

Writing for Intermediate Lab

General

All submissions must be files in Microsoft Word format.

Start paragraphs with indents, not extra vertical space. In technical writing, displayed equations also introduce vertical space, so that it cannot unambiguously indicate a new paragraph. Indented paragraphs are unambiguous.

Your full paper must be no more than 10 pages long, including all parts. This does not indicate that 10 pages are required: many excellent reports are shorter. It is never required for any section to start on a new page, although section titles should not get separated from the following text.

Neither an Acknowledgements section nor Appendices are likely to be appropriate for the papers written in this class.

Title Block

You should not use a title page. That *never* happens in a journal article. The title block should look similar to this example (precise format is flexible):

<p style="text-align: center;">Moderate Length Title: What You Did, Not Just General Topic</p> <p style="text-align: center;">Full names of Authors, in comma separated list</p> <p style="text-align: center;">Mailing address, in a single line, starting with name of institution</p> <p style="text-align: center;">(Date of submission)</p>

Title

The words that we use to describe the various experiments in this course are very abbreviated, for convenience. As in, “This week you’ll do the *Hall Effect* experiment.” These same words would not make a suitable title for your paper. A title needs to be more informative, such as, *Hall Effect Measurement of the Carrier Density of Copper*.

Author List

Anyone who worked on the experiment but did not contribute to the writing would typically be listed after the writers. The course instructor should not be included.

Abstract

Purpose: Interest others in reading your paper.

Structure: Single paragraph, no citations or equations.

DO summarize the important points, but leave out the details.

DO NOT write, “The purpose of this experiment...”. Write what you found out or determined, and the purpose should become self-evident. Focus on the physics demonstrated, not what you did.

The things you wrote for Analytical Physics I and II at Geneseo were very likely *not* appropriate as abstracts for journal articles. They may have been called Abstracts, but they might more properly be described as Brief Reports, providing more detail about the experiment than a journal article abstract needs.

Body

Structure: *Use Paragraphs!*

Write for an audience of junior-level college physics students. Anything commonly covered in a first-year college physics course would probably not be repeated. However, something from sophomore year might need a quick review; not everybody understands everything after one semester, and reading it again won't hurt.

Write in the style where the Body is split into sections with titles. Specific sections may be assigned to specific individuals. You may adjust the titles of those sections if appropriate; just don't violate the spirit of the division of labor.

MS Word displayed equations will not be full-sized if there is *any* other text in that line, including equation numbers. Solution: Put displayed equations in a full-width single-row table. Equations in a table cell are full-sized, and the equation number can go in another cell.

In MS Word equations, note that it is sometimes necessary to type the space bar in order to activate some types of formatting, such as sizing parentheses to their contents.

Introduction

Purpose: Give background on your topic illustrating its significance, ***and connect that background to your current work.***

DO include: Historical facts pertinent to most Intermediate Labs. Practical uses of the topic.

DO: Describe how current work and background are connected / relate. Failing to do this is the most common Introduction error.

DO NOT include: Details that should be in other sections.

DO NOT: fill this section with a qualitative description of your Theory section.

Equipment & Methods section

Purpose: Describe the specifics of the equipment used, including *special* modes of operation or data acquisition. This includes any methods that you devised yourself.

Put this section after Theory section if that would make it easier to describe the equipment.

DO include (if appropriate; experiments will differ greatly): An explanation of how the equipment works, in a general sense.

DO include calibration, alignment, or other steps to get equipment working.

DO NOT include: An equipment list. Instead, use text to describe the function of each piece.

DO NOT include: Minor pieces of equipment.

DO NOT include: A procedure or series of steps used for the current work. If you are unsure of the distinction between "procedure" and "methods," please ask for clarification.

Theory

Purpose: Describe the mathematical underpinnings of the equations used in your data analysis.

Put this section after Equipment if you need to refer to the specific geometry or setup of the current work.

DO include: Citations to derivations if available in other sources.

DO NOT include: Step-by-step derivations.

DO include background required for data analysis calculations.

DO NOT include: Theory that is not used for the experiment. Equations related to data analysis rather than physical relationships.

Analysis & Results

Purpose: Present your data (including specifics of its collection), and analyze it to produce a final result. To “analyze” means more than simply reporting numerical results.

DO include: What you did to get data. An example of raw data. Description of major sources of uncertainty.

