Laboratory Report Format

Scientists who perform research must communicate their results in writing. They write formal reports to supervisors, funding agencies, and scientific journals. For some experiments, you will be writing formal lab reports. They must be typed or word-processed. The chemistry department has Microsoft Word on its computers, as does the All-Campus Computer Lab in Franklin Hall. The reports must be double-spaced (except for the abstract which is single-spaced), and you must use 12-point Times or Times New Roman font. Although there is no specific minimum length required, a typical length for a thoughtful and well-written report is around 6 to 8 pages, excluding figures, graphs, etc. Proper spelling and grammar must be used! Regardless of the overall length, all reports must include the following sections: Title and Author, Abstract, Introduction, Experimental, Results and Discussion, and a Sample Calculations page. Also, any graphs that are prepared for the data analysis must be included with the report. Each section must be labeled. These sections are described below.

Title and Author

This is self-explanatory. The format is:

Title of the Experiment (not simply the experiment number!)
Your Name
Chem 101
Date

Abstract

The abstract is a brief, single-spaced paragraph at the beginning of the report. The purpose is to **briefly** describe what experiment was done, on what kind of chemical system it was done (but don't write any equations here!), why it was done, and what the most important final results and conclusions were. For example, in experiment 1 you have determined the rate law for the reaction, its overall order, and its activation energy. Thus, your abstract should include those final results.

Introduction

This section introduces the experiment to the reader. The purpose of this section is to provide the reader with any background information on the chemical system you have studied, the methods you are using to study it, why you are studying it (beyond the fact that it was assigned!), and what you might expect to observe. **Thus, you should also include in this section your Initial Model that you developed prior to starting the experiment.** Also be sure to include all relevant chemical and mathematical equations. They should be numbered according to the following format:

$$A + 2B \rightarrow C \qquad (1)$$

$$M_1V_1 = M_2V_2 \qquad (2)$$

The numbers allow you to easily refer to the equations at later points in your report (e.g. equation (1), equation (2), etc.). Any equations must be part of the logical flow of the text! Do not simply insert them at the end of the introduction!

Experimental

This describes what you did when performing the experiment. Here you describe the methods used. However, do not describe in painful detail every little thing you did! For instance, if you used 10.0 mL of 6.0 M HCl for a specific procedure you do not need to describe how you measured it!
Correct: "I then added 10.0 mL of 6.0 M HCl to the reaction mixture."
Incorrect: "I cleaned and dried a 50 mL graduated cylinder. I then filled it with 6.0 M HCl until the bottom of the meniscus was aligned with the 10.0 mL mark. I then poured it into my reaction mixture."

You should assume that your audience knows how to do standard measurements. However, if you deviated from the procedure, you should describe what you did and why. Lastly, do not report results in this section. Save the results for the Results and Discussion section.

Results and Discussion

This is the most important part of the report. First you report your results. You must report them using complete sentences. For experiments with numerical data, such as experiment 1, you must also list them in a table. Each column of the table must be titled, and the unit of measure for the numerical results is shown only in the column title. All tables should be imbedded in logical places in the text and should be numbered as Table 1, Table 2, etc. and each table should have a brief description of its purpose. For example for a kinetics experiment you would have initial rates data and a typical table might look like

Table 1: ACID BASE TITRATION DATA for the reaction between A & B

Trial	Initial [A], mol/L	Initial V_A, L	Initial V_B, L	Final V_B, L	Total V_B, L	M_B, mol/L
1	0.100	0.020	0.000	0.034	0.034	0.059
2	0.200	0.020	0.010	0.045	0.035	0.114

Tables can easily be made in Microsoft Word. Simply click on the Table menu then select Insert and then Table from the menu. You can define the number of columns and rows you need, and you can choose a table format by clicking the AutoFormat button. I prefer you use the Simple 2 format. It is clean and easy to read. Colored and shaded columns are unacceptable!

Before you start discussing the results in detail, you should describe any trends that are evident. For example, with the above data in mind, you might state the following:

"As shown in Table 1 above, two different concentrations of acids were used in this experiment, resulting in different base concentrations at the end. No conclusion can be made at this time. Table 2 given below, demonstrates the results after I re-did this experiment the following week. I carried out multiple trials on only one of the reagents left out as unknowns." Notice how this describes the results without any details about possible reasons for this result. No models or theories are being discussed yet. It is important to present and describe the results in a clear manner before diving into any detailed discussion of what caused the observed results. Finally, you should also include any observational results (e.g. "the color change was sudden" or "the color change was gradual.").

Figures such as graphs should be labeled as Figure 1, Figure 2, etc. and given a title. If you make your graphs by hand, then they should follow after the last page of the Results and Discussion section. If you make your graphs with Excel, then you can try to import it into Word if you know how. Regardless, all graphs must be properly labeled with a title, with all axes must be labeled with titles and units.

The discussion of your results will be your Revised Model. After you have analyzed your results you will go back to your initial model, make any revisions to it as necessary and back up your assertions in the Revised model with your experimental evidence, which is your data. This should be fairly detailed. If you want you can also make drawings if this will help with the molecular-level explanation. Any drawings you present for your model may be done by hand as long as they are neat. This is where you need to be thoughtful and thorough. Remember, the Revised Model is worth 10 points by itself!

Sample Calculations

At the very end of the report, after any graphs, you will attach a page of sample calculations. This part can be hand-written. If your data analysis requires repetitive calculations of the same type, just one representative calculation of this type is required. However, you need to show a sample calculation for each different type of calculation.