

## Writing a Scientific Lab Report

### Title

A good title is short, yet descriptive. For example, if your lab experiment was studying the variables that affected enzyme activity, “Enzyme Lab Report” would not be a good title. It is short, yes, but not very descriptive. By the same token, “A Laboratory Exercise in which the Effects of pH, temperature, substrate concentration, and enzyme concentration are studied” would not be a good title either. It is very descriptive, but too wordy. A good title choice would be, “Enzyme Activity and Denaturing”. The title is the first part of your lab report, and is centered at the top.

### Abstract

An abstract is a summary of the report that comes after the title and before the introduction. It should be about 1-2 paragraphs long and state: the purpose of the study (“In order to examine the effects of denaturing...”); what you did (“The conditions of pH, temperature, substrate concentration, and enzyme concentration were examined...”); how you did it (a **brief** overview of the methods) (“The liver enzyme catalase was placed in a variety of environments in order to determine what conditions denatured an enzyme...”); what the important results were (“The enzyme reacted with the substrate hydrogen peroxide  $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$ . This reaction produced a white, bubbly foam inside the test tube with spherical bubbles ranging from <1cm to 3 cm in diameter...”); and why these results are important (“...thus indicating that the water had moved into the potato by osmosis.”) The abstract is a summary that should be able to stand alone, meaning that it is a repetition of the major points of the paper. The abstract should be written last, after the rest of your paper has been written. However, it is still placed at the beginning of the paper; after the title and before the introduction.

### Introduction

In this section, your goal is to introduce the major themes of the lab. For the enzyme lab just completed, your introductory section should include the following sections. Enzymes (what they are, what they do), substrates and active sites, denaturing, pH (acids/bases), temperature, concentration size (surface area, volume), and catalase (because we used beef liver). Each section would be its own paragraph, which is encouraged to do! Use your references here as you support your intro with research.

### Procedure

The purpose of this section is to describe what you did in enough detail so that the reader could duplicate the experiment based on your description. This should not be done as a “recipe” or a “list of materials used”, but rather an account of what you did written in **past tense** and in **third person** language (words such as I, you, we, she, they, he, etc... should not be used). For example, “10 drops of acid was added to the test tube so that the liver was submerged in it. The test tube was swirled so that the acid had a chance to interact with the enzymes in order to denature it.” You should include all quantities and measurements, but don’t get too wordy. If a procedure was repeated, just say that the procedure was repeated (and if a different solution or concentration was used during the repeat, and what that different solution or concentration was).

### Results

This is where the important results are **stated**. This means that the results section will be more than just charts and graphs, the results will be summarized as **text** also. Don’t just re-state the data in the tables; summarize the important patterns and trends you see. Note any correlations – both direct and indirect. When referring to tables and figures, **never** start a sentence with a table or figure reference (“Table 1 shows that...”). Instead, tell what you want to see in Table 1 and then reference the table (“The most common grade is a B while the average grade is a C (Table 1)”). The text should come before the tables and figures, but the tables and figures should be in your lab report, not as a separate sheet at the end of the report.

When naming tables and figures, the principle is simple: any table will be labeled as a **table**, while anything that is NOT a table will be labeled as a **figure** (graphs, charts, etc...).

**Tables** are labeled at the top and given a descriptive title. Table numbers are assigned by the order they appear in the report (ex. “Table 1 – Frequency of letter grades for the 6<sup>th</sup> hour Advanced Biology Class”). Here is an example

Table 1 – Frequency of letter grades for the 6<sup>th</sup> hour Advanced Biology Class

Letter Grade	Frequency
A	0
B	3
C	7
D	3
F	2

**Figures** are labeled at the bottom and given a descriptive title. Figures are numbered independently of tables, but are still numbered by the order they appear in the paper. Therefore, you can have a Table 1 and Figure 1. Here is an example figure:

