$\rho_{Cu} = 8.9\ g/cm^3$ $\rho_{steel} = 7.88\ g/cm^3$ $\rho_{Brass} = 8.4\ g/cm^3$ $\rho_{Bronze} = 7.45\ g/cm^3$ $\rho_{Al} = 2.712\ g/cm^3$ $\rho_{Pb} = 11.34\ g/cm^3$ $\rho_{Fe} = 7.87\ g/cm^3$ $\rho_{Sn} = 7.28\ g/cm^3$

$\rho_{Zn} = 7.14\ g/cm^3$

Name _____ D.Sturman BHS

DENSITY LAB

Objectives

To learn the various methods of obtaining volumes and masses of various metals. To learn how to find the density of various metals.

Materials

Electronic balance	Metric ruler	calculator	vernier caliper
Metal samples	graduated cylinder	water bottle	

Pre-lab Questions

1. In chemistry, what two units do we use for volume?

2. Define density. What is the formula?

3. In chemistry, what two units do we use for density?

Procedure

1. Find the mass and volume of each metal sample. Find the volume of each sample using two different methods described below.
*For the measurement method use the vernier caliper to measure the diameter and height of the various metal samples. The volume formula of a right cylinder is _____
*For the water displacement method fill a graduated cylinder with a known amount of water. Gently place the metal sample in the cylinder. Take a new reading for the water level on the cylinder. The difference in the final reading and the initial reading is the _____. *Don't forget to estimate one beyond on the cylinder.*

2. Fill in the data table below with the appropriate data.

Metal #	Mass (g)	radius (cm)	height	initial water volume (ml)	final water volume
1	18.22	.650	5.090	69.7	75.8
2					

3. Show the calculations for each metal's volume below. *You should have two calculations, one for the measurement method and one for the water displacement method.*

Metal #1

$V = \pi r^2 h$

$= \pi(.650)^2(5.090)$

$= 6.76\ cm^3$

Metal #2

$1\ mL = 1\ cm^3$

$V = 75.8 - 69.7$

$= 6.1\ ml = 6.1\ cm^3$

4. Show the calculations for each metal's density below.

Metal #1

$\rho = \frac{18.22\ g}{6.76\ cm^3} = 2.70\ g/cm^3$

Metal #2

$\rho = \frac{18.22\ g}{6.1\ cm^3} = 3.0\ g/cm^3$

5. Given the densities of the various metals
a) #1 is Aluminum b) #2 is _____

6. Check with the teacher to verify the identity of each metal. Calculate the percent error for the density of each metal. Choose the calculated density that was most accurate to do this.

$\%error = \frac{|A - O|}{A} \times 100\%$

%Error #1

%Error #2

A = accepted value

O = observed value

$\%error = \frac{|2.712 - 2.70|}{2.712} \times 100\%$

$= \boxed{.442\%}$

Yay!

Sturmian

Metric Conversion Application Problems **Full credit will only be given if work is shown using dimensional analysis and rounding to the correct number of significant digits.*

1. Convert the volume of each metal sample from cm^3 to m^3.

Metal #1

$$6.76\ cm^3 \cdot \frac{1\ m}{10^2\ cm} \cdot \frac{1\ m}{10^2\ cm} \cdot \frac{1\ m}{10^2\ cm}$$

$$= 6.76 \times 10^{-6}\ m^3$$

Metal #2

2. Convert each metal's density from g/cm^3 to kg/m^3.

Metal #1

$$2.70\ g/cm^3 \cdot \frac{1\ kg}{10^3\ g} \cdot \frac{10^2\ cm}{1\ m} \cdot \frac{10^2\ cm}{1\ m} \cdot \frac{10^2\ cm}{1\ m}$$

$$= 2.70 \times 10^3\ kg/m^3$$

Metal #2

silver

3. Convert the density of ~~gold~~ from 9.32g/cm^3 to kg/m^3.

4. What questions do you have regarding this lab, converting, and/or significant figures?