Names: _____

CHM 090 Lab Experiment: Measuring Length and Mass

1. Use the "English" side of your ruler to draw a line 2 inches long in the space below. Mark the "0", "1", and "2" inch positions.

2. Use the "metric" side of your ruler to draw a line 5 centimeters long in the space below. Mark each cm division using numbers 0-5.

3. Is one of your lines a lot longer? If so, which one, or are they about the same? _____

4. According to your lines above, 1 inch equals **about** _____ cm? (Do not look at your conversion chart for the exact number)

5. Look at the ruler on the cm side. Each cm is divided into smaller divisions. These smaller divisions are called millimeters (mm). How many mm are in a cm? _____

6. How many cm are in one meter? _____

7. Now look at the inch side. Each inch is divided into smaller divisions. These smaller divisions are what? _____ How many of them are in one inch? _____

8. Considering the little marks, are inches or cm easier to use? _____
   Consider if the line is not exactly one inch but a little bit more, is it easy to measure? Or would the cm side be easier to use. Explain.

Measurements: English vs. Metric System

1. Think about conversions in the English vs the metric system. In the English system we have 5280 feet per mile, 3 feet per yard, and 12 inches per foot. Can you convert these in your head? What about metric conversions? We have 10 mm per cm, and 100 cm per meter. Can you convert these in your head? Now that you have thought about conversions answer this. Scientists consider the metric system easier and faster to use. Why? Explain in complete sentences:


Electronic balances are very accurate, and can detect small masses. The basic unit of mass in the metric system is a gram (g), and our balances read out to the nearest 0.0001 g.

Your instructor will show you how to use the balances. They are very sensitive; so do not lean on the bench next to the balance. Always use a weighing cup or beaker to weigh a sample, as the balance pan can be easily damaged. **Take these steps to measure mass**.

1. Be sure all the balance doors are closed, and press the front bar on the balance where it says "O/T". The digital display should read 0.0000 g, but it is OK for the last digit to fluctuate a bit.
2. Place a weighing cup on the center of the balance pan; close the door and press "O/T" bar. The balance should read 0.0000 g. **Do NOT** touch the "O/T" bar again.
3. Remove the weighing cup from the balance, and add your sample to the cup. Return the cup to the center of the balance pan, and close the door. Wait for the digital readout to stabilize. **Record all the numbers.** This will be the mass of the sample in grams. **ALWAYS WRITE DOWN ALL THE NUMBERS WHEN USING THE BALANCE.**

Follow the directions above to weigh the following common objects on a balance. Be sure to use a plastic cup to weigh each object. Write down ***all of the numbers*** on the balance display.

One popcorn kernel: _____ g One grain of rice: _____ g

Use a plastic eye dropper to add one drop of water to a weighing cup.

One drop of water: _____ g

You might assume that all pennies weigh the same, since they are produced by the same method. But our balances can detect even small differences. Weigh two pennies (one at a time) and record the weights below:

First penny:_____ g Second penny: _____ g

The pennies differ by_____ grams. (Subtract the two weights.)

Answer the following questions by measuring. Describe what you did in complete sentences to get the answer, and record all measurements you make in the process.

1. What is the approximate weight (in grams) of a ream (500 sheets) of paper? Since you cannot weigh 500 sheets of paper, come up with a common sense way to estimate.

   Describe the method used to estimate the weight for 500 sheets. Show your work.

   approximate weight of 500 sheets of paper = _____ g

2. Water evaporates rather rapidly in Arizona. Add several drops to the weighing cup. How many grams of water evaporate from the surface in one minute? Discuss how to figure this out with your lab partners.

   Describe the method used to estimate the grams of water that evaporate per minute.

   grams of water that evaporate per minute = _____ $\frac{g}{min}$