

CHEM 446 Lab Reports

Plagiarism

Laboratory reports by students who have previously taken CHEM 446 are available, but not from us. Plagiarism is a serious academic infraction. Using a report from a student who has previously taken the course, and – in particular – simply replacing data in a document with yours are forms of plagiarism. It is unlikely that the laboratory instructor will check your report for this sort of plagiarism while grading, but such a check may be made. It is not worth the risk to try such a stunt.

You must turn in copies of the data from your notebook that may be used to check the data in your report. You should be analyzing the data you and your partner took, not that of someone else.

Style of a Report

Laboratory reports are to be created with a word processor. They are to be carefully constructed, edited, and proofread before submitting. Reports should contain no hand-written or hand-drawn material. Grammatical and typographical mistakes in a report do not encourage the reader to trust the experimental data, so you should construct the report with an eye to proper English, proper style, and careful organization.

Technical reports are different from the papers written for a nonscientific audience. Do not lead the report or a paragraph with conclusions. Draw conclusions from data and arguments that have been presented in the paragraph. Do not write in narrative style. It is not necessary to define standard terms like standard deviation, etc. Remember that you are writing a report for a technically literate audience.

Reports should follow this general format.

1. The report should begin with a **Title** that indicates name of the experiment and the experiment number. On a separate line should be the name(s) of the author(s). **This year, include below the name(s) the e-mail addresses of all authors.** On a subsequent line should be course and section number, and on a separate line should be the due date of the report and, if different from the due date, the date when the report was submitted.
2. The **Abstract**, (10 pts) a **brief** summary of the results of the experiment, should be included on the title page. The title and abstract should not be more than one page. The abstract should include the important results of your experiment, including values you determined (including uncertainties) of parameters, a comparison of the results with literature data (no reference number needed here). Do **not** put a table of data in the abstract.
3. An **Introduction** (10 pts) to the report discusses the theory of the experiment and has necessary and appropriate equations. Do not copy directly from the laboratory write-up; that is plagiarism. The introduction should not be a detailed laboratory write-up, nor should it be a tutorial on the subject. A brief introduction that states the problem, generally describes or mentions the methods used, and provides the motivation for the experiment is all that is needed. You do not need to repeat derivations.

4. The **Experimental Section** (10 pts) describes the general procedure used. Again conciseness and brevity are important in writing this section; do not repeat the write-up of the procedure. If you made any significant deviations from the written procedure, mention them in this section. This section should be written in the past tense – what you did, not what someone else would do.

5. The **Results and Discussion** section (40 pts) contains tables, figures, and necessary equations. The methods of presenting data will vary from experiment to experiment, but the essential “raw” data should be provided, as well as any quantities derived from them.

6. When possible, comparisons should be made of your data with literature values in a **brief Conclusions** section (10 pts). The abstract and conclusions may be very similar. A reasonable assessment of sources of error should be given, but don’t “make up” reasons. “Misreading balances” or “incorrectly standardized solutions” are not allowed to be mentioned as sources of error; consider the experiment and understand where error may enter the procedure. You may not be able to explain why your data and the literature data do not agree, but compare the data – numerically when possible. This section must be written in the past tense – what you did, not what you “could have done”. Conditional verbs are not allowed.

7. If there are discussion questions, include them at this point, perhaps as a series of paragraphs in the section entitled “Conclusions”, or as a separate section. It should be clear to the grader that you are answering discussion questions, so writing out the discussion question, followed by the answer.

8. A good report always contains a list of pertinent references. These should be included in a section entitled **References** at the end of the report in ACS standard format. Below are some examples, but you can find the full ACS Style Guide on the Web at

<http://pubs.acs.org/userimages/ContentEditor/1246030496632/chapter14.pdf>

An article:

¹Sawyer, A. K. *J. Chem. Ed.* **1983**, *60*, 416.

A book:

²Bakmutov, V. I. *Practical Relaxation for Chemists*, John Wiley: New York, 2004.

A newspaper article:

³Squires, S. Falling Short on Nutrients, *The Washington Post*, Oc 4, 2005, p H1.

