CHAPTER 2. Guidelines for Wiring a Scientific Lab Report

You will be asked to submit a typed Group Scientific Lab Report for many of the labs you will perform during this semester. These reports should be handed in during lab the following week, unless otherwise instructed. Late reports will have 5 points taken from the final score for every day they are late. However, if your lab report is handed in 2 days after the due date, you will receive no grade (0 points). IT PAYS TO GET IT IN ON TIME!

The following are guidelines for writing a lab report; follow them to save you time, but be sure to follow your professors' instructions for each lab. The Materials, Methods, and Procedures are written in your lab manual and SHOULD be written again. They will be a part of The Scientific Lab Report, since you will be designing your experiment and must describe your procedure. Your report will be comprised of: Cover Page, Introduction, Materials and methods, Data, Results, Discussions, Conclusions, Work Cited, and Acknowledgments. Below are examples of lab reports. These are hypothetical reports, but they illustrate the main points about a lab report.

For every Group Lab Report, unless otherwise specified by your instructor, you must have the following:

1. A Title and your Name and lab partners. This is called the cover page (sheet) and it is required.
2. An Introduction – brief scientific background about the experiment performed
3. A Materials and Methods – how the experiment was performed.
4. A Data section that includes: drawings, tables, and (or) graphs. Each drawing should be labeled and have a figure legend (a brief sentence explaining the drawing). Each table should have: a title when required; each graph should have a title when required; figure legend, and labels for both the X and Y axis; and units (such as centimeters, grams, etc.) when appropriate. Failure to provide all required components will result in a deduction of points. [See Example 1 on page 9.]
5. Results – a brief English descriptive paragraph about all the data (good or bad).
6. A Discussion - is an interpretation of the data and results that explain how they relate to the existing literature (At least two scientific journal must be discussed) on this topic. The discussion should be to 3-5 paragraphs long (the most important part of the report).
7. A conclusion that states your hypothesis and thoroughly answers why you got the results that you did. Did your results support your hypothesis? Why or why not? Conclusions are at least two well-written paragraphs for each concept described in the lab. Your lab instructor may give you specific questions to answer in your conclusion. Your conclusion will be graded on how thoroughly you cover each question or concept described by your instructor.
8. Acknowledgements. This is where you thank anyone who was of help in the experiment or writing of your lab report. All reports should have an acknowledgement section.
The Following are Data examples only and should not be turned in for any of your lab reports:

**Example 1**
The effects of temperature on *Elodea* and millfoil leaf size.

**DATA:** All tables must be typed. Hand-drawn tables, no matter how neat in appearance, will result in a loss of points.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Mean Leaf size of Elodea (mm)</th>
<th>Mean leaf size of millfoil (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2.75</td>
<td>1.2</td>
</tr>
<tr>
<td>10</td>
<td>4.75</td>
<td>1.5</td>
</tr>
<tr>
<td>20</td>
<td>7.5</td>
<td>4</td>
</tr>
<tr>
<td>35</td>
<td>12.5</td>
<td>5.5</td>
</tr>
</tbody>
</table>

**Table 1**- The effect of temperature (4-35°C) on Elodea and millfoil leaves.

*Figure 1* – The effect of temperature (4 - 35°C) on the size of Elodea and millfoil leaves.

*Box 1.1 – An example of a figure that might be included in a lab report.*
Example 2
The effect of different concentrations of maple syrup on cell structure.
by
Jeannie McDonald

**DATA:** If your data section consists of diagrams, make sure you label them properly, or you will lose points.

*Figure 2.1 – The effect of 1% maple syrup on *Elodea* leaf cell structure.*

*Figure 2.2 – The effect of 10% maple syrup on *Elodea* leaf cell structure.*
IMPORTANT NOTES

Note the sentence under the graph labeled ‘figure legend’ in Box 1.1. The figure legend is a brief sentence describing the graph; it is NOT a key. In computer programs: keys are often referred to as legends; that are not what we are looking for. Notice that this graph has both a title and a figure legend, it also has the x- and y-axis labeled (x-axis is Temperature and y-axis is Mean size of leaves). Finally, for each label there is a unit (the unit for temperature is °G and the unit for leaf size is mm).

What kind of graph should you use? You should use a line graph if your x-axis is continuous. For example, in the above graph, we could have used an infinite number of different temperatures; the data is continuous. If we had looked at mean leaf size by time, time is also continuous. You should use a bar graph when you have discontinuous data. For instance, if our x-axis was Environment or Site, Gender, etc., a bar graph would be appropriate.

A 3-D GRAPH IS NEVER APPROPRIATE; THEY ARE ONLY USED IF YOU HAVE AN X, Y, AND Z-AXIS.

What is the difference between an independent variable and a dependent variable? An independent variable is one that is controlled by the investigator. In other words, it is what is varied during the experiment. For instance, in the above graph, temperature was being varied. Therefore, temperature is the independent variable. Independent variables always go on the x-axis. A dependent variable is what is being measured, counted, or recorded. In the above graph, the sizes of Elodea and millfoil leaves were being measured, so leaf size is the dependent variable.

Graphs must either be computer-generated or drawn on graph paper using a ruler. Graphs that have not been prepared in this fashion will not be accepted. Use of thick markers or crayons for hand-drawn graphs will results in a loss of points, as they are very difficult to read.
CONCLUSIONS

(1) This section should discuss all of your data. There should be at least 1 paragraph for each of your figures, discussing why you got the results that you did. For example:

“The hypothesis for this experiment was that the size of leaves in both plants would increase in size as temperature increased. The results from our experiment supported our hypothesis. The data illustrated in Table 1 was graphed and shown in Figure 1. The leaf size increased with increased temperature. As the temperature increased, the molecules of water moved faster, allowing more water into the leaf than in the cooler temperatures. There may have been an error in our experiment, however, since students did not leave their plants in the water for the same amount of time.”

[Note: This is the bare minimum you would put in your conclusion to receive a passing grade on this portion of your lab report. This example only dealt with one aspect of a non-existent experiment. Your lab experiments will be much more involved; therefore, the conclusions should reflect that.]

Sometimes your instructor will have you do experiments that will not be graphed. When this occurs, you will still have to include them in your conclusion, stating why you got the results that you did. The above conclusion is very brief. Your conclusion for a real experiment should be detailed enough that your instructor knows you were able to grasp all concepts of the lab.

(2) "The hypothesis for this experiment was that there would be no difference in Elodea leaf structure when exposed to different concentrations of maple syrup. As seen in Figures 2.1 through 2.3, our hypothesis was not supported. The incubation of leaves in both 10% and 50% maple syrup resulted in a shrinking of the central vacuoles. This indicates that these concentrations of maple syrup are hypertonic compared to the leaf cells. The concentration of solutes outside of the cell was higher than that inside of the cell, so water from the inside of the cell crossed the cell membrane and cell wall and entered the solution in an attempt to reach equilibrium. However, there was no change in the leaf structure incubated in the 1% maple syrup, suggesting that this concentration is isotonic to the leaf cell.”

[Note: Again, this is only an example and should not be used in any of your lab reports.]

ACKNOWLEDGMENTS

My thanks go to Angie Jones for her good measuring skills in this experiment and my Instructor Karen Green for her helpful comments and discussion of the results.

Note: Anyone who helps you with your experiment and (or) lab report should be mentioned in this section. If the Reference Librarian at the library helped you, acknowledge that individual.

Please remember that these are basic guidelines only. The more thorough you are the better your grade will be. If you have any questions about how to do your lab report, see your instructor. Lab reports are a major part of your grade. By doing them thoroughly and turning them in on time, you will improve your chances of receiving a good grade.