Physical and Chemical Properties & Changes

Properties of Matter

- All substances have **properties** that we can use to **identify** them

- Two types of properties:
  - **Physical Properties** - **Chemical Properties**

Physical Properties

- **do not change** the **chemical nature** of matter.
- **Readily observable** (easy to find with our five senses)
- Helps understand how **this substance will behave** under various conditions.
  - Will it mix with water?
  - Will it explode if I leave it on a table?
  - What will happen if I mix it with KCl?

Examples of Physical Properties

- Area
- Attraction/Repulsion to Magnets
- **Boiling Point**
- **Color**
- Concentration
- **Density**
- Electric charge
- Energy
- **Freezing Point**
- Intensity
- **Length**
- **Mass**
- **Melting Point**
- Pressure
- Radiance
- **Temperature**
- Tension
- Velocity
- Viscosity
- **Volume**

Chemical Properties

- **Change the chemical nature** of matter

- **Only** seen during a **chemical reaction**.
  - Ex) we only know how sodium reacts with water when we *see* it react

Examples of Chemical Properties

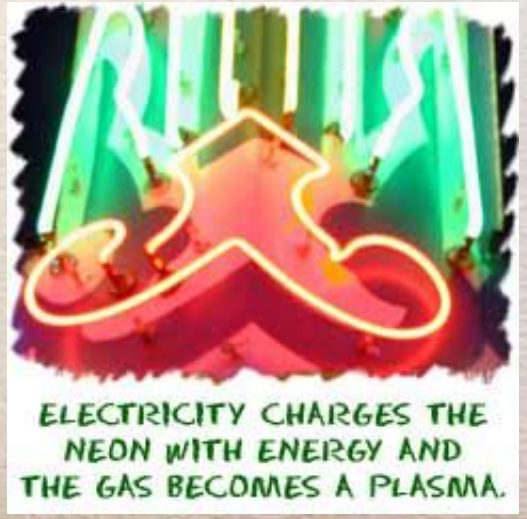
- **Heat of combustion** (fire) - the Energy (heat) released when a chemical combusts completely
- **Reactivity with other chemicals** - how long it takes for a chemical to react with another chemical
- **PH** - measure of acidity or alkalinity of a solution
- **Flammability** - how likely a substance is to catch on fire

Changes in Matter

- Matter changes all the time…some big, some little
- Two kinds of changes: **Physical change** and **Chemical change**.
  - A **Physical change** :
    - No new substance formed
    - Change of state
  - A **Chemical change** (or chemical reaction)
    - New substance formed

Physical Changes

- Result in a **change of state**
  - (ex. liquid --> gas, or gas --> plasma, etc.)
- New substance has the **same properties** as the old substance
- *No* new materials are produced
- You can get the original substance back easily!



Examples of Physical Changes

- Melting a block of ice - it's still H_2O
- Breaking a glass bottle - it's in a million pieces, but it's still glass
- Painting a piece of wood will not make it stop being wood
- Common physical changes:
  - Melting - Condensing - Crushing
  - Freezing - Breaking - Cutting

Chemical Changes

- One or more **NEW substances** are created.
- New substance is different from the original, with **different properties**
- You cannot get the original materials back easily, or sometimes at all
  - Ex. When you light a match and the flame burns out, what is left has changed forever. You can never light it again.

Clues of a Chemical Change

1. New **color** appears
2. **Heat** or **light** is given off
3. **Bubbles** of gas are given off
4. A **precipitate** (solid) is formed
5. The change is difficult or impossible to reverse