There are certain issues of style that should be obvious.

(1) Be consistent in formatting the report. If numbers of equations are in parentheses, always put them in parentheses. If sections are numbered, then all sections should be numbered. To cite a reference, use a superscripted number.

(2) All sentences should be complete sentences. All paragraphs should be written as a explaining a single thought.

(3) Certain words are often misused. For example, remember that **data** is a plural noun. You cannot analyze a single number or **datum**. **None** is a singular noun. A plot of data is a figure, not a “chart”. A set of numbers in columns is a table, not a figure.

(4) All equations, tables, and figures are to be numbered consecutively through the report, based on first citation. Tables and figures should appear in the body of the text near the first reference in the text – NOT at the end of the report. **The title goes above a table and below a figure.** Each table and figure must have a brief descriptive title. The titles of all tables should follow the same format, either capitalizing all major words, or – in another format – capitalizing the first word only (with the exception that proper nouns are always capitalized). The format of all figure captions should follow one standard format. If you write captions in complete sentences, all captions should be in complete sentences. If you write captions in phrases, all captions should be in phrases.

(5) All tables of data should be discussed at least briefly. No data may be discussed that are not presented in the report. Footnotes are useful in tables for a value that is common in the calculations of data in the table. Use superscript lower-case letters to reference footnotes. In general, tables provide the data for the figures and should precede them in the report.

(6) Each column in the table needs a heading, but these should be concise. Don’t let values extend from one page to the next. Change the font as necessary. Break the table into parts if needed. Units must be specified, either in the heading or as a footnote. Lines separating rows and columns (borders in Excel) help the reader to understand data.

(7) Adjust the scale of your figures to fit your data: the initial computer values are often not the most useful way of presenting data. Most of us think in powers of 10. That is, a scale with divisions of tenths is easier to read than a scale with divisions of 1/11. Do not give negative values on an axis when negative values are impossible. Remember this: You choose how to present your data, not the computer program. Significant modifications must be made to an EXCEL figure to make it acceptable.

(8) In a figure, the horizontal axis always represents the independent variable – the one that was changed. Data points should be clearly visible in your figures when a line is drawn through them. Use individual values, not error bars around the average. Do not use a plotting program that automatically connects the points. If you have an equation, use it to fit your data, and display that as a line on the figure, along with the data. Use different shapes or colors of points for data obtained under different conditions (Exp. 6), but don’t get carried away with your artistic temperament. Background colors almost never help in a figure. Vertical and horizontal gridlines are necessary. The figure should have a vertical line to close the right hand side. The labels on axes should be appropriate; be sure to format them with superscripts and subscripts, where appropriate. Check the numerical values for the coordinates to ensure a consistent and reasonable number of decimals. Do NOT use an EXCEL heading inside the block of the figure. Journal editors don’t like this.

(9) Sample calculations are not wanted, but the equations that are used to obtain results must be given. Use an appropriate program for writing algebraic equations in an easily readable form; regular typed or handwritten formulas are not acceptable. Do not use text to describe what can be written in an algebraic equation. Superscripts and subscripts are essential in algebraic and chemical equations.

(10) When reporting data, one often averages data to find what should be “the value.” Average values should always be given with the appropriate standard deviations.

(11) Pay attention to significant digits in tables and text, including trailing zeros. The number of decimals should reflect your experiment, not a standard computer format. In EXCEL, it is necessary to specify the number of decimals in each cell or column. When multiple values of a single quantity are directly measured, give each value in the table and use each value in your figure.

(12) Results written as equations that relate variables should include experimental parameters and standard deviations.

(13) Don't waste space in your report. A half-empty page looks weird. Reorganize your report to eliminate large empty spaces.

REPORTS ARE TO BE SENT IN PDF. Formatting does not always transfer well from one program to another, so check the PDF before sending to be certain that the format is correct. An electronic copy of each report **as a PDF** is to be sent to the laboratory instructor for grading the report. The deadline for receipt of a report on an experiment is the beginning moment the laboratory period two weeks after the experiment was begun.