Physics 1 Honors: S.I. Units and Scientific Notation

Why use the SI System?

In the U.S. we use the English or Standard System, most of the rest of the world uses the Metric or SI System.

The SI (International System of Units) system is the form of measurement typically used by scientists.

Why use the SI System?

Scientists use the SI System worldwide because:

- **Measurements are easily understood by all scientists**
- **Measurements are easier to convert than the English system**

MEASUREMENT SYSTEM COMPARISONS

MEASUREMENT	ENGLISH	SI SYSTEM
LENGTH	Yard / Inch	Meter / Centimeter
MASS	Ounce / Pound	Gram / Kilogram
VOLUME	Quart	Liter
TEMPERATURE	Fahrenheit	Celsius / Kelvin
TIME	Second	Second

All Measurement systems have standards. Standards are exact quantities that everyone agrees to use as a basis of comparison.

BASIC TYPES OF MEASUREMENT

In SI the basic units are:

- ✔ **Length is the meter (m)**
- ✔ **Mass is the gram (g)**
- ✔ **Volume is the liter (L)**
- ✔ **Temperature is Celsius (C)**

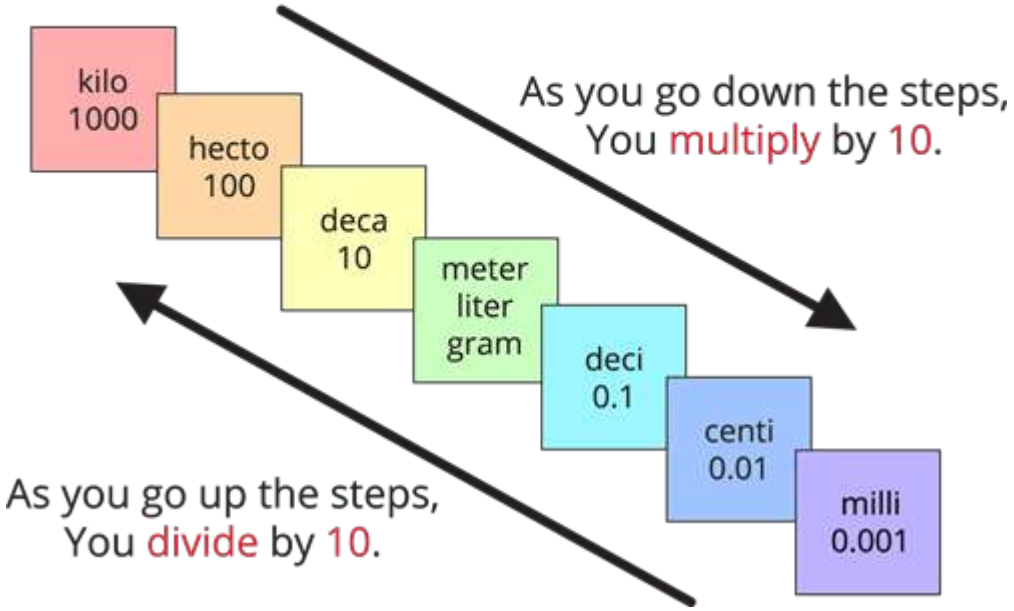
Kilo	1000
Hecto	100
Deca	10
UNIT	1
Deci	1/10
Centi	1/100
Milli	1/1000

This system works with any SI measurement.

The UNIT becomes whichever type of measurement you are making. (mass, volume, or length)

It is the same system regardless if you are measuring length, mass, or volume.

Metric System Conversion Stairs



More Conversions . . .

2,321.0 millimeters to meters =

521.0 grams to hectograms =

8.5 kiloliters to centiliters =

<u>NOTE</u>: ***The digits aren't changing, the position of the decimal is. In the English system the whole number changes.***

Kilo Hecto Deca UNIT Deci Centi Milli

Dimensional Analysis

When you are doing mathematical operations with values that have units, those mathematical operations also apply to units. Using the units all the way through the course of a problem is called "Dimensional Analysis"

For example:

10 seconds + 15 seconds = _____

2 meters * 10 seconds = _____

Practice on your own…

1. 15 m / 5 s = ?

1. 2m * 2m = ?

1. (1m * 10 s) / 5 s = ?

Scientific Notation Practice

In physics we sometimes have to work with large numbers (the distance from the Earth to the Sun is about 149,000,000,000 meters) and very small numbers (the mass of an electron is 0.00000000000000000016 kg). To properly work with these we use scientific notation.

Physics doesn't usually focus on significant figures as much as you did in chemistry.

Scientific Notation Practice

149,000,000,000 meters from the Sun. Convert this into scientific notation.

1) The mass of an electron is 0.00000000000000000016 kg. Convert this into scientific notation.

1) The mass of the Earth is 5.98×10^{24} kg. Write this as a normal number.

Multiplication in Scientific Notation

Add the exponents

$$(a\times10^{m})(b\times10^{n})$$

Multiply the coefficients

Example:

$$(3.1\times10^{4})(2\times10^{3})$$
$$=(3.1\times2)\times10^{4+3}$$
$$=6.2\times10^{7}$$

Division in Scientific Notation

Divide the coefficients

$$\frac{a\times10^{m}}{b\times10^{n}}$$

Subtract the exponents

Example:

$$\frac{9.06\times10^{8}}{3\times10^{5}}=\frac{9.06}{3}\times10^{8-5}$$
$$=3.02\times10^{3}$$