# Laboratory Notebook Instructions

Use a *bound* (not the spiral type) laboratory notebook with all pages numbered at one of the corners. Use only a blue or black pen to write in the notebook; no pencils or water-soluble felt-tip pens will be allowed. Write your name, class period, the dates included in the notebook and your contact information both on the outside front cover and on the inside front cover in permanent ink. Never erase or cross out anything that is written in your notebook. If you make a mistake, draw a single straight thin line through the mistake, initial it, and then write the correction (~~example~~). Depending upon the purpose of the report, some of the sections may be emphasized, combined, or even deleted, while others may be added. Use subheadings to divide the report into smaller logical sections if needed.

**Main Sections in the Lab Notebook** Experimental Report

Leave the first few pages of the lab notebook blank for the **Table of Contents**. Update the Table of Contents as you go by writing the date, Experiment Title (or a brief description) and the page number.

**Title of the Experiment, date and your name** at the top of each page (after the Table of Contents)**.** Remember that each page should be numbered.

**Purpose (Objective)** of the experiment: The objectives should be short but explained clearly, usually in one of a few sentences.

**Background/Research:** Have an idea of what the lab is about before you start. Write down important information, scientific or engineering principles, equations, etc.

**Hypothesis:** Predict what you think the outcome of the experiment will be. It is O.K. if you turn out to be wrong… what is important is that you are honest and write your prediction.

**Precautions:** list any safety precautions that should be followed during the lab. Do this BEFORE listing the steps of the experiment. Include any special disposal instructions for chemicals or special handling or storage procedures that should be followed. Include a list of personal and classroom protective equipment that may be needed.

**The Materials and Methods section:** Observations, procedures, equipment, materials and data should be recorded so that any person could pick up the notebook and conduct the experiment with reproducible results. Good lab techniques go hand in hand with the ability to analyze data meaningfully -- they are equally important.

**Materials and Equipment:** list these in two separate sections

- **Equipment** consists of things you expect to find in the laboratory every day; machines, scales, glassware, goggles, etc. List (in bulleted list or table form) all equipment you will use. Be very specific. Include information like the manufacturer, model number, size, etc. If the equipment you are using requires a special set-up, it is a good idea to draw a diagram of the set-up or even take a picture and tape it into your lab notebook in this section.

- **Materials** are things that are 'consumable' (get used up). This includes chemicals, gloves, etc. Be very specific when listing the materials. Include information like manufacturer or supplier, lot number, expiration date (expiry), type of material it is made of, etc.

**Procedure (Protocol):** Write down the steps of the experiment. A diagram of the steps is helpful. Give a reason for the step if it is not totally obvious. Do not copy the laboratory handout word for word. Write short instructions that are detailed enough that anyone could perform the experiment in class without referring back to the handout. Give specific amounts, temperatures, special mixing or other instructions and the reason for the special procedure. If the procedures you followed were different from those specified in the lab handout or instruction, give a detailed description of what you actually did in the experiment. Describe the methods of measurement and indicate their reproducibility. List briefly each series of experiments run and the reason for running it. Describe the procedure used. Present the essential equations. This section is incomplete if another person cannot reproduce exactly what you have done.

**Data:** State what the data represents and why you are measuring it. Enter all data taken in the laboratory directly in the notebook (not scratch paper or your hand). Include the units of measurement (mL, grams, degrees Celsius or Fahrenheit, %, etc). It is best to record data into a table whenever possible. Record other observations you make as well as measurements: the appearance, smell, sounds, unusual events, etc. Any calculations and data analysis should be done directly in the notebook – show your work!

**Results this section usually contains graphs, pictures of the result, and brief explanations of each.** Summarize the data and present any significant experimental findings. Whenever possible, the results should be presented as a graph or table because they are much easier to understand and interpret. The graphs and tables should have a verbal explanation of the results that draws attention to the most important parts. The significance of the numbers, the general trends, or the lack of them should be pointed out. Graphs should be taped permanently in the notebook. Sign your name and write the date so it crosses the tape and the paper. Explain any significant or unexpected deviations. This is especially important in a research environment, for many great discoveries have been made accidentally. (If the phenomenon is normal, someone else must have already observed it.)

**Discussion:** Interpret the results in terms of scientific principles and the circumstances of the experiment. Discuss the reliability (trustworthiness) of the experimental data and any uncertainties. Compare your results with those expected and tell why you think they are different. State any assumptions you made. Compare your results to other classmates' whenever possible. Tell how your findings differ from others, or how the result depended on the various assumptions or procedure followed.

Discuss any alternatives that should be considered. Propose what is to be done next.

**Conclusion:** Briefly summarize the findings supported by the data and the subsequent calculations of this experiment. Describe how the phenomenon investigated depends upon the variables that have been investigated.

**References:** Use bibliographic format to cite your references. All references used must be cited.

**Answers to Questions: A**nswer any questions that may be given with the lab handout.

Example layout:

**Date_____ Title _____ Name _____**

**Purpose (Objective)**

**Background/Research**

**Prelab questions**

**Hypothesis:**

**Precautions:**

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**Equipment**

| **Item** | **Manufacturer** | **Model** | **Size** | **Unit** | | |
|---|---|---|---|---|---|---|

**Materials**

| **Item** | **Manufacturer** | **Type** | **Size or amount** | **Lot #** | **Expiration Date** | **Production Date** |
|---|---|---|---|---|---|---|

For chemicals, also list LD50 or other toxicology data and physical properties (chemical formula, melting point, boiling point, density)

**Procedure (Protocol)**

| Steps you intend to follow (Present/future tense) | What you actually did (Past tense) |
|---|---|

**Data (in table format when possible)**

| **Quantity** | **Units** | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**Results**

**Discussion**

**Conclusion**

**Answers to Questions**

**References**