give the simple theory and purpose of the experiment. During the course of the experiment you will record your procedure, all of your data, observations (and possible interpretations if necessary), problems encountered and how you solved them; also include any graphs, spectra, chromatograms, etc.

Do not copy procedures or results from the lab manual into your notebook.

NOTE: Some experiments may use chemicals or involve hazards already detailed in your notebook. In these instances, rather than rewriting the same information, you may refer to the page number of the initial entry.

Summary

Upon completion of the experiment, you will prepare a summary to turn in. It will be due one week after the scheduled completion of the experiment. The format will vary somewhat depending on the experiment. Specific requirements will be given by the instructor, but it will include mainly your results, and your analysis of those results. Your product from each experiment will also be turned in.

Some points to be considered in the overall content of the summary are:

(1) Conciseness: wordy, flowery explanations that don’t say much are to be avoided.

(2) Completeness: were all the important ideas covered?
(3) Error Analysis:
Discussion of low yield, melting point, or boiling point. The observed melting point or boiling point should be compared to the literature values. If they are not the same you should explain why. This discussion should not be a blind shot in the dark but based on sound scientific reasoning. Discuss parts of the procedure that could have affected the experimental results (how and why).

(4) Discuss problems that arose during the experiment and what the solution was and why. Also, you should include pertinent observations and their interpretation.

Safety Evaluation

Your safety evaluation will be based on at least some of the following items:

(1) Following the Chemical Lab Safety Rules
(2) Ability of you and your partners to work together on an experiment and budget your time
(3) Whether or not you are careless with equipment, reagents, and solvents.
(4) Cleaning up work bench and hood; putting equipment back where it belongs - CLEAN!!
(5) PROPER DISPOSAL OF WASTES

WASTE DISPOSAL

Liquid wastes are divided into two basic categories:

(1) Those that can be poured down the sink:
   (a) aqueous solutions
   (b) methanol, ethanol, other water miscible alcohols
   (c) acetone
   Make sure the water is running while these liquids are being poured into the sink; continue the running water for a few minutes afterward.

(2) Those which must be collected and shipped to a disposal site. Liquid wastes in this category will be deposited in the special containers provided. Anyone putting waste in the container must record the name(s) of the compound(s) and the amount(s) deposited. Note the separate containers for halogenated (contains F, Cl, Br or I) and nonhalogenated waste.
LATE PAPER POLICY

Notebooks - Preliminary

Notebooks are due the day you start the experiment. If not done on time, you will receive a zero.

Summaries

1. ALL WORK MUST BE TURNED IN TO RECEIVE A PASSING GRADE.
2. Summaries are due one week after the completion of the experiment. There will be a one point penalty if one week late and a three point penalty if two weeks late.
3. After two weeks, no grade will be given. You will receive a check which indicates that you have done the required work. This will be taken into consideration in calculating your final grade.
4. Any questions regarding this policy should be directed to your lab instructor or to the laboratory supervisor.

LABORATORY MAKE-UP POLICY

1. Notify your TA as soon as you know you will miss a laboratory!! You will then be rescheduled into another laboratory the same week, if possible with the same TA. You must either:
   a. Visit (room ___) or call your TA (Phone: ________________).
   b. Leave a note for the TA in Rm 607 with your phone number.
   c. Call Dr. Ann Makinen (7-2044) or see her (Room 510A).
   d. Call or see Dr. Mendenhall (Room 620C, 7-2359).

   TRY a-d IN THE ORDER GIVEN.

2. If your absence is on reasonable grounds, and you can’t make up the lab:
   a. Do the pre-lab.
   b. Do the summary portion of the lab with data you obtain from your lab partner.

   Don’t write the observations section in your lab notebook because you weren’t there to observe.

3. Two unexcused absences will result in an "F" for the course.

CHEATING POLICY

Read the departmental cheating policy which is posted on the bulletin boards at either end of the laboratory. These rules on cheating were jointly worked out by students and faculty several years ago.