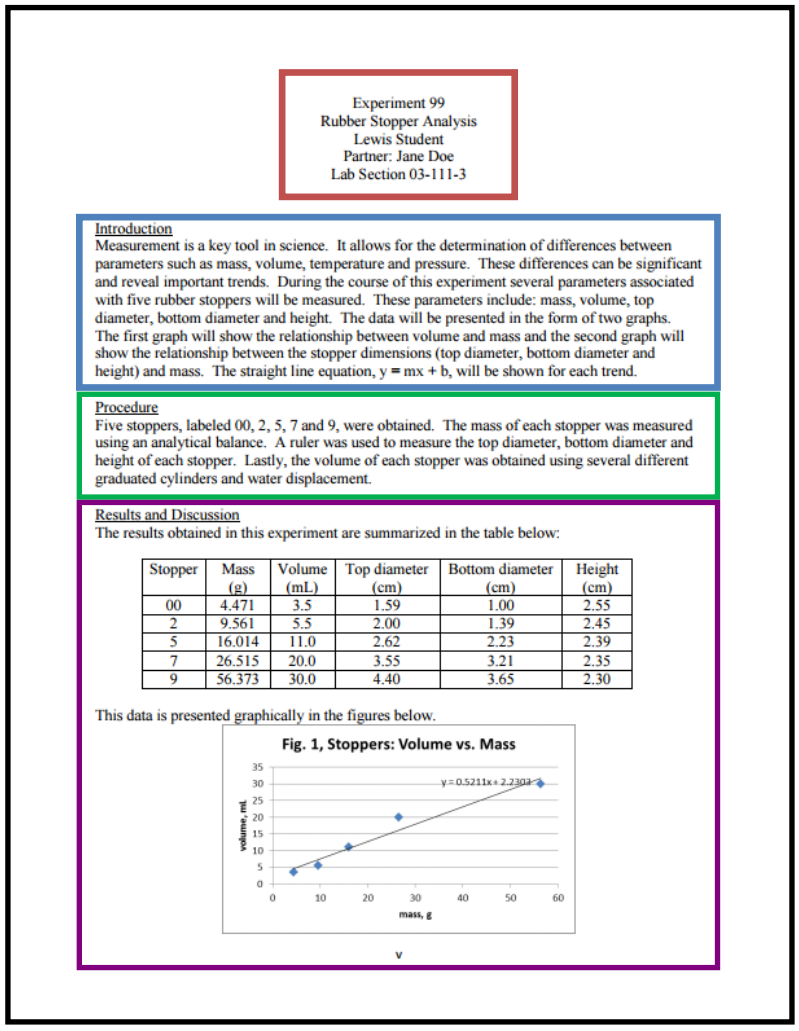
# Writing a Lab Report (Chemistry)

The process of writing a lab report can be daunting, especially when you're enrolled in multiple labs per week. Never fear, though! This resource will allow the task to come as a second nature! In the words of Julie Andrews, a very good place to start would be the beginning.

If you happen to be a STEM major, chances are you will have to become familiar with writing a lab report. **Lab reports are a way of documenting and interpreting the data you collect throughout your experiment. Be aware that biology and chemistry lab reports will have slight differences, depending on your instructor's preferences.** Your lab report should begin with the experiment number, title of study, name(s) of the authors, course number, and lab section. It should be centered at the top of the first page.

## Title + Three Sections:



Experiment 99
Rubber Stopper Analysis
Lewis Student
Partner: Jane Doe
Lab Section 03-111-3

Introduction
Measurement is a key tool in science. It allows for the determination of differences between parameters such as mass, volume, temperature and pressure. These differences can be significant and reveal important trends. During the course of this experiment several parameters associated with five rubber stoppers will be measured. These parameters include: mass, volume, top diameter, bottom diameter and height. The data will be presented in the form of two graphs. The first graph will show the relationship between volume and mass and the second graph will show the relationship between the stopper dimensions (top diameter, bottom diameter and height) and mass. The straight line equation, y = mx + b, will be shown for each trend.

Procedure
Five stoppers, labeled 00, 2, 5, 7 and 9, were obtained. The mass of each stopper was measured using an analytical balance. A ruler was used to measure the top diameter, bottom diameter and height of each stopper. Lastly, the volume of each stopper was obtained using several different graduated cylinders and water displacement.

