Name _____ Period _____
Partner _____ 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 g/cm^3, and the mass of apiece of aluminum foil can be measured with a balance. The volume of the aluminum can then can be calculated by using the rearranged equation: $V = m/D$.

Prelab Questions
Express numerical answers to the correct number of significant figures.

1. What is the volume of a block that has the dimensions:
L = 8.20 cm, W = 2.25 cm, H = 1.00 cm?

_____ Answer

2. If the density of a substance is 0.525 g/cm^3 and the volume of a sample of this substance is 18.25 cm^3, what is the mass of this sample?

_____ Answer

3. A piece of paper is known to have an area of 30.2 cm^2 and a volume of 5.2 x 10^{-3} cm^3. What is the thickness of this paper?

_____ Answer

Procedure
1. Cut a rectangular piece of aluminum foil. Be sure that the dimensions are at least 10 cm on each side.
1. Using a centimeter ruler, carefully measure the length and width of each piece of foil. Record the measurements in the data table. Think carefully before you record your results. 10 has 1 sig fig, but 10.(or 1.0 x 10^1) has, 2 and 10.0 has 3. Remember what the limitations of your ruler are.
1. Using a balance, find the mass of the aluminum foil. Record the masses in the data table.
1. Give your foil to another lab group and get one from them. Repeat the measurements. Make sure to use at least four different pieces of foil total.
1. Put the lab materials away and begin the calculations.

Data Table

Sheet No.	Length (cm)	Width (cm)	Mass (g)	Area (cm^2)	Volume (cm^3)	Thickness (cm)
1						
2						
3						
4						

Show the calculations for the first sheet below:

1. If you had used a very crude balance that allowed only one significant figure, how would this have affected your results for:

   Area?

   Volume?

   Thickness?

2. Could this method be used to determine the thickness of an oil spill? What information would be needed?

3. A very thin layer of gold plating was placed on a metal tray that measured 25.22 cm by 13.22 cm. The gold plating increased the mass of the plate by 0.0512 g. Calculate the thickness of the plating. The density of gold is 19.32 g/cm^3. (Show your work.)