Format for lab reports

The purpose of a lab report is to clearly explain why you have done the experiment, how you have done the experiment, what you have found in this experiment, and what do your results mean. The report should be written in a very direct manner without any extraneous information. Typically, the main body of a report is written in the passive voice (e.g. “The temperature was measured” as opposed to “I measured the temperature”), with the exception of the conclusions when personal pronouns can be used to describe your real understanding. Reports are usually best written with a specific format with sections that address each of the points mentioned above. The recommended sections for your reports are as follows:

A. Abstract

The Abstract is the first section of all reports. It should be a concise statement of the results (with errors) and conclusions of the report. The procedures or any other background information are not included in this section. Abstracts are typically about a paragraph, and although they appear first in the report, are usually the last thing written, for the simple reason that you should probably only know the results until after you have written the rest of the report.

B. Introduction

This is the section in which you address the question why you are doing the experiment. It can be appropriate to include historical background (along with references) as to why this experiment is significant, and what the quantity that you are trying to find is of interest.

C. Methods

In this section, you should discuss how you performed the experiment. This should include a clear description of all equipment used and a diagram of the equipment. The way that the data obtained from the equipment is used to calculate the quantity that we are trying to find should be discussed. It is often appropriate to include this section along with the introduction, particularly if we are using a very specific method to perform the measurement. For example, if we are using the Archimedes Principle to measure the density of an object, this would have a natural tie in to the historical background of the experiment, and the significance of Archimedes’ method (as opposed to simply measuring the mass and the volume of an object) would involve a direct description of the equipment. Every experiment is different, so it is up to the author to make a good judgement as to the best way to convey the necessary information as clearly as possible to the reader.

D. Results and Discussion

This is the section in which you should show all of your data, and the results from the data. For clarity, this is best put in tabular form. It is also a good idea to give one sample calculation of your data to show how your arrived at your results. Along with the results should be a calculation of the experimental error. This can be done by either propagating the error of the measurements,
or by computing the standard of deviation of a number of a repeated number of measurements. Ideally, the experiment will consist of repeated measurements, so you can compute a mean and standard of deviation, and this should be within the range of experimental error inherent in each measurement that you can evaluate by propagating. For example, if you are making repeated measurements of the volume of a cube, and the uncertainty in the measurement of each side is ±1%, the uncertainty of the volume can then be found (by error propagation) to be ±3%, therefore, you would hope that the standard of deviation of your collective results be less than 3%. If it isn’t, some explanation is in order. Which brings us to the discussion.

This is where the reader gets to see what sort of understanding the author has gained from performing the experiment. If everything works out wonderfully, then there is little to discuss, but more often than not, some data works out well, while some other data just doesn’t seem to do as good of a job (or it could all give unsatisfactory results). This is where you can offer some insight as to why this might be the case. For example, if we are performing an experiment to measure the acceleration due to gravity \( g \) by measuring the time that it takes an object to fall. Assume that we find that the small times \( t < 0.25 \text{ sec} \) give values of \( g \) that have a mean close to the accepted value but have a very large standard of deviation, the intermediate times \( 0.25 \text{ sec} < t < 2.5 \text{ sec} \) give fairly good values of \( g \) with a small standard of deviation, while the long times \( t > 2.5 \text{ sec} \) give reasonably consistent values of \( g \), but the actual value is too small. It would be up to you to offer some explanation for this, presumably based upon physical grounds. (I would suggest trying to do this yourself for the results from the free fall experiment just described.)

E. Conclusions

This section is a summary of the experimental results and your conclusion. This is also an appropriate place to offer any other general comments about the experiment, such as ways to improve it, limitations, or how it compares to other experimental techniques that try to do the same thing.

It is important to keep in mind that there is no one right way to do a report, and each report will ultimately differ depending upon on each experiment. The above sections should be thought of as nothing more good frame around which to develop your report, and are not strict guidelines. In every report, the author will have to make decisions about what are the important points that he or she wished to convey, and must decide as to the most effective way to do it.