How to write your formal lab report

**Heading:**
Should be the standard North Penn heading with your lab partners names and the lab title

**Abstract:**
This should only be a couple of sentences describing what the lab is investigating. Do not put results in here. For example: We are investigating what factors affect the speed of a car on a ramp, or we are attempting to confirm the principle that the acceleration of an object is zero when the net force equals zero.

**Introduction:**
This is where you reveal what you know going into the lab. This may require you to open the textbook and read about the topic to explore the theory completely. For example: if it is about speed, you need to explain what speed is, and the factors that affect it. If it is about balanced forces, then you should explain what you know about balanced forces and what factors affect them. You should use proper scientific terms and language, not street slang. The introduction should not be about your knowledge of the scientific method or experimental procedures in general.

This section is worth 14% of your grade

**Procedure:** Here is where you:
1) list your materials
2) List your independent, dependent, and control variables for the lab.
3) give the initial setup for the experiment
4) You should use bullets for the procedures. Every value that you use in your lab needs to be covered in the procedures, along with how to gather the data from the lab. Give a detailed step by step instructions as to how to perform the lab so that someone else with no experience can use your lab report, and conduct the lab with similar results to you.
5) The independent, dependent, and controlled variables are listed, or noted in the procedures.

This section is worth 16% of your grade

**Results - data table:**
The data table must include the independent variable, the dependent variable, any measurements used in the lab, any calculated values used in the experiment. It should also be logical and organized with all values and headings clearly labeled.

**Results – calculations:**
This is where you must show how you made your calculations. You must explain why you are multiplying or dividing certain values.

**Results – graph**
You must represent your data in a graph. The graph often shows the relationship between variables more effectively than a data table. Most times the independent variable goes along the x axis and the dependent variable goes on the y axis. You graph should be labeled in the proper units, and should have a line of best fit.
Discussion:
This is where you state how the data supports/refutes your hypothesis. You need to show me the evidence and reasoning behind your analysis. Just stating that your results support or refutes your hypothesis is not enough. You need to use your data in sentence form to show how it supports/refutes your hypothesis. For example: The acceleration of the ramp increased from 105cm/s to 210cm/s when the ramp angle was increased by 10 holes.

Error analysis:
This is where you make a calculation about how good the data you gathered is. You expect to get a certain value when you do your experiment, you need to calculate how close you got to it. This is usually done by taking the difference between the measured value and the calculated value then dividing by the measured value, then multiplying by 100%.

$$\left( \frac{\text{measured value} - \text{calculated value}}{\text{measured value}} \right) \times 100\% = \%\text{error}$$

You also should discuss how to improve the experiment for the next time you do it.

Conclusion:
You need to explain how the newly gained insight from the experiment changes how you will think about the topic in the future. There is almost no experiment that can’t be improved. You need to spend a little thought on how you can minimize error (uncertainty), new experiments that can test your hypothesis further, and maybe other experiments that can test another aspect of the topic. You conclusion could also examine some alternate hypothesis. A conclusion that shows good logical thought and deep insights into the scientific principles behind the lab will earn bonus points. Impress me and you will be rewarded.