

Guidelines for a Good Lab Notebook

A lab report is more than just something you turn in to get a good grade. It's your opportunity to show that you understand what is going on in the experiment, which is really the most important part of doing experiments.

There are three basic parts to a lab notebook: pre-lab, in-lab, and post-lab.

PRE-LAB

The main idea here is to give the reader an idea of what you are going to do in a few short sentences. You should write it in your own words, rather than paraphrasing or quoting the lab manual. It's always a good idea to read the entire experiment in the manual before you begin your introduction. The following are suggestions:

1. Background sentences: state why you want to do the experiment, what you think you will learn, and what other kinds of similar experiments have been done in the past.
2. Problem: In one sentence, state what you are going to do in the experiment.
3. Hypothesis: In one sentence, state what you think that you will observe. This is probably the most important part of the introduction.
4. Materials: You should also list explicitly any main chemicals, equipment, and techniques you will be utilizing for this lab.
5. Procedural Flowchart

This part of the pre-lab should take no more than one page. A good flowchart should give a reader an immediate idea of what is going to be done in the laboratory except in a less detailed format. In general there are two major steps when constructing the flowchart. First, read the experimental procedure carefully. Second, rewrite the procedures in a flowchart format. Keep in mind that the flowchart should be brief and cover all the steps in a simple and easy to follow manner. There should be no complicated sentences or paragraphs in the flowchart. This gives you a chance to THINK about what you read and how to rewrite it in a way that can be implemented into a flowchart.

Please DO NOT simply copy the entire procedure (or majority of the procedure) and make it look like a flowchart.

IN-LAB

1. Data

Always write in pen. Always record data **directly** into your lab notebook. I know some people like to be neat, and have nice formatting and all that, but it's more important to make sure you record all of the data immediately in case you forget what you wanted to say later or you forget to copy other data into your notebook. Draw a single line through any mistakes. Also, if you make a mistake it's a good idea to keep a record if it so you (or someone else trying to do your experiment) can remember to not make the same mistake twice.

2. Observations

In addition to writing down all those numbers (data), you should keep an eye (nose, ear, etc.) on what is actually happening in the experiment. If you add one thing to another and it evolves a gas, gets hot or cold, changes color or odor, precipitates a solid, reacts really quickly or slowly, or anything noticeable, you should write down that observation in your lab notebook. Other things to consider including are: make and type of any machine you are using, concentrations of all the standards you used, etc. One of the reasons you are doing this goes back to what was said about mistakes earlier. An experiment is exactly that: an experiment. If it turns out that you get an unexpected result, you can go back and trace your observations to see where the error occurred. If you don't have any observations, this is really hard to do. The bottom line: write what you do and do what you write.

POST-LAB

1. Calculations

It's a good idea to write out all the formulas you use in your calculations. Also, show all of your work. Be sure to include the units when you are doing a calculation, and don't drop the units halfway through the calculation. This is actually a pretty powerful tool because if your answer has the wrong units you know you must have made an error somewhere along the way.

2. Sources of Error

Speculate on possible sources of error. This is one of the most important parts of a lab. It will help you to understand where you may have gone wrong and what you want to change for future experiments.

3. Conclusions

The conclusion is a summary of what you actually did. Like the introduction, it should be short and to the point. It should include the following:

What you found: Restate any results that you may have calculated (with errors if applicable).

What you think: What do your results mean? Are they good? Bad? Why or why not? Basically, comment on the results.

Did you get the results you expected? Was your hypothesis correct? Why or why not?

What might you do to improve this experiment if you had to do it again?

What did you learn from the experiment?

4. Future Directions: Your own inquiry-based experiment

You should now be sufficiently acquainted with the subject matter and the experiment that you are ready to propose your own experiments. What would you investigate next and why? What would you expect to see and why? This second experiment will investigate what YOU think is interesting. There are many choices, but remember to only change one variable at a time, in order to be able to make clear conclusions.

a) Problem and hypothesis: You may change one step in the standard procedure. What variable will you be changing? Why have you chosen to change this variable? What do you expect to observe and why?

b) Data (phase II): Collect and analyze data in the same manner as the original experiment.

c) Final Conclusions & explanations: What are your new sources of error. Did you see what you expected? Why or why not? If you could repeat the experiment with other variables what might you try and why?