Writing in the Sciences*

Science writing prizes clarity and concision. The purpose of your language is to convey, as simply and precisely as possible, what you did, how you did it, and the significance of your findings. Scientists write for history – for other researchers, current and future, who will need and want to reproduce their results. While metaphors and other kinds of figurative language might very occasionally help to clarify a particular point, they can often mislead or distract readers.

Lab Reports

The lab report is the most common writing assignment in the sciences. In essence, it’s a student version of a scholarly article: it contains the same sections, obeys the same logic, and serves analogous functions. It also provides a template for the lit. review and the research paper, which are common assignments in upper-division classes.

Below, we describe the purpose(s) of each section of the lab report in order. We’ve also included a section of “WF Tips” for each section. At the end, there’s a list of issues that vary between the scientific disciplines, and often from professor to professor. In most cases, professors will let you know their preferences on these issues, but if they don’t – ask!

It’s important, in lab reports, to keep the sections separate: don’t go over materials and methods in Results, and so on. Some capsule repetition may be necessary for clarity (for example, you might need to recap your Results at the beginning of the Discussion). The lab report as a whole, however, should be unified, presenting a cohesive argument.

Abstract

Not all lab reports will require an abstract, although most scientific journal articles do provide them. An abstract covers all the sections in shorter terms. A reader should be able to understand your experiment and its significance just from reading the abstract. It’s typically written after the rest of the lab report has been completed.

Introduction

The Introduction provides the basic background a reader needs to understand your experiment. It should lay out how previous research (or a lack thereof) has led you to this particular question and explain your results’ potential significance, especially in light of your hypothesis. Write an introduction so that a reader outside your field can follow your reasoning and understand your hypothesis and its significance.

* This hand-out was developed by Ale Borunda ‘08, Mike Brown ‘07, Erik Lykken ‘09, Dara Regaignon, and Hannah Salim ‘09 on the basis of interviews with Professors Cheney, Duncan, Moore, Negrito, O’Leary, Parfitt, Seligman, and Vasquez.
WF TIPS:
1. Don’t misidentify the audience! You are writing to a broad, general set of readers, not exclusively to your professor.
2. Maintain focus! Don’t raise tangential issues. This isn’t a general survey of the field; it’s the background for your particular question and hypothesis.
3. It’s important to make a clear distinction between your hypothesis (the mechanism you’re interested in) and your predictions (the results you expect to see).
4. Make sure that you’re writing as clearly as possible. In particular, present your hypothesis and predictions directly and explicitly.
5. Cite appropriately! Give credit where it’s due.

Materials & Methods
The Materials and Methods section is written for the specialist in the field. This is where you tell the story of your experiment as clearly as possibly, describing clearly and precisely what you did. After reading your Materials and Methods section, another scientist should be able to reproduce your experiment; it’s therefore an historical document, providing a record of the experiment for not only current but also future researchers. Specify any variations from a standard protocol (lab manual, etc.)

WF TIPS:
1. Make sure that if you’re using a procedure or material that originates from someone else, you cite it.
2. Remember to take notes while doing your experiment, so that you can reconstruct what you did accurately.
3. Most figures belong in Results, to communicate findings.

Results
In the Results section, you report your data. Figures and tables are crucial here, but they don’t speak for themselves. It’s important to find a middle ground between simply pointing your readers to the figures without further explanation and explaining so exhaustively that the figures become redundant. Like the Materials and Methods, Results is largely descriptive, telling the story of what you found without explaining why.

WF TIPS:
1. Don’t start your Discussion in your Results! A tiny bit at the very end of the section is okay to make the transition, but no more.

Discussion
Why is the task of the Discussion. Here, you analyze the data, explaining why your results occurred and their implications; be sure to underscore your most significant results. You should refer back to your predictions and hypothesis here, analyzing why the results support (or fail to support) the hypothesis. In the Discussion, you draw out the implications of your experiment, raising the next question(s) to ask, the next experiment(s) to perform, and so forth. In some disciplines, figures are used in the Discussion – for example, if your hypothesis leads to a model that can be displayed visually; in other disciplines, you simply refer back to figures presented in the Results.
WF TIPS:
1. Don’t belabor your points: explain the significance and then move on.
2. Don’t be afraid of negative results. Even in a lab report, when you’re supposed to be reproducing established experiments, negative results mean that you should revise your hypothesis.
3. Avoid overly causal or deterministic language; data can be inconclusive without negating a hypothesis and can support the hypothesis without definitively determining causality. (E.g., rather than “X proves Y” use constructions like, “X suggests that or indicates Y” or “XY correlation implies that . . .”)

Conclusion
Chemistry typically calls for a separate conclusion, but in other disciplines the conclusion is often part of the Discussion. The Conclusion wraps things up; it’s similar to an abstract in that it provides a succinct overview of the whole experiment, emphasizing its significant implications. It’s important for the Conclusion to maintain focus, highlighting the most important implication of your experiment.

References
Scientific articles cite references throughout; frequently, the greatest density of references appears in the Introduction, but they are also especially important in the Discussion. There should be a complete list of References at the end of the lab report. Most science disciplines use a similar format, and lab manuals typically provide this information. When in doubt, ask your professor. You can also look up a scientific journal in the field and model your reference format on that. (Caution: Science and Nature use atypical formats.)

Some articles – and therefore some lab reports – include an Acknowledgements section, separate from the References. This section acknowledges collaborators and reviewers who do not appear elsewhere.

Variations – in other words, ask your professor!
- Chemistry lab reports typically include Conclusions; other disciplines typically fold the Conclusion into the final paragraph(s) of the Discussion.
- Some courses may require an Abstract with a lab report; many will not.
- Some courses will require you to put all figures at the end of the document; others will ask you to integrate them throughout.
- The appropriate voice (passive or active) and pronoun (first person singular, first person plural, etc.) vary widely from discipline to discipline and professor to professor. While some professors will ask you to use the first person singular, active voice (“First I did this . . . and then I found that . . .”) others will require the plural (“we”) or the passive (“This was done . . .”). If the professor doesn’t indicate in the lab manual, make sure you ask!
Other Science Writing Assignments

**Lit. Review**
The Lit. Review reviews the scholarly literature on a particular topic critically. It doesn’t simply provide a narrative of experiments done, but evaluates the previous work in an area in order to identify the key questions, findings, and implications. In a sense, it’s a much-expanded version of the Introduction to a lab report or scientific article. Lit. Reviews are guided by questions.

**Upper-Level Research Papers**
These follow general format of the lab report – which is also the format of scholarly articles – but are longer because the questions and experiments involved are more complex. They typically write up work done more independently.