Outline of a (full) Lab Report

A. Title page

- course name
- name and number of the experiment
- author of report
- lab partner
- date
- abstract

The abstract usually is a single paragraph, which summarizes the experiment and your results in a very concise form. It typically addresses the following main points with one sentence each:

- What is the main physics/space science aspect of the experiment ?
- What apparatus is used ?
- What was measured with the apparatus ?
- What is the main result ? If you measured a certain quantity, e.g. Planck's constant, state your final experimental value for that quantity including errors.

B. Main text

I. Objectives

A brief statement on the main purpose of the experiment.

II. Theory

A short presentation of the concepts and formulas (properly typeset) related to the experiment.

III. Equipment

(a) Give a well-labeled sketch of the basics of the experiment (wiring diagram, schematic layout of optics, etc.).

(b) List the principal pieces of apparatus used by manufacturer, model and serial number. When it may be important, list principal specifications of certain pieces of equipment (e.g. the focal length of an optical system, etc.).

IV. Procedures

Describe the main steps in the experimental procedures. Be sure to include any precautions. Sufficient details should be given such that another student can follow and do the experiment.

V. Data, Analysis and Results

(a) Use graphs and figures (do these professionally with good, well-labeled axes, a self-contained legend, smooth curves, error bars, etc.) and tables whenever needed. All graphs, figures, and tables should be numbered and have appropriate captions. Strive for clarity in the design; make it as easy as possible for the reader to see what you found. This is the real heart of the report, so work to make it clear and informative.

(b) Give results with error analysis so the reader knows what precision to attach to them. Also include your raw data at the end of the report, so your results and analysis methods can be checked by the reader.

(c) Compare your results with theory, handbook value, literature values, etc., whenever possible. If the difference falls outside the predicted uncertainty, a search for systematic error is in order. When a source of such error is suggested, it should be bolstered by at least rough quantitative as well as qualitative arguments to convince the reader that it is indeed a reasonable source of error of the magnitude observed.

(d) If there are approximations to theory involved in your experimental method, discuss these quantitatively to give the reader an idea how valid they are and what error they may give.

VI. Summary and Conclusions

This may be a brief summary of Part V above and should contain a discussion of the results and errors listed above.

C. Some general comments

- Overall, the report should be concise and clear. Even though it does not have to be journal quality prose, it should be well written in standard English. Its purpose is to convey information to the reader. Make this transfer of information as effective and painless for the reader as possible. Proofread your report before turning it in !!

- All equations should be fully formatted for easy readability. You may use the equation editor in MS Word (Insert -> Object -> MS Equation) to produce script like this: $v = \sqrt{\frac{2K}{m}}$ or use another equation editor such as LaTeX.

- Measured quantities with errors should be quoted in the form: $x = ... \pm ...$ units, for example, $v = 5.32 \pm 0.05$ m/s or $e/m = (2.17 \pm 0.17) \times 10^{11} C/kg$.
  If you distinguish between statistical and systematic errors, it should look like this: $v = 5.32 \pm 0.05(stat) \pm 0.03(syst)$ m/s.

- Never quote more than the significant figures in anything that you include in the report including in any spreadsheets that you use for data analysis.