

## Aim 2: What are density and percent error?

### HW From textbook "CHEMISTRY a Contemporary Approach"

- Read "Properties of gases #4" p20
- Read "Density Problems" p225-226
- Do Exercises 7.4, 7.5, and 7.6 p226

#### Density

It is the quantity of matter present in a given volume. See table T  $d = m / V$

Mass is defined as the quantity of matter in an object expressed in kilograms (kg), grams (g), or milligrams (mg).

Volume is the amount of space occupied by an object expressed in liters (L), milliliters (ml), or cubic centimeters (cm<sup>3</sup>).

Note: The milliliter (ml) and the cubic centimeter (cm<sup>3</sup>) are the same size; they are just expressed in different units.

Ex:

If an object has a mass of 20 grams and a volume of 10 milliliters, its density is 2 g/ml or 2 g/cm<sup>3</sup>

#### Percent error

See table T

$$\% \text{ error} = \frac{\text{measured value} - \text{accepted value}}{\text{accepted value}} \times 100$$

measured value = experimental value

accepted value = theoretical value

Ex: You are told to weigh a specific mass of BaCl<sub>2</sub>·2 H<sub>2</sub>O and to find the percent by mass of water in the crystal. After heating the mass of hydrated crystal to constant mass in a crucible, you obtain the following data. What is the percent error for the mass of water in the hydrate?

mass of the hydrated crystal	10.0 g
mass of the product after heating	8.8 g
mass of water	1.2 g
experimental percentage of water	12.0%
theoretical percentage of water	14.0%

$$\text{Percent Error} = \frac{12 - 14}{14} \times 100 = 14.3 \%$$

### Test your understanding

6/02

A student calculated the percent by mass of water in a hydrate as 14.2%. A hydrate is a compound that contains water as part of its crystal structure. If the accepted value is 14.7%, the student's percent error was

- (1)  $0.5/14.2 \times 100$     (2)  $14.7/14.2 \times 100$     (3)  $0.5/14.7 \times 100$     (4)  $14.2/14.7 \times 100$

8/02

1 A student used a balance and a graduated cylinder to collect the following data

Sample mass	10.23 g
Volume of water	20.0 mL
Volume of water and sample	21.5 mL

- Calculate the density of the element. Show your work. Include the appropriate number of significant figures and proper units.
- If the accepted value is 6.93 grams per milliliter, calculate the percent error.
- What error is introduced if the volume of the sample is determined first?

2 During a laboratory activity, a student combined two solutions. In the laboratory report, the student wrote "A yellow color appeared." The statement represents the student's recorded

- (1) conclusion (2) observation (3) hypothesis (4) inference

1/03

A student intended to make a salt solution with a concentration of 10.0 grams of solute per liter of solution. When the student's solution was analyzed, it was found to contain 8.90 grams of solute per liter of solution. What was the percent error in the concentration of the solution?

- (1) 1.10% (2) 8.90% (3) 11.0% (4) 18.9%

8/03

66 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.