Writing Lab Reports

The Weight of Words

Why is good writing important in science?

It’s how you communicate your results to others

It’s how new ideas are shared and built upon

It’s the final, preserved outcome of research. Its greatest legacy...

It also determines your grade

Good writing is strongly correlated to good grades…

Thinking About Writing

What is the goal of your notebook?

A personal record of everything you did.

Think of it like a journal.

Record of everything that might be important, so you don’t have to repeat your experiment

What is the goal of your lab report?

It should be a comprehensive unit, showing what you did and learned in the lab.

Your audience is your peers (A.K.A other Physics students, not specifically familiar with this material or lab)

Provide enough detail that one of them could understand and replicate your work.

Lab Notes

Exercises

– Include a clear and concise description of what you did.

– Circuit diagrams and sketches of scope traces are invaluable.

– Make tables clear and neat.

– Always include units on measurements!

– Check your measured results while in the lab to make sure they make sense.

– Attempt to explain what you see. What was meant to be learned from this exercise?

Analysis/Plots

– Graph your data as you go to catch measurement

mistakes.
–
Compare your results with your expectations whenever possible.
–
For plots, make sure to label each axis and include a title or caption.
–
Every plot must have an explanation!

Submit Notes for Review

Pre-lab questions

–
Must be signed off at the very latest within the first hour of the Friday before the lab is due.

Signatures

–
Must have a GSI sign  questions while the circuit is working.

Exercises

–
Include a copy of written lab notes in order.

Analysis/Plots

–
Extra analysis may be included as an appendix, or can be integrated into the lab notes.

Report

Introduction (no Introduction for Labs 1 - 11)

–
Should motivate the lab and discuss some of the things a student should learn.

Pre-lab

–
Type up and include with report.

Exercises

–
Rewrite exercises, integrate graphs, analysis and comments to make a clean easy to read report.

Conclusion (no Conclusion for Labs 1 - 11)

–
Should be a follow-up discussion to the introduction with some examples of things you actually observed.

Lab Notes

–
Append for verification.

Sample Manual

University of California at Berkeley

Donald A. Glaser Physics 111

Instrumentation Lab

Lab 0

Introduction to Resistors

Pre-Lab Questions:

1. How can the impedance of a resistor be determined from its I-V curve?
0.1 Measure the resistance of several 22Ω, 1KΩ, and 470KΩ resistors with the DMM. Do they fall within their expected tolerance?
0.2 Use the offset adder in the laboratory breadboard box to supply the resistor with different voltages within the range of 0-5V. Measure the current through the resistor and voltage across the resistor simultaneously with the DMM and oscilloscope. Plot your data on an I-V curve. What is the impedance according to these measurements? Does it match what you expect?

Standard Scientific Report Format

Abstract

–

Brief motivation for experiment and summary of results

Background/Theory:

Explains theory/equations that are relevant to the experiment

Methods:

Explains experimental setup and how data was taken

Results:

Summarize measurements in easily readable form
Analysis:
Interpret results, compare to theory, support conclusions
Conclusion: (no Introduction or Conclusion for Labs 1 - 11)
Summarize results, discuss problems, offer improvements, etc.

Tips for Exercises

•**Fully answer all questions in the manual**
– Some questions are open-ended. You will have to decide what is necessary to answer them.
•**Clearly state and explain results**
–Label all plot axes
–Explain what is significant for all tables and plots
•**Support all conclusions with data**
•**Properly typeset equations**

$$-Ae^{-Bx} \text{ not } A * e\backslash\hat{}(-B * x)$$

•**Be concise!**

Introduction (no Introduction for Labs 1 - 11)

•**What were the main goals of the lab?**
–ie. the things a student should learn from this lab.
•**How does the lab introduce and achieve these goals?**
–3-4 examples
•**Why should anyone want to learn about any of this?**

Introduction

We build circuits that demonstrate the limitions of operational amplifiers (OpAmps). Op-Amps are often treated as ideal, capable of performing many tasks more robustly than standard linear circuits or transistors circuits. However, many practical and simple circuits may fail due to non-ideal behavior. In this lab, we build circuits that allow us to observe and estimate some of the LF356 op-amp's limitation, particularly its voltage offset, bias current, maximum output current, and slew rate. We also build a differentiator that demonstrates how negative feedback can subtly turn into positve feedback, due to unintended phase shifts accumulating in a cricuit. - - -

Conclusion (no Conclusion for Labs 1 - 11)

•**Summarize your findings.**
–Focus on results you found during the lab.
–Include 3-4 that you found interesting or important.
•**Example**
Poor: “We measured low pass filters over a range of frequencies.”

Better: “We found that the low pass filter attenuated signals significantly above the cutoff frequency of 7.2 kHz, which was very close to the cutoff frequency we calculated from theory.”

Conclusion

We were able to successfully estimate several values for various parameters of the LF356 op-amp. We estimate offset voltages to be typically $+_-$ 1-2 mV; we estimate input bias current for our particular op-amp to be 10^{-10}A, near the maximum range of the expected bias current. - - -

Scoring a zero means lost points, but not turning in a lab means automatic F for the course.
