# Topic 1 Organization of Matter

# Review: Organization of Matter

- Matter can be organized in a variety of different ways… let's see what you remember about the following terms:

Atom
Element
Molecule
Compound
Mixture
Pure substance

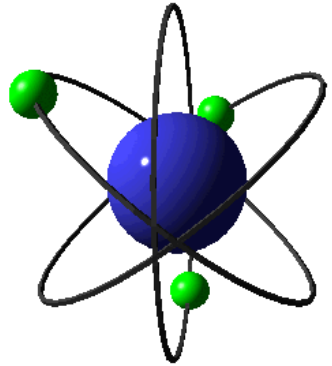
Heterogeneous mixture
Homogeneous mixture
Solution
Colloid

# What is matter?

- Matter is anything that has **mass** and takes up **space**.
- Matter is made up of atoms and **molecules**.

# Review: Organization of Matter

- **Atom**
  - **Smallest unit of matter**
  - Simplest form of an element



# Review: Organization of Matter

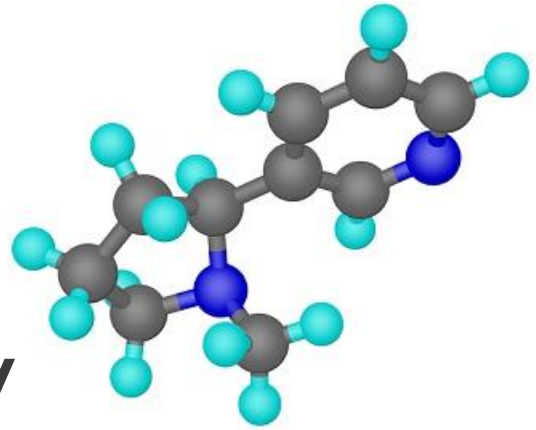
- **Element**
  - Substance made from **one type of atom only**

