

APPENDIX A: THE FORMAL LABORATORY REPORT

The formal lab report is intended to assess your proper use of the terminology of physics, your understanding of physical concepts, relationships, and principles, and your ability to investigate the behavior of a physical system experimentally.

The formal lab report should be typed, with either computer-generated or neat hand-written graphs, diagrams, and equations. You must use complete sentences. (Occasionally, lists may be appropriate in the methods section). The report should contain the following sections:

- I. Heading. *You do not need a separate cover page.*
 - a. Title. The title should be brief and describe the purpose of the experiment
 - b. Authors. The report author should be indicated **as well as laboratory partners.**
 - c. Date
- II. Abstract. The abstract should briefly describe the purpose of the experiment, how it was carried out, and the main results. It should be a single paragraph.
- III. Introduction. State the physical law to be tested, describe your model of the physical situation and how the physical law applies to the model, and **describe the strategy used to test the law.**
- IV. Methods
 - a. Experimental Setup. Describe the apparatus and how it was set up. **Include a clearly labeled diagram** of the apparatus.
 - b. Procedure. Describe how the experiment was carried out. Additional diagrams may be helpful here.
- V. Data.
 - a. Make a data table to record your experimental measurements. The table may be computer generated or neatly hand drawn. This table should include **all** measurements made in the experiment. Be sure to indicate the units of measured quantities.
 - b. If you made qualitative (non-numeric) observations, these should be recorded here as well. (In some cases, these observations could include figures).
 - c. Include uncertainty estimates for each of your measurements, **and the justification for those estimates.** DO NOT include any calculations: this section should be for things you observed ONLY!
- VI. Analysis. Present the analysis required by the lab manual in this section.
 - a. Calculations: For each calculation you make, state the equation you used, using the correct variables (NOT the values) and EXPLAIN the rationale for using the equation. You do not need to show the values plugged into the equation. Unit conversions do not need to be presented or explained in the report.
 - b. Graphs: Graphs should be computer generated with axes labels and error bars. Indicate on the graph if the error bars are too small to see. DO NOT connect data

points with lines! When appropriate, you may add a best fit line to the graph and display the equation of the best fit line on the graph.

- c. Uncertainty propagation: Determine the uncertainty of your calculated values using the methods of uncertainty propagation described in the Error and Uncertainty handout and/or in class.

VII. Conclusion

- a. Discussion: Discuss whether your results confirmed or disagreed with the theoretical model's prediction. This discussion must include a comparison of experimental uncertainty to the discrepancy between the experimental result and the theoretical prediction: see the Error and Uncertainty handout on how to deal with this. (Saying something like "the results are reasonably close" is not good enough)!
- b. If the experiment did not agree with the model's prediction, discuss possible invalid assumptions made by the model or possible sources of experimental error. Finally, explain what the experiment shows (or does not show) about the laws that govern the physical world.