Results and Discussion
The results obtained in this experiment are summarized in the table below:

| Stopper | Mass (g) | Volume (mL) | Top diameter (cm) | Bottom diameter (cm) | Height (cm) |
|---|---|---|---|---|---|
| 00 | 4.471 | 3.5 | 1.59 | 1.00 | 2.55 |
| 2 | 9.561 | 5.5 | 2.00 | 1.39 | 2.45 |
| 5 | 16.014 | 11.0 | 2.62 | 2.23 | 2.39 |
| 7 | 26.515 | 20.0 | 3.55 | 3.21 | 2.35 |
| 9 | 56.373 | 30.0 | 4.40 | 3.65 | 2.30 |

This data is presented graphically in the figures below.

Fig. 1, Stoppers: Volume vs. Mass
y = 0.5211x + 2.2303
volume, mL
mass, g
0 5 10 15 20 25 30 35
0 10 20 30 40 50 60

v

**Title**

**Introduction**

**Procedure**

**Results/Discussion**

# Writing a Lab Report (Chemistry)

## Introduction ⟶ *Bold or underline, no indentation*

The introduction should present the concept being investigated and provide background information. State your purpose for conducting the experiment. Your introduction should also state the experiment's importance/relevance. List and explain any parameters being measured in the experiment, and list any mathematical formulas used to obtain data. Include any information that was given to you prior to the experiment (example: the specific heat of water). Discuss any tables or figures that will be included in your report, making sure to identify the variables. Your hypothesis/predictions should also go in the introduction. This information is necessary to include because your goal is to convince your audience of your experiment's importance to science.

In lab reports, your writing should **never be written in first person**. Your purpose should be in **past tense**, but background information should always be in **present tense**. When citing sources, be sure to include the author's last name and year of publication (Author, 2015).

*This example uses APA 6 format. Please ask your instructor what format they prefer.*

Introduction

Measurement is a key tool in science. It allows for the determination of differences between parameters such as mass, volume, temperature and pressure. These differences can be significant and reveal important trends. During the course of this experiment several parameters associated with five rubber stoppers will be measured. These parameters include: mass, volume, top diameter, bottom diameter and height. The data will be presented in the form of two graphs. The first graph will show the relationship between volume and mass and the second graph will show the relationship between the stopper dimensions (top diameter, bottom diameter and height) and mass. The straight line equation, $y = mx + b$, will be shown for each trend.

## Materials and Methods ⟶ *May also be called "Procedure"*

Be straight forward and to the point with the procedure – give enough information for an individual to be able to replicate the experiment, but do not include extraneous information. Exclude steps that are common sense, such as labeling or recording data. Since your audience is the scientific community, it is assumed that these steps are a given. Make sure you specify the amounts of materials used. Include any equipment used during your experiment. **Do not forget about units, temperature, and time.** If your procedure includes multiple tasks, consider making subheadings within the procedure

Procedure

Five stoppers, labeled 00, 2, 5, 7 and 9, were obtained. The mass of each stopper was measured using an analytical balance. A ruler was used to measure the top diameter, bottom diameter and height of each stopper. Lastly, the volume of each stopper was obtained using several different graduated cylinders and water displacement.

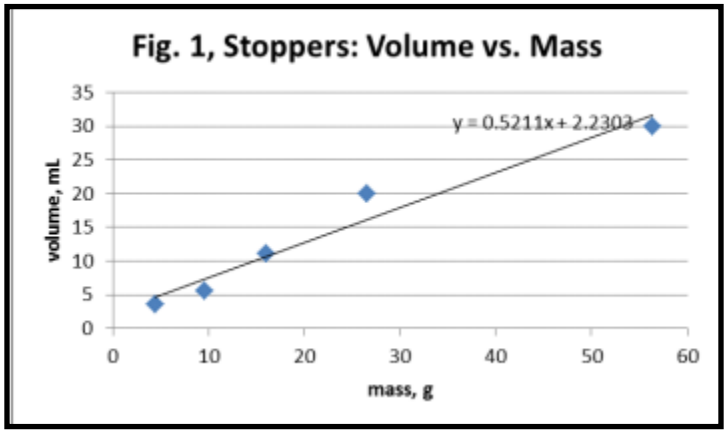
# Writing a Lab Report (Chemistry)

