Phys. 327 — Lab Notebook

You must use a lab notebook to record your work in the laboratory. The lab notebook is to be an Ampad #22-157 (Ampad calls it a Computation Book). No other notebook will be accepted.

In experimental physical science, a lab notebook is your *diary*. You write down not only what you did, but why. You include your data (or sample data if they are taken by computer), results, etc. You may certainly print things out and tape them into the notebook – this is standard practice. Basically, you want to achieve two goals: You want a record that *you* can understand if you look at it years later, and you want a record as evidence that you actually did the work, if someone questions that later.

Remember, this is a tool. You are not writing a book to sell to the masses, but rather something that you or someone else can read and understand. It is not meant for publication, but rather as a resource when you start writing something for publication, or just if you want to remember what you have already done. Consider the beauty of the simple declarative sentence.

Before you start the first lab, leave a few (∼5) pages blank, so you can add any information about the course, and a table of contents.

Start each lab on a new page (on the right, with the book open flat), not on the back of a page used for a previous lab.

**TO BEGIN:**

1. **Heading.** At the beginning of each lab include a title, the date, and your lab partner’s name.

2. **Purpose.** Next, write a brief introduction of the purpose and procedure you are setting out to do. This can be just a few sentences or a paragraph, but should indicate what you plan to do.

**AS YOU PROCEED:**

3. **Layout and equipment.** Include a diagram of the apparatus and a list of the equipment used. This should be near the beginning, before you start writing down your results.

   - Include enough detail so you can reconstruct the experiment later.

   - This is about function, not looks. Use block diagrams, not artistic rendering. It is OK to tape in pictures, but only if they are clear and simple.
• You can leave some space and expand the diagram as you go along with the experiment, but never leave this for a later day — get it done before you clean up or leave the setup.

• Include everything you use when possible, such as manufacturer and model number. In real life you can refer to previous pages, but that won’t be appropriate in this class.

4. Procedure. Record how you use the apparatus. Write neatly! Indicate this step-by-step where appropriate.

This is probably the hardest part of the lab notebook. You need to include enough detail to satisfy the goals of the lab notebook (above) but not enough that it becomes silly or tedious. The amount of detail will certainly depend on the lab you are doing, and even on your style. This is something that you can only master with practice.

Think about this step before you come to the lab, so that you can gain some good practice and insight.

5. Data and Graphs. Record your data. Exactly what you should record depends strongly on what you are doing. If you are measuring a few numbers, write them in a table in the lab book as you go along. Don’t be afraid to use up pages in the notebook. I guarantee none of you will use up the Ampad 22-157.

Sometimes, this is problematic, since you may be recording gigabytes of data onto a computer disc. In that case, you might want to include some sample data, or just a description of how it trends. For sure, you record the file names, folder names, etc., so you can find the data later!

If you need to plot your data, keep the plot in the lab notebook. Sometimes you can just use a ruler and make a nice plot by hand. Other times, you will plot the data with the computer, using excel, origin, or some other program.

Remember, printed material can be cropped and taped into your notebook.

AS YOU FINISH:

6. Sample Calculation. If you have to calculate a result from your experiment, show it in the lab notebook. If you are running the calculation many times, at least show a sample.

7. Analysis and Critique.

• Display and discuss your results. For example, if the goal was to calculate some constant then state the answer. You might want to draw a box around that, or highlight it in some other way so that it stands out if you come back to this later.
• Discuss the uncertainty in your measurement. This part is **required** if you want to make an A in this class.
  
  – How good is the final result?
  – What is the uncertainty from any fitting?
  – Are their **systematic** errors (as opposed to random or statistical scatter)?
    If so, can you account for them?

• Discuss the strengths and weaknesses of this experimental design. Provide or discuss suggestions for improving the experiment?

• If you identified a problem, try to describe which way it would have shifted your results. If possible, estimate by how much.

8. **Conclusion.** What did you find out from this experiment? Be brief! For example: “We have successfully measured the Rydberg constant to within 5% of the known value. Our experiment was limited by the spectrometer we used. There appears to be a systematic shift in the value of the spectral lines, perhaps as large as 1 nm each, and this could be the source of our error.”

It is understood that all of the experiments are different. Not all of the above discussion will always be appropriate for every experiment, so you actually have a lot of latitude in what you write. But the above should be a good guideline, and remember: nothing in physics is exact so a careful analysis of your uncertainty is **always essential.**