

MIT OpenCourseWare  
<http://ocw.mit.edu>

1.061 / 1.61 Transport Processes in the Environment  
Fall 2008

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.

## WHY A LAB NOTEBOOK?

The scientific process depends on peer review, *i.e.* scientists check one another's results, and work together to build a solid foundation for scientific advancement. To facilitate this scientists are expected to lay out and describe their work carefully enough that it can be reproduced and checked by others. The following story demonstrates why reproducibility is an essential component of proving new discoveries in science.

Suppose that a stranger told you that she had discovered a new chemical mixture that when added to gas would increase a car's gas mileage. She plans to manufacture and market her discovery and asks if you want to be her partner. Would you give her money right away? Based only on her word? What if she took you for a ride and showed you that her gas mileage was reduced? Would you believe her then? What if she showed you how the chemical mixture was made, so that you could *reproduce* her results? You could make the mixture yourself and test it in your own car. Then you would be confident in the result. Similarly, the best proof for a new scientific result is that it can be reproduced by more than one scientist. A well-documented lab notebook will ensure that results can be reproduced.

### Elements to Include in Your Lab Notebook in order of appearance

1. Title
2. Objective: 1-3 sentence introduction to overall goal of experiment
3. If needed, notes taken at start of class can be included here.
4. Methods:
  - 4a. Sketch of experiment with sufficient detail, labels, dimensions, that you could recreate the set-up as much as ten years later.
  - 4b. Describe any equations or general theories that contribute the basis for any part of the experiment. E.g. The mean velocity  $u$  is estimated as  $u = L/T$ , where  $T$  is the time recorded for a buoyant drogue to travel a distance  $L$ .
  - 4c. Description of how experiment is run - as sequence of steps or in prose.
5. Tabulation of observed quantities with units and uncertainty
6. Analysis. The manipulation of observed quantities using the equations and/or theory described in 4b. Set off final result with box and label, or other highlight.
7. Discussion of results

### Rules for Significant Figures

- Experimental uncertainty should be rounded to one significant figure.
- The last significant figure in a stated result should be at the same decimal position as the uncertainty.
- In multiplication and division, the least number of significant figures in any number in the equation determines the number of significant figures in the answer.
- In addition and subtraction, the least number of places in the decimal portion of any number in the problem determines the number of decimal places in the answer.