DO include: A description of the calculations required to get the results from the data. References to equations in Theory section without rewriting them. Equations specific to your analysis.

DO include: Your final result(s), including appropriate numerical value(s).

DO NOT include: Detailed uncertainty calculations.

Conclusion

Purpose: Succinctly summarize results, and connect them to (possible) future related work or use.

DO include: Specific improvements or extensions you would have implemented with more time (although DO NOT write, “If we had more time...”); these can be either to improve results, or to make experiment easier to execute. Possible applications, or areas for further investigation.

DO NOT include: Any new conclusions about your data, as those should have been in Analysis.

DO NOT include: Vague speculation about what might have or could have gone wrong.

Figures and Tables

Structure for Intermediate Lab: Place in-line with no text wrapping, caption in the next line using a font smaller than the body. Should be placed near the first reference to the figure or table.

DO include: Figures and Tables from other sources, as long as the caption includes a reference to a citation for the original source. These must be modified if they contain aspects that are inappropriate for your paper. (You do not have to get permission from the author, as would normally be the case.)

DO: Combine multiple figures, such as several similar graphs on the same axes. This facilitates comparison.

DO: Refer to figures in other sections when appropriate, even if prepared by your partner.

DO NOT include: A figure without any reference to it in the text.

DO NOT include: Titles on graphs. Captions copied from other sources.

DO NOT include: Photographs without prior permission from the instructor. A line-drawing schematic is nearly always a more effective choice. The drawing facilities in Microsoft Word are

quite good. A hand-drawn and scanned image is fine too. DO NOT spend hours creating a work of art.

Reference List

Purpose: Provide the specific information on external sources/references.

Structure: Each reference has a number, the title of the source, and sufficient information to locate the source. There are specific “styles” with exacting rules, but Intermediate Lab doesn’t get that detailed. An adequate example (this one is for a web page):

[5] Author Names, Company or Organization Name, *Title*, full URL.

DO: Use Arabic numbers to enumerate, not Roman numerals.

DO include: Titles of journal articles in your references.

DO include: The full URL for specific web pages, not just the root site address.

DO NOT: Include a reference without citing it in the text. This is not a Bibliography.

The use of Microsoft Word’s system for adding endnotes can be very helpful to you, including automatically re-numbering them when you merge writing from several authors.

For this course, you get a special dispensation for some web page citations. This is because (1) you have limited time to complete the labs, so you can’t always do a proper literature search, and (2) web pages will most likely not disappear before the end of the semester. Two kinds of web citations are allowed, corporate and identifiable individual.

- If a company or similar large organization (national lab, university, scientific organization, even a web-based educational organization) has published something on the web, then that is fair game. Such large organizations are more reliable than individuals because their business and/or existence is on the line, and usually they have published the same information on paper (which you would track down and reference if you were submitting your paper to a journal).
- Web pages by individuals may be referenced if you can give the author’s name and institutional affiliation. If you can’t get that information, then you need to find another source to reference.

Check List

Here’s a checklist you can use to make sure that you aren’t making some of the most common mistakes.

- All equations are justified by one of these three reasons: obvious (Analyt III level or simpler), derived from previous equations in paper (which ones should be mentioned), or reference to a citation.
- Equations justified by reference to a citation should still have a qualitative description of the concepts and assumptions behind their derivation.
- All Figures should have captions; not just “Figure #”, but a sentence (maybe two) of descriptive caption.
- Some idea of reliability of result is given, preferably numerically.
- Major sources of uncertainty are identified. “Uncertainty” is not “error.”

- ❑ All *results* from your work that are mentioned in the Conclusion section are also mentioned before that. This includes uncertainties. Speculation or suggestions in the Conclusion need not have appeared before.
- ❑ Abstract: Does it start by describing the purpose (without using that word)? The purpose is NOT your education.
- ❑ Abstract: Does it describe your results in 1-2 sentences
- ❑ Introduction: Is there an explanation of why the subject of study is important/useful? If the reason is just “it’s interesting,” include some historical background justifying that (e.g., demonstrating that other people have thought so too).
- ❑ Introduction: Does it preview the rest of the paper
- ❑ Equipment: Are all significant dimensions reported?
- ❑ Conclusion: Does it focus on improvements for difficulties *that you actually encountered*?
- ❑ Conclusion: Do suggested improvements have a realistic chance of actually improving results?
- ❑ Conclusion: Have all occurrences of the word “success” and its variants been DELETED?