

General Physics I and II Laboratory

Laboratory Essentials

In order to make the laboratory experience a positive one for you and all of your classmates, please keep the following in mind:

- * No food or drink in the laboratory (exception: screw-top water containers; please keep top screwed on when not actually imbibing). Leave your lab station as you found it.
- * Save all of your computer data files in your file space. Take your data with you! Make a backup copy of ALL your data. You can access both Logger Pro and Graphical Analysis on the MC network for data analysis outside of the lab. This will be important for printing out your graphs.
- * All graphs should be computer generated. It's fine to "rough out" some data in your lab notebook by sketching a graph, but you will need to paste in a computer generated one for your final copy. All graph axes should be labeled appropriately, with units and all graphs should have a descriptive title. All graphs should be printed large enough to read but small enough to fit into your lab notebook.
- * If you use a spreadsheet for data analysis, be sure to paste the results in your lab notebook and keep a copy of the spreadsheet in case I ask to see your work. As with all data tables and graphs, appropriate units, labels, and titles should be used to make interpretation clear.
- * All measurements should include uncertainty estimates and proper units. If needed, use the partial derivatives method (which we will learn by mid-semester; prior to that use the basic uncertainty rules that we learn during the second lab) for all uncertainty propagation through calculations.
- * This week's lab must be finished by next week's laboratory meeting at lab time. Any unfinished labs will be graded "as is" for work completed up to that deadline. Labs will be graded according to the rubric posted in the lab and on the course website at <http://users.manchester.edu/facstaff/gwclark/PHYS210/labs-210.html>.
- * Please keep the lab notebooks on the designated lab shelf in the lab as much as possible. You can access the lab at any time by the course keypad code: _____. If you need to briefly take your notebook with you for some further work, that's fine, but try to keep them in the lab as much as possible. Lab notebooks must remain in the laboratory every Tuesday from the time of your lab until 6 am Wednesday morning and over the weekends (from 6 pm Fridays to 6 am Mondays).

The Laboratory Notebook

Be brief, yet complete! Record everything in your notebook (including any data file names and any bad data or mistakes!). Your notebook should describe the process that you undergo in your studies - *i.e.*, it should provide narrative, include sketches/printouts of all graphs, and discuss conclusions that you draw from your results. Clearly define all of your variables and describe your work in a concise, logical, & chronological format. All graphs should be in proper form (should include titles & labeled axes with appropriate units and should maximize the use of the graph area). All laboratory experiment lab entries should begin with the lab name and number, the date, your name and your partner(s) name(s), a brief outline of the purpose of the lab, and a narrative of the procedure (with appropriate diagrams/sketches), and end with a concise and informative conclusion.

Show all measurements with proper units and uncertainty estimates. Show all uncertainty calculations, whether by partial derivatives method or deviation from the mean. Be aware of significant figures in the results of any calculations.

Conclusions should be brief and complete. A good conclusion will always recap the results, including uncertainties, and include a discussion of how the uncertainties relate to your expectations. None of the mathematical models that we will use will be "perfect" or complete! Spend some time in thought about the effects of neglected variables on your results and discuss them in your conclusions!

For more information about General Physics I Lab (including the *Formal Laboratory Writeup*), please go to <http://users.manchester.edu/facstaff/gwclark/PHYS210/labs-210.html>.

General Physics Lab Notebook Grading Rubric in Detail

Note that some reallocation may be necessary if the lab has a format that deviates from this approximate distribution of emphasis.

Lab Entry Component					Score
Heading [0.5]	Lab title, name + partner(s) names, date, experiment number and title [0.5]	Two or more of the items listed are missing [0]			
Objective/ Procedure/ Narrative [2.0]	A concise statement of goals and experimental plan with narrative throughout the write-up; apparatus/models are diagramed and briefly described, with all appropriate variable names labeled. [2.0]	One of the items listed are missing or inadequately addressed [1.0]	Two of the items listed are missing or inadequately addressed [0.0]		
Data [2.0]	Presented with appropriate notation, units, and uncertainties; tables used when appropriate; data taken with a computer should be pasted into the notebook, as tables or graphs; all graphs have appropriately labeled axes and titles; sufficient data are presented for the experiment. [2.0]	One of the items listed are missing or inadequately addressed [1.5]	Two of the items listed are missing or inadequately addressed [0.5]	Three of the items listed are missing or inadequately addressed [0.0]	
Calculations/ Results [2.5]	Complete mathematical statements; all formulas shown; data should be plugged into equations with units and the results clearly indicated; any spreadsheet output shown and explained; calculations must be appropriate and correct; results are reasonably accurate. [2.5]	One of the items listed or calculations are missing or incorrect or result somewhat inaccurate. [1.5]	Two of the items listed or calculations are missing or incorrect or result somewhat inaccurate. [0.5]	Three of the items listed or calculations are missing or incorrect or result is completely inaccurate. [0.0]	
Uncertainties [1.5]	All measurements (data) and results should show uncertainties; calculations of uncertainties should be shown and explained; for multiple calculations, one sample may suffice. [1.5]	Uncertainties incorrectly stated/calculated or inappropriate in at least one instance. [1.0]	Uncertainties incorrectly stated/calculated or inappropriate in two or three instances. [0.5]	Uncertainty issues are not addressed or are completely inadequate. [0.0]	
Discussion/ Conclusions [1.5]	Includes a summary of results (using correct physical principles), including an explicit statement of numerical results, with uncertainties, discusses shortcomings of the mathematic modeling of the experiment (validity), problems with the experimental setup, and suggestions for changes/improvements to the lab; reasonable rationale are given for all discrepancies (justified by specific evidence) [1.5]	The conclusion lacks one of the items listed or inadequately addresses one of the items. [1.0]	The conclusion lacks two of the items listed or inadequately addresses one of the items. [0.5]	The conclusion is grossly incomplete or is not present [0.0]	