

Chemistry 3A

Introductory General Chemistry

Experiment 1a

Making Measurements

Introduction

Measurements of **mass** and of **length** in one dimension and length in three dimensions to get **volume** are common in the laboratory

In this experiment you determine mass and volume and length measurements on a **metal bar** and on **pure aluminum shot** to get the property of **density**

Is the metal bar aluminum or another metal based on your calculations?

Background

Measuring mass. We did this last week with small amounts of table salt (**sodium chloride**, **NaCl**) and of DI water using the electronic balance. An electronic balance has a maximum capacity. Other scales, like a (triple-)beam balance are used for heavier objects

Measuring volume. We need an accurate volume measurement. It will be done in two ways:

1. Using a ruler to measure the lengths and calculate usually in three dimensions (width, height, breadth)
2. Displacement of water in a measuring container such as a graduated cylinder. Sufficient water to fully immerse the object is filled in the cylinder and an initial reading taken. The object is immersed in the cylinder with water (it **MUST** be completely immersed), then the final reading is taken.



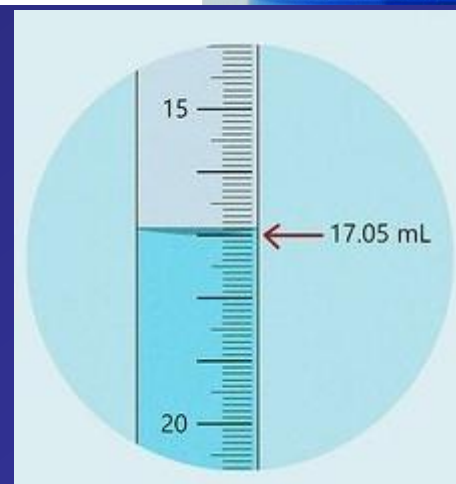
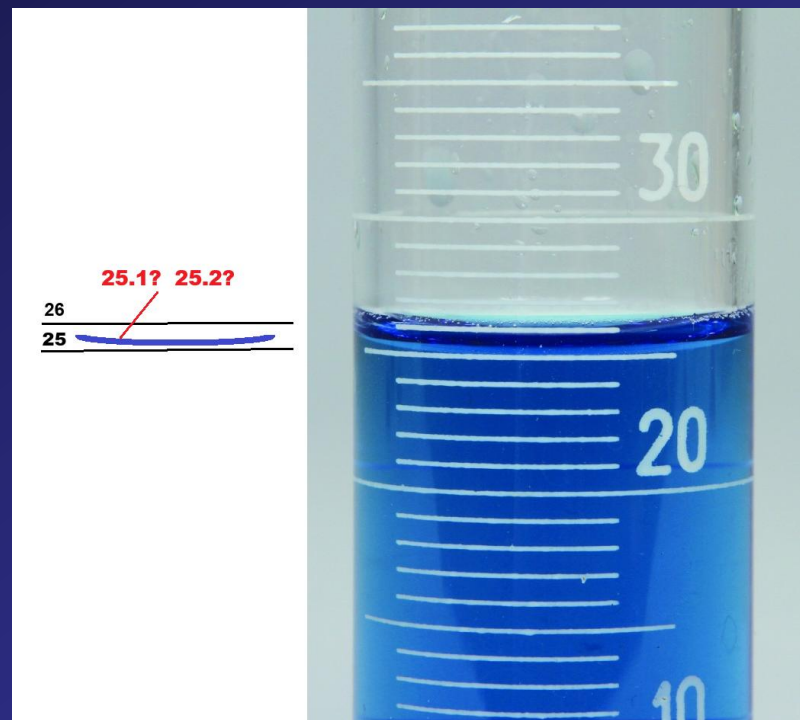
A Note About Reading Precision

Volumetric devices / instruments / containers like a buret and graduated cylinder have markings (the major markings have numbers)

It is asserted that if an instrument has 1 mL markings like a graduated cylinder, it is precise to one-tenth of that, that is, ± 0.1 mL

If it has 0.1 mL markings like a buret, it is precise to one-tenth, or ± 0.01 mL

User your best judgment



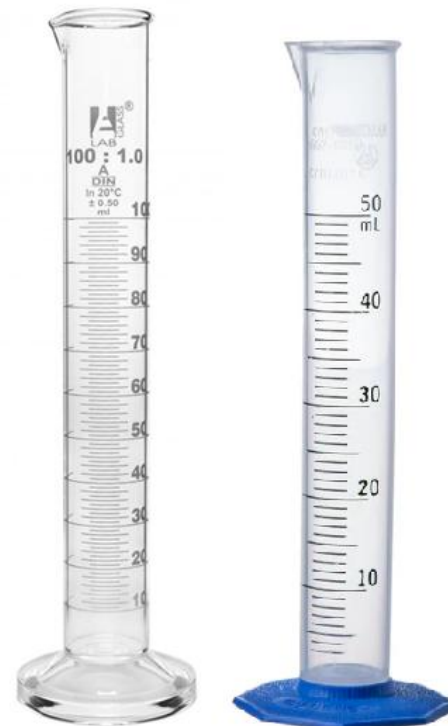
Equipment You Will Use



electronic balance



glass stirring rod



Equipment You Will Use

aluminum shot



metal bar



metric ruler



Procedure

Equipment/Material Needed

weighing balance

metric ruler

50 or 100 mL graduated cylinder

10-30 g aluminum shot

glass rod

Consumables Needed

DI water (~60 mL)

- ❖ p. 22: record identifier on metal bar; describe its appearance
- ❖ measure bar mass. Record all digits on balance
- ❖ Use ruler to measure bar dimensions; use significant digits
- ❖ Use water-filled graduated cylinder to measure volume. Make sure it is fully immersed! Make sure to use glass rod to tap out air bubbles on any object measured by volume displacement method
- ❖ Record your data and make your calculations, taking care to express results using significant digits

Clean Up

- Use paper towel to dry the aluminum shot, then put in the “return metal” container. Also dry the metal bar before putting in container
- Empty the water bottle before putting it back
- Place all other equipment from where it was obtained