INTERMEDIATE LABORATORY - PHYX 3870-3880
Content of Lab Reports

NOTES ABOUT WRITTEN LAB REPORTS:

- Grading of the written reports is based on the following (see the rubric below for more details):
  - Understanding of concepts conveyed in lab report
  - Data and error analysis procedures in lab report
  - Clarity and correctness of conclusions drawn on the basis of your data and analysis
  - Presentation of information (including spelling, grammar, and style) in lab report
- Referring to the "Baird Model", written lab reports should:
  - Identify the problem (system) to be studied.
  - Identify the input(s) and outputs(s) to be studied.
  - Describe the approach to use outputs to tell how the inputs affect the system and its outputs.
  - Propose a model to test and how to test the model.
  - Describe the results of your observations and the quality of the observations (uncertainties).
  - Determine (both qualitatively and quantitatively) the effectiveness of your model.
  - Discuss generalization of the model and potential applications.
- You are encouraged to perform the experiments in pairs; however, lab reports should be written independently. It is a good idea to have your partner critique your report before it is submitted for grading.
- Write your lab reports with next year's students as your audience. Your report, together with the lab write-up, should provide these students with all the information necessary to perform the lab, analyze the data, and evaluate their results. In addition, your report should highlight the interesting aspects and physical principles of the lab topic.
- The lab report differs from the lab manuals, which provide specific instructions for how to perform the measurements. Lab reports are typically written in the past tense describe what you *did*, rather than what a student *should do*.
- As a general rule you should avoid:
  - Use of first person, unless it refers to things dependent on your having done them
  - Unnecessary use of time references or "travel log", unless the specific time order matters
  - Contractions, colloquialisms, slang and jargon; this is a formal report

NOTES ABOUT WRITTEN LAB REPORT FORMATS:

- Formal (full) written reports have no length limit, but are typically 6 to 8 typed pages. Not all experiments are appropriate for a written report; check with the instructor.
- Brief reports are limited to four typed pages including all data, figures, tables, and references. The emphasis is to convey the important points of the experiment in a concise manner. A typical brief report might contain one or two paragraphs for each of the sections listed below. Emphasis must be placed on the important physics and your results.
- All measured quantities and those derived quantities included in the conclusions must quote an uncertainty (which has been justified in the text) and have units listed. **Pay attention to significant figures.**
- SI units should be used except under special circumstances.
- Refer to the *AIP Style Manual* for suggestion on preparing a scientific paper and on specific formats for figure, equations, headings and references. The *AIP Style Manual* is available free of charge for download from the internet at http://www.aip.org/pubservs/style/4thed/toc.html .
- A *Word* template for articles written for the *American Journal of Physics* is provided as a possible format template for your lab reports.
- You are required to cite a *minimum* of three references (five for extended lab reports) from *peer reviewed journals* in each lab report. Footnotes in the text should indicate where material from each reference is

specifically used, rather than simply including a list of the references.

- Online search engines such as *Google Scholar* or *Web of Science* are invaluable in locating relevant references. Hardcopy holdings of four particularly useful journals—the *American Journal of Physics*, *The Physics Teacher*, *Physics Today* and *Scientific American*—are found in SER 109.
- You are encouraged, but not required, to use *EndNote Basic* to organize and format your references.

NOTES ABOUT USE OF A LAB NOTEBOOK:

- Data should be recorded in a lab notebook. Use of your lab notebook is intended to help you develop good habits in the laboratory and help you organize your thoughts.
  - Record all your data and comments directly into your notebook.
  - Record your procedure and any additional observations you made. Often the seemingly unimportant detail is the key bit of information you need to understand the experiment.
  - Include notes about your experimental strategy.
  - Preliminary calculations and results from analysis programs should also be kept in the notebook.
  - It is permissible for you to photocopy data from your partner's notebook to avoid having to take duplicate notes, but each notebook should contain a complete record of all data taken.
  - All material should be permanently attached in your notebook; there should be no loose paper.
- For these experiments which are graded solely on the notebook, you should: (i) complete all calculations and error analysis and (ii) enter some summation and conclusions concerning your results. The presentation need not be polished, but the indications of your understanding must be there. Notebooks will be graded on the completeness of the data, correctness and clarity of the data and error analysis, and an understanding of physical concepts as conveyed in concluding remarks. The notebook need not be pristine; however, you should be neat, organized, and complete enough to be able to reconstruct your experimental results at some later data. In addition, you should take mercy on your instructor and make the notebook coherent and legible enough that she/he has some hope of grading your work.

Components to Include in a Written Lab Report

Title page:

Title of lab
Experimenter's and partner's names
Class name and number
Date of completion of experiment and report

Introduction:

Statement of purpose - What do you plan to accomplish? Why is the lab interesting or important? What are the important physical principles explored in the experiment?
Identify the problem (system) to be studied. Identify the input(s) and outputs(s) to be studied.
Describe the approach to use outputs to tell how the inputs affect the system and its outputs.

Theory:

Any appropriate scientific or historical background
Any appropriate discussions of theory
Any appropriate derivation of equations*
Propose a model to test and how the experiments performed will quantitatively test the model.

Procedures:

List of apparatus*
Diagram of experimental setup*
Details of procedures you used; what was done and how it was done. Emphasize procedures different from those outlined in manual

Results:

Describe the results of your observations and the quality of the observations (uncertainties).
List of data* (Tabular or graphical format is best)
Description of methods of analysis (including, where appropriate, sample calculations)
Discussion of error analysis

Discussion and Conclusions:

Summary of results
Summary of error analysis
Determine (both qualitatively and quantitatively) the effectiveness of your model.
Significance of results - how does this verify the basic physical principles?
Discuss generalization of the model and potential applications.

*May be appropriate to put these items in an appendix