

Introduction

The general physics sequence at PSU consists of both lecture and laboratory work. Concurrent registration in both the lecture and laboratory courses is required. The purpose of the laboratory course is to provide a hands-on learning experience that a lecture course cannot provide. Since the laboratory course serves more than one lecture section taught by different professors, the lab and lecture will not always introduce topics at the same time.

Location: Rooms 113 or 161, Science Research and Teaching Center (SRTC)

Website: <http://web.pdx.edu/~ralfw/physics/lab/index.htm>

Required Materials:

1. This Laboratory Manual.
2. Laboratory Notebook: 8 1/2" x 11", quadrille-ruled (this means each page is graph paper), and bound. You may continue to use the same notebook from one quarter to the next.
3. Your physics textbook used in the lecture course
4. Pen. Pencils may only be used for plotting data and data tables.
5. Calculator. Any ordinary calculator will suffice.

Laboratory Procedures:

1. It should be noted that copying or plagiarism the work of other students, webpages, books or other sources will not be tolerated and will result in a zero grade for the assignment and reported to the university (<http://www.pdx.edu/dos/sites/www.pdx.edu.dos/files/conduct%20process%20outline.pdf>).
2. *Read the description of the experiment and the corresponding chapter in the textbook before entering the laboratory.* You will learn more and enjoy the experience better if you come to class prepared. Your teammates and your instructor will expect that you have done this.
3. *Take the weekly on-line quiz* (Note: quizzes not given summer term). The quiz is meant to prepare you for the next week's lab and reinforce key concepts from the previous week's lab. Sign in to <https://d2l.pdx.edu/> using your ODIN account name and password, (same as your PSU e-mail account), following each week's lab to take the quiz. You will have five tries to complete each quiz, but only a quiz completed 100% correctly will count as a completed quiz. Each quiz is available for the full week and needs to be completed, at the latest, fifteen minutes before the lab session.
4. The class will start with a briefing by your instructor. They will briefly describe the goals and methods of the laboratory exercise. If the topic has not been covered in lecture, your instructor may give a short lecture on the subject. Make sure that you arrive to the lab on time. Students arriving late to class will need to make-up the lab at a different time. Please ask your TA for options to make-up a missed lab.
5. You will then be asked to perform the experiment. The laboratory course is a collaborative experience. Experiments are performed with one or two team members (no more). If you do not have a teammate, notify your instructor.
6. Record all of your data and observations in your laboratory notebook. The laboratory notebook is an essential facet of this course. It will be described in detail below.
7. Prepare a report in your notebook for review by your instructor. The requirements for this report vary depending on whether it is a Formal Lab Report or an Informal Lab Report. The difference will be explained at the end of this section.

Title IX

Portland State is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment (sexual assault, domestic and dating violence, and gender or sex-based harassment and stalking). If you have experienced any form of gender or sex-based discrimination or harassment, know that help and support are available. PSU has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and on-housing accommodations, helping with legal protective orders, and more. Information about PSU's support services on campus, including confidential services and reporting options, can be found on PSU's Sexual Misconduct Prevention and Response website at: <http://www.pdx.edu/sexual-assault/get-help> or you may call a confidential IPV Advocate at 503-725-5672.

Please be aware that all PSU faculty members and instructors are required to report information of an incident that may constitute prohibited discrimination, including sexual harassment and sexual violence. This means that if you tell your instructor/TA about a situation of sexual harassment or sexual violence that may have violated university policy or student code of conduct, your instructor/TA has to share the information with their supervisor or the University's Title IX Coordinator or the Office of Affirmative Action. For more information about Title IX please complete the required student module "Creating a Safe Campus" in your D2L.

Your Laboratory Notebook

Nowadays all professional experimental work in physics takes place in an atmosphere of close collaboration, whether the team consists of 4 or 400 colleagues. The work may be conducted at a university, national lab, or industry and often there is collaboration among these different groups. While the experiment is being conducted the team generally has *one lab notebook* that is shared by the members as they come on and off shift. Arriving colleagues must have a reference at hand detailing the procedures, problems, and successes of the experiment as it progresses. Those working on data analysis or theory for the project may receive copies of pertinent pages from the notebook by fax or mail. So typically *the lab notebook is a group notebook and remains in the lab*. No one ever takes it home.

A shared notebook is inconvenient for a general physics course. Students will be allowed to take their notebooks home to write their reports, thus each student will have their own notebook. Preparation and data sections must be filled out in the lab session, however, and the data itself should be identical to that of your lab partner.

