

Physics 272, Laboratory for Physics with Calculus II

Section 6, Spring 2010

Dr. Yost

Office:	216 Grimsley Hall	Textbook:	Joel C. Berlinghieri, <i>Physics Laboratory Manual for Scientists and Engineers</i> (Tavenner, 2009)
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Classes:	221 Grimsley Hall, Thursday 9:00 – 10:50 AM	Office Hours:	MWF 9-10AM, 4-5 PM, Th. 11AM – noon, or by appointment
Web Page:	www.vic.com/syost/phys272		

Welcome to Dr. Yost's section of **Physics 272, Laboratory for Physics with Calculus II!** In this laboratory, we will conduct a sequence of laboratory experiments to illustrate the concepts of thermodynamics, electricity, and magnetism covered in Physics with Calculus II and introduce you to basic methods of data analysis used in physics. You will also get practice in the exposition of physical results, building your skills in scientific writing. You will obtain practice in comparing a measurement to theoretical expectations and in making meaningful statements about the errors and precision of a measurement.

Grades

You will conduct a series of experiments with a partner. Your grade will be based mostly on reports that you turn in after each experiment. Each report will be graded according to how well it communicates your results and your **understanding** of them, including the degree to which your measurements match or do not match theoretical expectations. My impressions of your behavior and procedures in the laboratory will be a factor in the grade assigned to a report. I will discuss the laboratory with each group before they leave. **You will need to check out** to receive full credit for doing the experiment. This includes leaving your experimental area in an acceptable condition. You will also have pre- and post-lab questions on WebAssign to encourage an understanding of the lab work, and an end-semester assessment.

Experimental reports and data analysis sheets	70%
Pre-lab and Post-lab homework questions	15%
End Semester Assessment	15%

Reports

Every laboratory will require a report, and these will be the primary basis for your grade. These reports come in two types: Experimental Reports (ER) and Data Analysis sheets (DA). These alternate as shown on page 7 of the lab manual. The content of each type of report is described below.

Reports will be submitted electronically via WebAssign. Reports will always be due at the beginning of the following week's laboratory. See the department-wide policy on due dates at the end of the syllabus. Use a standard file name convention as shown in brackets on page 7 of the manual. If you are Smith and your partner is Jones, the first week's report would be Week15-TH4410-Smith&Jones.xls (or .xlsx), since it will be an Excel file.

While you will work together in the laboratory, at its end, each student will have an individual record of the experiment, and will use this record to write a personal laboratory report. If data is taken in Excel, you may share the data taken during class, but anything added after I have checked your group's work must be your own work. A lab report is absolutely **not** a team or joint project. Any interpretation should be your own, and anything written about the data must express your own ideas and be in your own words. Sharing a word document is not permitted, and modifying it does not make it your own work. Using material written by partners without proper attribution is plagiarism, and must be reported as an honor violation. Using materials written by partners is permissible if you fully attribute it, but you will not get credit for such work.

Approximately 50% of each report grade is based on my assessment of your laboratory work in class. The remainder is based on your writing. These are not completely independent, as my impression of your laboratory work may be based partly on what you wrote about it in your report.

Experimental Reports

A report should follow the guidelines on page 9 of the lab manual, with the following additional specifications. The report must be written submitted in MS Word. (If you wish to use another, you must notify me in advance to discuss alternatives. This is not an excuse for missing a report.) It should be complete but not excessively wordy, and should avoid repetition and overgeneralization. A good report should begin with a standard title page as explained in the laboratory manual, clearly showing your name and who your collaborators were. It should then have the following sections:

1. Introduction

Always begin with a short summary of what your experiment is supposed to demonstrate, in your own words. This may be just a sentence or two, and need not be labeled as a separate section, but could be the opening paragraph of the *Procedure*.

2. Procedure

Give enough detail of the experiment to explain how you did the measurement, and what equipment you used. Anything special you did to make the measurements more precise should be noted here. Any problems should also be noted. Don't just reproduce the lab manual. This should be specific to how you carried out the instructions. When discussing equipment and its use, also estimate how accurately you believe it can measure the data you are taking. Give a reason for your estimate. Knowing the precision of your measurement is essential to deciding whether or not it agrees with theory. This section need not be pedantically repetitive, but also should not omit any important detail.

