

Lab: The Density of Solids

NAME: _____

Purpose: Part 1: To find the densities of several objects using different methods.

Part 2: To identify a substance by its density.

Part 3: To compare the densities of some common substances.

Procedure:

Part 1:

1. Find the density of a cube. Put all your answers in significant digits using correct units.

Volume = $l \times w \times h$ = _____ Mass = _____ Density = _____

2. Find the density of a marble.

Original volume of water = _____ Final volume of water = _____

Volume of sphere = final - original = _____ Mass = _____
Density = _____

3. Find the density of an irregular shaped object.

Original volume of water = _____ Final volume of water = _____

Volume of irregular shaped object = final - original = _____
Mass = _____

Density = _____

Part 2: Density is a physical property of matter, meaning it does not depend upon the amount of matter present. Thus density of one drop of water is the same as the density of a glass full of water. Intrinsic physical properties such as density, boiling point, melting point, color, and crystal shape can be used to identify substances. In this case you will use density to identify the composition of certain unknown metals provided by your instructor.

1. Fill a graduated cylinder approximately one-third full with water and record the level of the meniscus to the nearest tenth of a milliliter.
2. Record the mass of your sample on a triple beam balance. Record the mass in your data table.
3. Add the unknown sample to your graduated cylinder. Try not to splash any water out of the cylinder.
4. Read the new level of the water. Record the volume of the unknown sample in your data table. The volume of the sample is the final volume - original volume.
5. Find the density of the unknown and record it in your data table.
6. Compare the values for density of your unknowns to the densities in the table below and predict the identity of your unknown. Record in your data table.

Table 12: Identifying a Substance by Its Density

	<i>mass</i>	<i>volume</i>	<i>density</i>	<i>likely identity</i>
Unknown 1				
Unknown 2				
Unknown 3				

Table 13: Densities

<i>Substance</i>	<i>Density at 20°C (g/mL)</i>	<i>Substance</i>	<i>Density at 20°C (g/mL)</i>
0.91	ice	8.90	nickel
1.00	water	8.96	copper
2.70	aluminum	10.5	silver
7.14	zinc	11.35	lead
7.87	iron	13.6	mercury

8.00 Brass

1.13 nylon

1.34-1.42 PVC

Part 3:

1. Obtain a sample of distilled water.
2. Obtain a sample of copper and aluminum and a cube of copper and aluminum
2. Determine the density of each of your samples the best way you know.
3. Record your densities for your samples on the data table below.
4. Record your densities on the board.
5. Compare the densities of your samples to those of your classmates.

Table 12: Identifying a Substance by Its Density

	<i>mass</i>	<i>volume</i>	<i>density</i>	<i>class average</i>	<i>Known value</i>
H ₂ O					
Brass cube					
Nylon cube					
Brass cylinder					
Nylon cylinder					

Questions:

1. What does the experiment demonstrate about the density of a substance? What does it demonstrate about the densities of different substances?

2. Do you think that density can be used to identify a substance? Explain your answer.

3. Describe how you would determine the density of an irregularly shaped object.
