Introduction To Laboratory Practices
(Short Version)

January 2000

This document is an abridged version of Introduction To Laboratory Practices. Details can be found in the full version. ***You are responsible for understanding the content contained within the full version.***

Departmental Policy On Laboratory Attendance And Reports

1. Attendance and participation in lab is required to pass the lecture portion of the course.
2. Points may be deducted from your report for certain violations: not creating a graph as the data is collected (unless instructed to do so by the instructor); collecting data on scrap paper; recopying results.
3. Your lab partner may help you but may not do your work for you. To report your partner's work as if it were your own is plagiarism. (Check the *Student Handbook*, under 'Academic Honesty' if you are unsure as to what constitutes plagiarism. It is your responsibility to be aware of the rules.)

Laboratory Report

1. *Title*. Enter at the top of the first page of each report: the name of the experiment, the date, your name and your partner's name.
2. *Sketch of experiment*. This helps you and your reader to visualize what you did in your experiment. If you refer to any quantities in your report that can be shown on the sketch, label them. *Be sure that labels in sketches and data tables are consistent*.
3. *Data Section*. Record your original observations in your report as you collect them. Use tables to keep data neat and organized.
4. *Sample Calculation*. It will be tedious to present all your calculations; show one sample of each in sufficient detail to demonstrate how your results were obtained.
5. *Graphs*. These include hand–drawn and computer graphs.
6. *Conclusion*. This is a **brief** summation of your results and conclusions drawn from them. Present a brief table that summarizes your numerical results.

   Next, evaluate your results - how reliable is the information on which you base your conclusion, what reservations do you have about it, how might you improve the experiment, etc.? Do not blame error on "human error"; the errors of the experimenters can be reduced by careful technique, or repeating the procedure. *Be specific;* what made a particular measurement difficult, or what aspects of the experiment lend themselves to greater uncertainty in measure? Don't be quick to blame the apparatus, unless you are positive that is the cause (this can usually be checked with other equipment).

Data

Details on recording and presenting data in your report can be found in the full version of Introduction To Laboratory Practices

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Calculation

A. *Significant figures*:

Keep track of significant figures during calculations. Be wary of rounding errors! *Details can be found in the full version of Introduction To Laboratory Practices*

B. *Percent difference*:

You can compare two numbers by calculating the percent difference between them. Do this by subtracting the two numbers and dividing by the average of the two. *Note: There is usually no more than **one** significant figure in percent differences.*

Example: Two measurements of the same object give the length as 4 cm or as 5 cm. The percent difference is calculated as:

$$\frac{(5-4)\,cm}{\frac{1}{2}(5+4)\,cm} = 0.2\overline{2}$$

Since only one of the digits in this figure is significant, we shall call it 20%.

Graphs

Both hand–drawn and computer graphs must follow the conventions outlined below:

1. *Title:* Every graph must have a title. A title should consist of words describing what quantities are being plotted against each other for what experiment. The title should be sufficiently descriptive to be understood without reading the rest of the report.
2. *Axis labels:* Each axis must be labeled, giving both the *quantity* and the *units* in which it is measured. If the axis represents force in units of hundreds of Newtons, you might label it 'force (100 Newtons)' or 'F (10^2 N)'.
3. *Axis scale:* For the hand–drawn graph, try to fill as much of the page as possible, but don't overdo it. The smallest grids of the graph should be in units of 1, 2, 5, or any of these numbers multiplied by a power of 10. It is very difficult to plot points between the grid lines or to read those points off of a graph in which each block is, say, 3, 6, or 0.8 units.
4. *Plotting individual data points:* In order to make individual data points on your hand–drawn graph highly visible, but retain the precision of marking them, you should surround a single tiny dot with a larger symbol, such as a circle, triangle, or square. *Do not* use a cross or an 'x' to mark data points!
5. *Indicating slope points*: On a graph of linear data, use a small cross or 'x' to indicate the points used to determine slope. If possible, place the coordinates of that point next to the symbol. Slope points should be *widely separated*, as close to the ends of your best fit line as possible; **never use data points to calculate slope!**