

# Formal Laboratory Report Style Guide

Mr. Bigler

Revised: October 29, 2010

When you do experiments, you write them up in your lab notebook, which is a kind of personal journal of the experiments you have done. A formal lab report is how you communicate the details of your experiment to the outside world.

There are many ways of writing up a laboratory experiment. You have probably already done several different forms, in your ninth grade science and biology classes. The format we will use in this class is called “journal article format,” because it is the same format that scientific journals require for published articles. More practically, it is the format required by most colleges. It more or less resembles the format of an English term paper.

## Sections

### Summary

A standard journal article laboratory report is organized into the following sections:

**Title:** A single sentence fragment (no verb) that describes your experimental objective and gives some indication of the method (procedure).

**Abstract:** A one-paragraph summary of the *entire* experiment—your procedure, results, and analysis.

**Introduction:** A description of the scientific background for your experiment, including any previous experiments that your experiment builds on. (Remember to cite your sources!) The final sentence (analogous to the thesis statement in a term paper) is the objective of your experiment.

**Materials and Methods:** A detailed description (in paragraph format) of the procedure for your experiment.

**Results:** Your data, as you observed/recorded them. Note that this section is only for data that you observed or measured directly. Your analysis (including calculations) belongs in the Discussion section.

**Discussion:** Your calculations, an analysis of what your results mean, and your error analysis.

**Conclusion:** A short paragraph that restates the objective from your introduction and relates it to your results and discussion, and describes any future experiments or improvements that you would recommend.

**Works Cited:** A bibliography of all of the sources you got information from in your report.

## Details

### Title

The title needs to describe what the experiment was about and give some indication of what the procedure was. Remember that if people do an internet search, the title is the only thing they will see, so a more descriptive title is better.

Titles of lab reports are *long*—often almost a complete sentence (except for the verb). An example of a good title might be “The Effect of Temperature on the Pressure of Nitrogen Gas.” Try to be as specific as you can; “The Magnetic Properties of a Vanadium-Iron Alloy” is better than “Properties of a Magnetic Alloy,” or even worse, “Magnet Lab.”

The title should not contain chemical symbols, formulas, or abbreviations. Note that a separate title page is not necessary. Your lab report is graded on content, not length, so there’s no reason to kill extra trees.

### Abstract

The abstract is a short (less than 200 word) “executive summary” of your *entire* lab report. Its purpose is to communicate your entire lab report (procedure, results, and discussion) to somebody who doesn’t have time to read it.

An abstract is like *Spark’s Notes* for your lab report. For a high school lab report, it will probably be one paragraph of 4–6 sentences. The first 1–2 sentences should describe the objective of the experiment and the procedure. (The description of the procedure should read a lot like the “Experimental Plan” in your lab notebook.) The next 2–3 sentences should summarize the major results and conclusions, and the last sentence should describe any possible sources of error, the percent error (for a quantitative lab), and any other limitations or caveats on your conclusions.

Abstracts are often published separately from the rest of the report, so your abstract must be complete and make sense without any of the rest of your report. This means your abstract can’t refer the reader to any other section of the report for tables, figures, or other information.

### Introduction

This section describes the science behind your experiment, and should tell the reader why you performed it. The introduction should include background information about the chemical principles involved, and a summary of any prior related experiments. If your experiment includes a hypothesis, you would state it in the introduction.

For a high school lab report, the introduction should contain at least two paragraphs. The final sentence of the last paragraph should state the objective of your experiment, much like the final sentence of the introduction section of a term paper usually states the thesis of the paper.

The information in your introduction will almost certainly come from other sources (textbooks, class notes, handouts, *etc.*). You need to include citations that point to bibliography entries in your Works Cited section.

## Materials and Methods

This section (sometimes called “Experimental”) describes your procedure, in enough detail that someone else with your level of experience could repeat the experiment. The section must be in *paragraph form*, and in the past tense. *e.g.*,

Sodium carbonate (10.0 ml of a 0.10 *m* solution) was placed in a 100 ml beaker and acetic acid (0.50 ml of a 1.0 *m* solution) was added.

You must include all of the relevant quantitative information, such as the names and concentrations of all chemicals used, temperatures, times, *etc.*) Your description must be specific. If the experiment involves a complicated set-up, you may include a drawing to show it. (Remember that figures need to be numbered and have titles, just like tables.) However, the drawing is not a substitute for the description. Be sure to include the manufacturer and model number of major laboratory equipment used (pH meters, spectrophotometers, *etc.*)

The first time you mention a chemical, write out the name, followed by the chemical formula in parentheses (*e.g.*, sodium chloride (NaCl)). After the first time, you can refer to the chemical by its formula.

