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.

Short Report

•
Do everything you would for “Submit Notes for Review”
•
Attach short paragraph answers to specific questions.

Full Report

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

Lab Notes
–
Append for verification.

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**Sample Manual**

*University of California at Berkeley*

*Donald A. Glaser Physics 111*

*Instrumentation Lab*

*Lab 0*

*Introduction to Resistors*

**Pre-Lab Questions:**

<table>
<thead>
<tr>
<th>1. How can the impedance of a resistor be determined from its I-V curve?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0.1</strong> Measure the resistance of several 22Ω, 1KΩ, and 470KΩ resistors with the DMM. Do they fall within their expected tolerance?</td>
</tr>
<tr>
<td><strong>0.2</strong> 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?</td>
</tr>
</tbody>
</table>

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**Standard Scientific Report Format**

**Abstract**
Introduction

We build circuits that demonstrate the limitations of operational amplifiers (OpAmps). OpAmps are often treated as ideal, capable of performing many tasks more robustly than standard linear circuits or transistor 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 limitations, 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 positive feedback, due to unintended phase shifts accumulating in a circuit. - - -
Conclusion

• **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 $\pm 1-2$ 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.

**Grading**

**Full Report**
  – Selected exercises will be marked for content.
  – Presentation and completion.
  – Late reports accepted at -10% per day.
  – All exercises and pre-lab signed for full marks.

**Short Report**
  – No late reports accepted.
  – Short answer questions will be marked for content.

**Notes Only**
  – No late reports accepted
  – Four point scale for completion and content.

*Scoring a zero (perhaps due to a late Short Report) means lost points, but not turning in a lab means automatic F for the course.*

**Details**

• **Please turn in the evaluation for each lab online.**
  – Please put at least 10 minutes of thought into it; simple yes or no answers do not help us.
  – Would the evaluation you turned in help you if you were the one trying to revise the lab write-ups?
• Reports due online at Bcourses by 11pm
   – Lab is open at 12noon Monday, and 1PM Tues, Wed, Thurs, Fri, so you can finish before they are due, scan in report at the Library if needed.
   – We will not be able to answer questions in the lab the day the report is due.

• Ask questions!
   – Ask them early. Don’t wait till the last minute!

Source URL: http://instrumentationlab.berkeley.edu/labreports