

# Organic Chemistry Laboratory

## CHEM 2461

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Text: Organic Chemistry Lab, CHEM 2461, 2462, 2463, Prof. Joseph Hornback

Read the **Introduction** (pp.1-6) and the **A Guide to Success in the Organic Chemistry Lab** (pp. 6-9) sections in the lab text.

The schedule of experiments for the quarter is attached. Please read the experiment **before** coming to lab and do the "Before You Begin" assignments. You will not be allowed to begin the experiment until the TA has verified that you have completed the "Before You Begin" assignments and you have prepared your lab notebook for the experiment. If you read the experiments before lab and plan your time well, you will find it easy to complete the experiments in the allotted time or less. Planning ahead will also enable you to use your time most effectively. For example, an experiment might require that a reaction mixture be heated for one hour. The best use of your time would be to get the reaction started immediately. Then, while the reaction is being heated, you could distill the product from the preceding experiment, take melting points, wash glassware, or even study. In addition, you will find it advantageous to clean your glassware before you leave for the day. When you come for the next lab, your glassware will be clean, dry, and ready to use.

**Safety: READ Lab Safety: General Guidelines** at the beginning of the lab text and the **Laboratory Safety** section on pp. 11-20. The organic laboratory is a potentially dangerous place. However, no accidents need occur **if you are careful and are constantly aware of what you are doing and why**. Read the directions given in each experiment carefully and in advance. Pay particular attention to any special safety precautions that are given for an experiment. Make sure you understand each step of the experimental procedure and any potential dangers. If you have questions, ask! Use your common sense and, above all, **THINK!**

The following safety rules will be in effect at all times:

1. Safety glasses must be worn at all times.
2. Wear proper attire; gloves and lab coats when necessary; shoes (no sandals); no shorts.
3. No flames or smoking allowed in the lab.
4. No food or drink allowed in the lab.
5. No horseplay allowed in the lab.
6. Keep all work areas clean and orderly. This includes your bench, the balance table and the hoods. Clean up all chemical spills immediately.
7. Use proper disposal procedures, as specified by your TA, for all chemicals and solutions.
8. Be careful to avoid contaminating the reagents. Close all containers snugly after use.
9. Be sure to read the labels on chemical containers carefully. Many chemical names are very similar.
10. Most organic chemicals are toxic to some extent. Treat them all with respect. Avoid getting them on your skin or clothing and avoid extensive breathing of their fumes. Work in the hoods when the experimental directions so instruct.
11. No students are allowed in the lab unless the TA is present. Only students assigned to that lab section are allowed in the lab.
12. No chemicals, glassware or equipment are to be removed from the lab. No unauthorized experiments are to be done.

**Notebooks:** Read Appendix II (pp.381-382) in the lab text.

You must have a **bound** lab notebook (not spiral). You should use the style described in the lab text. The "Before You Begin" assignments must be completed in your lab notebook before lab. You will not be allowed to begin the experiment until this material is complete. All data, observations, etc. must be entered directly in your notebook at the time the information is obtained in the lab. Your notebook will not be graded on neatness, only on completeness.

**Reports:** Read **Appendix III** (pp. 383-387) in the lab text. We will use a slightly modified version of the description in the text. The report for each experiment must be typewritten and all structures must be done using a structure drawing program such as ChemSketch. The report should include:

Title of the experiment  
Your name and the date

#### Introduction

This section has a statement of the problem and any applicable chemical equations. See the beginning of the discussion section on p. 386.

#### Observations

#### Data

#### Calculations

#### Results

#### Discussion

#### Conclusions

#### Exercises

Include the answers to any Exercises that are assigned in the syllabus.

Excluding the data, calculations, and graphs, the report should be a maximum of two pages long. The Discussion section can be considerably briefer than that of the sample lab report in the text.

Unless you are told otherwise, each report is due at the beginning of the next lab after the completion of the experiment. Reports will be penalized 30% for lateness. Reports more than two periods late will not be accepted.

