Experiment Two

Measurements

Procedure

Part 1.

Measure the length of your laboratory notebook along its longest side. What is it measurement in centimeters? What is its length in inches? Record your observed values and divide the values by each other. What was the ratio to 3 significant figures of dividing the length in centimeters by the length in inches? What was the ratio when you divided the length in inches by the length in centimeters? Record your results in your notebook.

Measure the length of a dollar bill in centimeters and in inches. Obtain the ratios as you did for your laboratory notebook to 3 significant figures. What was the ratio obtained by dividing the length of the dollar bill in centimeters by its length in inches? What was the ratio obtained when you divided the length in inches by the length in centimeters? Record your calculations and ratio values in your notebook.

The accepted ratio value between centimeters and inches is 2.54 cm/in. How do the 2 values that you obtained compare to this value? Calculate the percent error between your calculated ratios and the accepted value. Use the formula given below:

$$\text{Percent error} = \frac{(Ratio \text{ value you obtained}) - (\text{Accepted ratio value})}{\text{Accepted ratio value}} \; x \; 100\%$$

What can you conclude when you compared your experimental ratios to the accepted value by using the percent difference values you obtained? Are your ratios close to the accepted value or far away from it? Write down your conclusions.

Part 2.

Weigh a dime or a quarter using a top loading balance to the nearest 0.01 g. Record the mass observed in your notebook. Take the same coin and measure its mass again on an milligram balance to the nearest 0.001 g and record the value. Take a final mass reading of the coin on an analytical balance to the nearest 0.0001 g and write down the value observed.

Part 3.

Measure 2 ounces of tap water using the provided measuring cups and pour the measured water into a dry 100 mL graduated cylinder. Carefully determine the volume in the graduated cylinder by reading the bottom of the meniscus as indicated in Figure 1. Estimate your reading accordingly. You should be able to read 3 significant figures or to the tenth of a milliliter. For example, the correct reading for the volume of liquid in the graduate cylinder in Figure 1 is 54.2 mL. Record the experimental value you observe in your graduated cylinder.

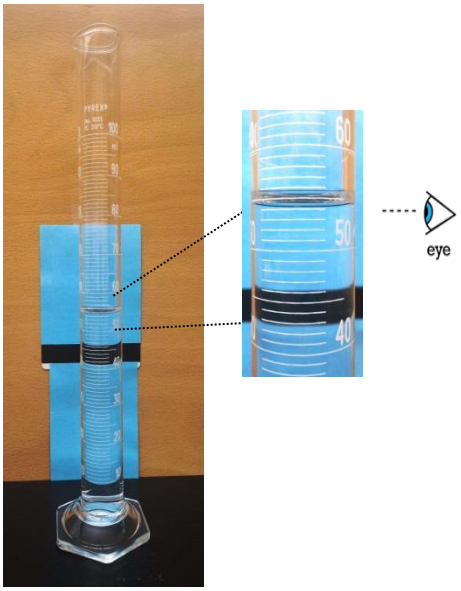

Figure 1. How to read the volume in a graduated cylinder.
Always read the bottom of the meniscus with a direct line of sight.

Determine the ratio of milliliters to fluid ounces by dividing the volume of water in milliliters by the volume in fluid ounces. Report your ratio to three significant figures. Record your calculations and results in your lab notebook.

Take a test tube and fill it with water up to its rim. Pour the water from the test tube into a 50 mL graduated cylinder and record the volume of liquid that your test tube can hold. Record the length of the test tube also.

Use a Mohr pipet to measure 2 mL of water and dispense the liquid into one of your test tubes. Use a marker to indicate the 2 mL spot on your tube. Repeat this procedure for 4 mL and for 6 mL. These marks can be very useful when you want to estimate required volumes in future experiments.