Formal Report Module
Student Guide

Before the Practical

Before this Practical you should write a first draft of your Formal Report and circulate it to the other members of your Team at least one day before the Practical is to meet.

You will be receiving first drafts from the other members of your Team. You should read them before the Practical. It is a good idea to write notes, comments corrections etc. on your copy of the other people's drafts. Bring the "marked-up" copies to the Practical.

During the Practical

During the Practical, the Team will discuss the reports and how they may be improved. A good way to do this is:

1. Choose a member of the Team and discuss his/her report as a group. What is good about it? How may it be improved?
2. Choose another member of the Team and discuss his/her Formal Report. Repeat until all Format Reports have been read discussed.

The purpose of the Practical is not to *assess* the drafts. Instead, you are being asked to help each member of your Team improve their Formal Report, and they in turn will try to help you improve yours.

After the Practical

After the Practical, you will individually write the final draft of your Formal Report, incorporating the suggestions and corrections that you think are appropriate.

Since Team members will have read and commented on each other's Formal Reports, we expect that some sentences or phrases of the final drafts will be similar to each other. However, your report is the result of your individual work, and when entire blocks of text are identical between two or more Reports, this becomes a violation of the Academic Code of Conduct.

Turning in Your Final Draft

One of our responsibilities is to protect you from any classmates who may not be completely honest. Thus you will turn in your final draft two ways:

- In hardcopy.
- An electronic version submitted to http://www.turnitin.com.

Both versions must be identical. Details on using turnitin.com appear in Appendix 1.

The remainder of this document discusses the purpose of Formal Reports, the structure that they should have, and where you can get help on writing.

Introduction

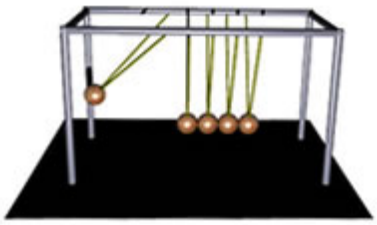
The process of communicating the results of scientific work is the topic of this Module. You will individually write a *Formal Report* to communicate the results of your experimental work. After this Module has been completed, you will prepare a final draft of your Report which will be turned in for marking by the Instructors.

In the real world, such communication is used for:

- Applying for research grants.
- Reporting to supervisors.
- Communicating to colleagues, either through journal articles or web documents.

The single most important factor in written communications is to write from the viewpoint of your readers. Here, you should assume that your readers are first year Physics students who have not actually done the experimental work that you are reporting. Your goal is to write a report that will inform your readers about the important features of your work and its results. The reader is not interested in going through the details of how you multiplied, divided, etc., and is unlikely to have any interest in long tables of numbers. You will have to use your judgment to determine what to include and what to exclude. For example, most common measuring apparatuses do not have to be described. However, any ingenious or novel method or tool in your experiment should be explained in sufficient detail that the reader can understand what you did.

A common problem with Formal Reports is that students include too much information. You will need to decide what is important and what is not, and include only the important information.



An example of a good formal report is a recent article on Newton's cradle, a common toy shown to the right. The article appeared in the American Journal of Physics, and you may access a pdf version at:
http://www.upscale.utoronto.ca/Practicals/Modules/FormalReport/AJP_Newtons_Cradle.pdf

The paper is just over 8 pages long in typeset form. This is probably about 16 pages of normal hardcopy text not including figures. You may wish to know that the authors of the

above paper estimate that they spent about 600 hours doing programming and data analysis, 250 hours of experimentation and 150 hours of theoretical analysis.[a] Thus they spent a total of about 1,000 hours on the work reported in a 16-page "Formal Report." If you condense the information in your report to the same degree, it will end up about **0.1** pages long! This is not possible or desirable, but does suggest that the text of your report should almost certainly not be more than 800 words (3 pages double spaced not including figures or tables).

Structure

Most organizations have *style guides* for written documents, and they can differ from organization to organization. We suggest you use the style and structure that is common in journal articles for your Formal Report.

1. **Title**. This should be short, but precise, and convey the point of the report. It could be either a statement or a question. For example, a title like "Voltage-current relationship of a transistor" is good, as is "Does the transistor obey Ohm's Law?" But simply "The transistor" is too vague and is not a good title.
2. **Authors**. All people who worked on the Practical being reported should be listed. **Your name should appear first**, followed by the others in the Team: this designates you as the *principle author* of this report. Your student number and email should be given in a footnote to your name.
3. **Your Practical**. Day and time, where, Pod number.
4. **Instructors**. Your Teaching Assistants.
5. **Date**.
6. **Abstract**. The abstract summarizes, in a few sentences, the content of the report. It provides a brief outline of what the report is about; it should include a statement of what it is you measured and its value (Warning! -- students often make abstracts too long -- note that an abstract is not an introduction.) The abstract should be indented.
7. **Introduction**. The role of this section is to state why the work reported is useful, where it fits in the bigger picture of the field (or of science in general), and to discuss briefly the theoretical hypotheses which are to be tested (e.g. for the Absolute Zero Practical, state the meaning of absolute zero and how it is to be measured, mention the equation PV = nRT and discuss its verification, and under what circumstances you expect it to be valid).
8. **Experimental Method**. Describe the apparatus and procedure used in the experiment. Remember that a picture (or simple diagram) is often worth a thousand words! Enough details should be provided for the reader to have a clear idea of what was done. But be careful to not swamp the reader with insignificant or useless facts.
9. **Results and Discussion**. In this section, you present and interpret the data you have obtained. **If at all possible, avoid tables of data.** Graphs are usually a much clearer way to present data (make sure axes are labeled, and error bars are

