

Name _____ Date _____

Partners _____

Experiment 1 Measurement & Error Analysis

Part 1: The Mass and Diameter of a Battery

The objective of this activity is to determine the mass and diameter of a battery, using precision tools.

What To Do

The primary question investigated in this activity is: What is the diameter and mass of a C-cell battery?

State a Hypothesis

1. Pick up the battery and note how it looks and feels. Now, based on your observations, make the following “educated guesses”.
 - a. How heavy does it feel? What do you think is the mass of the battery?
 - b. Without relying on a ruler, what do you think is the width of the battery?
 - c. All students will measure the mass and diameter of a C-cell battery. How close do you expect the results will be to one another? What do you expect the percent difference to be?

Write your responses to these questions in the space below:

Measure the Diameter of a Battery

2. Use a pair of calipers to determine the diameter of the battery at its widest point, usually located at its top end (the positive terminal). Write your measurement in the space below:

Diameter of battery: _____ cm

3. Consult with other students in the classroom, find out the result of their measurements, and record the data in a table below.

--

4. Calculate the average diameter of the battery as determined by the class. Record the result in the space below:

Average diameter of battery = _____ cm

5. Calculate the percent difference between your result and the average result obtained by the class.

--

Percent difference = _____ %

Measure the Mass of a Battery

6. Using a triple beam balance, determine the mass of the battery. Write your measurement in the space below:

Mass of battery: _____ g

7. Consult with other students in the classroom, find out the result of their measurements, and record the data in a table below.

--

8. Calculate the average mass of the battery as determined by the class. Record the result in the space below:

Average mass of battery = _____ g

9. Calculate the percent difference between your result and the average result obtained by the class.

--

Percent difference = _____ %

Batteries are used in all sorts of devices, manufactured by all sorts of companies worldwide. Like anything that is manufactured, a battery is designed with agreed-upon specifications that are monitored during the manufacturing process.

Analysis

10. Review and think about the results of this experiment. Summarize your findings and thoughts.

Conclusion

11. State a conclusion that addresses this experiment. That is, provide an answer to the primary question: *What is the diameter and mass of a battery?* Limit your conclusion to 2-3 sentences. A conclusion is not a summary of the experiment.

What to Submit

After completing Part 1, submit the Experiment 1 – Part 1 worksheet to your instructor for evaluation.

Experiment 1

Measurement & Error Analysis

Part 2: Relating Diameter & Circumference of a Circle

In this activity you will experimentally determine the relationship between the diameter and circumference of a circle.

State a Hypothesis

- Describe what you expect to observe.

What To Do

Design an Experiment

Using the materials provided and/or any other materials you have available, design an experiment in which you will determine the relationship between the diameter and circumference of a circle. A template of circles is provided on page 1S20.

To begin, you must prepare the following elements of a well-thought-through experiment prior to carrying out your procedure:

Caution: This assignment asks you to determine the relationship between the diameter and circumference of a circle. The assignment does not ask you to verify how circumference or diameter may be calculated.

1. State the objective of your experiment, in the form of a question.

2. Outline the procedure you intend to follow in order to test your hypothesis. It is best to list the procedure in step-by-step style so that it is easy for you to follow.

