

Guidelines for Writing Laboratory Reports at LaSalle University

This document provides general guidelines¹ for students enrolled in advanced chemistry courses at LaSalle University. These guidelines are to be followed for any report in analytical chemistry, physical chemistry, instrumental analysis, organic laboratory methods and inorganic chemistry.

The outline for a paper is:

- Authorship and Abstract
- Introduction
- Results and Discussion
- Experimental
- References and Acknowledgements

Authorship and Acknowledgements: Authors are those who claim intellectual ownership of the written report. Except for group projects, there should only be one author on a paper handed in for a grade. Students or faculty who assisted with experimental work or interpretation should be acknowledged in an Acknowledgements section at the end of the paper. Authorship should be noted on the opening page in a citation similar to:

Radiosensitization of Tumor Cells by Cantharidin and Some Analogues
William A. Price*, Corinne C. Stobbe, Su-Jung Park, and J. Donald Chapman
Department of Chemistry and Biochemistry
La Salle University
Philadelphia, PA 19141
Submitted January 1, 2004

General writing: The writing center may be able to provide advice on using correct grammar and a clear and concise writing style. You need to use a spellchecker and to proofread your *printed* document before submitting it; pictures and symbol fonts that show up on the computer screen are sometimes not printed correctly.

Format: For ease of reading and grading, reports should:

- Be one-sided with line spacing of 1.5 lines (Format Paragraph, Line spacing 1.5)
- Have 1-inch margins (File, Page Setup, Margins)
- Use 12 point, Times New Roman font.

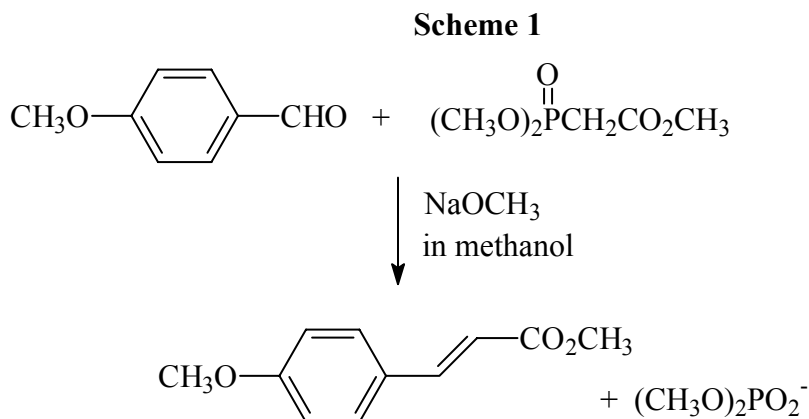
Greek symbols can be added by using the Insert Symbol menu item. Pages should be numbered in the lower right corner (Insert, PageNumbers). Graphs and data tables should be embedded directly into the document when they are discussed. Do not place them on

separate pages or at the end of the report. It is acceptable to write by hand missing symbols and/or mathematical equations, and it is also acceptable to tape in figures.

Abstracts: An abstract should stand on its own and repeat what is in the rest of the paper. Abstracts should be short and summarize the main results and conclusions of the paper.

Chemical structures: Inclusion of chemical structures of the molecules you are writing about can dramatically improve the quality of a paper. You should draw their own chemical structures and reaction schemes rather than relying on photocopies. Chemical structures may be drawn freehand or with structural drawing programs such as ChemDraw[®], ChemWindows (from Know-it-all[®]) or IsisDraw[®] (the last is a freeware program available at www.mdl.com).

Figures, Tables and Schemes: Figures should be numbered starting with Figure 1. Each figure should have a caption underneath that describes what is shown in the figure. When the figure contains a spectrum or other experimental data, the caption is a good place to include experimental details such as slit width, scan speed or other pertinent information. Tables and reaction schemes should also be numbered starting with 1. For these, the captions go above the table or scheme. Schemes are used for synthetic pathways and reaction mechanisms, and often have minimal captions, such as just “Scheme 1”. For example:



The figures, tables and schemes may either be woven into the text (preferred) or placed at the end of the paper (tables first, then schemes, then figures).

