

Chemistry 101 Lab 1 Accuracy and Precision in Measurement

Name: _____ and _____

Date: _____

Objectives:

- (1) To understand the meaning of accuracy and precision and determine the relative precision and accuracy of different glassware items.
- (2) Learn to measure volumes and masses (using volumetric glassware and top-loading balances).

Introduction: When we work in a laboratory environment it is important to make measurements that are both accurate and precise. Accuracy and precision, usually used interchangeably, have different connotations. Accuracy is related to the actual or “truthful” value of the object measured. Precision relates to how small a value can be distinguished by the instrument and also to the amount of agreement (reproducibility) between a series of measurements. A ruler that can measure out to the millimeter is more precise than a ruler that can measure out to the centimeter.

How to determine accuracy? We will measure a volume of water with 3 different pieces of glassware each with a varying degree of accuracy and precision. By knowing the density of water (an exact number) and an accurate weight of a given volume of water we can ascertain the accuracy of the volume measured.

How to determine precision? When making volume measurements we can ascertain the precision of the glassware by noting how many decimal places out we can comfortably make the measurement.

Remember: Measure water volume at the bottom of the meniscus.
Use the same balance for the entire lab.

1. Determination of accuracy and precision of various glassware items

1. Weigh a 100 mL beaker, a 10 mL graduated cylinder and a 100 mL graduated cylinder and record the dry mass for each on your data sheet.
2. Add, as best you can 10 mL of water in each glassware item. Record the volume for each one on your data sheet, **remembering that you should estimate one place past the markings.**
3. Weigh and record the mass for each item containing the 10 mL of water.

Chemistry 101 Lab 1 Data sheet

Names: _____ and _____

1. For each piece of glassware, calculate the mass of the water added, then use the density of water (0.998 g/mL) to find the **calculated volume** of the water. Record your three volume calculations below. Be sure to that all measurements include the correct number of significant figures and appropriate units.

	100 mL beaker	10 mL grad. cyl.	100 mL grad. cyl.
Dry Mass (step 1)			
Volume H ₂ O (step 2)			
Dry Mass of container + H ₂ O (step 3)			
Mass of H₂O (subtract mass from step 1 from Step 3)			
Calculated Volume (from mass of H ₂ O)			

Questions:

1. a) Which Piece of Glassware (100 mL beaker, a 10 mL graduated cylinder or the 100 mL graduated cylinder) is most accurate? Explain why you came to this conclusion.

b) Which piece of glassware is the most precise? Briefly explain why.

2. If comparing a news event covered by the television news and the newspaper which would you consider more *accurate* (TV or newspaper)? Which would you consider more *precise*? Give a brief explanation for your answers.