**Products:** The syllabus specifies that the product should be turned in for several experiments. Submit the product in a clean, labeled test tube along with the report. The label should use the format on p. 41 of the lab text.

**Grading:** Your grade will be based on a total of 900 points

Before You Begin Assignments, 10 pts/Exp.	50 points
Lab. Reports 100 pts./ Exp.	700 points
Products 10 pts/Exp	50 points
Lab. Notebook	50 points
Subjective	50 points

## Schedule of Laboratory Experiments

### July 8 Check In

Look over the equipment shown in Appendix I (pp. 377-379).

### July 9 Experiment 1 Drawing Chemical Structures on the Computer

Bring your laptop computer to this lab. You will download a free program for drawing chemical structures from the Internet. This is the program that you will use to draw any structures in lab reports for subsequent labs. (You may load the program before coming to lab if you so desire.) Go to [www.acdlabs.com](http://www.acdlabs.com) on the Internet. Click "Downloads". You must register first. Then download ChemSketch. You will learn to use this program during this lab. Also, go to [www.mdli.com](http://www.mdli.com) and download the Chime program that is appropriate for your computer. This program enables you to view molecules in three dimensions and will be very useful in class. This program is self-extracting. Click "run" when prompted and the program will be installed on your computer.

Note that neither of these programs is available in a MAC version. You can use MarvinSketch to draw structures. It can be downloaded from <http://www.chemaxon.com>. In addition, ChemSketch is installed on a number of computers in the library. You can draw your structures there and paste them into your lab report. To view 3-D structures you can use jmol.jar. This program will be available on BlackBoard. It will not view the structures directly from the organic home page. You will need to use the file of structures also on BlackBoard.

The procedure for this experiment and the structures to be drawn in your lab report are available on BlackBoard. The report for this experiment need only include the title, your name and date, and the structures you are instructed to draw.

### July 10 Experiment 2 Separating the Components of "Panacetin"

Be sure you have read the Introduction (pp. 1-9) in the lab text. Read the "Scenario" and the "Applying Scientific Methodology" sections on pp. 21-22. Read Extraction and Evaporation: Separating the Components of "Panacetin" on pp. 29-34. Do the "Before You Begin" (BYB) assignments. Briefly outline the "Directions" for the experiment in your lab notebook. Include "Exercises" 1 and 2 in your lab report. Turn in the aspirin product with your lab report.

### July 11 Experiment 3 Identifying a Component of "Panacetin"

Read Recrystallization and Melting Point Determination: Identifying a Component of "Panacetin" on pp. 37-42 in the lab text. Do BYB assignments 1 and 3. Include

"Exercises" 1, 2, 3, and 4 in your lab report. Turn in the product with your lab report.

**July 15 Experiment 4 Synthesis of Salicylic Acid from Wintergreen Oil**

Read Heating Under Reflux: Synthesis of Salicylic Acid from Wintergreen Oil on pp. 43-50 in the lab text. Do the BYB assignments. Include "Exercises" 2, 3, and 4 in your lab report. Turn in the salicylic acid product with your lab report.

**July 16 Experiment 5 Preparation of Synthetic Banana Oil**

Read Simple Distillation, Gas Chromatography: Preparation of Synthetic Banana Oil on pp. 53-60 in the lab text. Do BYB assignments 1, 2, and 3. Purify the product by distillation this week, but do the analysis by gas chromatography tomorrow. Include "Exercises" 2, 3, and 4 in your lab report. Turn in the isopentyl acetate product with your lab report.

**July 17 Experiment 6 Acid-Base Strength of Organic Compounds**

Read Minilab Acid-Base Strength of Organic Compounds on pp. 205-206 in the lab text. You should have time to do this Minilab during the 1 hr. reflux period of Experiment 5.

**July 22 Experiment 7 TLC Analysis of Drug Components**

Read TLC Analysis of Drug Components on pp. 81-85 in the lab text. Do BYB assignment 1. Include "Exercises" 1, 2, and 3 in your lab report.

**July 23 Clean Up and Check Out**