

PHY 251 and 252

General Information for the Physics Laboratory

Purpose of the Laboratory

1. To reinforce subject matter presented in class by experimentally verifying relationships which were established theoretically.
2. To observe the methods used in science by actually using them.
3. To discuss experimentally the relationships between physical variables by varying them and observing their effect on each other.
4. To become familiar with specific techniques and pieces of equipment that may be essential for subsequent work.
5. To become familiar with the limitations imposed on the conclusions derived from experimental results by the precision of the equipment.
6. To develop skills in keeping adequate and careful records and in the reporting of scientific research.

General Instructions

1. Do not try to perform the experiment until you understand what is to be done and how to do it. Failure to do so may damage equipment and/or yourself.
2. All experiments must be completed in the laboratory.
3. All calculations should be finished to ensure proper results.
4. You are not to leave the lab until your instructor has accepted your work.
5. When your experiment is finished, be sure that equipment is as you found it, or neater.
6. Lab reports are to be completed and turned in as directed by your instructor.
7. Lab reports must be typed.
8. Lab reports are due the third class period after performing the lab.

Experiment Write-Up

To make a complete report of your laboratory experiment, there are certain elements which are desirable, or even essential. Most write-ups should include the following items, though some experiments may not require one or another of the items. In every case, the order of items included should be as follows:

1. Name of experiment, your name, and date
2. Names of lab partners
3. Objectives: A brief statement of what you are trying to do.
4. Theory: Explain any laws and/or formulas involved.
5. Procedure: Explain what is done to perform the experiment.
6. Diagrams (if applicable): A simple (but neat) sketch or picture of the laboratory setup. These should be similar in structure to the diagrams drawn to illustrate in-class examples (simple and neat diagrams can be easily created in Microsoft Power Point and copied into your lab report document).
7. Data: All data taken in the experiment must be recorded in your lab data notebook, but all data taken does not need to appear in your lab report. Instead, insert select samples of your lab data to demonstrate the type of information that was recorded in the lab.

8. Calculations: If a calculation is complex, a sample calculation should be shown. It is not necessary to show every calculation, just the end result.
9. Results: All results and percentages of error must be recorded. Where appropriate, these may be included in the data table. Construct graphs when this is a suitable way to display results. All data and result table and graphs must be properly numbered and titled with the names of the quantities listed or plotted. Explain any large percentage errors or unusual results.
10. Questions: Answer all questions which may be given as part of the instructions for that lab.
11. Conclusions: Give a brief summarizing statement of the conclusions that can be drawn from the experiment. **It must include how the theory discussed in the lecture was supported/refuted experimentally.**
12. List of references

Grading of Lab Reports

Lab reports will be graded on the basis of 20 points per lab, broken down as follows:

1. Performance of lab (5 points)
2. Report format, content, detail, neatness (4 points)
3. Data and Results accuracy and appropriate presentation, tables, graphs (4 points)
4. Answers to Questions (3 points) (if there are no Questions on the lab, these points are distributed among #'s 2,3, and 5)
5. Conclusions (4 points)

Late reports: **No lab reports will be accepted late.**

Labs are performed in groups of two. **Lab reports, however, must represent your own individual effort. You and your lab partners will lose significant points if identical lab reports are turned in.**

Data Tables

Experimental data needs to be entered in a logbook in such a manner that is clear what the data represent and what factors control each datum value. This requirement is usually best achieved by showing the data in a table. A good data table is one for which a person mildly acquainted with the experiment can readily access the data at a glance, and put to immediate use if desired. The following criteria are usually accepted as those necessary for a good data table:

1. Each data table should be headed by a table number and a title (see illustration)
2. The table should be subdivided into columns. Each column should be labeled clearly, and the units in which the quantities are measured should be denoted in the heading of the column. One of the columns should be reserved for remarks, if needed.
3. The data table should be delineated; that is, columns will be separated from other columns by a straight line, boundary lines must be placed at the top, bottom, and sides of a table (see illustration).
4. If certain data are constants they may either be included in the table or by footnotes to the table.
5. Data tables should be neat and carefully laid out.

