

Tips for Writing a Scientific (Lab) Report

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The lab report should be about 2-4 pages long. In addition to including all of the items below in each and every report, use 11 or 12 point type in a easy to read font with 1" margins; number pages in sequential order; separate sections with appropriate sub-headings; and staple all pages together. Please note that every section has a point value. Each part of the sections will also be assigned a specific point value that will be customized for each experiment. Please note: Failure to include required items is the most common reason students receive low grades on lab reports.

Additionally, lab reports must be submitted via My Courses in Microsoft Word. A folder will be created for all of your submissions for the semester. Please name report file as follows (e.g. for distillation lab). Increase to 002 for Lab 2, 003 for Lab 3...

001_LastNameStudent1_LastNameStudent2_DISTILLATION_Date

Some labs will be submitted individually some as groups. Your instructor will specify for each experiment. *If* you are allowed to submit a group report, you must keep the 'Track Changes' ON during the entire writing process in MS Word, this will allow instructor to see who has contributed to certain sections and assign grades accordingly.

Title: Write a clear, specific, descriptive title. For example, "Separation by Distillation" is too vague. Did you really separate all possible compounds in the world by distillation? Say "Separation of Ethyl Acetate and Butyl Acetate by Distillation."

Author Names: *If* you are allowed to submit a group report, list the author names and affiliations as in the following example:

Roger Moore¹, Sean Connery², Timothy Dalton³

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²Department of Chemistry, Queens University Belfast, Belfast, Northern Ireland. ³Queens College - City University of New York, Queens, New York.

Abstract:

An abstract is defined by Webster's New World Dictionary as "that which presents the substance or general idea in brief form; concise, condensed." Present a *brief* summary of the whole experiment in a few sentences, including what was done, how it was done, and what the results were. An abstract should serve as a "preview" or a "teaser" of the best results that you obtained. You want people to want to read your paper!

Introduction:

This is the description of the purpose and goals of the experiment including any historical background about the science you are about to describe/perform. This is the time to let the reader know you've done your homework about other, related experiments in the field, and are not attempting to "reinvent the wheel". You can use Figures, Equations and Schemes to explain your objectives (see below). This is also the place to introduce any abbreviations that you will

use throughout the written work. Common abbreviations (e.g. mL for milliliter need not be explained). Remember you shouldn't start a sentence with a number unless it's part of a written-out chemical name. Do not worry if you seem to be repeating much of what was said in the Abstract. Chemical structures must be neatly drawn or produced by ChemDraw, a structure drawing program that is available for your use in Rogers 308.

Figures – Typically a cartoon-like image of flow chart used to explain the overall goal of an experiment in simple terms.

Equations: Equations used to calculate results from your raw data.

Schemes: Chemical reactions, often showing reaction mechanisms.

Materials and Methods:

More detail about how the experiments were performed. Diagrams, drawings, pictures, flow charts, reaction schemes, *equations, model calculations and UNITS!* (a good opportunity to learn how to write these in MS Word), showing experimental setup and calculations.

Equipment/glassware/reagents used, their manufacturers, limitations (i.e. number of digits to which they are accurate), purities, etc. This language has to be tight and assume the reader is familiar with labs (i.e. you do not have to specify that you wore a lab coat or cleaned up the bench after your experiment). This is the place to really explain to the reader what you did and how you did it. For example, don't just say that the glassware was dried, say it was dried in a Fisher Scientific oven at 110°C for 1 hr after washing with soap, water and acetone.

Results and Discussion:

Write a short paragraph or two describing the success (or failure) of the procedure, paying attention to recovery and purity (e.g. organic lab). Compare your data to literature data. That is, state whether or not your HPLC retention time or TLC R_f matches the standard, whether your melting point is consistent with the literature value, and whether or not your NMR or IR spectra matches those found in the literature. Describe what happened in your experiment. Describe the interpretation of the results and their significance. Explain what the results mean, what conclusions can be drawn, what is the statistical significance of your data (e.g. analytical lab). Your data should be presented in the form of charts, graphs, tables, as appropriate. Tables must be well-organized, efficient, numbered, and given clear descriptive titles.

All should be labeled with captions and you can have Figure 1, Table 1, Scheme 1 for example (you restart the count with each type of Figure, Scheme, Table, etc.). Error should be described and error bars calculated from standard deviations should accompany all graphs/charts. You can also put the standard deviation and number of experiments n in the Tables (so the reader can calculate confidence intervals for your data).

A detailed discussion of waste disposal is also required for each lab report.

Conclusions:

This is where you can embellish on the results a bit, but don't stick your neck out too far! Simply restate the major findings and if any of the data hints that there should be more

experiments needed to prove an offshoot of your findings, great, you may have made a discovery!

References: Numbered endnotes must appear throughout your report to cite sources. Complete bibliographic information must be provided for all references in the report. You must reference anything that you had to look up, even if it was in the lab manual, your textbook, or the Sigma-Aldrich catalog. You will be penalized for undocumented sources. You really should not need to be reminded to reference your sources at this point in your college career.

Writing Quality: The most important characteristic of scientific writing is clarity. Even the most brilliant scientist must clearly explain his/her ideas in order for them to make any impact and have any chance of being funded. You will be graded on clarity and grammar and mechanics.

Appendix:

Attach your labeled, assigned, primary/raw data to the report. Primary/raw data includes graphs, spread sheets, calculations, and spectra. Assignments structures, bonds, atoms, etc directly on the spectra whenever possible – ChemDraw is great for this. Include ALL relevant information. Be sure your data are carefully labeled. Sample name legends can be included here as well.

Example of a Data Table: Here data is tabulated and averaged. This is often done in Excel to facilitate calculations. Notice that some borders are removed for ease of reading and everything is aligned on one side or middle of the column. Units are included in the header of the column and can be bold. Do not cut off Tables between pages and try to include all Figures, Tables, Schemes, etc. on the page where it is explained in the text – so the reader does not have to flip through pages to find the relevant visual aid.

Banana Sample Collection Site	Number of Samples (<i>n</i>)	Temperature (°C)	Number of Seeds per Plant
Columbia Site 53	50	19.0	52
Columbia Site 28	48	21.0	60
Costa Rica Site A324	52	25.0	62
Costa Rica Site B432	121	35.0	58
<i>Total Columbia</i>	98		
<i>Total Costa Rica</i>	173		
<i>Average Columbia (+/- SD)</i>		20 (+/- 1.41)	56 (+/- 5.66)
<i>Average Costa Rica (+/- SD)</i>		30 (+/- 3.53)	60 (+/- 2.83)

There are infinite ways to make data tables, the easiest to read are the best!

Other Helpful Tips:

- Use the font Symbol for Greek letters.
- You can superscript a lower case o for degree symbol.
- SPELL CHECK YOUR DOCUMENT before submitting it!
- Take time to make your tables and plots correctly.
- Chemical names are NOT capitalized, for example, hexanes is correct, Hexanes is not correct