Unit 1

Matter

What is Matter?

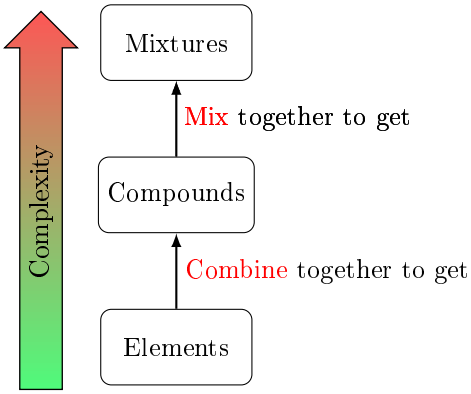
1. Matter is the "stuff" that makes up everything in the universe.
2. Properties of Matter
   2.1. Each specific substance has its own combination of properties that can be used to identify the substance.
   2.2. Matter can Δ it's properties. ★
      2.2.1. Ex. Water is a
         2.2.1.1. Liquid at room temperate
         2.2.1.2. Solid at cold temperatures
         2.2.1.3. Gas at high temperatures
   2.3. Examples:
      2.3.1. Hardness
      2.3.2. Texture
      2.3.3. Flammability
      2.3.4. Color
      2.3.5. Shape
      2.3.6. Temperature

      This is some text that I want to put a side margin note in for. ★

★ *Δ means "Change"*

★ *Test side note*

Kinds of Matter



3. Elements
   3.1. If you break down an element any more, then it just becomes generic protons, neutrons and electrons.
      3.1.1. It stops behaving like that element

   - Ex: If you break down Gold into protons, neutrons and electrons, it is no longer a shiny metal that conducts electricity.

   3.2. Each element has its own symbol
      3.2.1. Usually the first 1 - 2 letters in the name
      3.2.2. Always CAPITAL lowercase if two letters long
      3.2.3. Examples

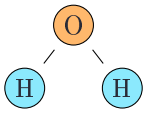
   - O → Oxygen
   - He → Helium
   - C → Carbon
   - H → Hydrogen
   - Al → Aluminum
   - Au → Gold

The latin word for Gold is "Aurum", so it still follows the rule, just in a different language.

4. Compounds

Ex: Carbon Dioxide (CO_2)

Ex: Water (H_2O)



4.1. Examples

- $C_6H_{12}O_6$
- $NaCl$
- CH_4
- CO_2
- $CaCO_3$
- $Al(OH)_3$

5. Mixtures
   5.1. Ex: Well Water
      5.1.1. Well water is a mixture because it has minerals, salts, and even dissolved oxygen within it

Changes in Matter

6. Physical Changes

Figure 1.1: Ripping Paper

   6.1. Before it is ripped, it is paper
   6.2. After it is ripped, it is still paper
      6.2.1. Thus, this is an example of a physical change.
   6.3. Other examples
      6.3.1. Melting Ice
      6.3.2. Smashing a rock

7. Chemical Changes
   7.1. Chemical changes occur when
      7.1.1. A substance combines with another to form a new substance.
      OR
      7.1.2. Chemical decomposition into two or more different substances.
   7.2. Examples

- Burning Wood
- Iron Rusting
- Mixing Baking Soda and Vinegar

Measuring Matter

8. Mass
9. Weight
10. Volume
11. Density

Matter Formulas

Density Formulas

When Density is unknown

$$density = \frac{mass}{volume}$$

Density is measured in

$\frac{g}{cm^2}$ | $\frac{g}{mL}$

When Mass is unknown

$$mass = density \cdot volume$$

Mass is measured in

g | kg | mg

When Volume is unknown

$$volume = \frac{mass}{density}$$

Volume is measured in

L | mL | cm^2

Pressure Formulas

When Pressure is unknown

$$pressure = \frac{force}{area}$$

Pressure is measured in

atm

When Force is unknown

$force = pressure \cdot area$

Force is measured in

N

When Area is unknown

$area = \frac{force}{pressure}$

Area is measured in

cm^2 | m^2

1.5.1 Gas Laws

Boyle's Law Formulas

When Pressure is unknown

$pressure = \frac{force}{area}$

Pressure is measured in

atm

When Force is unknown

$force = pressure \cdot area$

Force is measured in

N

When Area is unknown

$area = \frac{force}{pressure}$

Area is measured in

cm^2 | m^2

Charle's Law Formulas

When Pressure is unknown

$$pressure = \frac{force}{area}$$

Pressure is measured in

atm

When Force is unknown

$$force = pressure \cdot area$$

Force is measured in

N

When Area is unknown

$$area = \frac{force}{pressure}$$

Area is measured in

cm^2 | m^2

Gay-Lussac's Law Formulas

When Pressure is unknown

$$pressure = \frac{force}{area}$$

Pressure is measured in

atm

When Force is unknown

$$force = pressure \cdot area$$

Force is measured in

N

When Area is unknown

$$area = \frac{force}{pressure}$$

Area is measured in

$\mathrm{cm}^2 \mid \mathrm{m}^2$