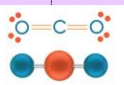


# Chemistry

is the study of

## MATTER

- its **properties**
- and **structure**
- and how **energy** affects it



# Matter

Anything that has **mass** and **volume**.

The amount of material

The amount of space occupied



### Side Note:

**Mass** and **Weight** are *not* the same.

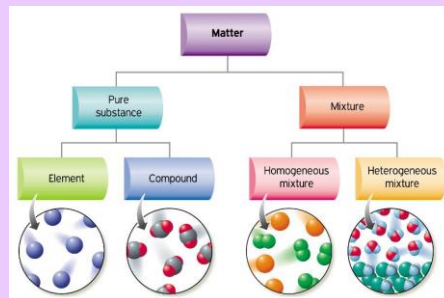
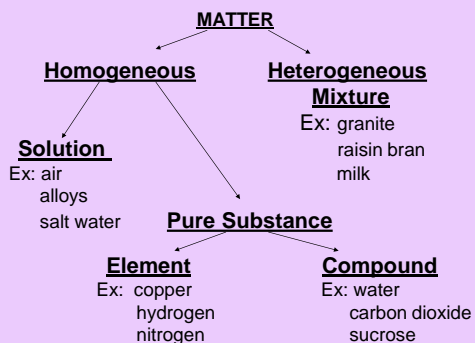
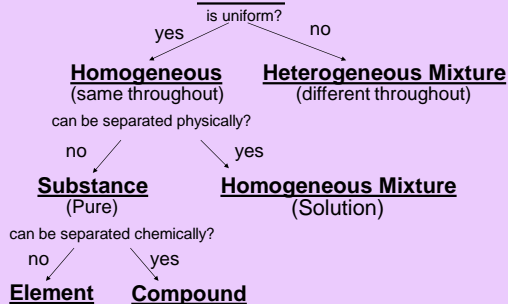
**Mass:** amount of material  
measured by a balance

**Weight:** pull of gravity on that material  
measured by a scale

Think: Astronauts in outerspace  
Weight-less? Yes.  
Mass-less? No.

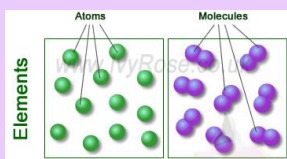


### MATTER



## Element

- Matter consisting of only one type of atom
- Cannot be decomposed by *chemical or physical means*



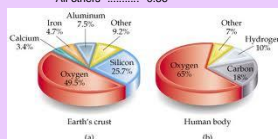
- 118 elements and increasing (1-92 naturally occurring, 93+ man-made)
- Names are abbreviated with chemical symbols (symbols with 2 letters: 1<sup>st</sup> upper case, 2<sup>nd</sup> lower case)
- Organized on the Periodic Table
- Fewer than ½ make up 99.99% of all substances

### • Elemental Composition of the Earth (includes the crust, oceans and atmosphere)

Element	Percent by Mass
Oxygen	49.1
Silicon	26.1
Aluminum	7.5
Iron	4.7
Calcium	3.4
Sodium	2.6
Potassium	2.4
Magnesium	1.9
Hydrogen	0.88
Titanium	0.58
Chlorine	0.19
Carbon	0.09
All others	0.56

### • Elemental Composition of the Human Body

Element	Percent by Mass
Oxygen	64.6
Carbon	18.0
Hydrogen	10.0
Nitrogen	3.1
Calcium	1.9
Phosphorus	1.1
Chlorine	0.40
Potassium	0.36
Sulfur	0.25
Sodium	0.11
Magnesium	0.03
Iron	0.005
Zinc	0.002
Copper	0.0004
Tin	0.0001
Manganese	0.0001
Iodine	0.0001



## Compound

- Substances consisting of unlike atoms, chemically bonded
- Cannot be separated by *physical processes*
- Can be separated by *chemical processes*
- Expressed by chemical formula – Ex:  $C_6H_{12}O_6$

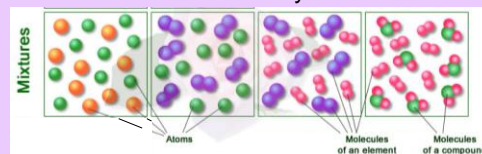


- Properties of compound are different than the properties of its elements
- **Law of Definite Proportions:**  
The elemental composition of a compound is always the same

Ex: Water is *always* 8 parts oxygen to 1 part hydrogen by mass – anywhere, any sample

## Mixtures

Two or more materials together, but not chemically bonded



- Can be separated by *physical* means

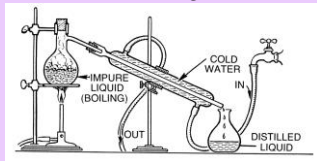
- Ex: With magnet



Chromatography



Distilling



By hand



## Heterogeneous Mixtures

Not uniform in appearance  
Fairly easy to separate



## Solution (Homogenous Mixture)

- Will pass through a filter
- No part settles out
- No Tyndall effect (scattering of light)

• **solute** + **solvent** = **solution**  
*lesser amount*    *greater amount*  
 Ex: salt            Ex: water

