

Name(s): \_\_\_\_\_

Date: \_\_\_\_\_

## The Thickness of Aluminum Foil Lab

There are two major types of values in lab situations. A direct measurement comes from a piece of laboratory equipment like a balance or a ruler. A value that is calculated from a measurement is said to be an indirect value. Today you will work with both direct and indirect values and practice the use of significant digits. This will be accomplished by trying to measure the thickness of some aluminum foil.

The formulas that will enable you to find the thickness of the foil are familiar to you. The *volume* of a regular objects is found by using the formula  $V = L \times W \times H$ , where  $L$  = length,  $W$  = width, and  $H$  = height. Imagine that the regular object is a rectangular shaped piece of foil. Then the formula might be revised to  $V = L \times W \times T$ , where  $T$  = thickness of the foil. Going one step further, the area of the foil can be expressed as  $A = L \times W$ , so the original formula for volume can be restated as  $V = A \times T$ . Since this experiment involves finding the thickness, it would be better to rearrange the formula once again. Dividing both sides of the equation by  $A$ , we get the new equation:  $T = V/A$ .

You can measure the area of some foil easily but the volume can not be found directly. You will need to use density. Remember that *density* is a property that is expressed as  $D = m/V$ . The density of aluminum is known to be  $2.70 \text{ g/cm}^3$ , and the mass of a piece of aluminum foil can be measured with a balance. The volume of the aluminum can then can be calculated by using the rearranged equation:  $V = m/D$ .

### Procedure

1. Cut a rectangular piece of aluminum foil. Be sure that the dimensions are at least 10 cm on each side. You may also use the precut sheets instead.
2. Using a centimeter ruler, carefully measure the length and width of each piece of foil. Record the measurements in the data table on the back of this page.
3. Using a balance, find the mass of the aluminum foil. You may need to gently fold the foil to place it on the balance. Record the masses in the data table.
4. Give your foil to another lab group and get one from them. Repeat the measurements. Make sure to use at least three different pieces of foil total.
5. Put the lab materials away and begin the calculations.

### Data Table

Foil Piece	Length (cm)	Width (cm)	Area (cm <sup>2</sup> )	Mass (g)	Density (g/cm <sup>3</sup> )	Volume (cm <sup>3</sup> )	Thickness (cm)
Foil #1					2.6989		
Foil #2					2.6989		
Foil #3					2.6989		

### Analysis

1) Calculate the area for each piece of foil. Show all calculations. Area = L x H. Fill in the table appropriately.

2) Calculate the volume for each piece of foil. Show all calculations. Volume = Mass/Density. Fill in the table appropriately.

3) Calculate the thickness of each piece of foil. Show all calculations. Thickness = Volume/Area. Fill in the table appropriately.

$$\text{Percent Error} = \frac{(\text{experimental value} - \text{accepted value})}{\text{accepted value}} \times 100\%$$

4.) Calculate your percent error for this experiment and determine at least three sources of possible error.