FORMAL LAB REPORTS

The formal report documents the experiment that was performed and provides a detailed discussion of the results obtained and how those are important. From such a report, a peer group of chemists who are familiar with the same general subject matter should be able to reproduce the experiment and perform their own analysis.

Reports generally have three goals:
I. To justify the reasons for performing the experiment.
II. To record the results of the experiment.
III. To allow others to evaluate the results.

Formal reports should contain the following components:

1) Title Page
2) Abstract
3) Table of Contents
4) Introduction and Background
5) Experimental Apparatus and Procedure
6) Results and Discussion
7) Conclusions and Recommendations
8) References

Title Page:
The title page should clearly display:
- The name of the experiment
- Your name
- The course number, section, and lab instructor's name
- Date

Abstract:
The abstract should contain one or two paragraphs which clearly and concisely present an overview of the report. Complete sentences must be used, not phrases. Include information on:
- What was done?
- Key results.
- Key conclusions.
Introduction and Background:

This section is written to provide the reader with all the background needed to appreciate why you did the experiment and to understand your results and conclusions. The introduction should provide:

- The objective of the experiment.
- Relevant background information.
- An indication of the importance of the work.
- A brief preview of what will be described.

Main Body of the Report

The main body should consist of four sections: Objectives, Method, Results and Conclusions. Each section must be clearly identified with a heading. Write each section in a logical, coherent manner using complete sentences.

Objectives

Identify the main objective(s) of the experiment. You should be able to cover this section in one brief paragraph, i.e. two or three well written sentences. You may paraphrase statements found in lab handouts but do not copy them.

Methods and Procedures (not more than 1 pages)

Write about the general strategy used to obtain the data. Identify the equipment you have used and the data collection techniques. A schematic of the experiment is almost always necessary. Describe your procedures in such detail that the knowledgeable reader could reproduce your experiment or analyze potential flaws. The intent of this section is to:

- Summarize the experimental strategy.
- Identify what aspects of the equipment and procedure are significant to the outcome of the experiment.

Results and Discussion

Present all relevant observations you made, including any qualitative ones. Prepare graphs and tables that best display the results of the experiment and discuss them. For some experiments, you'll be acquiring a lot of data using the computer. Do not include these reams of raw numeric data in your lab report; present it in appropriate graphs and tables.

Indicate trends, analyze why they occur, and explain any significant features or differences from expected results. Do your measurements and calculated values make sense? If your data don't make sense, point out what possible problems might have occurred. Be as specific and quantitative as possible. Avoid the use of catch-all phrases such as "human error." Always comment on "wild" data points. Graphs and tables must be numbered and referenced in the text. More detailed information on graphs is given below.
**Conclusions and Recommendations**

Present the conclusions you draw from the results. All conclusions should be clearly stated and supported with evidence. Cite specific results and observations from the experiment and tie them to your conclusions. Summarize reasons for any disagreement between your results and the expected results. Recommend ways to correct problems that may have led to discrepancies or bad data points. Recommend any practical way of improving the experiment.

**Graphs, Tables and Figures**

Graphs and tables should be clear and logical. They should be free-standing and carefully labeled, so that the reader can understand them without referring to the text. Hence, you will have to choose figure captions and table titles carefully. Note that "x vs. y" or anything similar is rarely appropriate - captions and titles should be descriptive of the experiment. Each graph should be properly scaled to display the variation legibly and drawn using standard data symbols and curve drawing techniques. Be sure to include plot labels, coordinate labels and units. The text should reference all figures and tables by number rather than by title. Don't use color unless absolutely necessary. Use the X axis for the known parameter and the Y axis for the variable under study.

**Additional Notes:**

Reports will be graded largely on their ability to clearly communicate results and important conclusions to the reader. You should proofread your report as well as spell-check it.

- Neatness and organization will also influence the grade a report receives. Be sure to follow explicitly the format indicated above. Type reports, and attach lab notes as appendices.

- Avoid being overly verbose and flowery when attempting to convey your point - be concise.

- Avoid qualitative phrases such as "the results were quite close" or "heat fluxes were in good agreement with the correlation." Be as quantitative as possible.

- Do not copy material without citing the source. This includes lab manuals, text books, your neighbor, old labs, etc. Plagiarism, of any degree, will not be accepted; you will be asked to redo the report and docked accordingly.

**References:**

Cite complete references for any information that you draw on.

**Length of the report:**

While different labs will vary in length, it is expected that no report would be longer than about 5 pages of text and may well be shorter. A concise report will likely be clearer. Avoid duplicate information unless absolutely necessary. Do not repeat experimental procedure descriptions when the procedure in part X was the same as in part Y.