Lab Report Writing Guide
for AP Physics – Mrs. Burgess

- When writing a lab report for physics, you will type your reports using Google Drive. All partners must write while signed individually into Google Drive, and there must be evidence in the revision history that both partners contributed equally.
- You must turn in your report both via wwwTurnItIn.com **and** as a hardcopy. The hardcopy is due at the start of class on the due date.
- Keep all of your lab reports as a record of your work. Some colleges require this.
- Your lab report should follow the format described in this document.
- Do not write in first person (I, me, my, mine, myself, we, us, our, ours, ourselves). Points will be deducted for writing in first person.

HEADING

- In the upper **left** corner, type:
  The Authors' Names (first & last)
  Other lab partners' names (first & last)
  Period
  Date

TITLE

- The title should be a short phrase identifying the variables in the experiment or the purpose of the experiment.
  - *Example: The Effect of Heat on Gas Pressure in a Sealed, Rigid Container*

OBJECTIVE

State the problem that you solved or, most often, the hypothesis that you tested. You must make the correct choice between writing a problem or a hypothesis, it must be reasonable given the theme of the experiment, and it must be written in the correct format.

- Sometimes you will solve a problem. This can be equivalent to finding the answer to a question.
  - *Example: Determine the acceleration due to gravity.*
- More often you will be looking for the effect of an independent variable (the cause) on a dependent variable (the effect.) In these cases, you should make a prediction that is research-based. These should be written as "If (*cause*) then (*effect*)" statements.
  - *Example: If the temperature increases, then the pressure of the gas in a sealed, rigid container should increase.*

BACKGROUND

The background serves two crucial purposes. First, it justifies the prediction you made in your hypothesis or explains your problem. Second, it justifies your choice of procedure as a reasonable method of testing your hypothesis or solving your problem.

- Justify the hypothesis or choice of problem: Here you will explain all relevant background theories that informed your decisions in creating your hypothesis or choosing the problem you are solving. It is expected that you will…
    - Explain all relevant laws/theories/principles/concepts
    - Define all terms
    - Include and explain all relevant formulas if applicable
- Justify the procedure you've chosen as a relevant means of testing your hypothesis or solving your problem. It is expected that you will…
    - Give a brief narrative overview of your procedure. Include variables, a brief description of the method, and how the relevant formulas will be used.
    - End by stating how this will allow you to test your hypothesis or solve your problem.

MATERIALS

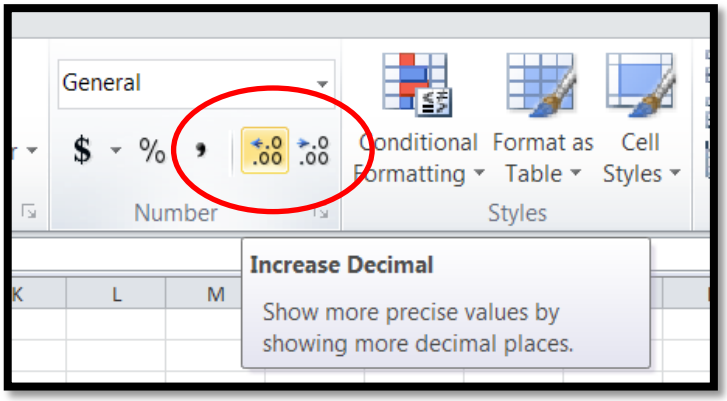
Clearly list all materials used in the experiment.

PROCEDURE

- Most important: Your procedure must effectively test the hypothesis or problem you are investigating. Exclamation point!
- You must describe the setup clearly. A copy-paste diagram, photograph, or cropped screen shot image is OK but is not required. However, a diagram alone is *not* sufficient. You must also give a written description of the setup, regardless of whether you've included a diagram. Note: If a computer software package is used, be sure to state the name of the software. If the software plots something, such as a graph, on the screen, that is also part of the setup.
- State what measurements you took and how you took them.
- State what calculations you did using the measurements you took (if you did calculations.)
- NOTE: When doing the above, DO NOT give instructions that a professional scientist wouldn't state. This will result in formatting point deductions. Such inappropriate instructions include:
    - Describing how to use the software (e.g., "click start; highlight data")
    - Mentioning the teacher
    - Mentioning *where* you're recording data (e.g., "Record these values in the data table.")
- *Tip: Write the procedure as you would write directions to get to your house.*

DATA TABLES AND GRAPHS

- This is where you will present your recorded data and/or your qualitative observations.
- Data must be neat and well organized. Data tables must be entered via a spreadsheet program (such as Excel) and copy-pasted into the lab report.
    - All data tables must indicate in column or row headers the variables measured.
    - All data tables must indicate the units of measurement for each variable.
    - All data tables must be appropriately precise with the correct number of digits.
        - In Excel, you can adjust the digits by highlighting your data table. Then go to the "Home" tab and look at the top of your screen. In the "Number" box, you can click one of the two icons circled below to increase or decrease the decimal to the appropriate amount of precision.
        - You must also include the uncertainty of all measurements. I suggest doing this in an adjacent column after the measurement so that you can do calculations with Excel functions.



- When you create graphs from your data, you should do so using the spreadsheet program. Then copy-paste the graphs into your report. Be sure to title the graphs and label the axes with variables and units. When relevant, you may include error bars.
- Sometimes it is relevant to include a screenshot of a graph recorded by our laboratory software. You can export an image of a PASCO graph and then insert it in your lab report when needed. Be sure to title the graphs and include the axis labels in your image.
- **Note:** Google Drive makes inserting data tables and graphs difficult sometimes. If you are having difficulty, simply finish writing all of the text in your Google document and then export it as a Word document. You can then easily insert the graph image into the Word document.

CALCULATIONS

- All your mathematical calculations should be labeled and organized in this section if required. (Your procedure of choice will indicate if you need to do this. If no calculations are used, this section may be omitted.)
- You only need to show the formula > substitutions > answer. You do not have to show algebra steps. (That would be horrendous.)
- Use units for *everything*, not just the final values. This includes your substitutions.
- In many labs it will be important to perform an error analysis. Please refer to the *AP Physics 1 and 2 Lab Investigations: Student Guide to Data Analysis* for details.

CONCLUSION

In a conclusion you will summarize the results (data) of the lab and (most importantly) what they allow the experimenter (you) to conclude about the objectives of the lab.

- Address…
    - what you can **conclude** in relation to your objective.
    - what evidence from your **results** supports that conclusion.
        - Note: Do not restate all of your numbers. Instead refer to trends and, perhaps, give a small sample of numbers that represent the trends.
        - If you performed error analyses, you must refer to these as part of your evidence. (For example, if the percent difference is less than 5%, you may conclude that the results show a significant similarity between two values.)
    - **experimental error**. There is always uncertainty in your measurements, and you should acknowledge that briefly. If major errors occurred, you should address these, as well. Such errors are either systematic errors or random errors.
    - What if you know your results are wrong? Draw your conclusions based on the results anyway, regardless of whether they're right or wrong. If you know they're wrong, though, you must then say so. (Otherwise the reader (your teacher) will think you didn't realize that there was an error and will mark points off.)
    - If the design was flawed, acknowledge the flaws and state how they could be corrected.

Note:

- This conclusion is not the conclusion to an essay. Do not describe what you did or what this lab was about. That information is already in your objectives and your procedure and should not be repeated.
- Do not comment about how great/interesting/successful/awesome this lab was. Scientists don't care if you liked doing a lab or learned a lot. It's a cold, hard world out there. ☺