Alchemists

- tried to change "base metals" into gold
- developed many techniques later used in modern chemistry

Modern

Lavosier
1. Made chemistry a quantitative science
2. nature of combustion
3. list of elements

Dalton: 1808 · "atomic theory"

Measurements

Measurements are comparisons of properties against accepted standards, called units.

English/US units:

1 foot = 12 inches 1 yard = 3 ft 1 mile = 5280 ft

1760 yd = 1 mile

PROBLEM: Units are not consistent. Hard to use

English units are nonstandard and difficult to use. Solution?

THE METRIC SYSTEM

All metric units are made from combinations of base units!

Base Units:

Length:	meter	m
Mass:	kilogram*	kg
Time:	second	s
Temperature:	Kelvin	K

*we usually treat the gram as if it's the base unit for mass!

What about size?

Metric units may be made larger or smaller by adding PREFIXES.

mega-	10^6	M
kilo-	10^3	k
centi-	10^{-2}	c
milli-	10^{-3}	m
micro-	10^{-6}	μ

Bigger units

Smaller units

Memorize these prefixes!

Applying prefixes

1 _____ m = _____ m

1 km = 10^3 m (1000 m) $10 \times 10 \times 10$

1 cm = 10^{-2} m ($\frac{1}{100}$ m) $\frac{1}{10} \times \frac{1}{10}$

Scaling units with metric prefixes ... examples

The distance between here and Columbia, SC is about 107,000 meters. What metric unit would be best suited for a distance like this?

107,000 m

km = 1000 m,

107 km

A piece of chalk is 0.080 meters long. What metric unit would be best suited for this length?

$cm = \frac{1}{100}\ m$

8,0 cm

Derived Units

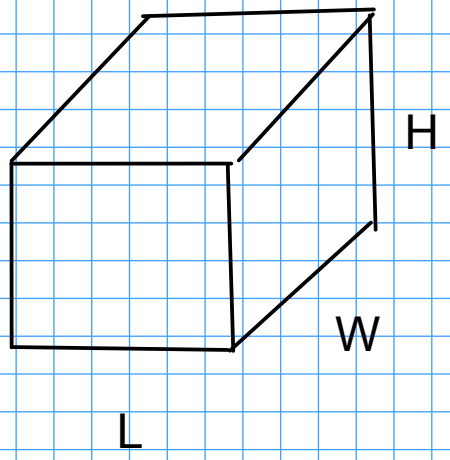
- are units that are made up of combnations of metric base units with each other and/or with prefixes

Two derived units are particularly important in introductory chemistry:

1) VOLUME

2) DENSITY

VOLUME



VOLUME = L × W × H

UNITS?

metric length unit = meter

So,

Volume = meter × meter × meter

= m^3 (cubic meter)

Practical issues for volume units

- Cubic meters are too large! A meter is very similar in length to a yard, so a cubic meter is a cube that is approximately a yard long on each side!

A smaller unit for volume?

cubic decimeters!

(decimeter = 1/10 meter)

Cubic decimeters are given the name "liters", abbreviation "L"

In the lab, we typically need an even smaller unit than the liter, so we use milliliters (mL)

"CC"
cubic centimeter
=
milliliter

1 mL = 10^{-3} L

-or-

1000 mL = 1 L