

Organic Chemistry Research Notebook

Of all the costly items that constitute a research lab, the most valuable is arguably your research notebook. If properly kept, it is a complete record of scientific activities in which you, no doubt, have invested many hours. The sound of a fire alarm has caused more than a few graduate students to grab their research notebooks before fleeing the building. When it is time to describe your scientific activities in a report, you will discover that these notebooks are indispensable. The human mind simply cannot remember every detail of so many experiments. Additionally, it is not uncommon to attempt to reinterpret experimental results years after the original observations were made. Without careful records, we are all doomed to constantly repeat our own work. This handout is designed to aid you in establishing an efficient method of recording your experiments and their results.

You must use a notebook with bound pages and with page numbers. The reason is that in time pages in 3 ring binders will rip loose.

Do not use water soluble ink or pencil.

Handwriting must be legible! (As a side note, I often use block printing instead of handwriting).

Each bound notebook must have a Table of Contents at the beginning of the book (on the inside of the front cover is OK). You should update the Table of Contents as you fill out the notebook. This means that, if your notebook is not already pre-paginated, you need to write in the page numbers.

Use the right-hand page for the “formal” lab notes, like tables, synthesis schemes and lists of reagents. Do not use the left-hand page except for small jotted notes and “back-of-the-envelope” calculations.

The recordings of each day of research should include a date, as well as the name of the experiment being performed.

Start the notebook description of a new experiment with the chemical reaction being carried out (when appropriate), a list of all chemicals that will be used along with their structures. A sketch of each apparatus must be provided as well. For simple operations such as heating an Erlenmeyer flask on a steam bath or filtration through a Buchner funnel, sketch the device the first time it is used. You don't have to sketch it again if you use the technique in a subsequent lab. For more complicated set-ups, i.e. distillation, refluxing, etc., sketch the apparatus each time you use it, because details will differ.

You must record your observations within minutes of making them. If you are collecting recorder output data, you can jot down some specifics about the experiment (i.e. how much enzyme, inhibitor, chart speed, etc.) on the output, and you should assemble the data into your notebook with a day or two after the experiment. It is permissible to tape or

staple chart output into your notebook, though some instructors and advisors prefer only tape. The details of the design and components of the experiment should be recorded in your notebook as you set-up the experiment.

All experiments, regardless of whether they "worked" or not, regardless of whether you are pleased or displeased with the results, must be recorded. Often the details of failures are most informative. Certainly, in this class, we will expect you to be able to explain why an experiment went awry; without your own details, you will be forced to report vague generalities like "the error in this experiment can be attributed to poor experimental setup" which will net you zero points on that question.

TLC: Draw a picture of the stained plate in your notebook; indicate the names of the solvent and stain used, the color of the spots, and the measured R_f values.

List the physical state of the synthetic product, and include its color, crystal shape (if solid) and odor (if applicable). If solid, measure the melting point.

Draw the structures of molecules, with correct stereochemistry, if they are not obvious. Whether you use the ball and stick or a Fischer representation will depend on which drawing will make the stereochemistry most clear to the reader.

These are the following guidelines that I will use when grading your notebook:

1. The first notebook page of each new day should have a date.
2. The writing must be with water-insoluble ink.
3. The writing must be legible.
4. The structures and amounts used of all reagents must be stated.
5. The protocol used should be described in the notebook along with a drawing of the apparatus (e.g., distillation set-up). The detail and clarity should be such that someone with a background in chemistry could reproduce the work. You will appreciate this when you must reproduce an experiment from someone else's lab notebook!
6. The structure of the reagents and compound(s) prepared must be shown as well as other data pertaining to the experiment (i.e., reaction time, temperature, yield, mp, sketches of TLC plates, IR data, etc.).
7. There should be a discussion at the end (please clearly label this section as "Discussions and Conclusions") including whether the experiment was successful and any conclusions drawn from it. If there were problems, possible reasons and solutions should be given. Occasionally, the lab handout for the experiment may give you tips on other items that should be discussed.