

## CHEMISTRY: MEASUREMENT LABORATORY

**OBJECTIVES:** To make laboratory measurements and become familiar with the measuring tools of chemistry.

### I. **MASSING:** Triple Beam Balance

1. Take any item marked A,C,Z,L and mass it on a balance. Make sure you **read the balance to two decimal places.**

*Note: Only rarely will a mass reading turn up with a zero on the end.*

2. Repeat for two more items.
3. Enter your masses on the data table.
4. Underline the uncertain digit in each measurement.

### II. **VOLUME:** Graduated Cylinders and Metric Rulers

#### *PART A: Graduated Cylinders*

1. Observe the liquids in the graduated cylinders marked A, B, and C and record the volumes on the data table. Make sure you read them to the correct number of decimal places. **All the cylinders read differently.**
2. Underline the uncertain digit in each measurement.
3. Observe the liquid in the 1 liter bottle. Record the volume on the data table.

#### *PART B: Cubic Volume/Density*

1. Select an item labeled E, F, or G.
2. Record its length, width and height in the data table. Underline the uncertain digit in each measurement.
3. Calculate and record the volume of the block.
4. Determine the mass of the block.
5. Determine the density of the block.

### III. AREA: Metric Rulers

1. Select an item labeled H, I, or J and measure its length and width with the ruler provided. Record the measurements on the data table and underline the uncertain digit.
2. Calculate and record the area of the object.

### IV. DENSITY

#### *PART A*

1. Select 10 pennies from those provided and mass them on an electronic balance.
2. Select a graduated cylinder and put in enough water so that it is of a greater height than the pennies. Record the volume of water in the data table.
3. GENTLY slide the pennies down the side of the graduated cylinder containing the measured volume of water. REMEMBER TO TILT THE CYLINDER SIDEWAYS.
4. Record the new volume in your data table.
5. Underline the uncertain digits in the measurements made in parts 2 and 4.
6. Calculate the density of the pennies.

#### *PART B: DENSITY OF WATER*

1. DESCRIBE ON THE DATA TABLE how you can determine the density of liquid water.
2. Once you have determined how to find the density of water do so in the laboratory. MAKE SURE YOU LIST ALL THE MASSES AND VOLUMES THAT WERE USED IN DETERMINING THE DENSITY OF WATER ON THE DATA TABLE.

#### **ANSWER THE FOLLOWING QUESTIONS/PROBLEMS IN THE QUESTION SECTION OF THE LAB.**

- A. What metal are the pennies made from? Look up the density of this metal and perform an experimental error calculation. **SHOW CALCULATION.**
- B. A block of gold has a density of  $19.3 \text{ g/cm}^3$ . The block of gold is 10.0 centimeters by 20.0 centimeters by 0.150 meters. What is the mass of the gold block? **SHOW CALCULATIONS.**
- C. A 215.04 gram block of copper has a density of  $8.96 \text{ g/cm}^3$ . What is the volume of the block of copper? If two of the dimensions of the block are 2 cm and 4 cm, what is the third dimension of the block? **SHOW CALCULATIONS.**
- D. An unknown piece of elemental metal has a mass of 0.450 kilograms and a volume of  $61.56 \text{ cm}^3$ . What is the density of the unknown elemental metal? Use the density information provided to determine the unknown element. **SHOW CALCULATIONS.**
- E. In IV Density, Part B, you determined the density of water. Perform an experimental error calculation. **SHOW CALCULATION.**