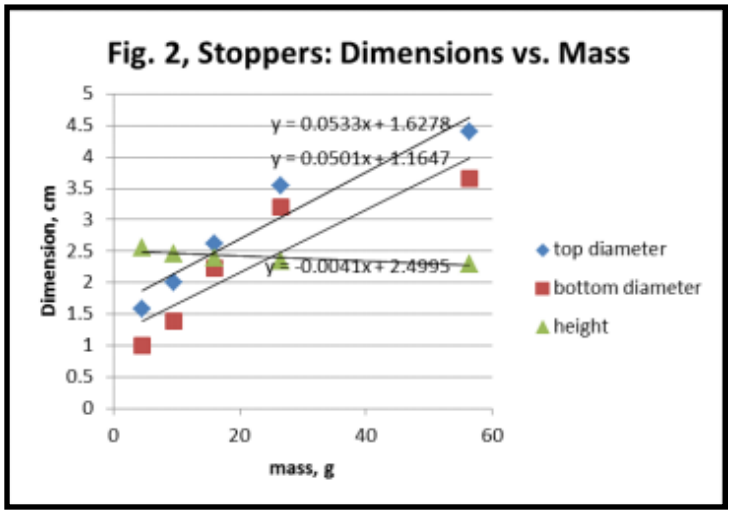
## Results and Discussion ⟶ *May be separated into two sections.*

### Results ⟶ *Interpreting figures/tables*

This is where any figures and tables should be displayed. Make sure each figure has a relevant and detailed title, and a short explanation that describes what each figure represents. Here are a few examples of tables/figures. These figures should be located right before the text portion of the "Results" section. On the next page will be an example of said text portion.

| Stopper | Mass (g) | Volume (mL) | Top diameter (cm) | Bottom diameter (cm) | Height (cm) |
|---|---|---|---|---|---|
| 00 | 4.471 | 3.5 | 1.59 | 1.00 | 2.55 |
| 2 | 9.561 | 5.5 | 2.00 | 1.39 | 2.45 |
| 5 | 16.014 | 11.0 | 2.62 | 2.23 | 2.39 |
| 7 | 26.515 | 20.0 | 3.55 | 3.21 | 2.35 |
| 9 | 56.373 | 30.0 | 4.40 | 3.65 | 2.30 |



# Writing a Lab Report (Chemistry)

Underneath your tables/figures should be your written results. Write a paragraph or two to describe your data; explain what each figure means, and identify any trends. Be sure to be continuously refer back to the figures and tables as you explain your data (According to Table 2, … etc.). Referring to figures and tables in your results and discussion helps your audience identify patterns or trends that your experiment may have revealed. Notice how the actual tables/figures have specific, descriptive titles, but when referred to in the text, they are denoted as "Table 1" or "Figure 1". This is for simplicity's sake as your audience reads through your report.

Be sure to include some sources of error that may have been relevant to your experiment, as well as some improvements that could be made for next time the experiment is performed. As can be seen in the example below, it is helpful to list the sources of error in one section, and then list the improvements afterwards. This helps you to think of solutions to problems you may have encountered in the lab, and it helps your instructor perfect the experiments as you move through the course. Do not make interpretations based on the data collected – that is for the conclusion/discussion.

Figure 1 shows the relationship between the mass values for the stoppers and the volume. This relationship was a direct one, the volume of the stoppers increased as mass increased. This relationship is summarized by the straight line equation $y = 0.5211x + 2.2303$. Figure 2 shows the relationships between mass and the other parameters (top diameter, bottom diameter and height). While the top diameter and bottom diameter increased with mass with straight line equations with a similar slope value ($y = 0.0533x + 1.6278$ and $y = 0.0501 + 1.1647$, respectively), the height of the stoppers decreased slightly with mass. The straight line equation for the height data set was $y = -0.0041x + 2.4995$.

