

Writing the Lab Report

AP Biology

Title

The lab report title should be a complete sentence with a verb. They should be as informative as possible. For example, if you are performing an experiment on the effects of light on the rate of spinach photosynthesis, a good title may be:

Light levels increase photosynthetic rate in leaf sections of common spinach.

Abstract

Formal science papers follow a traditional format that makes it easy for other researchers to find quickly the information they need (or in this case, for your teacher to grade the assignment). The abstract is a **brief** paragraph that summarizes the entire report. Though the first section of your paper, it should be written last after you have drafted the other sections. It should have a one sentence summary of the purpose, a short (one or two sentences) description of the procedure, and a sentence describing the outcome. An example:

*Many chemicals are known to be bactericidal, effectively killing bacteria. We wished to determine the effectiveness of triclosan, the antibacterial agent in many soaps, on killing bacteria normally found on human skin. The bacterium *Staphylococcus aureus* was cultured on nutrient agar plates, some containing 30 mM triclosan and the rest without. We found 83% fewer bacteria on plates containing triclosan.*

When you write the lab report, especially the abstract, choose your words carefully. Be as precise as you can: try to include numbers to back up your conclusions.

Vague statement: *More bacteria died on the plates with the antibiotic.*

Precise statement: *Plates with triclosan had 83% fewer bacteria than control plates without it.*

Introduction

The introduction is a passage that provides the reader with all of the background information needed to understand the experiments you performed. For example, if you ran a series of experiments looking at enzymes, you would define and discuss enzymes in general, and then talk in detail about the particular enzyme you are studying. You should discuss and define any concept that is central to the lab. It is in this section that you demonstrate to your teacher how much you understand about the topic studied. Consider it an informal exam. There is no size requirement for the introduction; it need only be long enough to make sure the following data are easily interpreted and understood in context.

Some labs consist of a number of separate experiments. Rather than writing separate lab reports, simply discuss them separately in the individual sections of the lab report.

Your introduction is going to require outside research, at the very least from your textbook. Always cite your sources. You may use the traditional MLA format you use in your English classes, or you may follow citation styles used in scientific journals. These guidelines can be obtained from your teacher.

Materials and Methods

This is probably the easiest part of the lab to write. Here you would describe in intricate detail the equipment and procedures you followed to perform the lab. This is particularly important if you have invented a new procedure—this is where you would share it with the world. However, you are following protocols previously published in your AP Biology lab manual, and you need not type them over again. You can simply cite them, as in the example below. The only time you have to write a more detailed passage is if you made modifications, which you must clearly state. Remember, your instructions must be detailed enough so that another AP Biology student could faithfully reproduce your work.

Laboratory procedures were performed as described in the AP Biology Lab manual.

-Or-

Laboratory procedures were performed as described in the AP Biology Lab manual except 35 mL of 2.6 M NaOH was substituted for 70 mL of 1.3 M NaOH.

Results

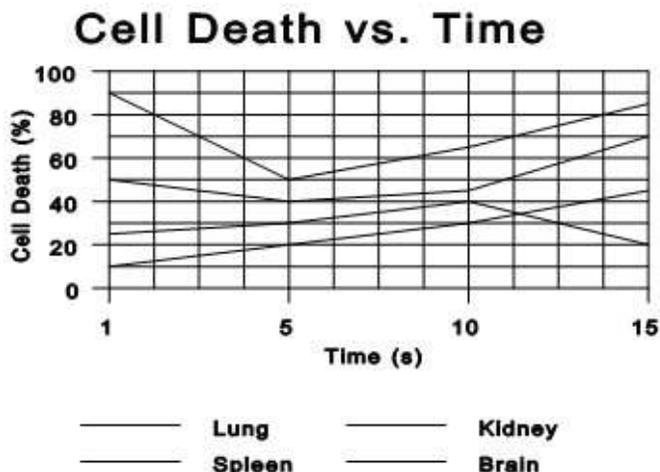
Here you should clearly display your findings from the lab. They should be accurate and easy to read. Avoid analyzing your data here. Simply report it. Some advice:

