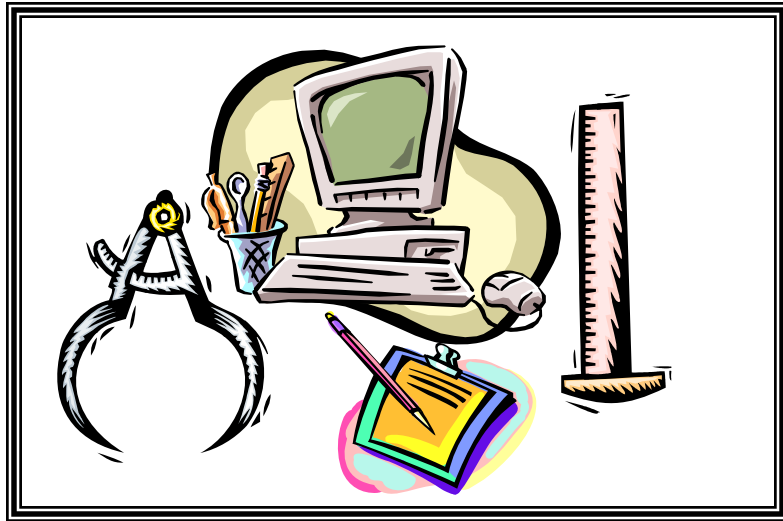


**Scientific Investigation  
Using Laboratory Equipment and Metric Units  
Promotion Benchmark 2 Lesson Review  
Student Copy**



**Vocabulary**

**International System of Units (SI)** – Universally used system of measurement around the world; also known as the metric system.

**Meters** – SI units of length.

**Liters** – SI units of volume.

**Grams** – SI units of mass.

**Qualitative observations** – Observations made by using your five (5) senses.

**Quantitative observations** – Observations made by recording numeric measurements.

**Review for Promotional Benchmark 2:**  
*Selects appropriate laboratory equipment and accurately  
measures using metric units*

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When observing items, there are two types of observations that scientists make: qualitative and quantitative. **Qualitative** observations are made using the five (5) senses: hearing, seeing, smelling, touching, and tasting. (This fifth sense, tasting, is normally forbidden in laboratory work.) **Quantitative** observations record information using numeric measurements. Numeric measurements are made using a system called the International System of Units (SI), more commonly known as the metric system.

Metric units are very specific and tell a lot about the items being measured. The units consist of a prefix and a base word. The base word tells the kind of measurement being taken, and the prefix tells the size of the item being measured. The most commonly used prefixes are milli-, centi-, and kilo-. The metric system is based on the decimal system (multiples of 10). For example:

*milli-* is expressed as 0.001 or  $\frac{1}{1000}$  of the base unit

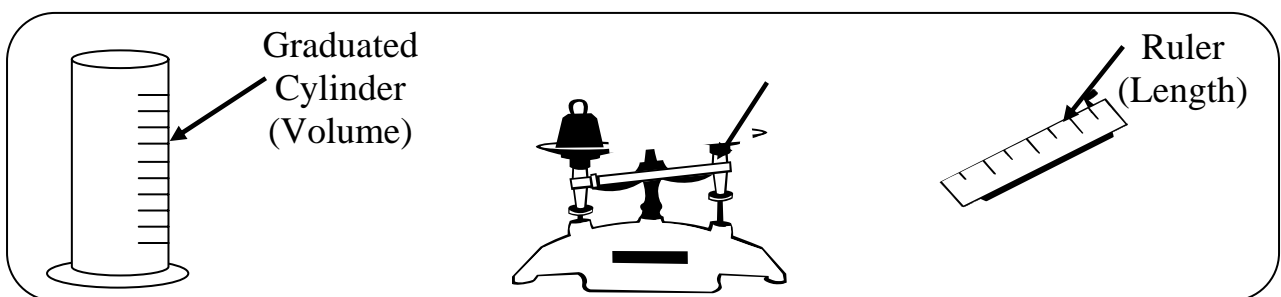
*centi-* is expressed as 0.01 or  $\frac{1}{100}$  of the base unit

*kilo-* is expressed as 1,000 times the base unit

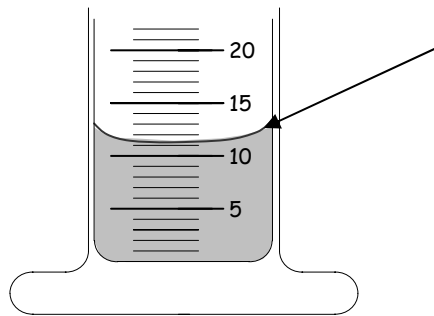
The meter, liter, and gram are three of the most commonly used base words in the metric system. The **meter** is used to measure length. The **liter** is used to measure volume. The **gram** measures mass. When the prefixes (milli, centi, and kilo) and base words (meter, liter, and gram) are put together, the measurement describes the size of the object and the type of measurement being taken. For example, a milliliter is a very small volume of liquid, and a kilometer is a long distance. The gram is a small quantity (about the mass of a small paperclip), so the kilogram is actually the standard unit of measurement in the metric system for mass. It is equal to about 2 pounds.