[a] Private communication from Gary Delaney, Trinity College Dublin, March 2005.

shown!). Please make sure the graphs and diagrams have concise figure captions explaining what they are about! **Do not show the details of error calculations.** The derivation of any formulae you use is not required, but should be referenced. Explain how your data corroborates (or does not corroborate) the hypotheses being tested, and compare, where possible, with other work. Also, estimate the magnitude of systematic errors which you feel might influence your results (e.g. In the Absolute Zero Practical, how big is the temperature correction? Does this alter your results significantly?).

10. **Conclusion**. In a few lines, sum up the results of your experiment. Do your data agree (within experimental error) with theory? If not, can you explain why? Remember that the conclusion is a summary; do not say anything in the conclusion which you have not already discussed more fully earlier in the text.
11. **Acknowledgements** if any.
12. **References**. In this section of the report list all of the documents that you refer to in your report. We recommend numbering the references sequentially in the text, in their order of appearance, and listing them in the same order in the references section.
13. Tables, if any, each with a caption. Note the caution in Point 9 above: tables of data should usually be avoided.
14. A separate page of the captions of the figures, if any.
15. The figures, one per page.

A sample beginning of a Formal Report is in Appendix 2.

About The Structure

When one picks up a scientific journal, typically the titles of the articles are scanned. If the title looks interesting, then the abstract is read to decide whether or not to read the entire paper. If after reading the paper one wishes further details then one contacts the author(s).

Reference Format

We suggest the following format for references.

Journal Article: author(s), “title”, journal name **volume**(number), pages (year).

Note that the volume number is in **bold** font. For example, one would reference the Newton’s cradle article like this:

> S. Hutzler, G. Delaney, D. Weaire, and F. MacLeod, “Rocking Newton’s cradle”, Amer. J. Phys **72**(12), 1508 – 1516 (2004).

Book: author(s), *title* [,edition if not the first] (publisher, location, year), pp. pages.

Note that the title of the book is in *italic* font. For example:

R. Knight, *Physics for Scientists and Engineers: A Strategic Approach*, 2nd edition (Pearson Addison-Wesley, Toronto, 2008), pp. 47 – 48.

Web Page: author(s), title, date, Retrieved date2, url.

Note that both the date of the page, if available, and the date you retrieved the page are given. For example:

J. Harlow, D. Harrison, and R. Serbanescu, "Blackboards, PowerPoint and Tablet PCs in the classroom", December 2005, Retrieved March 14, 2008, http://www.upscale.utoronto.ca/PVB/Harrison/BlackboardPptTablet/BlackboardPptTablet.pdf

Help on Writing

The University of Toronto expects all students to be able to write well, and offers extensive resources to help you learn how to accomplish this. You may access these resources at http://www.utoronto.ca/writing/.

This Student Guide was written by David M. Harrison, Dept. of Physics, Univ. of Toronto in March 2005,

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Appendix 1 – Details on Using turnitin.com

Go to http://turnitin.com/. To use turnitin.com you will create a user profile for yourself and will need the following information:

Thursday Pilot

- Class Name: `Thursday Pilot`
- Class ID: `2222126`

Friday Pilot

- Class Name: `Friday Pilot`
- Class ID: `2222127`

For both the Pilots:

- Password: `BigSecret`
  Note that the password contains both upper and lower case letters and has **no** spaces.
- Assignment Name: `Formal Report`

Appendix 2 – A Sample Beginning of a Formal Report

A cat always lands on its feet and buttered toast always lands butter side down: which of these sayings is truer?

David M. Harrison,* Jason J.B. Harlow, and Ruxandra Serbanescu
Thursday Practical, Room MP126P, Pod 8
Instructors: Peter Hitchcock and Catherine Robin

March 16, 2008

A well-known saying is that a cat that is dropped onto the floor always lands on its feet. Another well-known saying is that a piece of buttered toast that is dropped onto the floor always lands butter side down. We devised a simultaneous test of both of these sayings by strapping a piece of buttered toast to the back of a cat, butter side out, and dropping the combination. We found that …

Introduction

Common sayings known to our grandparents are often at least partially correct. For example, the saying that cats always land on their feet when dropped has previously been tested and analyzed and found to often be true.[1-4] There has also been some analysis of the saying about buttered toast always landing on the floor butter side down.[5-7] If a piece of buttered toast is strapped to the back of a cat, butter side out, the resulting combination is sometimes called the buttered cat paradox, and has led to speculations of anti-gravity.[8] In this study …

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