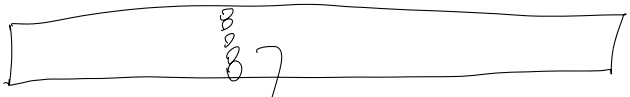
Chemistry = study of how matter undergoes change

CHEM 103 - mostly matter

Matter composed of small building blocks - atoms



- Aluminum foil $\frac{1}{1000}$ inch thick

really about 50,000 Al atoms

Approx 100 types of atoms, each with specific properties

Elements are matter with only 1 type of atom

Compounds are matter with more than 1 type of atom

Molecules - more than 1 atom connected together

water molecule contains 1 atom of Oxygen, 2 atoms of Hydrogen → compound H_2O

Oxygen molecule contains 2 atoms of oxygen → element O_2

Pure substances vs mixtures

↓ only 1 type of element/compound

↓ more than 1 type

heterogeneous mixture vs homogeneous mixture

State of matter - determined by the interactions between the "pieces" of matter

solid - strongest interactions

liquid

gas - weakest interactions

Quantitative ways to characterize matter

Mass, volume } extensive - depends on how much

Density, color } intensive

Change - either chemical or physical

chemical: becomes a new substance

physical: same substance

Tools for chemistry - Units, scientific notation, dimensional analysis

mass - grams, ounces, pounds, kilograms

volume - liters, gallons...

length - meters, inches, miles

energy - Joules

nano $\xleftarrow{\div 1000}$ micro $\xleftarrow{\div 1000}$ milli $\xleftarrow{\div 1000}$ base $\xrightarrow{\times 1000}$ kilo $\xrightarrow{\times 1000}$ mega $\xrightarrow{\times 1000}$ giga

300,000,000 is 3×10^{8}

0.0000005 is 5×10^{-7}

Dimensional analysis - uses relationships between various quantities to convert one quantity to another

Ex: how many inches in 3.5 meters

meters $\leftrightarrow$ inches - ??

meters $\leftrightarrow$ cm - know 100 cm = 1 m

cm $\leftrightarrow$ inches - know 2.54 cm = 1 inch

$3.5\text{ m} \times \frac{100\text{ cm}}{1\text{ m}} = 350\text{ cm}$

$3.5\text{ m} \times \frac{100\text{ cm}}{1\text{ m}} \times \frac{1\text{ inch}}{2.54\text{ cm}}$

$350\text{ cm} \times \frac{1\text{ inch}}{2.54\text{ cm}} = 137.8\text{ inches}$

Ex: You have \$10.50 and grapes cost \$2.49/pound
How many kilograms of grapes can you buy?

$\$10.50 \times \frac{1\text{ pounds of grapes}}{2.49\ \$} \times \frac{1\text{ kg}}{2.2\text{ pounds}} = 1.92\text{ kg of grapes}$