

PRECISION AND ACCURACY

LAB PP 3

INTRODUCTION

Experimental measurements allow chemists to describe, interpret, and predict behavior of chemical substances. Measurements are evaluated based on their accuracy and precision. Precision refers to how exact a measurement is and how closely it can be reproduced. Accuracy describes how close a measurement is to the true value.

The density of an object is its mass (m) divided by its volume (V). Density is an intensive property because it is independent of the amount of substance. The density of a substance is a constant and is characteristic of a substance, at a given temperature. Therefore, it can distinguish one substance from another. In contrast, mass and volume are extensive properties because they depend on the amount of substance.

In this lab, the mass and volume of water will be measured using a variety of equipment and the density of water, as determined by the various methods, will be calculated. Knowing the temperature of the samples, the experimental values will be compared to the accepted density of water and the accuracy and precision of the measurements will be evaluated.

PURPOSE

The purpose of this experiment is to determine the density of water by using a variety of measuring devices and to evaluate the precision and accuracy provided by the different devices.

EQUIPMENT

Beakers (such as 30 mL, 100 mL, 250 mL,)	Deionized water
Graduated cylinders (such as 10 mL, 20 mL)	Top loader balance
Volumetric pipets	Analytical balance
Thermometer	

PROCEDURE

Design an experiment to determine the density of water a number of different ways. Use a variety of the available equipment. Compare the precision and accuracy of the various measurement techniques. Make data tables to hold information such as equipment used, water temperature, mass of water, volume of water, and density of water for each trial. Consider the advantages and disadvantages of the different methods.

QUESTIONS

1. Which method of determining density was most accurate?
2. Which method of determining density was most precise?
3. Density can be determined mathematically and graphically. What are the advantages of each method? What are the disadvantages of each method?
4. Did the mass shown on the analytical balance tend to change with time? Why or why not?