PHYSICS 231a

LABORATORY SESSION 231023

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Office hours: Thursday 2:30-3:30pm
Tutoring: Wednesday 3:30-4:30pm

Entrance Quiz:
There will be an entrance quiz at the beginning of every lab session so read the
manual before coming to lab.

Make-ups:
The last week is usually reserved for make-ups and/or a lab final. Usually only one
(but no more than two) make-up experiment is permitted. Because of end-of-term pressures it
is better to avoid needing any make-ups. If you know in advance that you cannot attend a
particular lab session, speak to your instructor. It may be possible to do the experiment at
some other time.

Penalties for Missing Reports:
Failure to do and/or turn in a report on an experiment will result in a grade of zero for
that experiment. Two labs or less may be made up by making an arrangement for doing so
with the lab instructor (see above). Missed labs can only be made up if there is a documented
medical or family exigency. In well-documented emergencies a grade of incomplete ("I")
may be possible. In the case that several severe emergencies resulted in missing two or more
experiments the student should apply to the Office of the Dean of the College for permission
to withdraw from the course with a hardship grade of "W."

Conduct:
Eating, drinking, and smoking are not permitted in the laboratory. Of course, loud
talking and disruptive behavior are also prohibited. Please wear shoes and a shirt at all times.

Data Sheets:
Each partner must have his or her own data sheets. They should list the name of all
partners and the date performed. The data sheets may come from the writeup, a spreadsheet
printout, or you may have to write up your own data sheets. All necessary data should be on
these data sheets. All data (single item and tabulated) should be clearly labeled with a
description of the number and its units, and when appropriate, its uncertainty. If you use the
spreadsheet printout, put the partners and date at the top and put data labels and units at the
top of each column -- you can even do this by hand, if necessary. I will initial the data sheets
at the end of the period. Don’t leave before I initial your sheet, this will be your
responsibility.
The Report:

Your lab write-ups are to be turned in at the beginning of the following lab session. Use the following as a guideline to topics in the lab report:

a. Title: (1) The name of the experiment, (2) your name, (3) the name of your partner, (4) the course name and number, (5) the name of your lab instructor, (6) the date the experiment is performed, and (7) the date the report is submitted. Make sure the partners listed on this page are those with whom you performed the experiment.

b. Purpose and method: This should be short: a paragraph or two describing what measurements were made and for what purpose. You are trying to show that you understand the relationship between the experimental procedures and the theory. This can sometimes be fairly obvious or simple and may only take a sentence or two. Procedural details should not be given, unless they are in some way original or non-standard (extra credit). Pictures of apparatus with explanations of their workings are more than welcome.

c. Data tables: The original or photocopies of the original data sheets, collected in class and initialed by the instructor, should come first. Neatened or expanded versions of the data with additional derived quantities may come next. Once again, remember labels, units, and uncertainties.

d. Calculations, including Error analysis: Whenever possible calculations should be done in the lab. Include in your calculations the units associated with any variable and, where appropriate, cancel units or change them to derived units (e.g., change kg·m/s² to N). Describe and show all work. If you do the calculations with the spreadsheet, remember to put labels and units on any additional columns, and state in the report how these columns were calculated.

e. Graphs, Include a title, and axis labels with units. If straight-line fitting is performed on the data, either by hand or with a linear regression program, remember to record the slope and intercept and their uncertainties. Always use a ruler never free hand for a straight line fit. Draw in the regression line determined from the slope and intercept. Whenever possible put error bars on each graph point. If the error bars are too small or data points are difficult to see on the graph, put a small circle around each one.

f. Conclusions: This should include a brief discussion of the main findings. For example:

"We found that there is a linear relationship between the measured variable … and … This can be seen from the graph and is predicted by the theory."

Also state whether your results agree with expectations to within the uncertainties of the measurements: For example:

"The slope of the graph of … versus … as determined by (linear regression, hand fitting) was …±… (units). This value, together with Eqn. …, and the measured quantities …±… (units), and …±… (units), allowed for a determination of …±… (units). This is within … standard deviations of the accepted value of … (units)."

Always discuss the main sources of error.

g. Questions: Answer all questions posed in the handout.
Grades:

Labs take up 25% of your class grade. The break down is as follows:

- Participation: 3 points
- Quiz: 3 points
- Lab Reports:
  - Purpose/Method: 5 points
  - Data collection: 10 points
  - Calculation: 5-15 points
  - Graph: 5-15 points
  - Conclusion: 5 points
- Laboratory log: 4 points

Total: 50 points

**PHYSICS 231 LABORATORY**

Schedule of Experiments

*Fall 2005 Semester*

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<tr>
<th>Dates</th>
<th>Experiment</th>
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<tbody>
<tr>
<td>24-Aug</td>
<td>Classes Begin</td>
</tr>
<tr>
<td>30-Aug - 1-Sep</td>
<td>Electric Fields</td>
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<tr>
<td>6-Sep - 8-Sep</td>
<td>Ohm's Law</td>
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<tr>
<td>13-Sep - 15-Sep</td>
<td>Instrument Amplifier</td>
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<tr>
<td>20-Sep - 22-Sep</td>
<td>Wheatstone Bridge</td>
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<tr>
<td>27-Sep - 29-Sep</td>
<td>Resistance vs. Temperature</td>
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<tr>
<td>4-Oct - 6-Oct</td>
<td>Electrical Energy</td>
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<td>11-Oct - 13-Oct</td>
<td>No Labs -- Fall Break Oct 13 &amp; 14</td>
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<tr>
<td>18-Oct - 20-Oct</td>
<td>e/m Ratio</td>
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<tr>
<td>1-Nov - 3-Nov</td>
<td>Oscilloscope</td>
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<tr>
<td>8-Nov - 10-Nov</td>
<td>RC &amp; RL Circuits</td>
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<tr>
<td>15-Nov - 17-Nov</td>
<td>AC Circuits I</td>
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<tr>
<td>22-Nov - 24-Nov</td>
<td>No Labs - Thanksgiving Holidays Nov 24 &amp; 25</td>
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<td>29-Nov - 1-Dec</td>
<td>AC Circuits II</td>
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<tr>
<td>6-Dec</td>
<td>Lab Final/Makeup</td>
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<td>7-Dec - 8-Dec</td>
<td>Study Periods</td>
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