

## Lab Report Guidelines for Advanced Placement Sciences



**“A lab team that understands the procedure and knows what to expect is less likely to stay after school on lab days”**

Our AP lab activities are designed to provide a wide variety of activities. They will fall into two general categories:

- **OBSERVATIONAL OR “SKILL” LABS** – These labs will mainly involve watching natural phenomena occur or performing some scientific technique.
- **GUIDED INQUIRY OR EXPERIMENTAL LABS** – Many of our labs will be experimental; involving science process skills such as hypothesis formation; manipulation of variables; gathering, tabulating and graphically displaying data; & data interpretation. Guided inquiry labs will require you to design your own experimental procedure.

In college, lab report requirements vary greatly. Some are quite rigorous and require that a review of pertinent scientific literature be included in the introduction. We have simplified this requirement by asking you to summarize this scientific information without the use of resources other than our text and lab manual.

Some universities do not realize that our AP course is a true lab course, and we advise you to save all lab material that you do for this class until after you have received your credit for a full year of a biology or chemistry lab course. This is where your personal lab notebook will be of most use.

- ❖ **ALL FORMAL LAB REPORTS MUST BE WORD PROCESSED.**
- ❖ **ONCE YOU PLACE YOUR NAME ON YOUR SUBMITTED LAB REPORT, YOU ARE SIGNING A CONTRACT THAT STATES ALL THE WORK IS YOUR OWN.** You may work with other classmates to discuss the lab, but the wording used in your report is not to be copied from anywhere.

Please use the following format and numbering sequence when writing your labs:

### TITLE:

- Always begin your lab with a descriptive title as a header. The title is a statement of the problem being investigated. For example: “The Effect of Varying pH on Catalase Enzyme Activity,” NOT “Lab #5” or “Enzyme Lab” or “Changing pH.”

### I. Introduction

#### A. Problem:

What questions are we trying to answer in this investigation?

#### B. Background Information:

The background information summarizes the relevant scientific information that will allow you to explain your purpose or develop your hypothesis. This should be approximately a paragraph or two.

Include relevant chemical reactions.

C. Hypothesis:

The type of hypothesis you will develop, if one at all, will depend on the investigation we are conducting. If it is purely observational, then a hypothesis will not be necessary. If it is experimental, we as a class will discuss the form of the hypothesis before you create one. It is strongly suggested that the hypothesis be written as an "If...then..." statement.

D. Group Members

List the full names, spelled correctly, of the students you worked with for this experiment.

II. Materials and Methods

A. Materials

You may list the materials separately here. Better yet, incorporate them into your procedure as described below.

B. Procedure:

The purpose of the methods section is to summarize the steps you followed and the materials you used during the experiment so others can duplicate the results of the investigation. This section is written in paragraph form (not a numbered list). Include any changes made from the original procedure in the lab handout. This DETAILED account, written in passive voice, MUST include:

- ❖ An explanation of why you are performing the different parts of the procedure. Underline each of the materials used as they appear in your explanation and clearly give a reason why you used that particular material.
- ❖ Identification and explanation regarding the significance of the controlled variables, experimental variable(s) and control groups found in the investigation.
- ❖ Identification and explanation of the methods that will allow you to make observations and/or measurements to support your hypothesis

III. Observations, Data and Results:

A. Observations:

If the lab is observational in nature, include diagrams and/or descriptions of structures, chemical reactions, behaviors, etc. Note that ALL diagrams must be labeled and explained. Color changes, gas release, formation of precipitates, etc. should be included here.

If the lab is experimental, include written observations describing what you observed. It is important to note any procedural errors that may have occurred in this section or your report.

B. Data:

1. Tables

Organize your data in tabular form. All tables include appropriate descriptive titles that let the reader know what is documented in the table (this includes the units of measure associated with the data collected). Report your data with the appropriate number of significant figures.

Many labs will require you to design at least two tables: one that has your lab group's data and a second that has the class data with class averages. DO NOT FUDGE YOUR DATA. Put only the data your group and the class collected.

## 2. Graphs and Figures

Students often struggle when it comes to creating a graph. Make sure that the graphed data is also presented in a table. All graphs must include the following:

- Descriptive title
- Labeled axes with units included;
  - Controlled or independent variable on X axis, dependent variable on Y axis
- Appropriately spaced axes with correctly placed and connected data points
- Well defined key
- Use graph paper or graphing software
- Connect the points with a best-fit line

THE DATA IS THE ONLY PART THAT IS SHARED WITH YOUR LAB PARTNERS. EACH INDIVIDUAL MUST CREATE HIS/HER OWN GRAPHS AND FIGURES.

## 3. Calculations

Give one example of each type; pay attention to significant figures and units. Since typing calculations can be tedious, it is acceptable to hand-write calculations in. Give a descriptive label for each sample calculation. You need only provide the calculations here—discussion of your data will appear in your Analysis section. Where appropriate, include calculations of percent error, average deviation and/or standard deviation.

## IV. Discussion:

Here you present a summary of the data generated in the lab. Be sure refer to your actual data in this section. Do not simply say, "My data supported my hypothesis." You need to consider the question "How do I explain or interpret the data or observations in light of my hypothesis or my own expectations?"

A good discussion would include the following:

### A. Analysis

- An explanation of how your hypothesis and expectations reflect the data gathered
- The scientific explanation for your results. How do your results fit in with the concepts we are studying?
- When both group data and class average data have been collected, include a comparison of your data to the class's average data. Provide an explanation for any discrepancies between the two.

### B. Analysis Questions

- If there are questions to be addressed from the lab manual, you will address them here. Give thoughtful and scientifically accurate answers.
- **DO NOT WRITE THE QUESTIONS, THEN ANSWER THEM; DO NOT NUMBER THEM.** Rather, incorporate your responses to the questions as part of the discussion in paragraph form.

### C. Sources of Error

- Identify any experimental design and/or set up weaknesses that may have affected your results. Suggest improvements in the experimental design and/or set up that might correct these weaknesses. That is, how might you get more reliable results by changing the experiment? Any error you make during lab need to be brought to your instructor's attention immediately. Be sure to explain the effect of this specific error on your quantitative results—did it make your final value too large, or too small, and explain why.

- THIS DOES NOT INCLUDE YOUR OWN HUMAN WEAKNESSES AT PERFORMING THE LAB PROPERLY. When you make a mistake, it is up to you to repeat the lab or part of the lab you did incorrectly.

V. Conclusion:

In two or three sentences, use the significant (quantitative) results from the experiment to answer your original problem. The conclusion is your opportunity to demonstrate how you were able to solve the problem at the beginning of this investigation.

VI. Further Investigation:

In this final section, identify a new problem and briefly describe the changes that you would make to the existing procedure in order to solve this problem.

VII. Work Cited:

List your sources of information alphabetically by author, using the APA format. Any source that appears in this list must have been specifically used and cited in the body of this lab. All internet-based sources must be copied and attached to your lab report. If no outside resources were used, it is acceptable to write "None cited."