You may assume that anyone who is reading your lab report will know basic chemistry. For example, don't bother to mention safety goggles, but you should mention any *unusual* hazards or precautions, including whether any of the chemicals are explosive, flammable, or toxic, or if there are any special procedures for disposing of wastes. Do this in a separate paragraph, starting with the word “Caution:”.

If your procedure is based on a written procedure from another source (such as a lab handout), remember to include a citation and a bibliography entry in the works cited section.

## Results

In this section you present your data. You will probably want to use tables and/or figures to present the results. However, every figure or table must be numbered and the number must be mentioned within the text. All figures and tables also need titles, and need to be labeled with enough detail that someone who is not familiar with the experiment will know what they represent. (Remember to include units in your tables, and labels on both axes of your graphs.)

Keep in mind that tables are useful when the reader wants to know exact values, and graphs are useful for showing trends and for deriving values from a statistical fit of data. Tables and figures should be numbered sequentially (such as “Table 1” or “Figure 1”), and each one should have a descriptive title.

If your data include any calculated values, you must include the formulas in this section.

## Discussion

The Discussion section is where you interpret and compare your results. You should compare your results with published or theoretical values (including percent error) whenever possible, and list

and analyze possible sources of error. (Remember that published values need a citation in your works cited section.) If your experiment includes a hypothesis, you need to evaluate how well your data support or refute the hypothesis.

## Conclusions

As with an English term paper, this section should start with a sentence that restates and evaluates the objective that you stated in your introduction. Then, give a brief summary of the main results and conclusion(s) of the experiment (you'll probably use the same text here and in your abstract), as well as restating any *major* problems or sources of error. Finish with suggestions for improvements or future experiments.

## Works Cited

Any information that came from another source (including your textbook, class notes, handouts, *etc.*) *must* be listed here. You can use the same format for references that you use in your English classes or any other format, as long as it includes the author, title, where & when the work was published, and the specific location within the source (such as page numbers).

## Rules

Lab reports must:

- be typed or typeset on a computer, except for diagrams, which may be handwritten as long as they are neat and legible.
- include your name, and the name(s) of your lab partners (even though each of you must turn in separate lab reports).
- include your teacher's name and the class period.

## Stylistic Points

### No First- or Second-Person Pronouns

In formal writing, including lab reports, never use the first or second person. Instead of saying "I dissolved 8.5 g of sodium chloride in 100 mL of water," or worse yet, "You dissolve 8.5 g of sodium chloride in 100 mL of water," you should say, "Sodium chloride (8.5 g) was dissolved in 100 mL of water."

### Passive Voice

You have probably been told to avoid the passive voice by your English teachers. (The previous sentence is an example of the passive voice; the active version would say, "Your English teachers have probably told you to avoid the passive voice.") However, scientists often use the passive voice,

particularly when describing experimental protocols. This is done intentionally, to emphasize the fact that the report is about the experiment and its results. To your readers, the experiment is what matters; you are irrelevant! For example, most chemists would write, “The solution was heated to 100°C for 25 minutes,” rather than “the investigators heated the solution to 100°C for 25 minutes.”

## Verb Tense

Lab reports are written in a combination of past and present tense, depending what you are writing about. If you are writing about things you did (actions that took place in the past), such as the details of your procedure and the results that you observed, use the past tense. However, use the present tense for trends and properties. For example, write “The solution was heated to 100°C for 25 minutes.” because that was a specific action that was carried out at a specific time in the past. However, write “ammonia and hydrochloric acid react to produce ammonium chloride gas”, because this happens every time these chemicals come into contact with each other.

## Numbers at the Beginning of Sentences

Never start a sentence with a numeral. (The figure “2” is a numeral; the word “two” is not.) However, you need to report all numbers to the correct number of significant figures. This creates a problem: if you added exactly 1.00 g of salicylic acid to a beaker, you can’t say “1.00 g salicylic acid was added...” because you can’t start a sentence with a numeral. However, you also can’t say “One gram of salicylic acid was added...” because you need three significant figures. You also can’t say “I added 1.00 g of salicylic acid...” because you can’t use the the first person. The solution is to start with the substance, and put the exact amount in parentheses, *e.g.*, “Salicylic acid (1.00 g) was added...”

## Miscellany

Other than the above, you should follow the same rules of formal English grammar and usage that you have been taught in English class. Note particularly that the word “data” is plural, so you need a plural verb with it. You can’t say “The data shows that...” This is as bad as saying “The people says that...” If you ever need to use the singular of data, it’s “datum”.

## Works Cited

Simpson, Bill. *Laboratory Report Style*.

[http://www.uaf.edu/chem/434f02/prep/acs\\_guide.html](http://www.uaf.edu/chem/434f02/prep/acs_guide.html)

(accessed June 2004)

Queeney, Kate. *Guidelines for Writing a Formal Laboratory Report*.

<http://www.science.smith.edu/departments/Chem/Courses/labreports.htm>

(accessed June 2004)