Format for Formal Lab Report -Lite

Revised August 20, 2012

A formal lab report is a record of your laboratory activities and should include the following sections: Introduction, Experimental Procedure, Data, Analysis and Discussion and Conclusion. Each section is required to have a heading and should be neat, well organized and concise. It is customary in the scientific literature to number the sections of a report, typically with Roman numerals. Reports will usually consist of 2-3 pages of text with accompanying figures and tables.

I. **Introduction:** The reason for doing laboratory experiments is to further develop your understanding of the concepts and laws of Physics. The objective of a particular experiment is usually stated in the Introduction section of the lab handout. In a few sentences describe the particular concepts and laws of Physics that the lab was meant to demonstrate and state the objective of the lab.

II. **Experimental Procedure:** Include a one to two paragraph description of the experimental equipment and procedure, using your own words. Be sure to include a diagram of your experimental set up.

III. **Data:** Include the lab handout behind your written report. Your original (raw) data will usually be recorded in the handout, but it also needs to be included in your report in tabular form. There should be a description of the data that is contained in the various tables. Your tables should have a heading and figures should have very clear captions. The information should be laid out in a clear and logical order.

IV. **Results and Discussion**: This section contains the analysis of your experimental data and should include graphs and charts that display the data and the results of any calculations.

Calculations: In this section show any equations that you will be using along with a sample calculation for each.

Show equation ➔ Substitute values ➔ Calculate answer

It is not necessary to show the details of every calculation that you perform, one sample of each formula is sufficient and be sure to include the units.

Graphing: Graphs should be done on graph paper or printed from an application such as Excel. They should not be done on plain or quadrille paper. Every graph should have a title and the axes should be properly labeled with the correct units.

Curve fitting: The data points should be fitted to the proper curve. Just connecting the dots is not acceptable or appropriate. This is most easily accomplished in Excel. The idea behind curve fitting is to minimize the error in the individual data points and use the entire data set to describe a relationship that will summarize your results. The "curve" that we will be utilizing is a straight line. Not all the relationships will be linear, but by modifying the equations or the data it will be possible to use a linear trend line for almost every case.

Error Analysis: Thinking about uncertainties and errors is perhaps the most important part of an experiment. In general, you should spend most of your analysis effort here. Examine the assumptions that went into any derivations used to obtain your results. These include: no friction, a massless pulley, or any other approximations. Are these assumptions valid in the case of your experimental set up. If not, how would it affect your results?

In discussing the quality of your results you should compare them to your expectations. Include the uncertainties (experimental error) in all of your measured variables. The following question must be answered in this section: do your predicted (theoretical or accepted) results and your measured results agree within the limit of these uncertainties? Make a reasonable attempt to account for any discrepancies. Try to identify the factors that would cause this.

An acceptable discussion of error analysis is much more that just stating "human and experimental error!" This says nothing and will receive no credit. If there was human error, the corrective action is to go back and carry out the procedure correctly. If there were experimental errors list them and describe how they will affect your experimental results.

V. **Conclusion:**

In the summary you need to demonstrate that you understand the experiment that you just completed. Include a one-paragraph summary explaining very clearly your results.

Compare your measurements to the expected values. State and discuss whether your results are in agreement with the expected theoretical value. If the value of your percentage error (percentage difference) is smaller than the value of your experimental error, then your results are in agreement with the theoretical value within the limits of experimental error.

If the value of your percentage error (percentage difference) is much larger than the value of your experimental error, then you must describe the reason for this. State the possible sources of error and describe the expected impact of each of these errors on your experimental results.

Overall, did your results meet the objectives of the lab? This should be backed up with reference to your data and analysis. Finally, explain what you actually learned from doing the lab.

General Policies:

1. It is preferable that your reports are typed but neat, hand-written reports are acceptable. Hand-written reports should be done in black or blue ink – no pencil or other colored inks. Do not use paper ripped out of a spiral notebook.
2. Your report should be written in paragraph format and not as a list of bulleted items.
3. Your report should utilize the language and concepts of Physics to describe your activities and observations. You should follow the rules of English grammar and make sure all words are spelled correctly.
4. This final reminder should not be necessary at this point in your academic careers but experience indicates otherwise. The pages of your report should be numbered, organized in the proper order and stapled together with your name on the front page.