

## THE BIG D

### INTRODUCTION:

Density is a very significant physical property of a substance. Density will be explored in many ways throughout the year. For example, buoyancy: an object less dense than water will float and an object more dense than water will sink. Also, in meteorology (that would be the weather), differences in the density of air results in changing weather patterns. Density will keep coming up in different contexts throughout the year ... and just when you think it's gone, it'll pop right back up! Now, keep this following fact in mind when proceeding through the lab: under given conditions of temperature and pressure the density of a material is constant. We will discuss this fact very soon.

The density of any Earth material can be determined by measuring its mass and volume and using the equation:

$$\text{DENSITY} = \frac{\text{MASS}}{\text{VOLUME}}$$

**OBJECTIVE:** You will be able to calculate the densities at different materials and recognize that density is one of the most important properties of matter.

### VOCABULARY:

mass: \_\_\_\_\_

volume: \_\_\_\_\_

density: \_\_\_\_\_

### PROCEDURE:

**\*\* MAKE SURE TO FOLLOW ALL ROUNDING RULES EXPLAINED IN THE PROCEDURE AND MAKE SURE THAT EVERY MEASUREMENT OR CALCULATION MADE HAS THE APPROPRIATE UNIT ATTACHED.**

- \_\_\_\_ 1. Measure the *mass* of an object using the digital scale. Your answer will be in grams (g). Record your finding to the nearest tenth of a gram in the correct location on the Report Sheet.
- \_\_\_\_ 2. Find the *volume* of the object using the appropriate method. If the object is a rectangular shape, determine the volume in cubic centimeters (cm<sup>3</sup>) by using the metric ruler and the volume formula ( $v = lwh$ ). If the shape is irregular, determine the volume in milliliters (mL) by using the water displacement method. Do NOT round this number after using the volume formula. Record your findings in the correct location on the Report Sheet.
- \_\_\_\_ 3. Repeat steps 1 and 2 for the remaining 7 items.
- \_\_\_\_ 4. Calculate the density of each object by dividing the mass by the volume. Record all your density calculations to the nearest tenths place on the Report Sheet.
- \_\_\_\_ 5. After completing Report Sheet, obtain the accepted densities for each item from your instructor and record them in the chart under summary question #1 at the end of this lab.

**DISCUSSION QUESTIONS:** (\*\*Answer in complete sentences\*\* - every time this is not done, 2 points will be deducted from your score.)

1. Fill in the chart below with the actual densities of the objects.

Object	Actual Density (g/cm <sup>3</sup> or g/mL)
1. aluminum bar	
2. aluminum cube	
3. wood bar	
4. wood cube	
5. steel sphere	
6. glass sphere	
7. galena	
8. calcite	

2. Referring to the actual densities recorded in the chart above:

Does the size or shape of samples made out of the same material affect density?

3. Look back at your Report Sheet and the density calculations that you made and compare them to the actual values in the chart above. I'm sure you will notice that sometimes you did get the exact density measurement. But you probably had some measurements that were a little off – or even off by a lot. Name 2 different things that may have caused error in your measurements.

4. Thinking Question: Why is it important to measure the mass of an irregular object before finding its volume?

5. Using the actual density values of the materials from the chart above, and the Properties of Water chart on the *Earth Science Reference Tables*, put the items in the correct column on the table below.

Density of liquid water: \_\_\_\_\_

Item will float in liquid water	Item will sink in liquid water

# Report Sheet

(Don't forget to round each measurement/calculation according to the procedure and attach correct units!)

## 1. Aluminum Bar

Mass \_\_\_\_\_

l = \_\_\_\_\_ w = \_\_\_\_\_ h = \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_

## 2. Aluminum Cube

Mass \_\_\_\_\_

l = \_\_\_\_\_ w = \_\_\_\_\_ h = \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_

## 3. Wood Bar

Mass \_\_\_\_\_

l = \_\_\_\_\_ w = \_\_\_\_\_ h = \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_

## 4. Wood Cube

Mass \_\_\_\_\_

l = \_\_\_\_\_ w = \_\_\_\_\_ h = \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_

## 5. Steel Sphere

Mass \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_

## 6. Glass Sphere

Mass \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_

## 7. Galena (metallic silver mineral)

Mass \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_

## 8. Calcite (clear/gray mineral)

Mass \_\_\_\_\_

Volume \_\_\_\_\_

Density \_\_\_\_\_