EXPERIMENT 1 **Chemistry 100**

Measurement Techniques and Safety

Purpose: To Learn the basic techniques of laboratory measurement of mass, temperature, volume and length and the concepts of safety

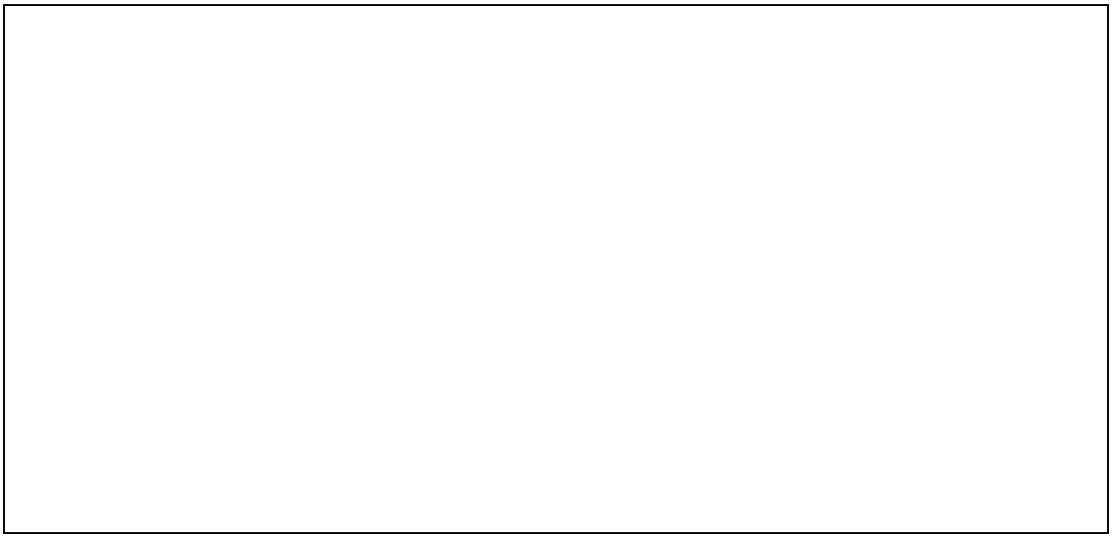
I. INTRODUCTION AND LABORATORY SAFETY

Laboratory work is basic to any scientific pursuit. It is important to learn safety in the laboratory. Read the safety handout. Next week you will be given a safety quiz. You must pass the quiz or you will receive am "F" grade for the lab portion of the course. Refer to the Chem. 100 laboratory syllabus for more details. Your lab instructor will show you a safety film and discuss specific safety topics pertaining to your lab work for this semester.

Fill in the locations of the following on the map below:

Large sinks
Emergency shower
Eye wash
Fire extinguisher
First aid kit
Hoods
2 Escape routes
Fire Blanket
De-ionized water

Front of classroom/ whiteboard



Notes from Safety film:

II. MEASUREMENTS

Measurements are basic to any scientific pursuit. A measurement has both a magnitude (numerical value) and a unit. Metric units are used in the sciences.

Metric System

In science, the metric system is used almost exclusively. In the metric system, the base unit of length is meters; of mass it is grams; of volume it is liters (liquids) or cubic meters (solids) and of temperature it is Celsius. To change the magnitude of a base unit a prefix is placed in front of the base unit. These prefixes are various powers of ten. Scientific measurements will have a magnitude and unit. 55.5 cm, for example, has a magnitude of "55.5" and the unit is cm (abbreviation for centimeters) indicating the measurement was of a length. When you make a measurement, always record it with a number and unit. For example: 22.53 mm, 34.00 °C, 1.5478 g, or 45.0 ml.

In the laboratory, measurements must be accurate. Due to inexact tools and faulty observations, measurements are subject to error; they are never absolutely exact. Scientific measurements are made from scales. Data should generally be recorded to one decimal place beyond the instrument's calibration. This requires estimating "between the lines" (interpolate) to determine the last digit.

PROCEDURE

A Length

1. **Length** Obtain a Metric-English ruler and string from the side shelf. Using the piece of string, measure the crown of your head. Use the metric ruler to measure the string in inches, millimeters, centimeters and meters. Record this data into the table .

