

Regents Chemistry

Ms. Randall

Lab Activity: Calculating Density

Background

Mass is a measurement of the amount of **matter** in a sample, while **volume** is a measurement of the space occupied by a sample of matter. **Mass** measurements are made on different types of balances. An electronic balance is commonly used because it gives fast results on a digital display.

Volume measurements are made in different ways depending upon the physical state of the sample being measured. The **volume of a liquid** is commonly measured in a **graduated cylinder**. The surface of the liquid curves upward where it contacts the cylinder walls. This curved surface is called a **meniscus**. Measurement of volume in a graduated cylinder is always made by reading the mark at the bottom of the meniscus with the eye positioned at the level of the liquid surface. The **volume of a solid** may be calculated from its dimensions (**LxWxH**), if the solid is regular and free of air space. However, if the solid is irregular or contains air space, its volume must be determined in another way, such as by water displacement.

Density is a derived unit that is found by dividing mass by volume. Mass and volume are classified as **extensive properties** while density is described as an **intensive property**. An extensive property depends on the sample size and includes measurements of mass and volume. Intensive properties such as density, melting point and temperature can be useful in identifying a substance.

Objective: To determine the density of two metals and compare the experimental results to actual densities.

Pre lab:

1. What term describes “the amount of something?”
2. What term describes the “three dimensional space” something occupies?
3. What term describes “mass per unit volume?”
4. Is density an intensive or extensive property?
5. **True or False:** Extensive properties are useful at identifying a substance.

Materials:

2 metals, weigh, boats, graduated cylinders, scale, ruler

Safety: goggles, aprons

Procedure

- 1) Obtain clean, dry samples of two different metals.
- 2) Using the materials provided, devise a way to calculate the density of each metal. Write a procedure to follow in your lab notebook.
- 3) Create a data table and record your results.

Analysis:

1. The actual density of each metal can be found on reference table S. Find the actual density and calculate the percent error for each metal. The formula for percent error can be found on reference table T. Show your work.

Lab Conclusion Questions: Calculating Density

1. Base your answer to the following question on the information below.

A method used by ancient Egyptians to obtain copper metal from copper (I) sulfide ore was heating the ore in the presence of air. Later, copper was mixed with tin to produce a useful alloy called bronze.

Calculate the density of a 129.5-gram sample of bronze that has a volume of 14.8 cubic centimeters. Your response must include a correct numerical setup and the calculated results. (2)

2. A student determines the density of zinc to be 7.56 grams per milliliter. If the accepted density is 7.14 grams per milliliter, what is the student's percent error?

- Show a correct numerical setup.
- Record your answer to the correct number of significant figures.

3. Using a balance and a graduated cylinder, a student collected data on a sample of an element:

Mass of sample – 10.9 g

Volume of water – 30.0 ml

Volume of water and sample – 34.0 ml

Calculate the density of the sample. Answer must include unit.