Possible sources of error in this experiment include water splashing out of the graduated cylinder when the stoppers were added. This would impact the volume of the stoppers and result in volume values that were lower than actual. Scale fluctuations would impact the mass values and result in values that were higher or lower than actual depending on the direction in which the scale was drifting. Lastly, the integrity of the stoppers could also be suspect since they can be easily gouged. This would impact the mass and volume of the stopper resulting in lower values than actual.

This experiment could be improved by repeating each measurement. This would provide verification of each value. The use of a measuring device such as a caliper would allow the dimensions to be measured with greater accuracy. Lastly, the use of a device (such as tongs or tweezers) to carefully place each stopper in the graduated cylinder for volume measurement would result in less splashing and more accurate volume values.

# Writing a Lab Report (Chemistry)

**Discussion** ⟶ *What do your results mean?*

You should begin your discussion by restating your purpose. This section is where you discuss what the data means, and make interpretations. Make sure to continuously refer back to figures/tables. This shows how your experiment contributes to the conclusions you have made. Include possible errors that may have occurred in the experiment that may have caused discrepancy within the data. You should also state whether or not the results support/refute your hypothesis/predictions and why. Include concepts that you are learning about in lecture to help support your conclusions. In terms of tense, this section is often a mixture of past and present. A good rule of thumb is that if you are referring to scientific concepts, you should speak in present tense; if you are referring to your own work, you should speak in past tense.

Conclusion

The results for this experiment clearly show that for the rubber stoppers there were distinct trends between mass and the other parameters measured (volume, top diameter, bottom diameter and height).

Figure 1 shows the linear relationship between volume and mass. As mass increased the volume increased with a straight line equation of $y = 0.5211x + 2.2303$. Figure 2 shows the relationships between mass and the stopper dimensions (top diameter, bottom diameter and height). There was a linear relationship between the mass and the top diameter and the bottom diameter. As the mass increased both diameters increased following a straight line equation. A straight line equation of $y = 0.0501x + 1.1647$ was obtained for the bottom diameter and a straight line equation of $y = 0.0533x + 1.6278$ was obtained for the top diameter. The trend for height was also linear but this parameter decreased slightly with mass with a straight line equation of $y = - 0.0041x + 2.4995$.

Because of these relationships it can be concluded that once the mass of a stopper is known, the other parameters (volume, top diameter, bottom diameter and height) can be estimated via the straight line equations given.

# Writing a Lab Report (Chemistry)

## References


Baird, Gregory M. A game plan for aging water infrastructure. American Water Works Association. 102(4): 74-82, 2010.

Desjardins, Joseph R. and E. Diedrich. Learning what it really costs: Teaching business ethics with life-cycle case studies. Journal of Business Ethics. 48: 33-42, 2003.

Edwards, Jerry and J. Maher. Water quality considerations for distribution system storage facilities. American Water Works Association. 100(7): 60-65, 2008.

Grayman, Walter M., L. A. Rossman, R. A. Deninger, C. D. Smith, C. N. Arnold, and J. F. Smith. Mixing and aging of water in distribution storage system facilities. American Water Works Association. 96(9): 70-80, 2004.

Job, Charles. EPA communique: Water system infrastructure: Long-range planning and sustainability. American Water Works Association. 101(8): 39-40, 2009.

Kirskey, Will. Thinking outside the waterworks: Transitioning to a decentralized water system model. American Water Works Association. 102(4): 34-5, 2010.

Kowalski, Dariusz, B. Kowalska, E. Holota, and A. Choma. Water quality correction within water distribution system. Ecol. Chem. Eng. S. 22(3): 401-10, 2015.

Mahmood, Ferdous, J. G. Pimblett, N. O. Grace, and W. M. Grayman. Evaluation of water mixing characteristics in distribution storage tanks. American Water Works Association. 97(3): 74-88, 2005.


These are some examples of citations in the bibliography section. Sources should be listed in alphabetical order. If a citation exceeds more than one line, include a hanging indent. This reference page is in APA format – ask your instructor which format they prefer you to use.

**Further Assistance:** For more detailed help or if you have questions, visit the Writing Center located in the Lewis University Library, or call 815-836-5427.


Thank you to Professor Mary Charles of the Chemistry Department at Lewis University for providing the Writing Center with an example of a proper Chemistry lab report to supplement this resource!