Name_____ Period_____

Density of Solid Materials
Laboratory Activity

Introduction:

This activity explores the concept of Density, which is defined as the ratio of the mass of a substance to its volume. It tells us something about the substance independent of the amount of that substance, and is therefore called a *characteristic property* of matter. This lab will investigate the densities of several solid materials of various shapes and sample sizes.

Materials:

- 25 ml graduated cylinder
- electronic balance
- Water
- Calculator
- Lead sinkers
- Small steel screws
- Marbles

Procedure:

1. Form teams of 3 of students. Each team will be provided with a graduated cylinder, an electronic balance, and several **lead sinkers**.
2. Each team should measure the mass (**m**) of its lead sinkers by using the electronic balance.
3. Each team should measure the volume (**V**) of its lead sinkers by using the graduated cylinder and immersing it in water to see how much water it displaces. Start with the cylinder about half filled with water. The water level should be measured before and after the immersion, and the difference between the two readings is the volume of the object.
4. Calculate the ratio **m/V** (the density) and enter it into the worksheet table below, as well as in a table drawn on the blackboard (by the instructor) by your team number.

   Density = mass / volume or **d = m/V**

   The equation shows that the units in which density is measured (the *dimensions* of density) are **g/ml**, or equally, **g/cm^3**.
5. Repeat Steps 2 - 4 for the quantity of **steel screws** provided. Each team will receive somewhere between 1 to 10 steel screws.
6. Repeat steps 2 - 4 for the quantity of **marbles** provided. Each team will receive 1 or more marble(s).

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Worksheet Table:

Material	mass, m (g)	volume, V (cm^3)	Density, m/V (g/cm^3)
Lead Sinkers			
Steel Screws			
Marbles			

Bonus exercise:

Using the data from the table on the board for any of these materials, plot a graph of ***m vs. V*** . (Is the origin a data point?) How does the slope of the graph compare with the average density value **m/V** in the table? [Recall that slope = (change in **m**) / (change in **V**)]

Discussion:

- Are the densities for these 3 materials the same?
- How do different teams' values of density (**m/V**) compare for a given material? Is there much variation among them? The fact that they are all (about) the same **indicates that the density (m/V) has the same value independent of the size of the sample size used**.
- What does it mean that Density is a characteristic property?
- Can you think of any other characteristic properties?

Additional exercise if time permits:

As a self-directed activity, find the density of water.