

The Laboratory Notebook

A good notebook is critical to success in the sciences. If you choose a laboratory-based career (management or in the lab), chances are that you will be keeping or reviewing laboratory notebooks. Notebooks may be considered legal documents by your company, so they are not taken away from the site. Plan to turn in your notebooks at the end of lab. If you come prepared, you should be able to complete the assignment, including your notebook, by the end of the lab period.

Format Guidelines for Set Up of Your Notebook (take your time...)

Step 1: Lab notebook must be a bound document, such as the black covered composition notebooks available from Staples (\$1-\$2). Spiral-bound notebooks are not acceptable to meet the notebook format.

Step 2: All notebook entries must be made with **blue or black** ink that **cannot** be erased. No other colors or enhancements will be accepted as following the format.

Step 3: Number **all** pages by hand, in order, 1, 2, 3, ... from the beginning until the end of the book. (If you can find a book with printed page numbers, this is acceptable as long as none of the pages are missing). You do not need to write "p." in front of the page numbers.

Step 4: On the inside front hard cover of the book do the following: print your name, sign your name, write your initials, and write the starting date for lab. (4 items)

Step 5: Reserve the pages 1 and 2 of your notebook for a Table of Contents. Place this title at the top of pages 1 and 2. Label the top of the left side of pages 1 and 2 with, "Title of Experiment". Label the top of the right side of pages 1 and 2 with, "Page Numbers."

Step 6: Have your notebook marked/stamped, and dated by the instructor

Format Guidelines for Keeping a Notebook in Addition to Those Above

- Write the date and the time at the top of every page when you start writing on that page. If you stop recording on a page, be sure to rewrite the date and time when you start recording again.
- Record entries in your notebook in time order. Leave no blank pages or vertical whitespace. Recording the time is always a good idea.
- Always start a new experiment on a new page. If unused vertical space remains on a page, cross it out as described below.
- If you leave blank lines or vertical whitespace, cross out these areas of vertical whitespace with a single diagonal line and initial along the line, and write the date. Initials must match those for the set up.
- All diagrams and figures must be drawn on, or permanently attached (taped or glued) to, a notebook page. Initial and date across the attachment and onto the notebook paper before applying tape.
- Never scribble, obliterate, or overwrite a notebook entry. See the section below for how to make corrections.

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Making Corrections

- All errors must be stricken with a single horizontal line. Write your initials by the correction (The initials must match those you wrote in Step 4 above). Explain briefly why the correction was made. Include the date and time that the correction was made.
- If you want to add material or a description to a section at a later time. Write the material in an open space, then initial (must match), date, and write the time. Draw a box around all the material that you added, including the initials, date, and time.

Come to lab each week with your notebook filled in to do the experiment

Follow the directions/guidelines at the back of Chapter 1, or see the sample lab, to set up your notebook each week. For the procedure and materials sections, see the corresponding sections in your lab book for details, as well as any additional instructions given during lab. *Always* start a different lab on a new page of your notebook. The sections are:

- *Date and time* at the top of every page
- *Title* of experiment
- *Title and start/end page(s)* included in table of contents.
- *Purpose* (often discussed in lab or before lab)
- *Materials and equipment* or references to them. (If you reference the book, the materials and procedures must be there exactly on that page. The materials and equipment for the next week should be available for you to inspect the week before. As a result, it is usually better to write these out before leaving lab.)
- *Table(s)* of important quantities/constants. For example, if you were boiling liquids, a table of boiling points for your samples should be provided, but the melting points would not be important for this table. If you choose to cite a reference, cite that specific reference and include the reason(s) for the citation.
- *Experimental plan* (Often given in lab the previous week - ask if you are not sure. This is a summary of what you will be doing, like the directions in a recipe.)
- *Mechanism*: Provide if there are chemical reactions needed; otherwise, write "none" under the section title. If you needed a chemical equation in the calculations section, the mechanism must appear here. Include arrow pushing diagrams for all steps in the mechanism.
- *Clean up* (Describe where waste should be placed. It's in the book.)
- *Observations* (Section title only, this section will be filled in during the lab)

Ask questions about what you do not understand at the beginning of lab. The instructor may give a pop quiz to see if you understand the lab and the procedures.