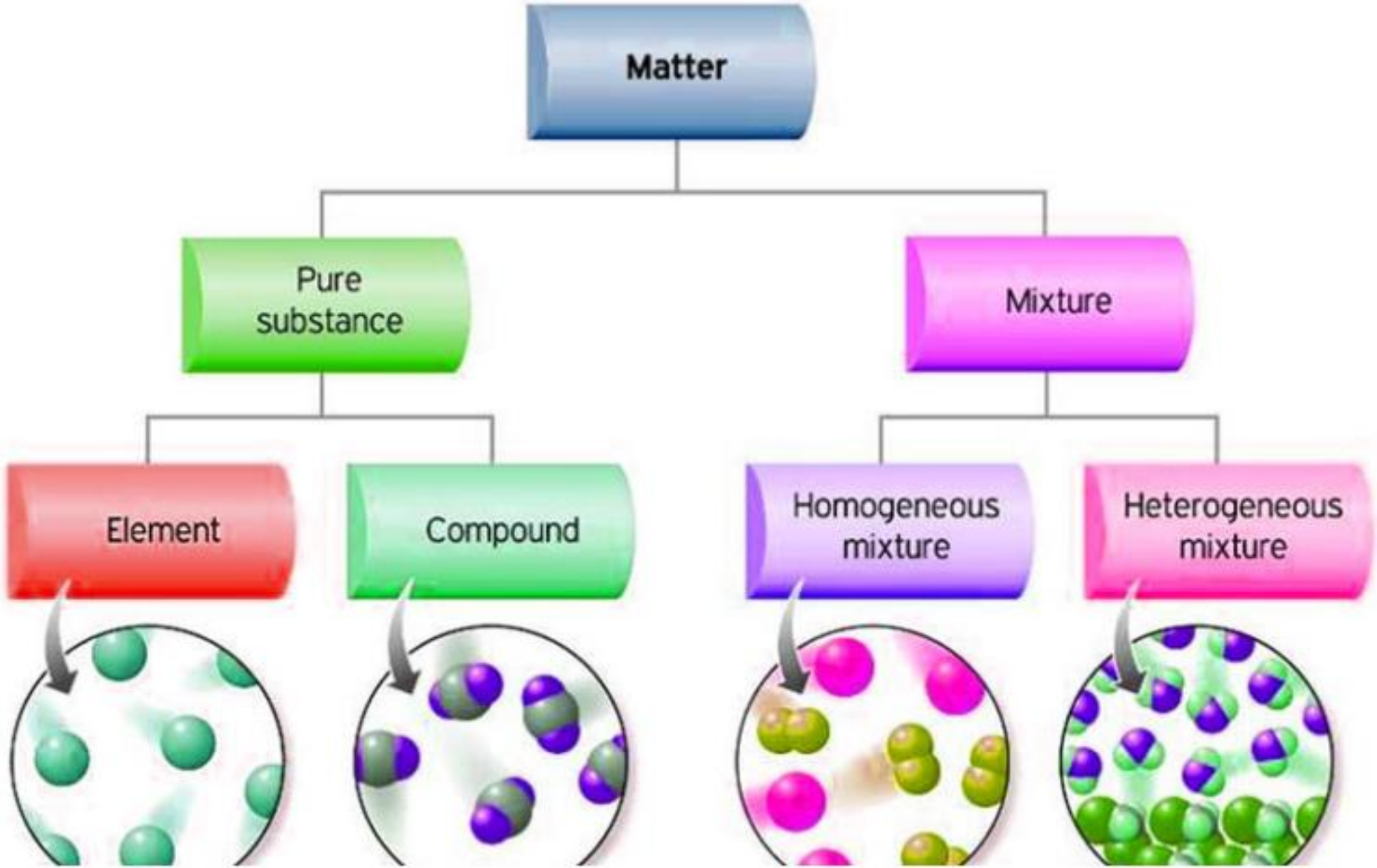
# Review: Organization of Matter

- **Molecule**
  - A **group** of two or more atoms that are **chemically bonded**

# Review: Organization of Matter

- **Compound**
  - A **molecule** formed by combining **two or more different types of atoms**




Matter
Pure substance
Mixture
Element
Compound
Homogeneous mixture
Heterogeneous mixture

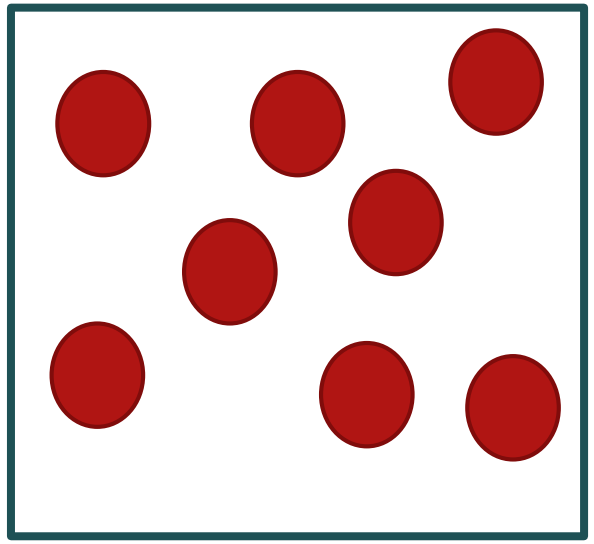
# Review: Organization of Matter

- **Pure substance**
  - A substance made of **all the same types of atoms or molecules**
    - Only **one type** of particle