3. Analysis

You should reproduce enough data from your tables to allow the reader to see how you came to your conclusion. Include equations necessary to compare your data to theory, and graphs showing how the data and theory compare. Any graphs should be done on the computer. Precise plotting of results is an essential part of interpreting the data, so sloppy graphs will result in a **significant** grade reduction. Unlabeled or improperly labeled graphs will also result in a grade reduction. Axis spacing should be uniform in terms of a measured quantity – linear or logarithmic spacing is acceptable, but random spacings are not. (*Warning*: Microsoft Excel, by default, typically gives meaningless random spacings. You are responsible for correcting this.)

4. Discussion

When writing the discussion, be aware that it is impossible to prove anything using an experiment. You can only confirm agreement with a theory within the precision of your experiment. The discussion should show how well the results agreed with theoretical predictions. It should say whether the agreement was within reason for your procedures, based on an estimate of the errors in the data you acquired. The sources of the errors should be discussed. If you do not agree with the theory, you should discuss possible reasons, and make suggestions for improving the measurements. Do not neglect this section. It is one of the most important, and an overly brief or vague discussion will result in a significantly lower grade. A thoughtful discussion can do a lot to boost your grade, even if the experiment didn't work out well. It is never sufficient to write off differences as "human error". There is always a physical basis for differences, and it is expected that you will try to understand these.

An "A+" sample lab report from a different course will be distributed. It includes all of the elements just discussed. I strongly suggest looking at it, and in particular, noting the quantitative nature of the discussion, which is an essential part of any lab report.

I include detailed feedback in reports when they are returned, and suggest reading it. If your grades on laboratory reports are unsatisfactory and you do not understand why, be sure to schedule an appointment to discuss this in detail, and bring your reports to the meeting. If English skills are a problem, you may also wish to contact the Citadel Writing and Learning Center. See their web site, www.citadelwritingandlearning.com.

Data Analysis

For laboratories that do not require a full report, you will need to turn in your data analysis. This will be turned in electronically in MS Excel format via WebAssign. This analysis will include tables made during the experiment, analysis based on these tables, and any graphs constructed from the data. You should show any final results clearly. The WebAssign page will include a box in which you should type a brief discussion addressing the following issues.

- Did your results agree with the expected results within the bounds of experimental error? Justify your conclusion.
- What main sources of error influenced your result, and can you estimate the size of these errors? Could you have done anything better to reduce the errors?

Your response will be taken as an indicator of your understanding of the experiment, and will be a significant factor in the grade, so do not neglect this. These comments must be your own.

WebAssign

Pre-Laboratory and Post-Laboratory Questions will be turned in using WebAssign. You will need an access to use the system. This code should be included in your textbook for the accompanying course. If you do not have it at the beginning of class, the system gives you a two-week grace period to acquire it. To log in, go to www.webassign.net, and enter your log-in information under **Account Log In**. Your user-id is the first part of your Citadel e-mail address, your institution is Citadel, and your password is the last four digits of your Citadel ID number. For example, if your name is e-mail address is smithj21@citadel.edu and your ID number is CIT-07-1234, then your user-id is smithj21 and your password is 1234. It is possible that you have a different user-id than last semester, since a different format was used then.

Instructions for answering WebAssign questions are provided by the system. Please take the time to read them, because you normally only have five attempts to answer a questions, and errors in entering the answer count toward the total. WebAssign will understand answers only in a very specific format. Do not guess what this format is. The first problem set has some questions designed to illustrate some common answer types. WebAssign is particularly fussy about symbolic answers. In particular, remember that capitalization counts.

No submissions are accepted after 9:00 AM on the due date, by WebAssign's clock. After that, the answers are available on-line, and may be discussed in that morning's class. Extensions for known conflicts require previous approval, and are given only in rare cases. Emergency extensions are possible only if you have not viewed the set after it was due.

If you had a WebAssign access code from last semester that was bundled with your textbook, you can still use it, even if your user-id has changed. Follow these procedures:

In order to transfer a multi-term access code between accounts, you will first need to link these accounts.

1. Log into one of your accounts and click the 'My Options' link in the top right corner of your homepage.
2. Click the 'Accounts' tab in the pop-up window and type the username and password of the other account and the password of the account that you are currently logged in as.
3. Click 'Save'.
4. After your accounts are linked, you will have a new 'Transfer' option at the access code prompt.