Use of copyrighted material: If you wish to publish your paper (or even post it on the web) you would need to get copyright permission to use a photocopied or scanned figure. When photocopies of journal articles or books are used as figures, a statement such as “(copied from ref. 5)” should be included in your figure caption. Even when you use a photocopied figure, its caption should be your own writing rather than a copy of the original figure caption. Use of photocopied tables is discouraged; data from a short table can be more easily reported using a table you type in and format yourself, and for longer tables, it is generally better to decide which part of the table is relevant to your report, and include only this information.

Equations: These should be inserted into the text as they are introduced and numbered consecutively. The number of the equation is included within parentheses, as shown below for equation 1, which was produced with the MS Word equation editor.

$$\ln k = \frac{-E_a}{R} \frac{1}{T} + c$$

References: It is very important that you clearly cite the source of the information you use in your paper. This is usually done using endnotes (end of paper). Use the citation style found in chemical journals; for example, see any recent article in the *Journal of the American Chemical Society*². More details may be found in a book on reserve in the library³. The exact pages do not need to be cited for journal articles, but should be included for references to books. In published scientific papers, if the same article is cited several times, it is given the same endnote number each time the citation occurs. Because this is logistically difficult (unless you invest in specialized software such as *ProCite* or *EndNote*), your instructor may allow you to submit papers with multiple complete footnotes to the same reference.

Passive voice and first person: Scientific writers generally use the passive voice and avoid the first person in writing Experimental sections. For instance, instead of saying “I added acetic acid (3.51 g) to the 100 mL round-bottomed flask”, the author might write, “Acetic acid (3.51 g) was added to the 100 mL round-bottomed flask.” However, there is no rule that passive voice must be used in *all* scientific writing, and experts on writing suggest that the passive voice should be avoided whenever possible. [Let’s try that again: experts suggest that writers avoid the passive voice whenever possible.] So if you are describing experiments carried out by Smith and co-workers, “Smith et al. found that...” is better writing than “It was found that...” In addition, there is nothing criminal about using “I” (or, in a co-authored paper, “we”); for instance: “one difference between my experiments and those performed by Smith et al. is the polarity of the solvent.” As another example, assume that you wish to propose a novel reaction mechanism (i.e. one that has not been made previously in the literature, to your knowledge). In this case, make it clear to your reader that this is your original proposal by writing “I propose the following mechanism:”.

Some Notes on Each Section of the Report

Introduction

The introduction should provide the reader with a reason for the experiment and sufficient background information so the reader may understand the importance of the current work. A brief review of previous work may be necessary. It also necessary to introduce the equations that you will use to interpret and explain your results.

Results and Discussion

This is the most important section of a report. In this segment, you develop and interpret the data that you collected. There is a great deal of latitude in writing this section but it should include all the results you obtained. These results should be presented with error estimates where appropriate. The nature of the error estimate is up to you as the author but multiple measurements of the same quantity are generally averaged and reported with a standard deviation. A data fit (linear or nonlinear) should include error estimates of the important parameters (slope and intercept).

It is important to discuss the data. Do not just report the values and the errors. What does the data imply? What is the chemical significance of the results? Do these results agree with a theoretical model or not? What may be the cause of the discrepancy if there is one? This is not the time to invoke the “human error” argument. Your experiments should be completed in a careful and precise manner. If you make a mistake, go back and fix it. Human error is not an acceptable defense for poor data. Additionally, do not use instrumental error indiscriminately. Many of the instruments you use are quite precise and it is usually incorrect to state that the instrument was the cause of a 15% experimental error. If you believe instrumental error is a factor, you must support your conclusion with some reasonable argument.

Experimental

This section begins with **Materials**.

List the chemicals you used, including the manufacturer (if known). Solutions from the lab should be listed along with the concentrations. Any solutions you prepare should also be included.

Measurements.

You should list any instruments along with the manufacturer. Instrumental parameters such as slit width or scan speeds should be listed with the graphs of the data.

Other experimental information follows these two subsections.

Appendices

The appendices contain pertinent material that was not presented in the report. Sample calculations and Mathcad documents should be in appendices.

¹ Significant portions of this document were abstracted from **Haverford Chemistry Department General Guidelines for written reports**. Revised December 22, 2000 by R. Scarrow

² LeCours, S.M.; Philips, C.M.; de Paula, J.C.; Therien, M.J., *J. Am. Chem. Soc.* **1997**, *119*, 12578-12589.

³ *The ACS Style Guide*; Dodd, J. S., Ed.; American Chemical Society: Washington, DC, 1986; pp 106-114.