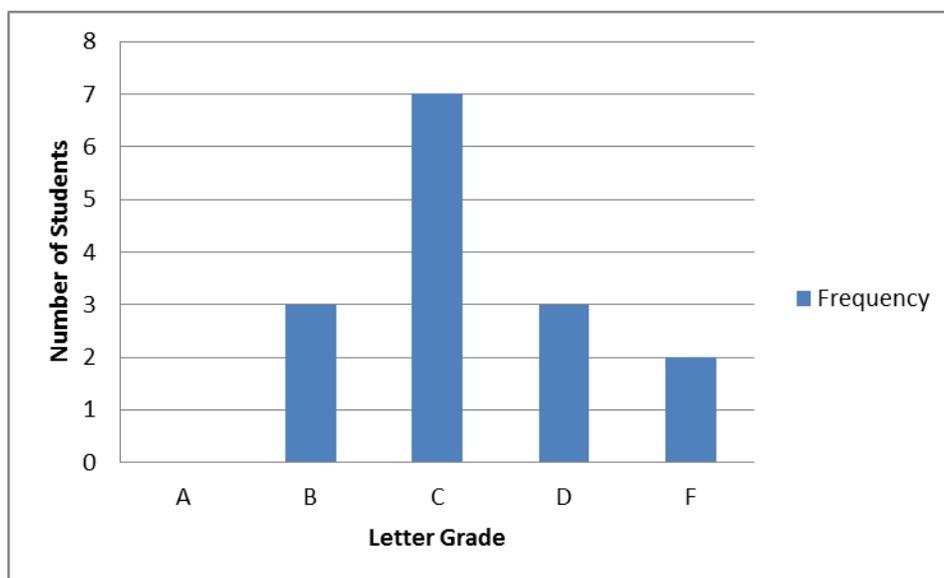


Figure 1 – A Histogram of grade frequencies for the 6<sup>th</sup> hour Advanced Biology Class

## Discussion

This is the most important part of the report. The discussion is the section where you **discuss and explain your results**. How do your results relate to the background information in the introduction? Did you answer the question that you set up in your purpose? Did you raise even more questions? You should explain any trends you see in the results and any data that differ from those trends. If the experimental results were unclear or raised more questions, this is where you propose new experiments. This section also gives you the opportunity to discuss what factors might have caused your data to be falwed. For example, if you wanted to find out why the enzymes in the ice bath did not behave the same was as the enzymes in the hot water, discuss it in this section. Finally, make conclusions about what the data from your experiment shows (i.e. “The data suggest that the environmental condition of low acidity, high temperatures had the largest effect on the denaturing of the enzymes.”).

## Literature Cited

This section comes at the end of the lab report. This is where you properly cite each reference you used in your paper. Remember to follow all of the MLA guidelines when doing this section.

## WRITING WITH THE PASSIVE VOICE

<p><b>WHAT IS PASSIVE VOICE?</b></p>	<p>“Voice” refers to the way the verb is used in the sentence. Remember that a sentence has to have a <i>subject</i> and a <i>verb</i>, and many verbs require <i>direct objects</i>. Here’s an example of <i>active voice</i>:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><i>subject</i></td> <td style="text-align: center;"><i>verb</i></td> <td style="text-align: center;"><i>direct object</i></td> </tr> <tr> <td style="text-align: center;">Babe</td> <td style="text-align: center;">hit</td> <td style="text-align: center;">the baseball.</td> </tr> <tr> <td style="text-align: center;"><i>doer</i></td> <td style="text-align: center;"><i>action</i></td> <td style="text-align: center;"><i>receives action</i></td> </tr> </table> <p>In <i>passive voice</i>, the subject of the sentence also receives the action. The doer of the action is someone else. Here’s an example of <i>passive voice</i>:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><i>subject</i></td> <td style="text-align: center;"><i>verb</i></td> <td></td> </tr> <tr> <td style="text-align: center;">The baseball</td> <td style="text-align: center;">is hit</td> <td style="text-align: center;">by Babe.</td> </tr> <tr> <td style="text-align: center;"><i>receives action</i></td> <td style="text-align: center;"><i>action</i></td> <td style="text-align: center;"><i>who did the action</i></td> </tr> </table> <p>We use both voices all the time, though active is more common and often to be preferred.</p>	<i>subject</i>	<i>verb</i>	<i>direct object</i>	Babe	hit	the baseball.	<i>doer</i>	<i>action</i>	<i>receives action</i>	<i>subject</i>	<i>verb</i>		The baseball	is hit	by Babe.	<i>receives action</i>	<i>action</i>	<i>who did the action</i>
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<p><b>WHY DO WE WRITE LAB REPORTS IN PASSIVE VOICE?</b></p>	<p>It’s part of the scientific point of view. We observe and record as objectively as possible, avoiding personal bias by removing ourselves. Using the passive also clarifies procedures and descriptions so they can be easily reproduced and compared.</p> <p><b>NOTE:</b> DO NOT write reports as directions, such as those given in the lab manual. For example, do not write, “Heat the water until it boils.” Instead, write “The water was heated to boiling.”</p>																		
<p><b>EXAMPLES OF PASSIVE VOICE IN REPORTS</b></p>	<p><i>Correct:</i> 250mL of distilled water was poured into a 500 mL beaker.</p> <p><i>Incorrect:</i> I poured 250mL of distilled water in a beaker. (active voice) Pour 250mL water in a beaker. (direction/command)</p> <p><i>Correct:</i> The covered crucible was mounted on a ring stand.</p> <p><i>Incorrect:</i> We put the crucible on a ring stand. (active voice) Set the crucible on a ring stand. (direction/command)</p> <p><i>Correct:</i> The temperature was initially measured at 80°C.</p> <p><i>Incorrect:</i> I measured the temperature at 80°C. (active voice) Measure and write down the temperature. (direction/command)</p> <p>It’s understood that all actions were done by the experimenter.</p>																		