In all other ways, strive to layout your notebook similar to the way professional scientists do. Guidelines are included below. Though you may not plan to become a scientist, this type of organized, systematic writing down of your experience and thoughts will help you to understand one part of the scientific method and to clarify your thinking in other areas of study.

Setting up your notebook:

- The first page of the notebook should be reserved for a Table of Contents and for your instructor's records.
- For easy reference, be sure all right-hand pages are numbered before beginning the first experiment.
- Use *consecutive right-hand pages* to record all formal work done in and out of the laboratory. Left-hand pages should be used for rough notes and calculations. This now standard format has arisen from scientists' efforts to make their lab notes easy to reference by their colleagues and others who might wish to examine them.

See the Laboratory Schedule to find out which type of report you should write for a particular day.

IN ORDER TO GET CREDIT FOR AN INFORMAL LAB

Perform all the experiments as assigned in the lab manual with your lab partner, including answering questions, completing data tables, and creating graphs.

Preparing Informal Lab Reports

Informal lab reports are completed entirely in lab. To get full credit for an informal lab you need to have done the following in your lab notebook

- Complete and report on all the tasks given by the TA at the beginning of the lab
- Answer all the numbered question from the lab manual.
- Record all data taken in your lab notebook.
- Do any data analysis required by the lab and calculate a percent error.
- Have your TA check off your lab notebook and give their approval.

You will not receive credit for your work unless your instructor has checked your notebook before you leave the lab.

IN ORDER TO GET CREDIT FOR A FORMAL LAB

Perform all the experiments as assigned in the lab manual with your lab partner, as you would for an informal lab. You will then have one week to write up a detailed formal report on all work (including answers to all question asked in the experiment). Your TA will let you know if your lab report should be hand written in your lab notebook or typed.

Preparing Formal Lab Reports

Below is a basic outline of the required sections for a formal lab report, your TA will provide you with more detailed requirements before the first formal lab. Note that TAs have the freedom to set the requirement to suit their individual teaching style and there may be some differences between lab sections.

- **Heading**, for each new day in the laboratory, in the upper right-hand corner of a new page write:

Student's Name
Lab Partner's Name
Date & Time of lab
Name of Instructor
Title and # of exp.
- **Preparation Section**: The preparation section begins the lab report and should demonstrate an understanding of what the experiment is trying to accomplish and the concepts being covered.
- **Procedure**: The procedure should describe how the experiment was done and be detailed enough that experiment could be reproduced from your description.
- **Raw Data Section**: This section should contain all measurement and observations taken during the lab. The measurements should be clearly labeled with proper units and significant figures.
- **Analysis Section**: Analysis typically includes graphs, relevant equations, non-trivial sample calculations, percent error, and discussion of sources of error. Any other relevant discussion of your data may go here as well.
- **Critical Conclusions, Insights, and Inquiry**: The conclusion should concisely convey the main results of your experiment.
- **Questions Section**: The questions section should answer all the numbered questions posed in the lab manual in numerical order with full sentences.

See the Laboratory Schedule to see which type of report you should write for a particular day.

GRADING POLICY

It is the student's responsibility to register for the class under the "graded" or "pass/no-pass" option. We will **not** sign petitions for changing grade options after the university's deadline.

Graded option students

Your final grade will be based on the cumulative score you have earned for all lab exercises, the weekly quizzes, and the Lab Final. Letter grades will be based on the traditional scale:

- 90% or better is an A or A⁻
- 80% to 89% is a B⁻ - B⁺
- 70% to 79% is a C⁻ - C⁺
- 60% to 69% is a D⁻ - D⁺
- 59% and less is a F

Your instructor has the freedom to alter this scale as he or she sees fit. Scores for individual lab reports, quizzes and the lab final will be available on D2L.

Additionally,

- **You must complete every lab.** If you miss **one** lab, there will be an opportunity to make it up during the scheduled make-up week. If you anticipate missing a second lab, talk to your instructor. Do not wait until the end of the term and then attempt to remedy the problem. You will fail the course.
- A zero grade on any assignment, whether for missing a lab or for academic misconduct, will result in failure of the course.
- Formal lab reports must be turned in at the beginning of the following lab session (during the regular school year this is typically one week after you performed the experiment). *Your lab report will suffer a 2-point reduction for each day it is late to a maximum of -50%.*
- Starting with the second week's lab a **weekly online D2L quiz** is given after every lab (Note: quizzes not given summer term).

Pass/No-Pass option students must earn at least enough points to earn a C⁻ to receive a "pass" grade

Incomplete grades

The Incomplete (*I*) grade is reserved for students who have suffered medical emergencies or some other unusual hardship. An instructor will only consider giving an *I* grade if a student provides written evidence (e.g., a letter from a physician) concerning the hardship.