

Lab Report Criteria:

Lab reports must follow a standard format. Any report that does not follow the format below will be handed back as unacceptable. A score of 75% or better is considered a satisfactory lab report. Your data may be the same as your partner's, BUT your written report must be your own independent work! Labs are a learning experience designed to reinforce concepts taught in lecture class.

Each section must appear on each report, clearly labeled, in the order shown below. If you do not do this, your report will come back to you without a grade. Lab reports must meet the minimum standards for proper English usage (DO NOT use instant messaging abbreviations!). The labs should be typed on a computer and printed in a normal sized, normal appearing font (i.e. USE 12 Times or 12 Arial, DO NOT USE *14 Brush Script* or *10 Old English Text* or *12 Lucida Handwriting*.)

Each lab must have a **cover sheet** that includes your name, your partner's name, date, lab name, and a brief, but **complete abstract**. Your lab report must be attached to the completed cover sheet. If you choose to attach separate additional sheets that contain graphs, calculation sheets, spreadsheets, extra questions, etc., they must be referenced in the appropriate section of your lab report (i.e.- see attached sheet" or "see pages ___ to ___").

WARNING: The sections with an asterisk (*) have components that need to be completed before you do the lab activity!

LAB REPORT FORMAT

I. Title* The title of the lab goes here. You may copy the title, or you can create your own **appropriate** title for each activity.

II. Purpose* - Write out the purpose of the lab, or the problem statement here. Every time - No exceptions!

III. Pre-lab Questions* - Answers to the pre-lab questions go here. **Use complete sentences.**

IV. Procedure* - If you are using a procedure that is written out for you in a lab handout, you may reference it by writing "*see lab handout, page(s) _____", provided that we didn't make any major changes. If there are any changes to the written procedure, they must be noted in this section, or you will receive no credit for this section.

If you are using a procedure that you have developed yourself, it must be written out in an easily understood, step-by-step format in this section that someone unfamiliar with this lab could REPRODUCE and get SIMILAR RESULTS! A list of materials needed must be included in this case. You may use a flowchart, or other type of clear organized graphic format to list your procedure. Whatever you write down must be *complete and thorough*. Again, someone else should be able to follow your directions to duplicate what you did in class. When in doubt, hand your procedure to someone *NOT in our class* to see if they can figure out what they need to do.

V. Data and Calculations - All graphs, data tables, and calculations (including percentage error) go here. Data tables should be reconstructed using tables or spreadsheet in MS Office applications.

Any time that you complete a lab which involves experimentally measuring a known value (such as the acceleration due to gravity) you **MUST** do a percentage error calculation. Failure to do so will result in getting your lab back without a grade.

Data tables that you create should be computer generated. Be sure to include column headers including associated units. If you use a spreadsheet to create a graph, you include a hardcopy of the spreadsheet used in addition to the graph.

Data and calculations must include the proper units, with all answers circled. **Calculations MUST be shown, and they must include the equations used. If the lab requires several repetitions of the same calculation, you only need to show a sample calculation for a single trial.** The rest of the trials can be figured out entirely on the calculator (or on your spreadsheet) then recorded. If you are using a spreadsheet,

you still need to show equations and examples for all calculations.

All graphs MUST follow the proper format, or no grade will be awarded for the lab in question.

Graphs will only be acceptable if they have ALL of the following:

- a proper title (at minimum “plot of variable y vs. variable x”)
- x and y axes correctly numbered and labeled, with proper units indicated, and arrows drawn on the ends of the axes, origin properly labeled.
- all straight lines drawn with a ruler
- all data points circled and connected with a best fit line
- interrupted numbering, if present, should be noted with a break symbol

VI. Conclusion – This is the HEART of the lab report, where you should put your best efforts.

A. Theory - In this section you explain the scientific principle behind the lab. Your explanation MUST relate **directly** to what you wrote down as the purpose of the lab. You MUST make a prediction in this section as to what should happen in the lab. For example, if the lab is about Newton's Second Law, then you should define and explain Newton's 2nd Law in the theory section, briefly relate this Law to what you did in the lab, and then use this Law to predict what the results of the experiment should be.

B. Analysis - This section tells what happened, why you think it happened the way it happened, and whether or not the lab went as predicted. In your analysis section you should report the major results of your lab (including percentage error), and you should make a judgement call on how well the lab went and say something about how well your results agreed with the theory and your predictions. **If the lab involved identifying unknowns, then they must be identified in your analysis section.**

If you made any big mistakes that affected your results, report them here. (a mistake is a non-repetitive accident, a procedural mistake: dropping a piece of equipment, not stopping the timer, etc.. Don't confuse these mistakes with sources of error!).

If you want to score some extra points, in the analysis section you can make suggestions about how you would improve the lab activity, or you could suggest related investigations or extensions to the activity that could be pursued in the future.

C. Sources of Error - SPECIFIC sources of systematic error should go here; *mistakes that you make in the course of doing the lab should go in the analysis section*. A source of error is something that is built into the lab activity that causes inaccurate results for anyone doing that activity, especially when it is a factor that is hard or impossible to control. **A source of error affects the data you collect every time you do a given procedure with the materials you are given, and will affect anyone who does this procedure.**

For example, if you attempt to measure the heat gained by an ice cube as it melts using a non-insulated cup and a thermometer, the non-insulated cup is a source of error because thermal energy you are trying to measure escapes from its surface. Also, the thermometer is a source of error in this case, because it absorbs a certain amount of energy that will not be measured, and most thermometers are only accurate to +/- one degree Celsius. This will throw off your data every time you use a thermometer.

It is extremely rare to do a lab that has no sources of error. Even if you appear to get perfect results, you may have measured data that is off by the exact amount needed to make it appear to be correct. Every measuring device has some amount of uncertainty built into it, so every lab that involves a measuring device must have error built into it. Engage your brain and think about the limitations of the often simplistic equipment that we use!

D. Post-lab Questions - Finally, answer ALL of the post-lab questions! Use complete sentences. You may refer to attached sheets if necessary.

Hand labs in by the due date and make sure they are complete!!!

Note: A penalty is applied to all late labs.

 **SAVE this sheet for your reference when writing your labs**