The AP Chemistry Laboratory Notebook

Integrity in the Laboratory Notebook

A laboratory notebook is one of a scientist's most valuable tools. It contains a permanent written record of the researcher's mental and physical activities during the experiment. It provides the ultimate understanding of physical and chemical phenomena. The act of writing in the notebook causes the scientist to stop and think about what is being done in the laboratory. It is an essential part of doing good science. The laboratory notebook is a permanent, documented, and primary record of laboratory observations. Each laboratory notebook must be written as an individual effort, but you are allowed to discuss data, calculations and conclusions with your lab partner. Academic integrity applies to the laboratory as well as on quizzes and tests. The experiments and lab reports are done in a group setting, but the laboratory notebook is an individual effort. Data should **never** be changed after the experiment has been completed. It is a violation of academic and scientific integrity to change or discard data.

When working in your lab book, always work carefully and neatly, and in pen, not pencil. You are not allowed to remove pages or use white-out to hide mistakes. In the event that you make an error, simply draw a single, solid line through it. Prepare a table of contents on the first several pages.

Your lab book is a permanent record of the laboratory work that you have completed in AP Chemistry. Some colleges require it as proof of completion of the lab component prior to extending credit for the General Chemistry laboratory. Your notebook contains a carbonless duplicate copy so that when you write you will produce an original and a copy. The original remains in the book as a permanently bound record and the copy is to be turned in for grading.

The following elements are required in your lab notebook. Each section should be labeled. Be clear and concise in your writing; avoid the use of terms such as "it", "stuff", and "thing." Your handwriting should be as neat as reasonably possible.

First, carefully read the description of the lab: Read it all. Don't just skim it. In fact, you may need to read it more than once to get a good grasp of it.

Next, answer the following questions about the lab:

1. What scientific concept is this lab about?
2. What is the overall purpose of the lab?
3. What is your hypothesis for the lab experiment?
4. What are some questions you have about the lab?

Title

The title should be descriptive. "Experiment 3" is not a descriptive title. "Determination of the Molecular Weight of Oxygen" is a descriptive title.

Date

This is the date (or dates) that you performed the experiment.

Purpose

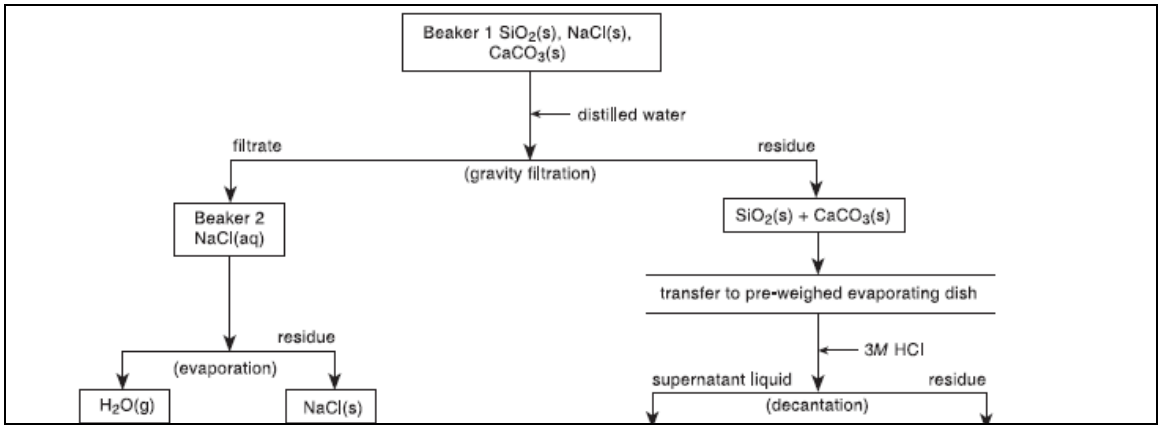
A brief statement of what you are attempting to do in this experiment.

Procedure

A couple of sentences describing the experimental methods you will be using. Do not include lengthy, detailed instructions. You are not to copy the entire set of procedures from the lab manual. You are describing the basic techniques and methods that you will be using in the lab. A flow chart is an excellent way to describe a lab procedure and is very easy to follow during lab. Flow charts can include pictures of lab equipment and lab techniques. Safety information should also be included here.

Example: A mixture of two substances will be separated, by differences in their boiling points, into pure components by the use of fractional distillation. The purity of each substance will then be tested using thin layer chromatography.

Example of a flow chart:



*****Title, Date, Purpose and Procedure must be recorded in your lab book prior to beginning the lab*****
This is what you write when you are asked to write a pre-lab.

*****The following information is recorded during and after the lab*****

1. Before you start the lab, review the objectives and procedures you will follow.
2. List all the variables in the experiment, identifying independent variable(s) and dependent variable(s).
3. Use the list of variables and units of measurement to create a data table.

Observations

Describe what you did during the experiment, using an abbreviated narrative form. Write this in your lab book as soon a possible, preferably **before** going on to the next step of the procedure. Standard techniques such as massing or measuring volumes need not be described in detail. Tell enough, but don't be too wordy. A sketch of the apparatus set-up, or instrumentation used, can be very useful and save a lot of words. The observations can be added to the pre-lab flow chart.

Data

Record all your data directly in your lab notebook. Organize your data in a neat, orderly way. Label all data very clearly. Use correct significant digits, and always include proper units (g, mL, etc.). Space things out—don't try to cram everything into a small space. Use tables where appropriate. (use a ruler to make tables) If **data** is reported within the body of the procedure, as opposed to within a data table, it should be **underlined**. Avoid leaving any blank pages. Try to place diagrams and calculations near to the text that describes them.

Calculations and Graphs

You should show ***how*** calculations are carried out. Give the equation used and show how your values are substituted into it. For repetitive calculations you only need to show one example, the other results can simply be tabulated. Give the calculated values, with correct units. If graphs are included, make the graphs an appropriate size. Label all axes and give each graph a title. Graphs or tables printed by computer should be neatly taped to the page and positioned so that they can be easily read. All tables and graphs should have titles that explain what they are. All curves on a graph with more than one curve should be clearly identified; this can be done with a legend on the graph or with labels on each curve. Remember that the purpose of your table or graph is to summarize your findings for yourself and for others and to reveal trends in your data. If experiments are not quantitative, this section may be omitted.

Conclusions.

Review all your data (tables, graphs, and drawings) and try to make sense of the overall findings of the lab procedure. Summarize the overall findings of your experiment in a sentence or two. If your lab instructor says it is permissible, compare your findings with those of other students in the lab. Take notes here of what you found, and if there are any differences in the findings, write down some possible reasons for the differences.

Make a simple statement concerning what you can conclude from the experiment. In this section, you should include information such as:

- What theory was demonstrated in this experiment?
- What do the calculations and results of the experiment show?
- How was the purpose of the experiment fulfilled?

Experimental Sources of Error

What are some *specific* sources of error, and how do they influence the data? Do they make the values obtained larger or smaller than they should be? Which measurement was the least precise? Instrumental error and human error exist in all experiments and should not be mentioned as a source of error unless they cause a significant fault. Significant digits and mistakes in calculations are **NOT** a valid source of error. In writing this section, it is sometimes helpful to ask yourself what you would do differently if you were to repeat the experiment and wanted to obtain better precision. If you can calculate a percent error or percent yield, do so and include it in this section. Use statistical analysis where necessary.