Keeping a Notebook

Keeping a proper laboratory notebook is an essential part of doing science. If you do an experiment but don't keep a good record of it, there's no proof that it happened and no way to use the results or to repeat the procedure if it turns out to be successful.

In academic, industrial, and medical research, laboratory notebooks can become important legal documents. A critical part of your training in science is to learn what kinds of information should be included in a notebook, and a large part of your grade for each experiment will depend on how well the experiments that you do are recorded.

Lab notebooks should always be kept in ink, not pencil. Please write the experiment title, your name, and the date at the top of the page at the beginning of each experiment, and sign and date the last page. These conventions are meant to insure that entries cannot be changed or falsified at a later date. It is important that you write neatly and clearly, so other people can easily read and understand what you have done. If I have to work to decipher what you have written, your grade will suffer!

Simply stated, a laboratory notebook is a record of what you did in the lab, what you observed, and what you concluded. Each experiment should be organized, readable, and include all of the information that needs to be there. Each experiment should contain all of the information that you (or anyone else with your level of experience) would need in order to repeat the experiment without referring to the Lab Manual.

The following elements should appear in your lab notebook:

<u>Table of Contents</u>: On the inside cover of your notebook is a table of contents. Every time you run an experiment, write it in the table with the page numbers. This will be particularly helpful to you during the final exams because I will allow you to refer to your notebook.

<u>Introduction</u>: Each lab should begin with an introduction where you explain the purpose of the experiment and what you hope to accomplish. It should not be an exact duplicate of the introduction in the lab manual, but some of the same ideas should be there – show me that you have read and understood the introduction provided for you. If the experiment focuses on a structure or reaction, you should draw it out in the introduction. If you are running a reaction, you should include a table of reagents as discussed in the calculations exercises. You should also include any safety notes that you think may be important.

<u>Procedures:</u> Divide the next part into two columns, one for procedures, and one for observations. In the procedure column, explain the procedures that you performed **in past tense** ("I stirred the reaction for 1 hour at room temperature"). Note that the instructions in the lab manual are written in present tense ("stir the reaction for 1 hour at room temperature") – you cannot just copy them! Also, something may happen that will force you to diverge from the lab manual instructions, and your procedure should say

what you actually did, not what you meant to do. Try not to wait until the end of the lab period or until you go home to write up the procedure – stop and write down what you have done after every few steps. You don't need to use complete sentences – bullet points or phrases are ok as long as you communicate clearly. Also, you don't need to include every detail that I write in the instructions - just a simple record of what you did, with enough detail that you could repeat it. See the sample lab notebook to get an idea of how specific to be.

<u>Observations and Interpretations</u>: In the observations column, record any observations that you make or data that you collect as you go along. For example, you might write "0.025 g of phenol" or "reaction turned yellow" or "boiling point 107°C." You should also include a brief interpretation of the observation if appropriate – the most useful observations are the kind that tell you something about what is going on with the atoms and molecules in the reaction. For example, after writing in the procedure column "added saturated aqueous sodium bicarbonate" you might write in the observation column "vigorous bubbling – CO₂ forming, so acid is being neutralized."

<u>Conclusion</u>: At the end of each lab, you should write a conclusion in which you summarize the results that you have obtained, including all of the data. I should not have to look back through your procedure to find out what the % yield was or what the IR looked like – you should repeat this here and interpret it. If you ran a reaction, you should indicate how much product you obtained, how you know it is the product, and how pure it was. After giving all of the data involved, you may then comment on how the reaction worked for you and anything you would do differently if you were doing it again.

<u>Questions:</u> After you have written your conclusion, answer the questions for each lab. Please rewrite the questions or word your answer in such a way that it gives the information in the question. The questions are designed to make sure that you actually understood what you were doing in the lab, rather than just blindly following the procedures. After looking at the lab instructions and thinking about the concepts involved, ask for help if you can't figure them out. Understanding these concepts will be critical on the final exam.

The following are the most common students errors in writing a notebook:

- trying to cram too much on a page
- handwriting that can only be deciphered by the writer
- copying the procedures from the lab manual rather writing down what you did
- writing down only minimal information, not enough to repeat the lab
- not including important observations, or not interpreting them
- not including all the necessary information in the conclusion

Please see the sample lab notebook entries found on the course website. One is for a lab in which a reaction is run, and the other is for an unknown (we will do these the second semester).