# *Packet 3C*
# *(All answers NEED to have the proper sig figs)*

**1)** Give the SI unit for each of the following properties:

| a) time | b) mass | c) energy | d) length | e) volume |
|---|---|---|---|---|

**2)** Determine how many items we have from the amount of moles:

| a) 4.00 moles walnuts | c) 1.33 mole marbles |
|---|---|
| b) 3.60 moles trees | d) $4.57\times10^{-7}$ moles grains of sand |
| e) $2.09\times10^{4}$ moles atoms of lithium | |

**3)** Perform the following conversions, make sure to include units:

| a) 3.50 km = x m | f) 19.32 g/cm$^3$ = x kg/m$^3$ |
|---|---|
| b) 6.002 mg = x g | g) $4.56\times10^{4}$ g = x kg |
| c) 89.44 g = x mg | h) $7.99\times10^{-4}$ L = x mL |
| d) $5.22\times10^{4}$ mL = x L | i) $3.29\times10^{8}$ kg/L = x g/cm$^3$ |
| e) 790 nm = x m | j) 38.5 mi/hr = x m/s |

**4)** Perform the following conversions:

| a) How many grams of mercury are there in 150 mL if the density is 13.55g/mL? |
|---|
| b) What is the temperature in Kelvin of something at 260°C? |
| c) What is the density of aluminum if a 5.0 cm$^3$ piece has a mass of 13.5g? |
| d) What is the temperature of a 500K flame in °C? |
| e) What volume of gold has a mass of 58.3 g if the density is 19.32 g/cm$^3$? |

**5)** The toxicity level of osmium powder is $10^{-7}$ g/ m$^3$. What mass of osmium powder must be released if a factory room with a size of 50m × 20m × 14m is shut down due to the presence of a toxic level of osmium powder? (Show work)

**6)** A piece of metal with a mass of 49.8 g is placed in a beaker filled with 150.00 mL of water, the water level then rises to 156.98 mL. From the densities below, determine the identity of the metal:
Show your work and circle your answer!

Silver 0.379 lb/in$^3$ Zinc: 0.258 lb/in$^3$ Aluminum: 0.098 lb/in$^3$

1 inch = 2.54 cm

**7)** Calculate the edge length of a cube filled with 245.7 g of water.
Density of water is 1.00 g/mL

## *Identifying a Metal*

In the world of chemistry, it is important for you to be able to identify unknown substances. There are several different techniques for doing this depending on what type of substance you are trying to identify. We are going to be identifying several different unknown metals throughout the value of their density.

| Metal | Density | Metal | Density |
|---|---|---|---|
| Zinc | 7.14 g/cm$^3$ | Aluminum | 2.70 g/cm$^3$ |
| Iron | 7.87 g/cm$^3$ | Nickel | 8.91 g/cm$^3$ |
| Lead | 11.34 g/cm$^3$ | Magnesium | 1.74 g/cm$^3$ |
| Copper | 8.92 g/cm$^3$ | Tin | 7.29 g/cm$^3$ |

The method that you will use is the water displacement method, measuring the amount of water that is displaced as an object is placed in a graduated cylinder. The procedure for this demo is as follows:

1. Mass some of your metal using the scale, be sure to write out all the numbers seen on the scale, this will determine your accuracy. Some of the metals are not in large enough pieces for you to use only one.

2. Obtain a 100 mL or 250 mL graduated cylinder. If you get a smaller one the metals you have will not fit in the opening.

3. Fill the graduated cylinder up to volume that you believe will cover the metal. Write down the original volume of water. Gently place the piece of metal into the water. Remember the graduated cylinders are glass, if you slide the metal in too fast the cylinder will break, don't do that.

4. Once the metal is in the water, record the final volume. In order to calculate the volume of the metal subtract the original volume from the final volume and that is the volume of the metal.

The following are questions that you need to answer for this student demonstration.

1. What is the formula for density?

2. Fill in the following table with the information that you gathered

| Unknown | Mass | Volume | Density | Identity |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

3. Write out all the calculations needed to get the density of the unknown metals.

4. List at least two other ways in which metals can be identified.

5. List three possible sources of error that may have occurred during the course of the experiment.

# *Product Testing*

We are going to see if you have gotten the proper amount of a product that you or your family have purchased. The following is a list of properties that I would like you to figure out about one of your favorite products. Look over the list of properties so that you select a good product.

- Mass in grams and kilograms
- Volume in liters, milliliters/$cm^3$, gallons
- Density in g/L, kg/$m^3$, lbs/$in^3$
- Compare if your measurements match with the published values on the container of your product.

You may determine these properties anyway you see fit with the tools provided in the lab. Your work that you should hand in should include the following

- Your product
- Procedure: numbered steps
- Analysis: data you collected as well as calculations that you performed.
- Discussion: how do your measurements compare with the measurements on the container.