

Lab Notebook Guide

Purpose: Why have a lab notebook, anyway?

In all fields of science, experimenters keep notebooks. Frequently, it's the only proof they have to prove they've performed an experiment. As a result, it's vital that lab notebooks be carefully managed so that people doing follow-up experiments can reproduce and verify the data collected.

One of the most important things about lab notebooks is that they're honest. If you do an experiment and it works out, everything in there needs to be 100% true so that others can follow the lab. If an experiment doesn't work out, a good lab notebook can save others many hours of time by showing them what doesn't work in an experiment. No matter what, lab notebooks need to be complete, even if the results are poor.

How to set up a notebook:

Every lab notebook needs to have the following information. Although it may seem overly formal, all of the information here is important in a formal lab notebook.

Page 1: Title Page

The first page of the notebook should include the following information:

- The name of the researcher
- The name of the institution where the research was performed
- The date the notebook was started and finished
- Complete contact information so the notebook can be returned in case of loss.

Pages 2-4: Table of Contents

It's usually a good idea to leave two or three pages after the title page for a table of contents. There should be columns for the name of the lab, the date of the lab, and the pages on which the lab can be found. All of this information needs to be entered into the table of contents before the lab is turned in or your lab is NOT complete!

Page 5: Your first entry.

All lab write-ups need to be in the following format (see following page for an abbreviated version of a proper lab write up).

Dates the lab was performed

Title of the lab

Purpose: The purpose section of a lab is where you tell the reader your reason for doing the lab in the first place. For example, many researchers for drug companies have as their purpose that they want to cure AIDS or some other disease. This section should be three or four sentences long. If it's too short, it won't be clear why you're doing the lab. If it's too long, you're doing too much work and the reader will probably just skip over it.

Hypothesis: If _____, then _____. (The hypothesis is a one-line sentence where you discuss how you'll solve the problem at hand. The statement after "if" is the independent variable. The independent variable is whatever you'll do to solve the problem. The statement after "then" is the dependent variable, because what happens will depend on what you did in the first place. Generally, the dependent variable will be that the problem you mentioned in the purpose will be solved.)

Materials: Your materials list must be VERY complete. You need to indicate how much of each material will be used in the experiment so you know what you'll need. If you plan on arranging some of the equipment into a more complex setup (for example, if you're going to heat something over a Bunsen burner, you'd need a ring stand, wire gauze, etc.), draw it as well as mentioning the equipment used. It's never a bad idea to leave a couple of extra lines at the end of this section so you can add more things that you've forgotten when you started your lab.

Procedure: This is a very clear, step-by-step list of things you plan on doing during the experiment. Each step should be short (one phrase or sentence). Again, it's not a bad idea to leave a few blank lines at the end of this section to add things that you may have forgotten.

Results: This is the section where you write down all of your raw data. It should consist of quantitative (numerical) data arranged in charts, as well as qualitative (non-numerical) data written out as sentences. The results section will most likely be long, so make sure you leave plenty of room. A good rule of thumb when writing the results section is that if you're not sure if what you've seen is a result, write it down. Your results section can never be too long!

Analysis: This is where you explain the meaning of your results. If you need to make a graph or a chart, use the data you took in the results section to make the proper charts here. If you need to explain why something happened, you need to write it here. If calculations are required, they belong here. The analysis section is the part of a lab where you explain

why your hypothesis is right or wrong, based on the data you've taken. Like the results section, if you're in doubt about whether or not to write something here, include it!

Conclusion: The conclusion section needs to have the following:

- A one-line sentence that either says that the hypothesis is right or the hypothesis is wrong. For example, if you proved the hypothesis that "If I poke myself in the eye, then my eye will hurt", this first sentence would be "When I poked myself in the eye, it hurt."
- If the hypothesis didn't work, an explanation of what you think went wrong. These should be specific suggestions (I should have heated the mixture to 55^o C), not general suggestions (I should have heated it more).
- A brief error analysis section. You should list at least two things that could have caused errors in the lab as well as ways you can prevent those errors in the future. The errors you mention should be errors that you can do something about, not mystical errors that probably didn't happen.

Some good rules of thumb:

- 1) Everything should be complete. If it's not, then your grade will be bad.
- 2) Your lab write up should be neat. If it can't be read, it won't be graded.
- 3) Get help if you need it. Labs are hard, so if you're floundering, ask for help from your lab partners or teacher. Important note: Copying something from your lab partners is cheating, not help. If you get help from your partners, make sure that it's in the form of guidance and hints, not outright answers.
- 4) Turn the lab in on time. If it's late, it will receive no credit!

On the next page is a copy of the sheet that will be used to grade each of your labs. Refer to it often when writing up your labs to ensure that your grade is as high as possible.

Lab Grading Sheet

Student name: _____

Lab Title: _____

Appearance:

- Lab information is written in the table of contents (1 point): ____
- Lab date and title are written at the front of the lab (1 point): ____
- The lab is neat (2 points): ____

Purpose:

- The reason for performing the lab is clear (4 points): ____
- The purpose is no more than four sentences long (1 point): ____

Hypothesis:

- The hypothesis is an if, then statement (1 point): ____
- The independent and dependent variables are reasonable (4 points): ____
- The hypothesis is one sentence long (1 point): ____

Materials:

- The materials list is complete (2 points): ____
- A sketch of the lab equipment is provided, if applicable (2 points): ____

Procedure:

- Every step of the experiment is included (2 points): ____
- Each step is short (2 points): ____

Results:

- Qualitative observations during the course of the experiment are included (3 points): ____
- Quantitative data was recorded in a proper form (3 points): ____
- All tables of information are properly labeled (1 point): ____
- All tables of information are neatly written (1 point): ____

Analysis:

- All proper graphs and charts have been included (3 points): ____
- All calculations are correct and complete, if applicable (5 points): ____
- Your analysis of the hypothesis is well-reasoned, based on your data (5 points): ____
- Your hypothesis was correct (3 points): ____

Conclusion:

- Includes a one line sentence confirming or disproving the hypothesis (1 point): ____
- An assessment of why the hypothesis didn't work, if applicable (2 points): ____
- A complete error analysis, showing at least two sources of error and possible ways of compensating for them (3 points): ____