AR Chemistry Lab: Density and Moles Name_____ MW TT 1 2 5

Density as a Conversion Factor:

Date_____

Intro: Every material has a **Density**, also known as a **constant mass / volume ratio**. A ratio is an equality, and therefore can be used as a conversion factor. Some examples are:

$D_{Pb} = 11.3 \frac{g}{mL}$ $D_{Cu} = 7.87 \frac{g}{mL}$ $D_{Au} = 19.3 \frac{g}{mL}$ $D_{CO} = 0.00436 \frac{g}{mL}$

11.3 g Pb = 1 mL Pb **7.87 g Cu = 1 mL Cu** **19.3 g Au = 1 mL Au** **0.00436 g CO = 1 mL**

Part A: Using Mass to Predict Volume (CHECK OFF EACH INSTRUCTION UPON COMPLETION)

____ 1. Place a clean beaker on your balance. Record its mass to one decimal place: _____.____ g

____ 2. Pour a layer of copper bb's into your beaker (amount on board)

____ 3. Record the new mass (beaker and bb's) to one decimal place: _____.____ g

____ 4. Subtract to determine the mass of the bb's. _____.____ g

____ 5. Use the space below to convert your grams of bb's to mL of bb's (conversion above)

_____ predicted mL Cu

Confirmation (The Checking Phase)

____ 6. Fill your 100 mL graduated cylinder about ½ full with tap water. Record the volume of the water (bottom of bubble at **eye level**) _____mL H_2O

____ 7. Carefully (without splashing water), place your bb's into the graduated cylinder. Record the new volume within the graduated cylinder. _____mL H_2O, Cu

____ 8. Subtract to determine the volume due to the copper bb's, and compare the measured value to your predicted value _____mL Cu

____ 9. Calculate your percentage difference (the % you were off):

$$\frac{\text{Predicted } \_\_\_\_\_ \text{ mL} - \text{Measured } \_\_\_\_\_ \text{ mL}}{\text{Predicted } \_\_\_\_\_ \text{mL}} \times 100 =$$ _____% Difference

Part B: Using Volume to Predict Mass (CHECK OFF EACH INSTRUCTION UPON COMPLETION)

____ 1. Fill your 100 mL graduated cylinder about ½ full with tap water. Record the volume of the water (bottom of bubble at **eye level**) _____mL H_2O

____ 2. Carefully (without splashing water), place lead weights into the graduated cylinder until the water increases by at least 11 mL. Record the new volume within the graduated cylinder. _____mL H_2O, Pb

____ 3. Subtract to determine the volume due to the lead weights. _____mL Pb

____ 4. Use the space below to convert your mL of Lead to grams of Lead (conversion on front page)

predicted
_____ g Pb

Confirmation (The Checking Phase)

____ 5. Place a clean beaker on you balance. Record its mass to one decimal place: _____.____ g

____ 6. Place your **dried** lead weights into your beaker

____ 7. Record the new mass (beaker and Lead) to one decimal place: _____.____ g

____ 8. Subtract to determine the mass of the Lead. _____.____ g

____ 9. Calculate your percentage difference (the % you were off):

$$\frac{\text{Predicted } \_\_\_\_\_ \text{ g} - \text{Measured } \_\_\_\_\_ \text{ g}}{\text{Predicted } \_\_\_\_\_ \text{g}} \times 100 = \_\_\_\_\_\% \text{ Difference}$$

C. Determination of a Mole

As discussed in lecture, when you have the molecular mass of a chemical weighed out in grams, you have a quantity defined as a **Mole**. The following table shows the relationship between **the mole, the molecular mass, and mass in grams** for several chemical.

Chemical	**Molecular Mass**	**Grams—Moles**
H_2O	18.02 amu	18.02 g H_2O = 1 mole H_2O
CH_4	16.05 amu	16.05 g CH_4 = 1 mole CH_4
CO_2	44.01 amu	44.01 g CO_2 = 1 mole CO_2
$Ca(OH)_2$	74.10 amu	74.10 g $Ca(OH)_2$ = 1 mole $Ca(OH)_2$

This list could go on "Forever"!!

Purpose: To create a "chemical kit" of 1.00 mole samples that you can enjoy All Semester!!!!

Procedure:

1. Obtain 4 zip-lock baggies.
2. Determine the molecular mass for each of the following compounds (Show Your Work).
3. Place a baggie on your scale. Record the mass of the baggie
4. Increase the weights until they read the molecular mass of the material **plus** the bag.
5. Add / Remove chemical from the bag until the scale is balanced . You now have exactly **one mole** of the chemical.
6. On a small piece of paper, write **your names, your period, and 1 Mole _______** for each chemical. Place the paper into the bag and seal it.
7. Once done: Admire and Save your work.

Chemical	**Baking Soda** **$NaHCO_3$**	**Table Salt** **NaCl**	**Sand** **SiO_2**	**Table Sugar** **$C_{12}H_{22}O_{11}$**
Molecular Mass Calculation				
Molecular Mass				
Mass of "Baggie"				
Total Mass Needed (add MM + Bag)				