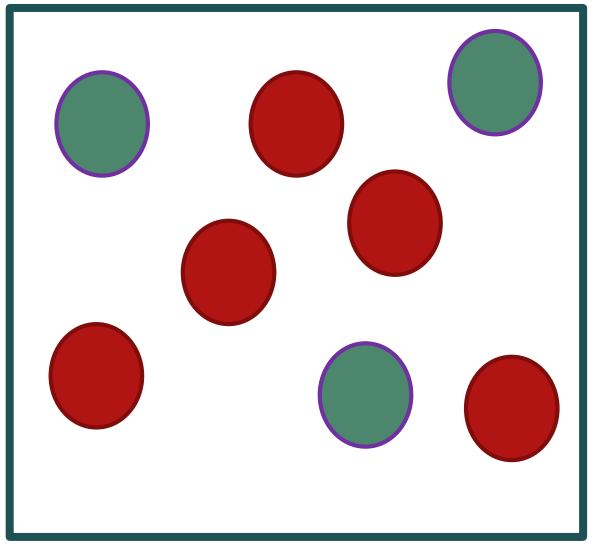
# Review: Organization of Matter

- **Mixture**
  - Two or more substances that are **NOT chemically combined** (contains at least two different types of particles)

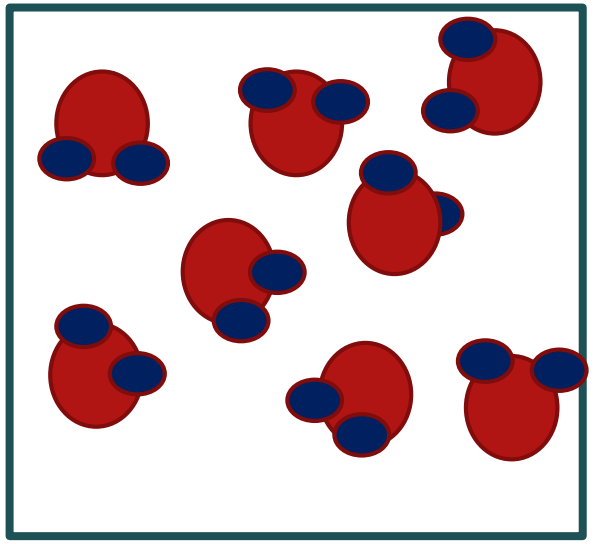
# Mixture or Pure Substance?



Pure substance



Mixture



Pure substance

# Mixture or Pure Substance?

Mixture

Mixture


Pure substance

# Review: Organization of Matter

- **Heterogeneous mixture**
  - A mixture where you can **clearly see** the **different particles or layers**

# Review: Organization of Matter

- **Homogeneous mixture**
  - A mixture of substance that **looks uniform** to the naked eye
  - You **cannot** see the **difference between the particles**

# Heterogeneous Mixtures

- A mixture of substances where you can clearly see the different particles

# Homogeneous Mixtures

- A mixture of substance that looks uniform
  - You cannot see the difference between the particles

# Review: Organization of Matter

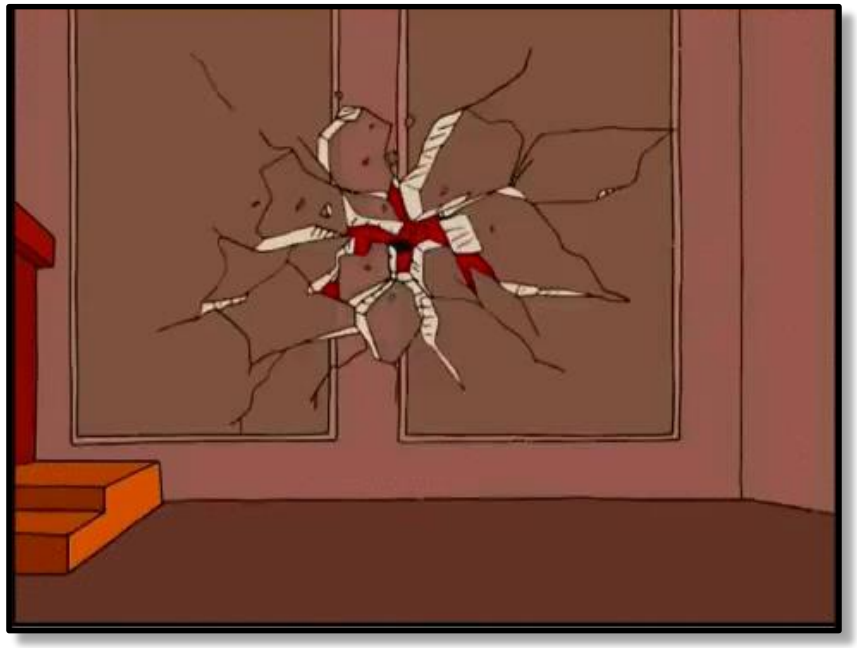
- **Solution**
  - A **homogeneous mixture** where the parts **cannot be distinguished** from each other even under **magnification**