Example:

Table 1. Wheatstone Bridge Measurements of Resistance Coils

Sample No.	L ₁ (cm)	L ₂ (cm)	R (Ω)	X (Ω)	Remarks
1	86	14	18	2.93	
	82	18	18	3.95	See Note 1
	80	20	18	4.5	
	78	22	18	5.1	See Note 1
	76	24	18	5.7	
	82	18	18	3.95	Replace battery
	82	18	18	3.95	
2	75	25	24	8.0	
	74	26	24	8.4	
	76	34	24	10.7	Suspect math error
	74.5	25.5	24	8.2	

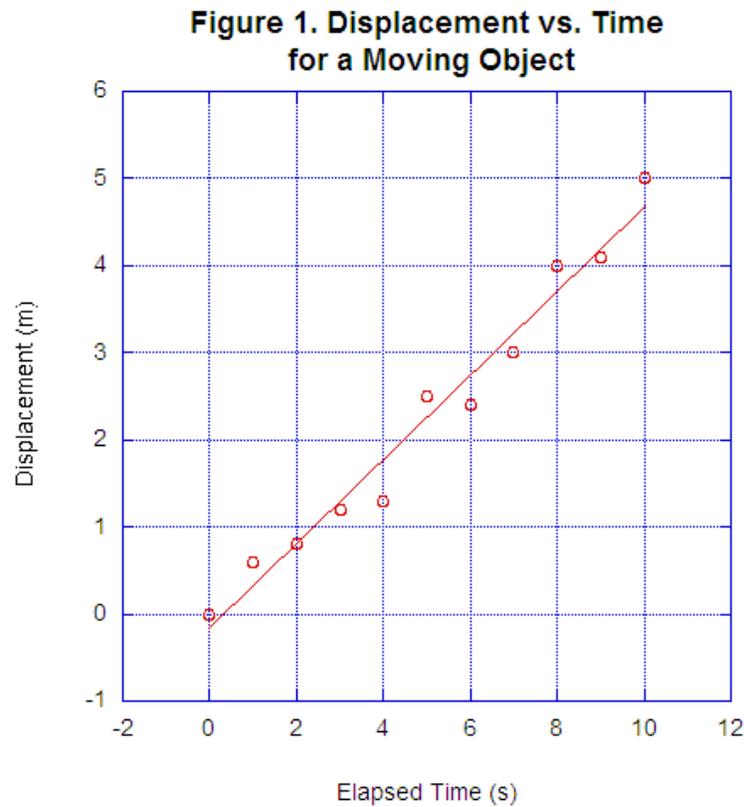
Note 1: Galvanometer shows considerable drift. Electrical contacts tightened.

Graphs

Graphs are a good way to show a range of data in a simple, easy-to-read manner. They allow even the casual reader to see facts about an experiment at a glance, such as trends, scatter of data points, or comparison to theoretical predictions. In order to best achieve these results, a graph should be constructed in a careful manner, with obedience to several features of construction. The following specifications and illustrations designate the usually accepted criteria for a good graph:

1. The graph should be given a figure number and a title. The graph should be included in the report at the appropriate place.
2. The graph should be constructed with an appropriate choice of scale. The scale on each coordinate should be chosen so that the graph nearly fills the space allotted to it. The same scale need not be used on both axes.
3. The axes of the graph should be clearly labeled with the quantity being plotted, the units of measure in parentheses, the scale divisions used, and enough numbers to establish the scale. Avoid cluttering.
4. Unless otherwise instructed, the independent variable (abscissa) should be plotted along the horizontal axis and the dependent variable (ordinate) along the vertical axis.
5. Experimental points are never connected. In some experiments, a smooth curve should be drawn through the plotted points. The curve need not pass exactly through all the points, but should be drawn in such a way as to fit the points as closely as possible; in general, as many points will be on one side of the curve as on the other. See the example graph. In other experiments, you will give a theoretical curve as a continuous line.
6. If a theoretical curve is calculated for the data, the values of the parameters should be shown on the graph and thoroughly discussed in the report.

Example:



Missed Labs

It is extremely important that you do not miss a lab experiment, as there is only one section that meets per week. However, if you do have to miss a lab, make arrangements with your lab instructor to make up the lab at a time convenient to the instructor. **No more than 1 lab can be made up by a student without a valid doctor's excuse or a valid excuse from the Mississippi College Office of Academic Affairs. Any student missing two labs or more without an excuse automatically accepts a zero for those labs.**

Lab Component of Course Grade

Your performance in lab constitutes 20% of your final course grade. However, **no student will be allowed to pass the course with lower than a 60% average in lab at the end of the semester.**