Labs that take multiple weeks must have only one of each section shown above. The preparatory write up for the multiple-week experiment must be complete by the first lab of the experiment.

During lab, fill in your notebook

When lab starts, only your textbook, your lab notebook, black/blue pens, and a calculator are permitted to be used. Put all other materials away. The instructor may permit the use of your textbook during lab. If you set up your notebook correctly, you will not need your textbook.

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Follow the guidelines at the back of Chapter 1 in your text, the sample lab, and your statement of experimental plan (see above) to fill in these sections. For example, if the description/standard practice in the textbook calls for two measurements and you make just one measurement, then expect, at most, half credit for this work. The sections are:

- *Observations*: record as they occur in time order. Use either format in the book for recording observations, as long as you record all observations in time order. If there is a gap in time, include the date and time when you start writing again. It is good practice to record the time that each observation is made. Observations must be consistent with the stated procedure. For example, if book states two trials that agree within 1°C, there had better be at least 2 trials recorded in your notebook. If the book states 1°C/minute temperature increase, your observations had better include a table of temperature and the time at which the temperature was recorded. If the book states that the temperature should be recorded when the first drop melts, then observations must be taken that are consistent with the procedure. This requires that you read and understand the procedure before lab. Labs that take multiple weeks will have multiple weeks of observations.
- *Calculations*: Always provide equations that you will need. Provide calculations if there are any that can be done before lab; otherwise, write “none” under the section title. It is acceptable to include simple calculations as part of the discussion. For example, if your goal is to synthesize 5g of product, you must include the chemical reactions, stoichiometry calculations, and masses/volumes of reagents to be obtained before coming to lab. If your goal is to calculate a percent error or a percent yield, then you will need to collect data from the lab before completing the calculation. The equation must appear in calculations. The result should appear in the discussion.
- *Discussion/Conclusion*: Explain what your results **mean** about the system(s) under study. For example, compare the theoretical prediction to the results obtained by experiment. An example of an unacceptable conclusion (0 points) for a lab on melting points would be, “I melted naphthalene, and it melted at 78°C, exactly as expected from the table.” A better conclusion would be to explain what your melting point range indicates about the purity of the naphthalene. If your melting point technique is poor, repeat the melting point experiment. Read the textbook carefully (including pre-lab questions and introductory chapters) for guidance about the expected results.

Format penalties and legend that apply to grading each lab

A notebook that does not follow format (FMT: 11 points per lab)

Coming to lab with notebook not completely filled in (PREP: 11 points for that lab).

Writing in pencil, erasable ink, or using other colors (INK: 11 points for that lab)

Missing notebook page (MP: 11 points per page)

Suspected time violations or entries out of place without explanation (TO: 5 points per violation)

Scribbles, obliterations, and notebook corrections that do not follow format (C: 5 points per violation).

Loose paper on desk during lab or in lab book (LP: 5 points per violation)

Whitespace violations (WS: 2 points per violation)

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Missing dates and or times (DT: 2 points per violation)

New page for new experiments (NP: 2 points per violation)

Define an acronym (ACRO) at first use (ACRO: 1 point per violation)

Other violations (described- 1 point per violation)

Grading Breakdown by Section(s)

Date through Observations title (33 points)

Observations through Mechanism (33 points)

Discussion / Conclusions (34 points)

Penalties apply independently of points assigned for each section.

Note: your instructor may give you the option to rewrite your notebook record for a maximum grade of 85. If this is important to you, ask.

Experiments requiring a written report have the same requirements as a notebook, except that the experiment and data can be recorded and submitted on ordinary notebook paper (or typed). Plan on turning your notebook in after each lab, then having your notebook returned in the lecture class before lab.