Introduction to the General Physics Laboratory

Welcome to Physics 1110!

These laboratory exercises are designed for you to experience physics concepts directly. Thinking about how they apply to the phenomena you observe will give you a deeper understanding than any lecture, textbook, or video.

You naturally want the most from this manual and from this lab, both in terms of understanding physics and in terms of your grade. Here is how to get it.

Before lab

You will learn the most in lab if you are already familiar with the concepts to be explored and you know what to do. Read each week's experiment before coming to lab. If you are not confident in your understanding of the concepts that the lab will address, take some time to brush up on them and bring your questions and curiosity with you. Work the pre-lab exercises if any are provided. (Most labs have a pre-lab.)

Check-in

Sign the appropriate line on the sign-in sheet when you arrive at your lab session. Present your completed prelab to your instructor. Correct any deficiencies the instructor identifies for approval.

If you attend a session different than the one you registered for, write your assigned section and write and sign your name on a blank line at the bottom of the sheet. *You must sign in to receive credit for a lab*.

Lab groups

Although you may submit a lab on your own, working with a group is recommended. Many activities require more than one pair of hands to carry out, so it is only natural to collaborate when making sense of your observations as well. It usually *is* true that "two heads are better than one." Discussing an explanation often makes it stronger, and a second pair of eyes often catches errors and omissions.

Groups of up to four students may submit their labs collectively. Choosing a group is entirely the responsibility of the students. Groups do not need to have the same members from week to week.
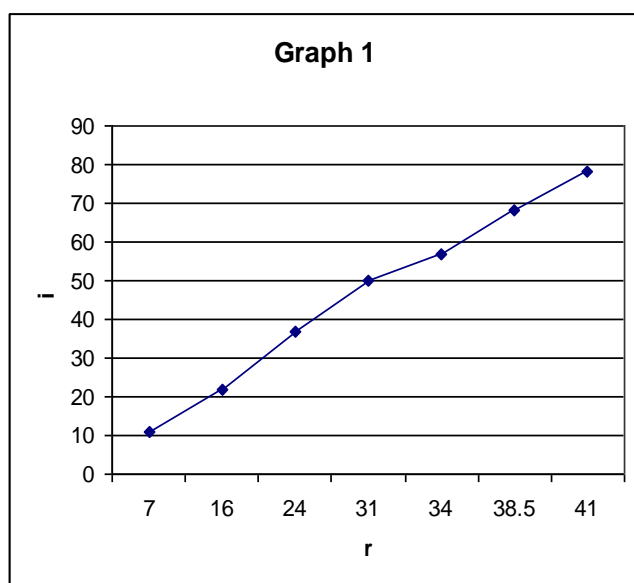
Check-out

Do all the lab activities and record all data during the lab session. Your data must be collected by the end of the lab session for you to receive credit. Submit your complete data to your instructor for check-out before you leave the lab.
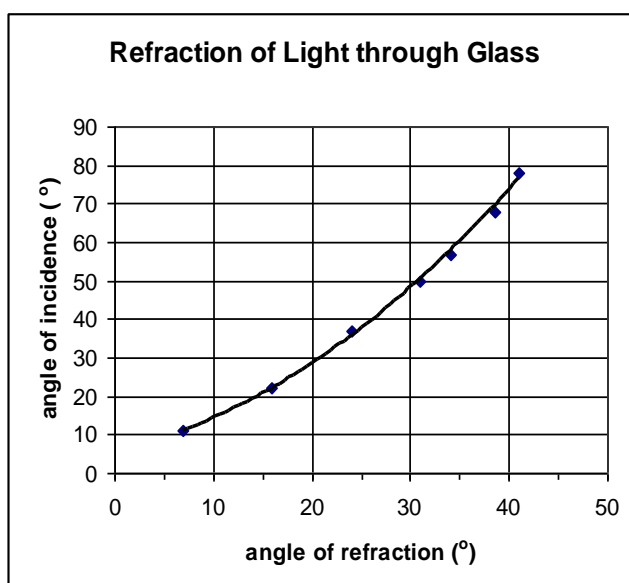
When your calculations, graphs, and answers are complete, submit them to your instructor for immediate grading. Labs are scored on an all-or-nothing basis. If the lab is satisfactory in all respects, it receives full credit. If any part is unsatisfactory, it receives zero credit. Correct deficiencies immediately! If you need more time than the lab period allows to process your data and answer questions, notify your instructor before leaving. For the lab to receive credit, your instructor must approve it *before the beginning of the next lab*.

Guidelines for Making Graphs

- It's a good idea to use pencil—then it's easy to fix mistakes. If you are familiar with a graphing program, you may use it instead of graph paper or the grids provided in this manual.

- Follow the instructions given. If they say to title the graph, write a title above the graph. If you use a computer to make a graph, you still must follow all directions.

- Give the graph a title that describes what the graph shows, e.g., "Motion of a Toy Car".

- When graphing "A vs. B", the first quantity (A) goes on the vertical axis. The second quantity (B) goes on the horizontal axis.

- Label each axis and include the units, e.g., Time (s).

- Make the graph big—use most of the grid provided. This makes it much easier to read. No matter what the range of your data is, it is always possible to scale the graph so that the data occupy at least half of both axes.

- Make sure you have equal intervals (e.g., 1, 2, 3, ... or 5, 10, 15, ...) and that they are equally spaced along each axis. In most cases, the axes should cross at 0.

- If your data show a trend, draw a smooth best-fit line that goes through the data and shows the trend. You should have roughly the same number of data points above and below the line. Don't just connect the dots!

- To find the slope of a straight line graphically, pick two widely-separated points *on the best-fit line* and find the rise and run between those places. Don't use actual data points—they seldom fall directly on the best-fit line.

- If you put more than one line or data set on the same graph, distinguish them using labels or different colors, symbols, or line patterns. Include a legend if helpful.

BAD

GOOD