- **Use quantitative data.** Data you have measured or counted are always superior to opinions. For example, instead of saying “*the seeds in cup A grew better than the seeds in cup B,*” say “*45 seeds in cup A grew, but only 10 seeds grew in cup B.*”
- How you present your data is very important. You must be honest, but you also want to present your data in a way that allows your audience to see the connections and conclusions you drew, and that you want them to draw as well. This is best done with tables and graphs.
 - Pay particular attention to the type of graph you choose, as it can influence the clarity and accuracy of your data.
 - Always label your tables and graphs and attach units to all your measurements. A column of numbers means nothing.

- You learned significant figures in chemistry and physics for a reason. Use them, or face my wrath.

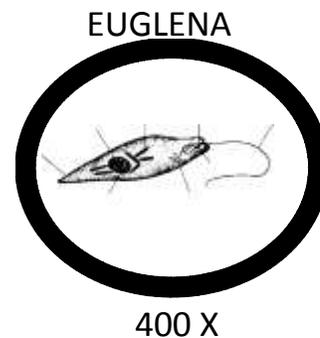
If you use a graph:

- It must be computer-generated or drawn on graph paper using a straight edge. No freehand lines unless you are sketching a curve. NEVER submit a graph sketched on blank or notebook paper.
- Label both axes, and include the units
- It should have a title explaining the data it shows
- Plan your graph so that you use most of the graph paper. Small graphs are hard to read, and are often used by unscrupulous scientists to hide bad data.



If you include a drawing (particularly from a microscope):

- Always label the drawing, and include the magnification if it is from a microscope or dissecting scope
- If it is important, use color. Otherwise, black and white is fine.
- It is acceptable to draw any graphs or pictures in pencil. Ink is not mandatory.
- It is perfectly acceptable to cut and paste the sketches from your original lab notes rather than redraw them.



If you include representative calculations:

Some labs will require stoichiometry or other math to calculate values. It is necessary to show one representative calculation. You do not have to show all your work. Make sure the math is neat and easy to follow. If dimensional analysis (or unit analysis) is being used, make sure units are included as well.

$$3.7 \text{ mL} \cdot \frac{0.13 \text{ mol}}{1000 \text{ mL}} \cdot \frac{125.34 \text{ g}}{1 \text{ mol}} = 0.060 \text{ g}$$

Discussion

Analyze the results here. Often, the lab manual will include questions that will help you complete this section. For example, in a diffusion lab you should clearly state what molecules diffused and in which direction, and include evidence from your data to support your claim. You should back up all your results with your data.

The best way to complete this section correctly is to review the purpose of the experiment. Then, state your conclusions from the experiment: what you proved or did not prove. Finally, make sure every conclusion is explicitly supported by detailing all of the results and data that agree with your findings.

If the data are poor quality, offer possible sources of error. Think critically about this, especially about the limitations of the lab equipment or any difficult or problematic procedures you performed. For example, if your data is too high, look for specific errors of the protocol that could lead to the inflation. A generic blaming of human error will get you nothing.

At the end of your conclusion, answer all the questions in the lab manual.

Acknowledgments

It is here that you give credit where credit is due. List your lab partner. Give the name of anyone who gave you assistance on this lab, especially if you used someone else's data.

References

In order to write the introduction (and possibly other parts of your lab report), you must look up information from other sources. Whenever you use someone else's information, you must give them credit. Place the references here.

The Website "A Research Guide for Students" by I. Lee <<http://www.aresearchguide.com>> is an excellent source of information on how to use parenthetical citations and how to cite references. The *FHS Guide to Research Papers* from the English department is also an excellent reference.

Students who want to use citation styles employed by biologists in technical journals can obtain citation guides from your teacher.