

Laboratory Report Guidelines

The writing of technical reports and journal articles is a part of almost all engineering and scientific work. Their main purpose is to communicate to others what you discovered. Reports are *not* a typed-up version of a lab notebook entry.

There are no exact rules, similar to cookbook instructions, for authors to follow in writing a technical report. However, there are some general principles that help to ensure a reasonably smooth and understandable presentation of scientific information. The main parts, along with comments on each part, are given below:

1. Title

2. Author

Name(s) of author(s), author's institution or company, date of submission

3. Abstract

A concise and specific summary of the entire work, commonly less than 100 words. It should include the important results and conclusions. Although it appears first, the abstract is typically written after the rest of the paper is done.

4. Introduction

Every scientific paper contains one or two introductory paragraphs that consists of a discussion of the subject, scope, and motivations (or purpose) of the experiment. The first paragraph is critical, as it plays a major role in determining the reader's attitude towards the paper as a whole. While writing your introduction, keep the following in mind:

- Make the precise subject of the paper clear. Assume that the reader is someone with your background in physics, but no particular knowledge of the experiment you performed. Therefore, include only background material to the extent necessary for the reader to understand the subject and to appreciate the reasons for doing the experiment.
- State the purpose clearly. This should let the reader to know the point of view and emphasis of the report, and what the reader should expect to learn from it.
- Indicate the scope of coverage. State the limits within which you treat the subject. This may include whether the work described was experimental or theoretical, the exact aspects of the general subject, the range of parameters explored, etc.

5. Theory

Succinct development of the theory related to the experiment. This may include important formulas, though not necessarily derivations. The report concentrates on what you did; therefore, a lengthy discussion of the theoretical work of others is generally not appropriate. Because this section can be particularly brief, it can be worked into the introduction or discussion sections.

6. Experimental Methods

Briefly describe the experimental apparatus and procedures, including whatever is necessary for others to understand what was done. A schematic of the apparatus may be useful here.

Keep in mind that the reader has your physics or engineering background and is familiar with typical lab equipment, but has no knowledge of your experiment and likely has no intention of repeating it. This is where it is important to understand the difference between a technical report and a lab manual. While a lab notebook has instructions on how an experiment is to be carried out, the technical report describes the experimental apparatus and procedures only so far as necessary for the reader to understand how you made the measurements.

7. Results

Include any important and necessary data to understand your results and prove your conclusions. Use table, figures or graphs when possible, including error estimates for relevant quantities.

Arrange the data in the most concise form possible. This generally means simple tables which includes average values and final results. Avoid presenting large amounts of raw data. For example, state that the average of 20 measurements was 1.87 seconds with a standard deviation of 0.09 seconds. Try to make tables self-explanatory. Graphs and figures can take the place of many words.

Include some form of error analysis, and state the uncertainty in the final result. Your goal should be to convince the reader that your quantitative results are believable.

8. Discussion or Conclusions

Discussion and analysis of the results. What does it mean? State specific conclusions regarding your study. Did you accomplish your goal (see the motivation in the introduction)? Add any recommendations for further work, as appropriate.

The mechanics of the report:

1. Type the manuscript.

Number all the pages, starting with the title page.

Double or 1.5 space everything except the abstract.

Use a reasonable font (Times, Times New Roman, etc.) and font size (10-12).

2. Divide the paper into clearly labeled sections. For example: ABSTRACT, INTRODUCTION, THEORY, EXPERIMENTAL METHODS, RESULTS, DISCUSSION (or CONCLUSIONS).

3. Equations

Place each equation on a separate line.

Number each equation. Place numbers near the right-hand margin

(If you're having trouble formatting an equation, write it in by hand.)

4. Tables and figures

Number tables and figures in the order in which they appear.

Give each table and figure a title and/or a self-descriptive caption.

(If you're having trouble inserting figures into the text, simply attach them at the end.)

5. Define all symbols. Place definitions for equations in the text. Symbols used in tables and figures should be defined in the captions.

Some general comments:

- Reports are brief and concise. Try to keep yours within 6-10 pages, with formatting.
- Use a simple, direct style. Avoid long, complicated sentences in the passive voice. Short, active sentences are easier to understand and faster to read. Traditionally, first person has not been used in scientific writing; however, it is becoming much more accepted, and I far prefer it. It allows much more readable style.
- Use a logical order of presentation and discussion for clarity. Avoid reference to details not presented or explained until later in the report.
- Reports should concentrate on the analysis of the data and the results – that is, the report should focus on the physical implications and the validity of the experiment. A common mistake is to have too much detail in the experimental description, yet be too brief in the analysis and results.

adapted from older versions by J Kintner and M Rosario
and "A Guide to Technical Report Writing," Physics Department, Harvey Mudd College