PHYS 251: Atomic Physics Lab
Fall 2023

Lab Report Guidelines

General comments

- The ***lab report is a summary*** of your experimental work, i.e. lab book (a lab report is not an essay).
- Shorter is better: You should aim for 3 pages (single spaced), including figures.
- Overly long lab reports will be penalized.
- The good lab report is self-contained. The reader should be able to easily understand:
    - Why you are doing the lab (i.e. why is the experiment interesting from a physics perspective).
    - How you did the experiment(s).
    - What did you get (i.e. data).
    - How you analyzed the data.
    - Your conclusions.
- If you have a number, then it must have a unit and an uncertainty ($\pm$ error).
- Uncertainty should be quoted to one digit … eventually two digits in exceptional cases.
- Uncertainties that are three or more digits long will be penalized.

Lab report contents

- **Header**
    - Title
    - Author list (writer and lab partners)
    - Submission date
    - Abstract (reminder: the abstract is the summary of the lab report, NOT an introduction)

- **Introduction**
    - This section answers the question: ***Why is the experiment interesting?***
    - Physics motivation for the experiment(s), e.g. historical significance of experiment.
    - Importance of the measurement technique.

- **Theoretical background**
    - This section answers the question: ***What physics theory is tested/used by the experiment?***
    - Brief description of the theory.
    - Relevant formulae, including a description of every parameter in the formulae.
    - Illustrating plots, if applicable.

- **Experiment description**
    - This section answers the question: ***What did you do, and how did you do it?***
    - Brief description of the basic idea of how the experiment works.
    - Diagram/sketch of the experiment.
    - Description of the procedure/methodology, including the values of the experimental settings
    - Connection between the measured values and the parameters in the theory formulae.

● **Data Analysis**

- This section answers the question: ***What did you get, or what did you find out?***
- The primary way to present your data is with **plots**.
- Each plot should have:
    - ∗ A caption.
    - ∗ Labeled axes (with units)
    - ∗ Data points and, if applicable, a fit to the data.
    - ∗ If multiple data series (or fits) are on a same plot, then they should be color-coded or symbol-coded, with a legend.
    - ∗ Use vector graphics format, e.g. PDF, SVG, EPS (or high resolution PNG); NO JPEG!!
- If you only have a few data points, then using a table can be an alternative to a plot.
- Discussion/description of the error analysis, including:
    - ∗ How the uncertainties were estimated (and how they were propagated).
    - ∗ Comparison between statistical and estimated/propagated uncertainties.
    - * Discussion of the quality of the fits to the data, e.g. reduced χ^2_ν and residuals.

● **Conclusion**

- Short summary of the report and your work.
- The section briefly answers these questions:
    - * ***Did your experiment work?***
    - * ***Do theory and experiment agree?***
        - → If there is a discrepancy, what are the causes of the discrepancy?

● **Bibliography**

Cite any sources that you used (e.g. for the introduction or theory sections), including the lab manual.

● **Appendices** *(optional)*

- The appendices are good place to put detailed calculations (e.g. error propagation), data, theory, etc, that you consider important but that also distract from the main results of the lab report.
- The lab report should be self-contained without the appendices (i.e. the appendices should not be required/essential to understanding the lab report.
    - → It should be possible to grade the lab report without reading the appendices.

Approximate grading scheme

Header	5%
Introduction	10%
Theory	15%
Description	30%
Data analysis	35%
Conclusion	5%

Note: A missing bibliography will result in a 5% deduction. The appendices will be graded.