Name: _____ Date: _____ Block: _____

Density Lab
The Thickness of Aluminum Foil

The volume of a regular object is found by using the formula V = L x W x 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 x W x T, where T = thickness of the foil. Going one step further, the area of the foil can be expressed as A = L x W, so the original formula for volume can be restated as V = A x T. Since this experiment involves finding the thickness, it would be better to rearrange the formula again. Dividing both sides of the equation by A, the new equation is: T = V / A.

The next problem will be to find the volume and area of a piece of aluminum foil. Remember that density is a property that is expressed as D = M / V, where M = mass, and V = volume. The density of aluminum is known, and the mass of a piece of aluminum foil can be measured with a balance. The volume of the aluminum can then be calculated by using the rearranged equation V = M / D.

Procedures:

1) Measure three rectangular pieces of aluminum foil (you may wish to cut them or use the squares that have been previously prepared).

2) Using a centimeter ruler, carefully measure the longest length and longest width of each piece of foil. Record the measurements on the data table. How precise can the measurements be, keeping in mind the use of significant figures? Think carefully before recording the results.

3) Using a balance find the mass of each piece of aluminum foil. Record the mass on the data table. Again, be careful to be as precise as possible.

4) Clean up, add your data from both labs to the class spreadsheet, and begin calculations.

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Foil Piece	Length (cm)	Width (cm)	Area (cm^2)	Mass (g)	Density (g/cm^3)	Volume (cm^3)	Thickness (cm)
Foil #1							
Foil #2							
Foil #3							

Analysis

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

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

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

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Conclusions: (To be completed on a separate piece of paper and attached)

Accuracy is the closeness of an experimental value to an accepted value. For example, the accepted value for the length of a football field is 91.4 meters (100 yards). If an individual were to measure the field and come close to 91.4 meters, then that measurement would be considered accurate. ***Precision*** is the closeness of the repeated measurements to each other. Using the same example, if the individual measured the field three times and each time found the length to be 89.0 meters, the measurements would be precise to the tenths, but not accurate.

In this experiment, the accepted value for the thickness of aluminum foil is available from the instructor. The closeness to these accepted values will determine the accuracy of the measurements. If more than one trial is performed with the same piece of aluminum foil, then the precision of the measurements can be calculated.

1) Calculate your percent error (and your percent correctness) for this experiment and determine at least three sources of error for each lab (this determines your accuracy).

2) How precise were the calculated values and your actual measurements?

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 all work.

5) In the determination of the density of a rectangular metal bar, a student made the following measurements: length, 8.53 cm; width, 2.4 cm; height, 1.0 cm; mass, 52.7064 g. Calculate the density of the metal to the correct number of significant figures.