If your textbook was not purchased through the Cadet Store last semester (or this semester), you may need to purchase an access code. You can get a single-semester access code for \$35 through WebAssign which is adequate for this course.

Laboratory Assessment

An **End Semester Assessment** is scheduled during your last regular laboratory period. It will consist of experimental tasks and related physics questions designed to see if you have retained what you learned by doing the laboratory experiments throughout the semester. For this reason, you should be certain to participate actively in each experiment, and never allow your partners to exclude you or do procedures you have not understood. More details on the structure of this assessment will be provided as the date approaches.

Schedule

The following topics in the laboratory manual will be covered this semester. The schedule may be subject to change.

Dates	Experiment	Number
Jan. 14	No laboratories – Classes start Wednesday	
Jan. 21	No laboratories – Martin Luther King Day	
Jan. 28	Measuring Absolute Zero	TH4410
Feb. 4	Thermal Length Expansion	TH4420
Feb. 11	Specific Heat and Latent Heat	TH4430
Feb. 18	Work Equivalent of Heat	TH4440
Feb. 25	Temperature Coefficient of Resistance	EM4510
March 4	Mid Term Break	
March 10	Voltage, Current, and Ohm's Law	EM4520
March 18	Electric and Magnetic Forces	EM4530
March 25	Faraday's Law of Induction	EM 4570
April 1	The Index of Refraction	OP4710
April 7 – 8	No laboratories – Spring Break	
April 15	Paraxial Imaging	OP4720
April 22	End Semester Assessment	
April 29	No laboratories – Classes end Tuesday	

Due-Dates, Attendance, Plagiarism, and Cheating

The following statements are department-wide policy, and will be strictly followed.

Physics Department-Wide Policy

Concerning Due Dates of Lab Reports and Lab Data

For all laboratory sections the due date on the submission of Laboratory Reports or Data Submissions is one week from the scheduled laboratory experiment. The instructor expects that you will turn in your Laboratory Report or Data Submission no later than at the beginning of the lab period one week from the scheduled laboratory experiment. The instructor, at his discretion, may remind you that reports are due but it is your responsibility to remember and to meet the due time.

Late Laboratory Reports or Data Submissions will be accepted up to one week after the due date, but will have a 10% reduction in grade. To be considered at all the instructor expects that you will turn in your Laboratory Report or Data Submission no later than at the beginning of the lab period one week from the scheduled due date. The instructor at his discretion may remind you that late reports are due but it is your responsibility to remember and to meet the cutoff time.

Laboratory Reports or Data Submissions will not be accepted beyond two weeks from the scheduled laboratory experiment. This is a Department-wide Policy and therefore it is not left to the discretion of the laboratory instructor. Students failing more than one third of their Laboratory Reports or Data Submissions will automatically receive a failing grade in the course.

A scheduled absence from lab should be discussed with your instructor so that an earlier or later lab section during that week can be substituted. Obtain an absence form from the Physics Department Secretary, fill it out, obtain any necessary authorizing signature and present it to your instructor before the start of the week in which you plan to be absent.

Note: Standing guard or attending a military physical is not an excuse for missing lab.

An unanticipated but nonetheless authorized absence will, at the discretion of the instructor, be treated as a onetime drop grade or substituted by an experiment during once per semester make up week.

Extraordinary circumstances will be addressed by the Physics Department Head.

Physics Department-Wide Policy Concerning Authorship of Lab Reports and Lab Data

STATEMENT ON PLAGIARISM

Laboratory Experiment Reports and Data Analysis Sheets are submitted for grading and are therefore part of your laboratory course grade. Normally the laboratory experiment is performed with a partner. As such you are allowed to discuss the meaning, setup, implementation, data, and results of your experiment with your partner. However, the written report or analysis sheet, which you submit for a grade, must be your own work, written in your words, with calculations and spreadsheets worked out and understood by you. Copying or multiple printing of calculations, spreadsheets, graphs, explanations, diagrams, conclusions, and the like without giving proper credit to the source is an act of plagiarism.

STATEMENT ON CHEATING

Pre-lab and Post-lab questions, which you submit for a grade, must be your own work. The use of any means which would give you an unfair advantage, such as having assistance in answering the questions, would be an act of cheating.

In-lab exams will be taken by you without assistance from any source not authorized by your instructor which would give you an unfair advantage. Using a source which gives an unfair advantage would be an act of cheating.