

## Lab Report Outline

### Title

When applicable, the title should reflect the independent and dependent variables examined in the lab. For example, *The effects of varying degrees of sunlight on growth of tomato plants*

### Abstract

An abstract is a short summary of your completed research. If done well, it makes the reader want to learn more about your research. There are four basic components of an abstract in any discipline.

1. Motivation/problem statement: Why do we care about the problem? What practical, scientific, theoretical, or artistic gap is your research filling?
2. Methods/procedure/approach: What did you do to get your results? (e.g. analyzed three novels, completed a series of five oil paintings, interviewed seven students, grew four pea plants)
3. Results/findings/product: As a result of completing the above procedure, what did you learn/invent/create?
4. Conclusion/implications: What are the larger implications of your findings, especially for the problem/gap identified in step 1?

### Introduction

This section presents the purpose and objectives of your research as well as background and your hypothesis. The purpose states the objective or reason for doing the research. This may also be stated as the problem being investigated. You should include necessary background knowledge in this section (cite sources). Your hypothesis should clearly state what you think the outcome of your research will be. You should state your hypothesis before you begin any experimentation.

### Materials and Procedures

This section provides a list of all materials used, as well as a step by step record of the procedure performed. This should be clear enough so that another person could reproduce exactly what you have done.

### Results

This section contains your data and observations. Summarize data collected. Data should be presented in tables, graphs and figures.

### Conclusion/Discussion

In this section you discuss and explain your results. Include interpretations of your data and observations. Discuss any sources of error. Include any unusual circumstances, problems, or difficulties that were encountered. This sections should discuss how the information gathered during the projected is useful to society or the individual. This is also where your should judge your hypothesis based on your results (whether it is supported or refuted). Remember, it is not bad to make an incorrect hypothesis. If your hypothesis was not supported, make a brief statement as to why you think this was so.

A well-written conclusion contains five parts:

1. The conclusion begins with an opening sentence that is usually a restatement of the lab purpose, written in passive voice.
2. The next two to three statements summarize the procedure.
3. The writer states an experimental value or finding, including supporting evidence of results.
4. The writer explains how close the experimental results were to the expected results, if one is available, or hypothesis.
5. Finally a closing sentence or two to end the paragraph.

### Citations

Properly cite all sources used (APA format).

### Answers to questions

Answer any questions required for the lab.

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### Sample Abstract

Intracellular pathogens (agents which infect host cells), such as *Mycobacterium tuberculosis* and *Listeria monocytogenes*, cause very high mortality rates in the United States. Therefore, deciphering the mechanisms through which the pathogens cause disease is of great interest. *Listeria* infection of mice is a well-developed model system for studying the fundamentals these pathogens. Animal cell cultures have helped show that *Listeria* causes illness by secreting molecules called virulence factors. P60 is an antigen (agent seen by the host immune system) implicated in regulated bacterial cell wall breakdown. This study seeks to determine if p60 is a virulence factor for *Listeria*. When the p60 was tested in a mouse, a 1000-fold reduction in virulence was observed. This suggests that p60 is a key factor in the disease-causing ability of *Listeria*. Further studies will focus on the exact role of p60. This work increases understanding of diseases like tuberculosis, food poisoning, and meningitis.

### Sample Conclusion

The heats of combustion of three metals (zinc, magnesium, and aluminum) were determined using calorimetry. Samples of each metal and their oxides were reacted with HCl(aq). The temperature change was measured for three runs, and Hess's Law was used to determine the heat of combustion. The results obtained agreed with the theoretical calculations. The heat of combustion was an exothermic process, and the average experimental error was five percent. Calorimetry was determined to be a good experimental method to determine the heat of combustion of these three metals, producing results that were consistent with accepted values.

## General Guidelines

### Lab Notebook General Guidelines

- Write only in blue or black ink.
- Do not tear pages out of your notebook.
- Number the outside corner of both sides of each page.
- Provide the date(s) on which each lab was completed.
- Strike out mistakes with a single horizontal line.
- Use the first two pages of the notebook as a table of contents.

### Guidelines for Completing a Scientific Graph

- Draw graphs directly into the lab notebook unless otherwise instructed.
- Include a figure number and descriptive title at the top of the graph.
- Plot the independent variable along the x-axis and the dependent variable along the y-axis.
- Label the axes with the name of the variable and units.
- Plan your graph so that data fills most of the available space.
- Data points must be clearly visible, identifiable, and unambiguous.
- If multiple sets of data are plotted on one graph, use a different symbol and line style or color for each data set. You must also include a legend.
- Data should be correlated by drawing a best-fit line or connecting data points when appropriate.