

AP[®] Chemistry Laboratory Guidelines

"To develop the requisite intellectual and laboratory skills, AP Chemistry students need adequate classroom and laboratory time. It is expected that a minimum of 290 minutes per week will be allotted for an AP Chemistry course. Of that time, a minimum of 90 minutes per week, preferably in one session, should be spent in the lab... In addition, students will probably need to spend at least five hours a week studying outside of class." ¹(from the College Board website)

The laboratory notebook is one of the most important documents that students will produce during the AP[®] Chemistry course. Students are expected to keep a precise, legible, and comprehensive laboratory notebook that conveys the quality and substance of the work done during the course year. In addition to explaining laboratory procedures, data, calculations and experimental error, the laboratory notebook may also be used to discuss the results of an experiment and to explain the theories involved. Students may be requested to produce their laboratory notebook by the Chemistry Department at a college or university in order to obtain credit for the laboratory portion of the Advanced Placement[®] Chemistry course.² (modified from Vonderbrink)

For your laboratory notebook this year, please follow these guidelines for set-up:

1. Use a quadrille-lined, spiral-bound notebook that has carbon-copy pages.
2. Keep the original pages intact in notebook, and submit the carbon-copy for grading.
3. Use black, non-erasable ink only. No pencils.
4. If you make a mistake, simply draw a line through your error. Do NOT erase or use white-out.
5. Number and date each page, be sure to sign at the bottom with your laboratory partner as witness.
6. Leave 2-3 pages in the front for "Table of Contents." Write the title, page number, and date of each experiment in the Table of Contents as the year proceeds.
7. Do not use first person or include personal comments.³
8. Be as CONCISE, ACCURATE, CLEAR, and LOGICAL as possible in your writing. Anyone reading your report should be able to grasp your thinking quickly and correctly.

Laboratory Reports

Title Page: (Title of Experiment, Date, Author - include laboratory partner in citation)

Abstract:

The abstract is a clear, concise synopsis of your experiment. The abstract should be able to "stand alone" and contain enough information to convey the purpose of the experiment and the important results found. To practice writing an abstract, read through the best examples from the Journal of the American Chemical Society: <http://pubs.acs.org/journal/jacsat>

Abstract requirements:

- Written in narrative, not bullet-points.
- Brief statement of purpose of experiment
- Brief summary of procedure used in experiment (NOT same as Procedure written in more detail later)
- Brief summary of results found in the experiment
- Brief explanation of the significance of the results, based on theory and applications in science.

It is acceptable to write the abstract AFTER completing the entire laboratory report write-up.

(page 2 or an acceptable length of page onward)

I. Purpose

A brief statement of the purpose of the experiment. Be sure to state your hypothesis or goal of laboratory, even if the stated goal is given to you in the experiment.

¹ "CollegeBoard.org." AP: Chemistry. Web. 01 Sept. 2012. <http://www.collegeboard.com/student/testing/ap/sub_chem.html>.

² Vonderbrink, Sally Ann. Introduction. *Laboratory Experiments for Advanced Placement Chemistry*. Batavia, IL: Flinn Scientific, 1995.

³ Vonderbrink, Sally Ann. Introduction. *Laboratory Experiments for Advanced Placement Chemistry*. Batavia, IL: Flinn Scientific, 1995.

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II. Procedure

A brief summary of the materials and experimental methods. Students may refer to the laboratory hand-outs and printed material for specific, detailed instructions. **Be sure to use correct citations in citing sources.* Do not copy, verbatim, the step-by-step procedure from the hand-outs.* Re-state the experiment in short, descriptive, and concise terms in your own words. Annotated flow-charts are acceptable, as long as they convey accurately the written work.

III. Data and Observations

Record all data and observations collected in your laboratory notebook, both qualitative and quantitative. Be sure to use:

- Correct Significant Digits
- Label proper metric units (g, mL, m, etc.)
- Organize data in neat, orderly form
- Use tables where appropriate
- Label all data. Scribbles of numbers without identifiers are not acceptable.

IV. Data Analysis, Calculations, and Graphs

Data analysis is used to show how calculations are carried out. Use the data collected, and analyze their significance by performing calculations and substituting your values in equations. Compare your results to the expected results. Use graphs where appropriate, and follow these guidelines:

- Provide a title for the graph "X vs. Y for Trial #2"
 - Label the X, Y axis correctly
 - Be sure the graph is drawn to an appropriate size (X,Y axis is evenly distributed)
 - Label important coordinates or trends on the graph (e.g. freezing point, pH, positive slope, etc.)
- *Refer to Vonderbrink's "Reporting Laboratory Data" for correctly reporting data**

V. Experimental Sources of Error

Refer back to the expected results, and compare your collected data. Examine specific sources of error and how they directly affected the data. State ways to improve your results in the future to obtain more precise and accurate results. Show your calculation for percent error or percent deviation. Answer these questions:⁴

- Are the values larger or smaller than expected? Why?
- Which measurement was the least precise? Why?
- How would you change the procedure to repeat the experiment and obtain more precise results?

**Significant digits and mistakes in calculations are NOT valid sources of error.*

**Instrument and human error are present in all experiments, and are NOT valid sources of error.*

VI. Conclusion / Discussion of Theory

Conclusion: Brief summary of the results of your experiment. Be sure to state if your experimental data supported / or did not support your hypothesis. State the significance of your data, and what the implications for your data mean.

Discussion of Theory: Refer back to the purpose of the laboratory to show the connection between your data that you collected during the experiment in comparison to the expected result. Possible questions to answer:

(adapted from Vonderbrink)

- What theory was demonstrated in this experiment?⁵
- What do your calculations show / or not show?
- How was the purpose of the experiment fulfilled / or not fulfilled?
- Why does / or does not the experiment work (what is the theory behind this)?

⁴ Vonderbrink, Sally Ann. Introduction. *Laboratory Experiments for Advanced Placement Chemistry*. Batavia, IL: Flinn Scientific, 1995.

⁵ Vonderbrink, Sally Ann. Introduction. *Laboratory Experiments for Advanced Placement Chemistry*. Batavia, IL: Flinn Scientific, 1995.

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VII. Questions

Answer pre- and post- laboratory questions.

Grading

Students are expected to submit their own, original laboratory report. Although data collected may be shared, the writing in each individual student's laboratory notebook is unique. Students who plagiarize or copy work from other students, outside sources, or the Internet will receive an automatic zero credit and are subject to academic discipline as defined by the NSHS Student Handbook.

| Laboratory Criteria: | Point Value: (out of 100) |
|---|---------------------------|
| Title Page | 5 pts. |
| Abstract | 20 pts. |
| I. Purpose II. Procedure | 10 pts. |
| III. Data & Observations | 10 pts. |
| IV. Data Analysis, Calculations and Graphs | 20 pts. |
| V. Experimental Sources of Error | 10 pts. |
| VI. Conclusion / Discussion of Theory | 10 pts. |
| VII. Pre- / Post- Lab Questions | 10 pts. |
| General neatness, organization, and presentation | 5 pts. |