Laboratory Notebook/Lab Write-up Specifics

Pre-laboratory Write-up

Each experiment must be completed during your regularly scheduled laboratory period, and careful planning of the experiments *before* you enter the lab is essential for success. Therefore, you are required to prepare a pre-laboratory write-up *prior to the beginning of your lab section*. Your write-up must be approved by the teaching assistant at the beginning of the laboratory period. *You will not be permitted to begin the experiments unless you have completed the pre-lab write-up and had it approved*. The pre-lab write-up consists of:

- (1) Completing all sections of your lab notebook for the week's experiment, from "Title" through "Procedure", inclusive (see the Laboratory Notebook Format below).
- (2) Your answers to the assigned pre-lab questions, written on a separate notebook page.

Under the section titled "Reaction", the equations for all chemical transformations relevant to the experiment should be included. Entries for the "Table of Reactants and Products" will vary somewhat with the nature of the experiment. The example that follows is for a synthesis experiment. For non-synthetic experiments (i.e., investigative experiments), the structures of all compounds and solvents employed, as well as their molecular weights, boiling points (for liquids), densities (for liquids) and melting points (for solids) must be included.

The Laboratory Notebook

The purpose of keeping a notebook is to provide a permanent record of a laboratory investigation. This record should be concise, but complete enough so that it can be read and understood. It should contain all of the necessary information for another chemist to (1) repeat the work, and (2) compare her/his results with the results of the chemist who performed the reaction the first time. Even an experienced researcher may not know what observations will be important at the end of an experiment. You should therefore make your notebook entries as complete as possible, recording observations when they are made and data as it is generated.

In an industrial setting, and sometimes in an academic one, the records made in a notebook can become critical intellectual property. Litigation over the control of that property often rests completely on what is written in notebooks, sometimes with millions of dollars at stake. Learning to keep a complete and accurate notebook is important preparation for a career in research.

Background or reference information, experimental procedures, observations, data, calculations and results should be recorded in your notebook at the appropriate times. *Experimental data obtained in the laboratory and all of the observations made, must be entered directly in ink in your notebook during the laboratory period, at the time that data/observation is generated*. Data should be entered in tables whenever possible. Errors are crossed out, not erased. Using "whiting-out" correcting fluids is never acceptable. The records are made directly in the notebook, and are *not* made on scrap paper to be copied later.

PLEASE NOTE: You will use a laboratory notebook with bound, duplicate, numbered pages that create an identical "carbon copy" page. The "carbon copy" pages for the day's experiment(s) will be turned in at the end of each laboratory period, with each page carrying the

complete date and your name. Legible notebook pages are necessary to receive full credit on laboratory reports.

The Format for Laboratory Notebook Entries

The first section is part of the Pre-lab write-up. It is due at the beginning of the lab before you begin the experiment. TITLE Date: Objective: What is the purpose of the experiment? What are you doing? Why is it important? <u>Reactions</u> (*if applicable*): $A \rightarrow B$ Table of Reactants and Products (if applicable): Compound Other Name or ID MW Equivalents Data Amount Moles g or mL (stoichiometry) bp, mp, density, etc. *only fill in what is applicable – (no mp if you have a liquid, no density if you have a solid, etc.) Procedure: You can refer to the laboratory handout rather than recopying the procedure. For some experiments (like experiment 3), a procedural flowchart will help or is required. A flowchart can save a lot of time, and you can avoid confusion. This is where the flow chart should be if you are using one. If you are using a flowchart, it should be completed before you begin the experiment (as part of your pre-lab). The following section is completed in the lab: Observations: All observations and data are recorded here. These include, but are not limited to: the times of reagent additions color changes gas evolution the time of a reaction quench boiling points melting points mass of material weighed or isolated

Raw data is recorded in this section, such as the calculation of the weight of the compound used, including the tare of the flask, and sketches of TLC plates. Draw pictures of any TLC plates that were run, and label spots.

Any pertinent comments regarding the experimental procedure should be noted.

If you are referencing the lab handout for the procedure, make sure you still document what you are doing as you complete the experiment in the Observations Section.

Example of Observations section entry: Weighed reagent A (3.4145 g) into 5 mL rb flack, added reagent B (3.567 g), added 5 mL ether. Color: yellow soln. Refluxed 30 minutes. After 15 minutes, solution turned purple. TLC'd to determine if reaction complete (TLC sketch below).

The following sections are to be completed for the Final Lab Report and they are due at the beginning of your laboratory one week after you have completed the experiment:

<u>Results</u>

In this section you should summarize all the important data from the experiment in a clear concise format. In many cases, you will need to put this is tabular form (*in a table*). Include anything that is important (%yields, Rf values, identification of unknowns, etc.)

PLEASE NOTE: That the data that you turn in during the lab period does not qualify as the results section for your final lab report.

Yes, you will be duplicating data that has been recorded in the <u>Observations</u> section. It is very time-consuming for TA's too have too hunt through 28 lab reports to find each bit of data that will be graded, so he/she will be looking in this section for your summarized data. It is important that this section be neat and well-organized. You do not need to redraw TLC's however! Recording Rf's will be sufficient. Attach original spectra and chromatographic data (i.e. IR, UV, NMR, GC/MS)

Discussion/Conclusion

In this section you will discuss what you did, why you did it, the significance of your results, and how your results relate to the overall objective (*i.e. what you learned in this experiment.*) The mechanism of the reaction (*if applicable*) should be discussed here. Any interesting observations should also be noted here, as well as explanations for any chemistry involved. Explain possible sources of errors (*explain what went wrong, suggest reasons for why things didn't go as expected, and describe what you would do differently next time to make things better.*) If you are identifying an unknown, give a detailed explanation of how you identified your unknown. End with your overall conclusion.

<u>Reference</u>

List your references in bibliography form. Reference anything that you used to write your lab report (textbooks, lab manual, internet sites, journal article, etc. If you didn't use anything else, then you don't need a reference section, but be careful of plagarism)

NOTE: Prelab/Postlab questions should be written on a separate notebook page

A sample notebook entry can be found in Pavia, Chapter 2, pages 26-27