**What should be in a Formal Report?**

Top of First Page, Centered:

* First Line: Title of the Paper (you may use the title of the Lab Activity, or get creative – as long as the title clearly explains the subject of your report)
* Second Line: Your name first (you are the main author), followed by your partners names,

Abstract:

* A maximum word count of 250 words.
* Should give a very brief overview of the subject of the report:
  + Purpose (why did we do this?)
  + Methodology (briefly, how did we test this?)
  + Results (what did we see?)
* Do not include interpretations of the results for the question you are answering.
* Abstracts are often written *after* the rest of the paper is written.

Introduction:

* Gives a general presentation of the research problem:
  + I.e. “It is known that X happens. In this experiment we attempted to expand on this to prove that Y also/doesn’t happen.”
* Describes exactly what the goal of the experiment is (i.e. to prove Kirchoff’s Loop Law):
  + What are we trying to find/understand/prove?
    - I. e. “We are attempting to show that Kirchoff’s Loop Law works in the lab as predicted by theory.”
  + Why are we attempting to understand this?
    - “Because it is required for this class” is incorrect!
    - Instead, try for something more like “To solidify my understanding of this phenomenon,” or “To explore the cause of the observations made.”
    - Use your own words!
  + This should serve as a clear and concise statement of your hypothesis for the experiment.
  + All of the points above can be combined into a few sentences, you do not have to have a separate sentence for each point.
* There are two ways to handle the introduction:
  + Written first to help you set the direction of the paper and lay out what the report of your experiment is trying to achieve.
  + Written last as a quick summary of the overall paper – note: you must have a very good paper structure for this to work well!
* The Introduction should be a paragraph (or a couple of paragraphs) that gives the reader an idea what the overall paper is about without having to read the whole thing, and is more thorough than the abstract.
  + Assume the reader has a base knowledge of the material.
  + Refer to any background research you performed, and any other relevant information you discovered in your literature review.
    - It is likely that the questions you answered in the pre-lab could be included or expanded upon here.
  + Mention any other papers or literature that may be relevant to the experiment.

Experimental Method

* A complete and accurate description of the equipment and the techniques used to perform the experiment.
  + This should include any and all diagrams of the setup of equipment or methods of measurement.
  + Detail measurement techniques:
    - How did you measure the values you recorded?
    - Why did you make the measurements in this fashion?
    - Why is this measurement valid?
* The goal here is to be descriptive enough to allow another experimenter to exactly replicate your experiment (and, ideally, find the same results!).
* *Note*: Pictures/Diagrams should be made electronically. Hand-drawn work must be of *extremely* high quality and should be avoided if possible. Photographs of hand-drawn items are not permitted; drawings must be scanned and inserted into the body of the paper.

Results:

* This should be the easiest section to put together, as it only requires the clear communication of the data you gathered, and not any discussion of this data.
* This is the section where your data should be presented in tables, graphs, diagrams, etc.
* The uncertainty in the data (usually based on your measuring tools and calculations) should be presented. This should be included in the data tables, graphs, etc.
* Appropriate units should always be included in your data presentation.
* Any calculations you performed should be mentioned, and the equation expressed in the paper.
  + Make a note of what each variable in the equation represents (i.e. the variable “vf” in the equation represents the final velocity).
  + Assume that the reader is capable of plugging your reported values into a formula, so do not show every calculation you made.
* *Note*: Pictures/Diagrams should be made electronically. Hand-drawn work must be of *extremely* high quality and should be avoided if possible. Photographs of hand-drawn items are not permitted; drawings must be scanned and inserted into the body of the paper.

Discussion & Conclusion

* This is the section in which you should explain the results of your experiment.
  + Did you prove/explain/understand what you set out to do? How are you sure that you did?
  + What does the uncertainty in your data stem from, and what does it mean about the quality of your results?
  + What factors influenced your results, how can they be interpreted, and what can be done to eliminate/compensate for these possible outside influences?
* This section should expand in words on what the results in the previous section really mean.
* Do your results agree or disagree with your literature review/previous research? Why or why not?
* What ambiguities are still left in the experiment, and how could these be resolved in future experiments?
* In this section you should tie everything in the experiment together, including the results and the experimental methods.
* Can include such things as:
  + Did you come up short in any of your techniques/measurements? Why? How could this have been avoided?
  + Are there any parts of your reported data that you are not confident about? Why? Can you suggest ways to verify this data or gather sounder data?
  + Did the analysis of your experiment inspire any new hypotheses further experiments? Concisely explain them.
  + Are there any questions still lingering, or new questions that developed due to this experiment?

References

* Cite all literature you used for the paper using standard format:
  + For Journals: Author(s) (last name, first name). Article Title. Journal Title. Date; Volume (Issue): Location.
  + Books: Authors (last name, first name). Title. Edition. Place of Publication: Publisher; Date.
  + Dissertations/Theses: Author (last name, first name). Title [dissertation/thesis]. [City (State)]: University Name; Date.
  + Websites: Title of Homepage. Edition. Place of Publication: Publisher; Date of Publication [date updated/ accessed]. URL.
* Number each of the sources you used, and in the body of the paper refer to them with a superscript of that number.
  + For example, I used a website[1] to determine these different citation formats.
  + [1] Scientific Style and Format. 8th Edition. c2014 [accessed 2016 February 13]. http://www.scientificstyleandformat.org/Tools/SSF-Citation-Quick-Guide.html

Required Format:

* At least 1 page (front and back, full)
* 0.5” Margins
* Single Spaced
* 2 Columns for body of paper (does not include, title, author(s), or abstract)
* 14 point font for title
* 12 point font for author(s), abstract, and body
* PDF or MS Word