In science, there are very specific tools used for measuring length, volume, and mass. The tool used for measuring length is a **metric ruler** or **meter stick**. The tool used to measure volume of a liquid is a **graduated cylinder**. The tool used for measuring mass is the **triple beam balance**.

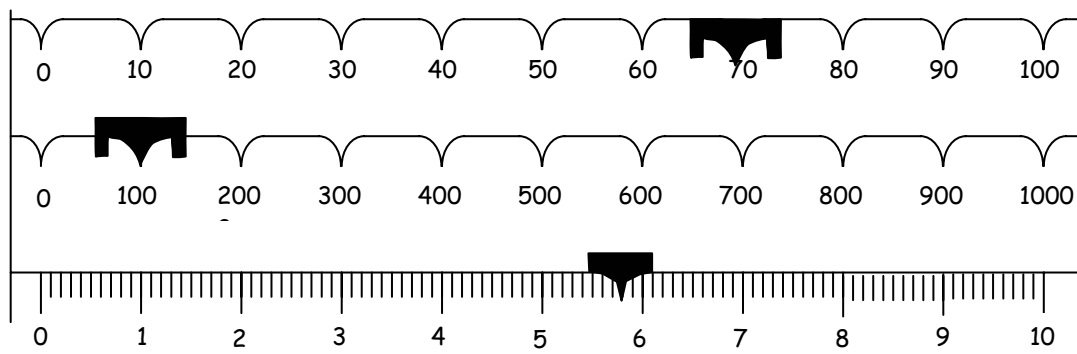
These tools are pictured below.



The **graduated cylinder** is read using the marks that are printed on the outside of the tube. When a liquid is poured into a graduated cylinder, its level rises up in a column. The scientist compares the level to which the liquid rises to the marks at the side of the graduated cylinder. The number shown at that level represents the volume in milliliters of the liquid. To measure accurately, use the marked increments on the scale and then “estimate one more” decimal place. Liquids poured into a graduated cylinder made of *glass* will form a curved line at the top of the liquid column, called the **meniscus**. In this case, read the volume of the liquid at the bottom of the meniscus. *For example, the volume pictured in the diagram below is 11.3 milliliters.*

