<u>Length and Volume in the Metric System</u>.

Reminder – Goggles must be worn at all times in the lab!

PRE—LAB DISCUSSION:

The metric system of weights and measures is used in science because of the simplicity and accuracy of the system. Since all units of the metric system are obtained by multiplying or dividing by 10 it is sometimes called the "decimal" system of weights and measures. For example, if your lab table measures 2.461 meters (m) in length, it is also 24.61 decimeters (dm), 246.1 centimeters (cm), and 2461 millimeters (mm) in length. This same ease of converting from one unit to another is also found in measurements of volume and mass.

PURPOSE:

To practice the use of the metric system in measurements of length and volume, to practice calculations involving measured quantities, and to determine the reliability of various devices used to measure volume.

PROCEDURE:

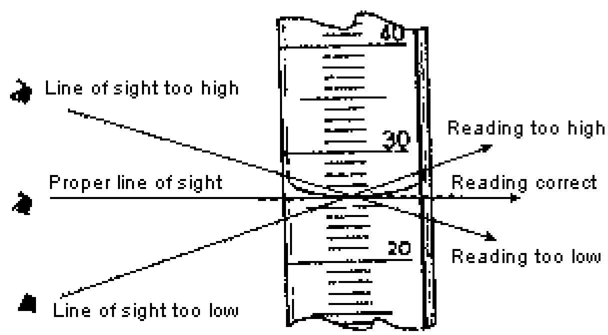
I. The Metric Units of Length.

A. Take a glass plate from your lab drawer.
B. Using a metric ruler, measure the length and width of the plate. Record these measurements in centimeters (cm).

II. The Relationship of Length and Volume.

A. Take a 100 mL beaker from your drawer.
B. Measure the radius of the beaker bottom (half the diameter) and the height of the beaker. Record your answer in centimeters (cm). Ignore the lip of the beaker and the slight curvature of the base.

III. Measurements of Volume.



A. Take your 10 mL graduated cylinder from your drawer. Examine it and notice its markings. Each major division represents one milliliter (mL) or one cubic centimeter (cc or cm^3).
B. Take one of your smallest test tubes and fill it completely with water. Pour the water into the graduated cylinder. Read the measurement in milliliters and record this value. Be sure you are reading at the BOTTOM of the curvature (meniscus). See diagram. Remember to read all values known with certainty AND ONE GUESS. Generally, all values for volume should be written TWO places past the decimal point.

Example: 3.65 mL

Take your next largest test tube and repeat step 6. Be sure to record your volume in milliliters (mL).
C. Take the 100 mL beaker you used in Part **II** and completely fill it with water. Using a 100 mL graduated cylinder from the side table, pour the beaker contents into the graduate and measure the volume in milliliters (mL). Record this value.
D. Take out your 10 ml graduated cylinder and your dropping pipet (medicine dropper).
E. Using your dropping pipet, COUNT how many drops of water it takes to equal one milliliter in the graduated cylinder. Be sure you are reading at the bottom of the meniscus. Record this number. Your number may vary from those around you as dropping pipets vary greatly.

RESULTS:

Observations and Data:

Record all data in your lab write-up, NOT on this sheet!

Part I

Length of glass slide	XXXXX cm	XXXXX mm	XXXXX m
Width of glass slide	XXXXX cm	XXXXX mm	XXXXX m

Part II

Radius of your beaker	XXXXX cm
Height of your beaker	XXXXX cm

Part III

Volume of a small test tube	XXXXX mL
Volume of a medium test tube	XXXXX mL
Volume of water held by beaker	XXXXX mL
Volume printed on beaker	XXXXX mL
Drops of water equal to 1 mL	XXX drops

Calculations (Show all of your work, including UNITS!)

1. Calculate the AREA of your glass slide, in cm^2.
2. Calculate the volume of your beaker, in cm^3, using data from Part II. Since a beaker is nearly a cylinder, its volume can be estimated using the formula $\pi r^2 h$.
3. Calculate the difference between the calculated volume of the beaker ($\pi r^2 h$) and the actual volume (how much water it held).
4. Calculate the volume of a single drop of water.