

Name: \_\_\_\_\_ Date Completed: \_\_\_\_\_  
Class: \_\_\_\_\_ Lab Minutes: \_\_\_\_\_



## Lab: Tools for Measurement

TOTTEN  
SCIENCE

### Introduction

During laboratory investigations, you are often required to make measurements of length, mass, and volume. You need to know the proper pieces of equipment to select and the appropriate procedures and units to use.

### Length Measurement

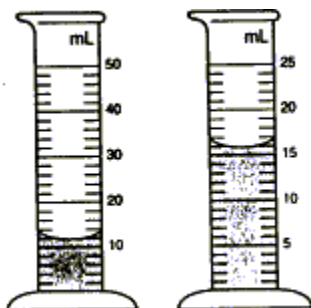
Typically a metric ruler is used to determine the length of an object. To measure length, use either centimeter (cm) or millimeters (mm). You should know how to convert millimeters to centimeters and vice versa.

The metric ruler we are working with is calibrated – or scaled – in centimeters. The lines indicated by numbers 1, 2, 3 and so on each represent a distance of 1 centimeter. The smaller divisions each equal 1 millimeter (**10 mm = 1 cm**).

### Volume Measurement

A graduated cylinder is often used to measure a liquid's volume, or the space it occupies. Liters and milliliters are typically used to indicate volume in the metric system. Graduated cylinders are calibrated in milliliters (mL).

Water and many other fluids form a **meniscus** (curving surface) when placed in the narrow tube of a graduated cylinder. To correctly read the volume of the liquid, place the cylinder on a flat surface. Then read from the bottom of the curved meniscus at eye level.

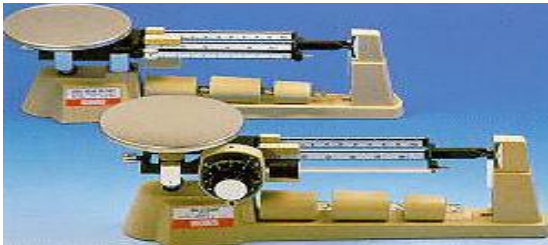
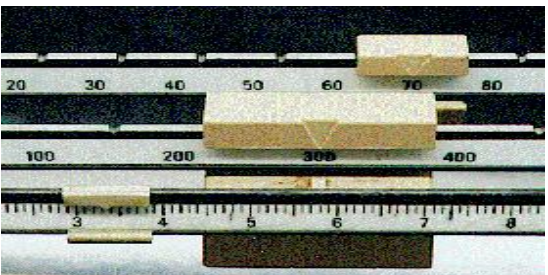


The graduated cylinder at the left is divided into increments of 2 mL, so the volume in it is 12 mL. The graduated cylinder on the right is divided into increments of 1 mL, so the volume in it is 16 mL.

### Mass Measurement

In the biology laboratory, **mass** – the quantity of matter in something – is often measured with a balance, which is a tool that works by comparing an object of unknown mass with an object of known mass. The triple-beam balance or an electronic balance is typically found in a high school laboratory. A triple-beam balance has a single pan and three bars (beams) that are calibrated in grams. One beam, the 500-gram beam, is divided into five 100-gram units. Another beam is divided into 10 units of 10-gram totaling 100 grams. The front beam is divided into 10 major units of 1 gram each. Each of these units is further divided into 0.1-gram units.

Before using a balance, make sure that the pan is empty and that the pointer and all of the riders (devices that are moved along the beams) are on zero. To determine the mass of an object, it is first placed on the pan. Then, starting with the 500-gram beam, the masses on the beams are adjusted until the pointer is again pointing to zero. The mass of the object is the sum of the readings on the three beams.

<b>Using the Triple Beam Balance</b>	
	The picture at the upper left shows two different models of triple beam balances commonly used in the biology laboratory.
	The picture at the lower left shows the measurement of a mass in progress. Without estimation, the mass of the object appears to be 373.3g.

**Directions:** Measure the following items and convert the values to the various measurements given.

**Distance:**

1. Measure the length of the desk and record the measurement. \_\_\_\_\_m
2. Change this measurement to: \_\_\_\_\_cm. \_\_\_\_\_mm.
3. Measure the width of the desk and record the measurement. \_\_\_\_\_m
4. Change this measurement to: \_\_\_\_\_cm. \_\_\_\_\_mm.

5. Measure the width of the room in meters. \_\_\_\_\_ m Change this to kilometers  
\_\_\_\_\_ Km

6. Measure the length of the room in meters. \_\_\_\_\_ m Change this to  
kilometers. \_\_\_\_\_ Km

**Volume:** Using a coffee cup and plastic cup, fill them with water and determine their volume by pouring the water into a graduated cylinder. Record their volumes in milliliters, centiliters, liters, and kiloliters in the space below.

Coffee Can: \_\_\_\_\_ mL \_\_\_\_\_ cL \_\_\_\_\_ L \_\_\_\_\_ KL

Plastic Cup: \_\_\_\_\_ mL \_\_\_\_\_ cL \_\_\_\_\_ L \_\_\_\_\_ KL

**Mass:** Weigh the following materials.

1. Notebook \_\_\_\_\_ Kg. \_\_\_\_\_ g.

2. Large bottle of soda \_\_\_\_\_ Kg. \_\_\_\_\_ g.

3. Pair of shoes (use paper on the scale- weigh it first, subtract this weight from the total weight) \_\_\_\_\_ Kg. \_\_\_\_\_ g.

**Conclusion:** Answer the following questions:

1. What is the metric value for mass? \_\_\_\_\_

2. What is the metric value for length or distance? \_\_\_\_\_

3. What is the prefix value for 1000X? \_\_\_\_\_

4. What is the prefix value for 1/100? \_\_\_\_\_

5. If we are moving from a large value to a small value, we move the decimal point to the  
\_\_\_\_\_.

6. If we are moving the decimal point to the right we are moving from a \_\_\_\_\_ value to  
a \_\_\_\_\_ value.