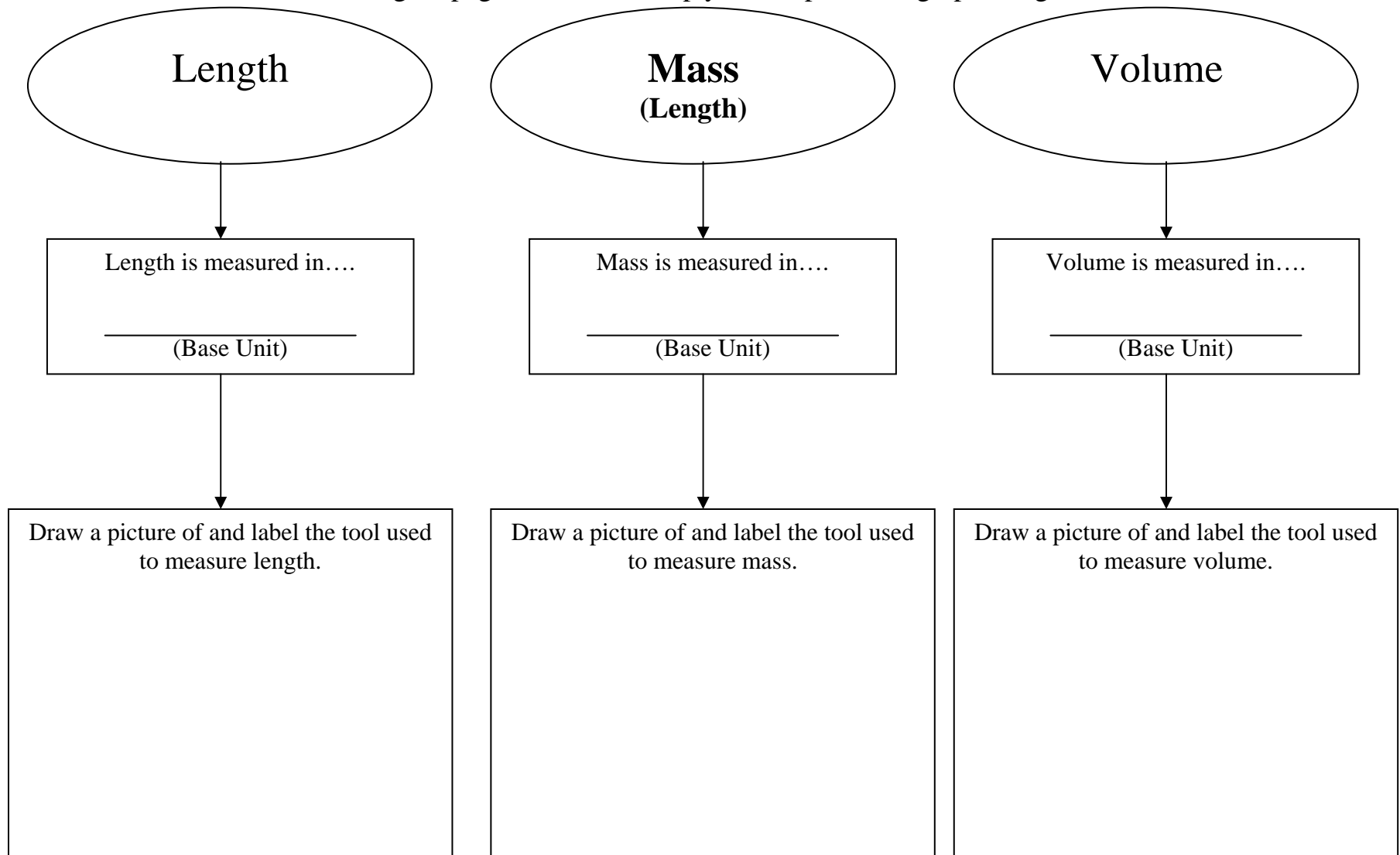


A **triple beam balance** is a balance that uses three scales or “beams” to quantify mass. The top beam displays the measurement to the tens place; the middle beam shows the hundreds place; and the bottom beam is the ones place. (Marks that appear between the numbered units on this scale should be expressed as a decimal place.) *For example, the mass pictured in the diagram below is 175.80 grams.*



## Concept Map for International System of Units

Use the reading on pages 22 – 25 to help you complete this graphic organizer.



## Review for Promotion Benchmark 2

### Directions:

Complete the sentences with the correct word from the word bank.

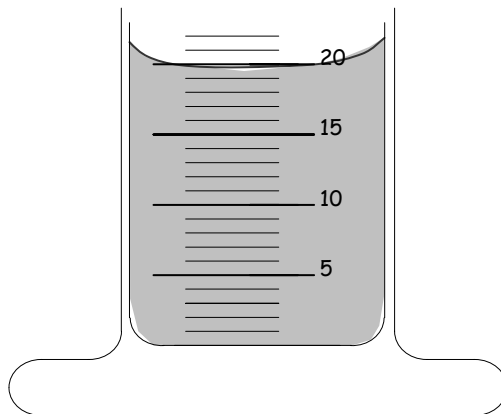
<b>kilo-</b>	<b>centi-</b>	<b>mass</b>	<b>triple beam balance</b>
<b>ruler</b>	<b>meter</b>	<b>liquid</b>	

1. A milliliter measures a small amount of \_\_\_\_\_.
2. Grams measure the amount of \_\_\_\_\_ in an object.
3. A \_\_\_\_\_ is used when measuring the length of something.
4. The \_\_\_\_\_ is the tool used to find the mass of an object.
5. The base word for length is \_\_\_\_\_.
6. The prefix meaning 1000 times the base unit is \_\_\_\_\_.
7. The \_\_\_\_\_ prefix is used when 0.01 or  $\frac{1}{100}$  is of a unit is used.

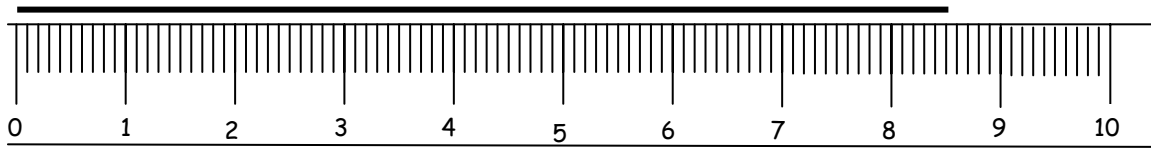
### Directions:

Write the correct measurement and units to the nearest milliliter.

8. How much liquid is in the graduated cylinder? \_\_\_\_\_



9. Find the length of the bar. \_\_\_\_\_



10. How much mass is on the triple beam balance? \_\_\_\_\_

