

## PHYSICS TERM PAPER HOW TO WRITE (ADVICE)

*Please save this – it may be helpful for peer review, and you may refer to the style sheet in your final editing.*

### I. GENERAL GUIDANCE:

#### Organization of your project

Main advice: not to underestimate the work of putting the paper together and writing it. Work hard early on to gather and study the necessary references for your basic story. It is quite likely that you will have to do something unplanned – reduce the scope of the paper, figure out something difficult, or locate additional references – which is unpleasant if it happens in the middle of the last night before the due date.

#### Large scale organization:

Identify the one or two interesting results which are the goals of the paper: what question do you want to decide, what quantities do you want to calculate? Find the path of reasoning which leads up to these results and consider cutting out anything else.

P.S. If you find yourself trying to write something you don't actually understand, *beware!* Avoid simply paraphrasing – it can take you close to plagiarism.

#### Small scale organization

There is bad writing that just sounds awkward, but I am more concerned about bad writing which obscures the meaning. I think that the commonest way this occurs is the loose antecedent. Remember that your readers, ignorant of the big picture, may be struggling to follow your story from line to line, and may be thrown off track if they are unable to identify what a sentence was talking about. The omissions I have in mind, most often, aren't literal violations of a grammatical rule, but are something more subtle. Namely, many words common in scientific writing denote relations between two ideas, but (in English) there is no grammar rules that forces you to say both of the ideas. Examples which can be ambiguous:

*“higher order terms”*

Higher order when expanding in what variable?

*“The approximation gives excellent agreement with experiment.”*

Which predicted quantity agrees with which measured one?

*“maximum value”*

Maximum as you vary which variable?

*“degenerate”*

Degenerate with respect to which Hamiltonian?

*“The X is symmetrical.”*

What about the X is invariant under what symmetry operations?

Use of “Also” at the beginning of sentences suggests that you haven’t thought out the relation of the previous sentence to this one. Maybe you mean one of these:

“because”

“consequently”

“on the other hand”

“for example”

“in fact”

“however”

For more sensitivity training about writing, read *The Elements of Style* by Strunk and White.

## II. MODELS

The best model I’ve found is the “Colloquia” section in *Reviews of Modern Physics*. e.g. S. R. Nagel (R.M.P. 64, 321, Jan. 1992) on “Instabilities in a sandpile”. The longer expository articles in *Physics Today* can also serve as decent models, and they are at about the right level.

Finally, I suggest you think of the paper as the basis for a lecture in Physics 653. The amount of material that could be covered in an hour or two of lecturing is about right for this length. However, the writing should not be like my handouts. Among other things, it should be a bit more like a review paper in paying more attention to the references and to possible different approaches.

## IV. TYPING

The final paper must be typed; it is strongly recommended that the draft be typed.

If you aren’t experienced with wordprocessing and aren’t experienced at writing papers, I would advise against learning both at the same time. Rather than use T<sub>E</sub>X, I would suggest just typing the paper in a computer file in plain text, leaving spaces to write the equations in by hand.

## PHYSICS 653: TERM PAPER STYLE SHEET

I have been trying a somewhat rigid format for term papers. My purposes are

1. to keep the length from getting out of hand
2. to make it fairer to compare papers when grading
3. to help clarify my expectations about term papers for you

### STYLE SHEET

If you find that you are out of the bounds given below, just write a note explaining why that's right for your topic.

1. Total Length – From 3200-4800 words. (f you need longer, you write me a special request. To calculate this, count the number of characters per line and divide by 6, that is the number of “words” per line. Then multiply by the number of lines/page and the number of pages – allow, of course, for pages which aren't full of lines. Don't count figures, tables, references, or appendices.

This length is similar to that of a Phys. Rev. Letter, and allows about as much material as is covered in a 1.5-hour lecture. It makes roughly 10 typed pages, not including the figures (but this depends on the size of type and line spacing, of course)

2. Front page – Include title, your name, date, course number, and an abstract (about one paragraph).

3. Page numbers. Please.

4. Sections – Use section headings, label them with numbers 1,2,.. (normally 3 to 7 sections in all.)

5. Introductory section – should contain (usually at its end) an outline of the path you are taking.

Each section should have a mini-introduction (about a paragraph), to tell something about the route you are going. (The abstract should be more WHAT you were going to do, not so much HOW).

6. Figures – include between 3 and 6 figures. (*Well, maybe less*) In the draft, they can just be stuck at the end; in the final paper, it obviously looks better if they are interspersed in the text, but you don't need to. Always give the reference when you copy the figure.

7. Equations: Not too many, please! Include from 10 to 20 displayed equations. Usually they should be numbered, [see “What's wrong with these equations” by N. D. Mermin, *Physics Today*, Oct. 1989, p. 9.]

8. References – cite them by number in brackets “[3]”, and put the references at the end (just like PRL). There should from 10 to 20 references.

IF POSSIBLE, THE BASIC REFERENCES SHOULD INCLUDE AT LEAST TWO INDEPENDENT POINTS OF VIEW.

Footnotes – additional explanatory remarks – you may either

- (1) put in the same numbered list as the references, à la PRL,
- (2) put at bottom of the page.

9. Acknowledgments – put at the end of the text, before references.

Please be careful to acknowledge anyone else who led you to central references you would otherwise have missed, who participated in conversations that were essential for your understanding the topics, who contributed an idea to your paper, or who made comments on it that induced significant revisions. *Any direct quotations must use quote marks (and be referenced); any paraphrases/summaries should be identified as such (and referenced).* Note here, too, if this relates to other term papers you have written or to research work you expect to do.

10. Appendices – OK, as long as the main text is readable without them. If you have material which is tangential to your story, but which cost you so much work that you can't bear to cut it, sticking it in an appendix is a good compromise.

#### **DUE DATES:**

Draft: Thurs. 10/25

Peer review reports: due about 2 weeks after you get papers.

After Thanksgiving break (Tues. 11/27).