The laboratory report for an experiment should consist of the following parts:

1) Title Page
2) Abstract
3) Introduction
4) Data and Calculations
5) Results
6) Discussion
7) Data Sheets and Spectra

In general it is assumed that the theory and procedure given in the write-up for the experiment were followed.

Reports must be written with a word processor. Hand written reports will be rejected. The pages should be bound together with staples. Do not use manila covers or paper clips.

Information concerning the treatment of experimental data and errors of measurement is given in the Appendix. An elaboration of what is expected in each of these sections follows:

Title Page

Put the lab title, your name, your lab partner’s name, your TA’s name and the date on the title page.

Abstract (1 page)

An abstract is a brief statement (not more than a paragraph) of the results of the experiment and the method used. Quote actual values for one or two of your most important results. For example:

The rate constant for the reaction between x and y was determined spectrophotometrically by monitoring the absorption of product z at 500
nm as a function of distance in a flow tube. A value of 0.82 ± 0.02 L mol-Is-1 was obtained.

**Introduction (1-3 pages)**

This is a description of the purpose and method of the experiment. Do not include equations. This should be written in your own words: do not just copy the handout or other references. Do not include a diagram of the apparatus.

**Data and Calculations**

This section includes a summary of the data and calculations leading to the final results reported, along with the corresponding estimates of uncertainty.

All the essential items should appear in the body of the report, usually in tabular form, though in a few cases a plot of the raw data may be appropriate. Each item should be accompanied by units and an estimate of uncertainty. Only minor reductions (such as subtractions of weighings or burette readings) should be carried out on the data sheet.

When multiple-step calculations are involved, it is helpful to make a table with results from each of the major steps in a different column.

One sample illustration for each type of non-trivial calculation should be shown. For each type of calculation, state the equation, define the symbols used, show substitutions, and give the calculated result accompanied by units and an estimate of experimental error. The sample should also show how the error was calculated. Methods for finding the error in a calculated result are described in the Appendix of this handout. Arithmetic details should be omitted.

Consider carefully the number of digits carried in a calculation. You must be sure to carry enough digits to preserve the accuracy of the data. On the other hand, it only wastes effort and increases chances for error to carry many meaningless digits. A good rule is to retain one or two doubtful digits. The question as to which digits are doubtful is determined from the estimated error. If you find after making the error estimates that you have carried unnecessary digits, you should round these off in the report.

Estimates of experimental error should be attached to the various table entries. If the error is practically the same for all entries in one
column, the estimate can be placed at the head of the column or with the first entry. Otherwise, errors should be given for several cases so as to illustrate the variation.

Error estimates should be rounded off to one or at most two digits. The number itself and the estimated error should be rounded off consistently (e.g. 32.14 ± 0.05).

Graphs must be generated by computer-Quattro Pro or any other program (Excel is fine) is acceptable, but you should assume that your TAs are only familiar with Quattro Pro.

When you expect a linear relationship, you should use the method of least squares to find the “best” line representing the data. Quattro Pro has a least squares fitting program built into it. The calculated line should be shown on the graph. The quality of the fit can be judged by inspection. For example, any significant systematic deviations should be evident.

Results

Your final results should be collected together and presented along with the estimated uncertainties, whenever possible, literature values should be given for comparison. Often the results and literature values can be placed in a single table for comparison.

Literature values can be found in standard references available in the Science library. Always cite the literature references from which values were obtained.

Be sure that you have used the proper number of significant figures in your results, and that you have given the correct units for each.

If your results are not as good as you think they should be, review the calculation-especially check numerical work, equations used, and units. Do this review as early as possible so that if more experimental work is needed, it can be done during the later periods allotted to the experiment.

Errors in calculation are common and generally inexcusable. If you are uncertain about some part of the calculation, consult a TA or faculty member and try to be sure the calculations are correct before completing the report. If the fault is in the data, you may wish to repeat some of the measurements.
Discussion

The discussion should include an evaluation of the quality of your data and results. This is based partly on evidence within your own data and experience, and partly on comparison of your results with literature values.

Reviewing your own data, you should ask yourself whether the internal consistency is as good as it should be according to the error estimates made. Is there internal evidence of systematic error, for example, a much larger discrepancy between parallel runs than the apparent errors within each run? Are there unexpected trends in the data?

Comparing with the literature data, do you find that your results agree as well as should be expected from your quantitative error estimates? If not, do you see evidence of systematic error—for example, are your points consistently low or high? Are there clear trends in the errors?

In any case, you should mention possible systematic errors and other factors which might contribute significantly to the error in the experiment but which were not allowed for in your quantitative error estimates.

When possible, you should try to predict the directions of these errors. (For example, in measurement of heat of solution, incomplete dissolving of the sample will inevitably tend to give a low result.) In some cases, you will need to consider the calculation carefully in order to predict the direction of an effect on the final results.

The discussion should be no more than 3 pages long.

References

All references, except the lab handout, should be explicitly cited. When information is obtained from a reference, that reference should be noted by a number in brackets in the text (i.e., [1]) At the end of the report, the references are then given according to those numbers. For example,


See any page in a scientific journal for more examples.
II. Working With Your Lab Partner on Lab Reports

All lab reports must include you and your lab partner’s name on the cover. For all data analysis, you may (and are encouraged to) work with your lab partner to develop the same results.

You should submit separate lab reports. However, we encourage you, at least, to analyze the data with your lab partner beyond sharing experimental data.