Name: _____

Micropipette Challenge

Pre-Lab: What is the Metric System?

Introduction

What is the metric system?

The metric system is a decimal-based system of measurement units. The basic units of the metric system include the liter (volume), meter (length), and gram (mass). Units for a given quantity are related by factors of 10. This means that units within the metric system either get larger or smaller by a factor of 10 (refer to Figure 1). The names of metric units are formed by adding a prefix to the basic unit of measurement. To tell how large or small the unit is, you should look at the prefix (e.g. kilo-, deci-, milli-). To tell what unit is being measured, you should look at the base (e.g. -liter, -meter, or -gram).

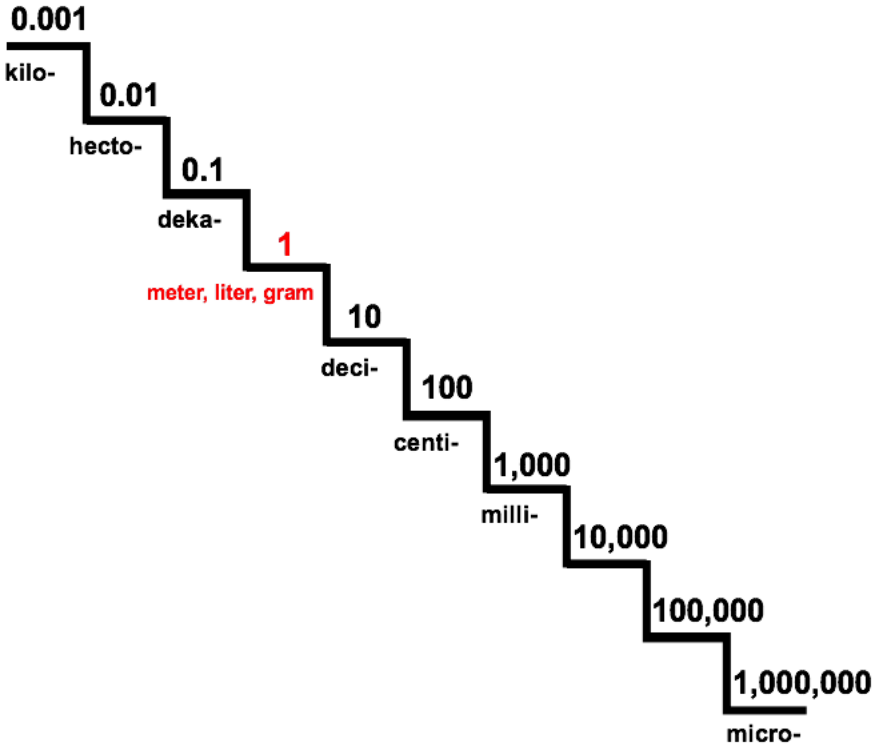

Figure 1. The metric ladder – a visual representation of the metric system.

International System of Units

The International System of Units (SI) is the international standard for measurement set forth by the International Treaty of the Meter signed on May 20, 1875. The SI system of measurement is derived from the metric system and uses the same prefixes used by the metric system. The 7 base units of the SI system are: *meter* (length), *second* (time), *mole* (amount of substance), *ampere* (electrical current), *kelvin* (temperature), *candela* (luminous intensity), and *kilogram* (mass). The SI system of measurement is not static but evolves to match the world's increasingly demanding requirements for measurement and is the most commonly used system of measurement. Currently much work is under way related to the intended future revision of the SI.

Who uses the metric system?

The metric system has been adopted by most countries, except Burma, Liberia, and the United States. Here in the United States, we use a system of measurement officially referred to as "The Traditional Systems of Weights and Measures," or more commonly known as the "Imperial" system of measurement. The basic units of the imperial system are listed below (refer to Table 1).

Table 1. The basic units of the imperial system.

Category	Unit of Measurement
Length	Inch
	Foot
	Yard
Volume	Fluid Ounce
	Pint
	Quart
	Gallon
Weight	Pound
	Stone
	Ton

Unit Conversions and Conversion Factors

Unit conversion is a multi-step process that involves multiplication or division by a conversion factor. A conversion factor is a ratio or fraction that is used change between units (i.e. a numerical relationship between two different units). A conversion factor is always equal to 1. Unit conversions allow scientists to easily share their insights with their colleagues and rest of the world, providing the opportunity for cross-collaboration on various initiatives.

To understand how to perform a unit conversion follow these examples:

Example 1. Convert 300 kilometers to meters.

Conversion Factor: 0.001 kilometer = 1 meter

$$300\ kilometers \times \frac{1\ meter}{0.001\ kilometer} = 0.3\ meter$$

Example 2. Convert 6 grams to pounds.

Conversion Factor: 1 gram = 0.002205 lb

$$6\ gram \times \frac{0.002205\ lb}{1\ gram} = 0.01323\ lb$$

Practice

Practice your unit conversion skills!

1. Convert the following: 5 meters = _____ kilometers
2. Convert the following: 3 grams = _____ milligrams
3. Convert the following: 7 meters = _____ centimeters
4. Convert the following: 60 milligrams = _____ kilograms
5. Convert the following: 2.5 meters = _____ millimeters
6. Convert the following: 4.5 centimeters = _____ kilometers
7. Convert the following: 77 meters = _____ decameters
8. Convert the following: 37 decimeters = _____millimeters
9. Convert the following: 0.002 centimeters = _____ millimeters
10. Convert the following: 44 milliliters = _____ liters
11. Convert the following: 25 kilometers = _____ meters
12. Convert the following: 880 liters = _____ centiliters
13. Convert the following: 9.5 kiloliters = _____ deciliters
14. Convert the following: 66 microliters = _____ liters
15. Convert the following: 5 millimeters = _____ micrometers