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 H2O
• 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