Inches	Centimeters	Millimeters	Meters

B Temperature

Scientific thermometers are calibrated in Celsius . These thermometers are not the same as the thermometers used to measure body temperature. **They should never be "shaken-down".**

1. Obtain a thermometer and small beaker from the reagent bench. Put about 30 ml of tap water into the beaker. Measure the temperature of cold tap water and record. Then run the hot tap until the water is hot. Repeat the procedure and measure the temperature. Make sure to go to the tenths place.
   NOTE: You must include units in your reading! For example, if the thermometer reads "29.3 Celsius", you would write 29.3 °C.

Substance measured	°C
Temperature of cold water	
Temperature of hot water	

Did you remember to include the unit °C" (Celsius) in your measurement? Did you include an estimate to the tenths place? **Instructors initials_____**

C Mass

The top loading balances are located on the bench by the windows. Mass measurements are made to the second decimal place (± 0.01 g). When using the balance the following guidelines must be followed:

1. Never place chemicals directly on the balance pan. Use a weighing paper, filter paper or a container (beaker, graduated cylinder, and etc.) to hold chemicals.
2. Always check to see if the balance is clean before using. If not, use the brush to clean.
3. Push the ON button. Allow the balance to calibrate. When the balance reads "0.00", it is ready to weigh. If the balance does not read zero, push the side of the button that reads "tare".
4. When using the balance, fluctuation in the last decimal place may occur due to disturbances near the balance pan. Record the most stable weighing, that is, the one you see remaining on the display for the longest period of time.

Obtain two metal plates from the side shelf and weigh:

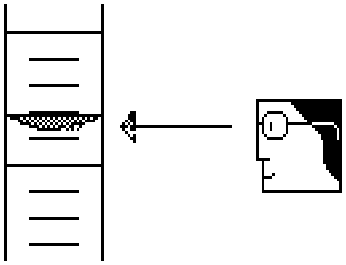
Metal plate number	Mass, grams

Did you remember to include the unit "g" (for grams) in your measurement?

Instructors initials_____

D. VOLUME

A graduated cylinder is used to measure the volume of liquids. The curved surface of the water inside the cylinder is called a meniscus. Read the volume at the bottom of the curve of the meniscus, with your eye level at the surface of the liquid.



1. Obtain a 4 inch test tube, 2 different sized plastic cups, and a 10 ml and 100 ml graduate cylinders.
2. Fill the test tube and cups to the very top and measure the volume using the appropriate graduate cylinder. Do not pour water into the cylinder above the top line. You may have to pour out the water in the cylinder and refill it a few times. Add together the total volume of the container and record in the table below wit correct units.

	Volume	
4 inch test tube		Use 10ml grad. cylinder and estimate to the 0.01 place
Plastic cup 1		Use 100 ml grad. cylinder and estimate to the 0.1 place
Plastic cup 2		Use 100 ml grad. cylinder and estimate to the 0.1 place

Did you remember to include the unit "ml" (for milliliters) in your measurement?

Instructors initials_____

NOTE: **Please empty the water from the glassware and return any equipment not in use for others to use!**

Do you have units on all of your answers?

E. COMPARING ENGLISH AND METRIC UNITS

1. At the reagent bench are some examples of English and Metric units for you to compare. For each pair of items, write which is metric and which is larger.

	Ounce or gram	Meter or yard	Quart or liter
Which is larger?			
Which is metric?			

F. CONVERTING UNITS

Practice (To be completed before obtaining instructor's initials)

Some simple metric-metric conversions You must show all work and units

2. How many ml in 25.2 L?

Answer_____

3. 455.76 kg is how many g?

Answer_____

4. 65.1 L = ? dl?

Answer_____

Before you leave the lab you must have your lab instructor initial your report sheet.

NO CREDIT will be given for lab reports without the instructor's initials!

Chem 100 Lab Report (This is what gets turned in next week)

Name _____ Date _____

Initials_____

EXPERIMENT 1: Measurements

A Length

Inches	Centimeters	Millimeters	Meters

B Temperature

Substance measured	°C
Temperature of cold water	
Temperature of hot water	

C MASS

Metal plate number	Mass, grams

D. VOLUME

	Volume	
4 inch test tube		Use 10ml grad. cylinder and estimate to the 0.01 place
Plastic cup 1		Use 100 ml grad. cylinder and estimate to the 0.1 place
Plastic cup 2		Use 100 ml grad. cylinder and estimate to the 0.1 place

E. COMPARING ENGLISH AND METRIC UNITS

	Ounce or gram	Meter or yard	Quart or liter
Which is larger?			
Which is metric?			

F. CONVERTING UNITS

Some simple metric-metric conversions You must show all work and units

1. **How many g in 251 mg?**

Answer_____

2. **22.351 kl is how many L?**

Answer_____