DENSITY AND QUANTITY

Goggles need not be worn for this lab.

PRE-LAB DISCUSSION:

Density is an important property of matter. By itself, or in conjunction with other properties, density can be used to identify substances. Density is defined as the quantity of matter in a given unit of volume. This relationship, expressed mathematically, is:

$$Density = \frac{mass}{volume} \quad \text{or} \quad D = \frac{M}{V}$$

Volumes of regularly shaped geometric solids can be calculated from direct measurements of their dimensions. For example, the volume of a rectangular solid is calculated by multiplying its length, width, and height ($V = \ell \cdot w \cdot h$). Volumes of solids are usually expressed in cubic centimeters (cm^3). Many solids do not lend themselves to direct measurement of their dimensions. These include irregularly shaped objects, such as rocks, and regular solids that are too small to be measured with any degree of accuracy. Volumes of such solids can be measured by water displacement. If a solid is immersed in a liquid such as water, the solid will push aside, or DISPLACE, a volume of water equal to its own volume. Thus, each milliliter of water that is displaced by a solid represents one cubic centimeter of solid volume.

CLAIM:

The density of a substance, being an identifying characteristic, is independent of the quantity of the substance that is measured.

PROCEDURE:

1. Obtain a sample of zinc pieces from the back counter
2. Weigh the a sample using the four-beam balance and record its mass to three places past the decimal.
3. Fill a 10.0 mL graduated cylinder to the 5.0 mL mark. Record this as the initial volume.
4. Submerge the solid in the graduated cylinder. Read and record the NEW water level.
5. Remove the solid and dry it off.
6. Repeat this process two more times, each time with a different size sample.

RESULTS:

<u>Observations and Data</u>

<u>Mass and Water Displacement</u>

	Mass	Original H_2O Level	Final H_2O Llevel
1. Sample #1	________________g	________________mL	_____________mL
2. Sample #2	________________g	________________mL	_____________mL
3. Sample #3	________________g	________________mL	_____________mL

<u>Calculations</u>

1. Complete the calculation of the density for each sample. Remember, $D = \frac{M}{V}$. List the masses of these substances arrived at from your. Calculate the volume by subtraction:
   Volume = Final H_2O Level – Original H_2O Level
2. Calculate the densities from the mass and volume data.
3. Remember that 1 mL = 1 cm^3, so g/mL and g/cm^3 are equivalent.

Sample #	**Mass** (g)	**Volume** (ml)	**Density** g/cm^3