

# Requirements for Experimental Notebooks

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Learning to maintain a laboratory notebook is one of the most important skills you will develop in Junior Lab. A good laboratory notebook is essential when you begin to write papers or to develop oral presentations summarizing your experimental efforts. A clear well-written narrative that includes experimental schematics, plots of raw data, and details of your analysis methods will enable you to receive quick feedback and assistance during lab sessions from peers, TA's and section instructors.

A poorly maintained notebook will prove immensely frustrating to you and your instructor. It is very difficult to answer questions like 'why didn't the experiment work' or 'why was my result off by an order of magnitude?' without being able to clearly and easily trace your efforts using your notebook. Don't count on being able to recall the gain of your amplifier even one day after a lab session!!! The following is a list of specific guidelines to follow when performing laboratory work.

1. **Create a descriptive table of contents** and make an entry every time you add new material. Title the TOC with the following:

**Date**———- **Contents**———- **Page**

Don't use generic entries like "Day 1" or "Analysis". Instead, produce records of significant milestones: e.g. "Calibration of NaI Scintillation Counter Using Ba-133 and Na-22 Check Sources", "Plot of monochromator linearity over the visible spectrum", "Montecarlo Simulation of Mean Slant Path Distance in Muon TOF Experiment". These sorts of descriptive headings will prove enormously useful later on when reviewing your notebooks.

2. **Sign and date every page** demonstrating authenticity.
3. **Don't ever erase**, use white-out, or tear out pages of a lab notebook. Indicate "mistakes" by simply drawing a single, neat line through the item. These may prove to not so incorrect as initially thought and will very often be useful as a guide to how the experiment was done and provide clues on how to better execute the experiment next time.
4. **Loose-leaf pages are never acceptable** within a lab notebook. Graphics or tables generated by computer must be neatly taped into the notebook. Remember to annotate these types of graphics with as much information about how they were created as possible.
5. Preparatory questions and solutions should be written in your lab notebooks.

6. Following the preparatory questions, **state the essential physics of the experiment in your own words**. List your experimental objectives and how they relate to the essential physics.
7. After listing the objectives, **identify the things you will have to do, the data you must obtain and identify the required calibrations**.
8. On the first day of a new experiment you should **sketch a block diagram of the apparatus and signal chain**.
9. **Identify the location of large data files** or long analysis programs if they are too big to directly enter or tape into your notebook. Analysis scripts, functional forms for non-linear fits, etc. should always be present in your notebooks.
10. **Note typical "readings"** and instrumental settings so to be able to quickly setup an experiment on subsequent days.
11. **Sketch waveforms** at various places within the signal chain. This will help ensure your understanding of each component and permit you to rapidly identify equipment failure.
12. When tabulating data into columns, **use headings and list the units and estimated measurement uncertainties**.
13. Don't wait until after the session has ended to visually examine the quality of your data. **Create hand drawn plots of data, as they are acquired, not later**. These initial plots will very often save you time and frustration in making sure that your data are reasonable and suggestive of the behavior you expect. **The importance of making preliminary plots and analyses in real-time cannot be overstated**.
14. Your notebook should contain diagrams, narratives, tables of raw data, formulas, computations, reduced data, error analysis and conclusions in a neat compact, orderly arrangement.

**Bring your notebook to every lab session and to all oral exams. Failure to do so will result in penalties to your grade!**