3. List the equipment necessary to perform your procedure.



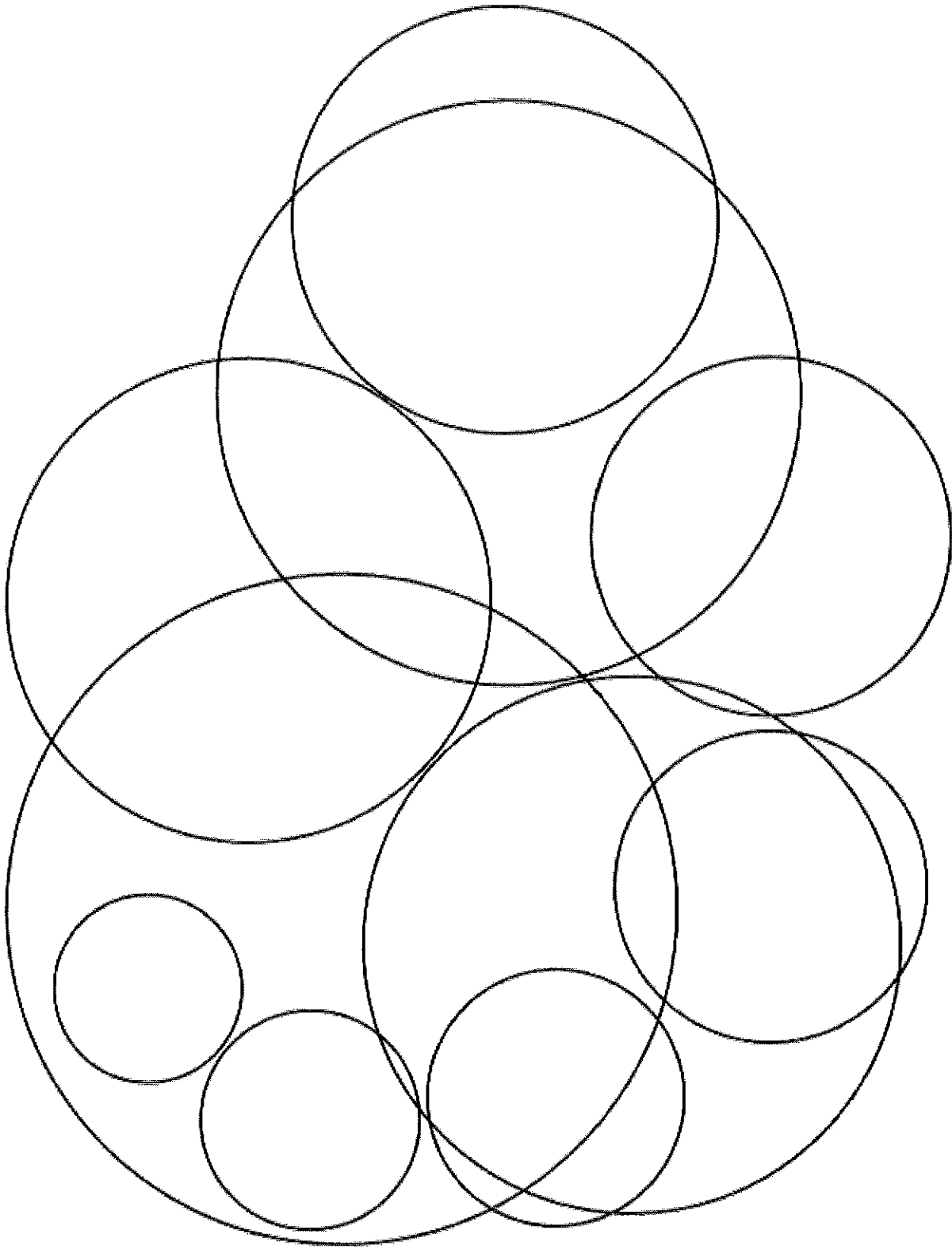
4. Create a comprehensive data table in the space below. The table should include one column for every variable that is measured. A comprehensive table will also include columns for results that are calculated from data that is measured during the experiment.

--

5. Have your instructor review your procedure. Obtain your instructor's approval before continuing.

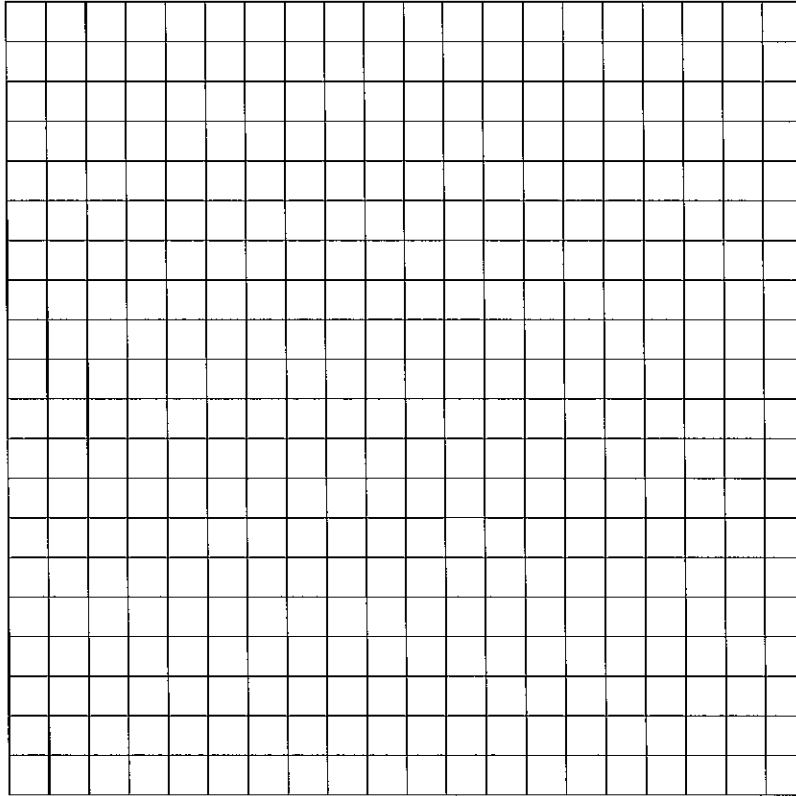
Approved by instructor: _____

6. Perform your experiment.



Since you are trying to understand the relationship between two variables, it is worthwhile to graph the results.

7. In the grid below, plot circumference versus diameter.



A graph can provide insight into the relationship between two variables. The slope of the line indicates how the variable on the y-axis changes with respect to the variable on the x-axis.

8. In the space below, calculate the slope of the line in your graph.

9. What is the significance of the slope of the line? What does it tell you about how circumference and diameter are related?

What to Submit

Prepare a formal lab report following the directions in “How to Write a Lab Report” found in the Appendix at the end of this manual.