# Review: Organization of Matter

- **Colloid**
  - A **homogeneous mixture** where the parts cannot be distinguished from each other to the **naked eye**
  - But the particles **CAN be distinguished under magnification**

# Solution

- A homogeneous mixture where the parts cannot be distinguished from each other even under magnification

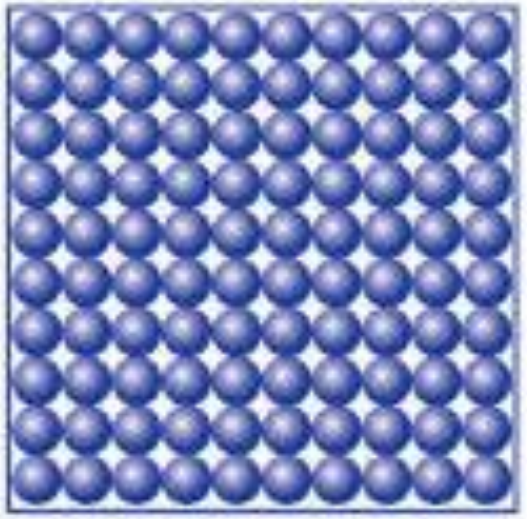


# Colloid

- A homogeneous mixture where the parts can be distinguished under magnification

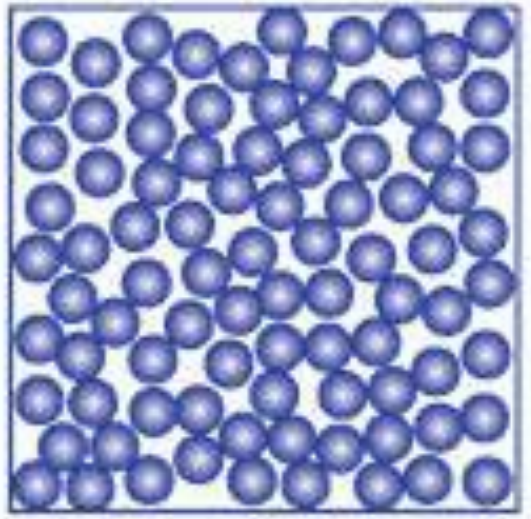

# Review

- How would you draw the particle model of a solid? Liquid? Gas?



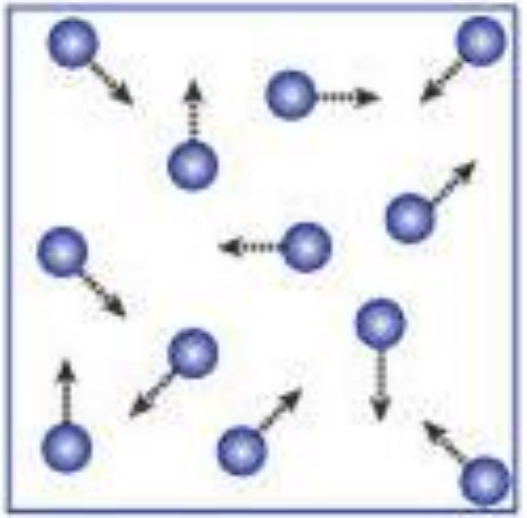
Solid

-Neatly arranged
-Strong forces of attraction between particles (physical bonds)
-No real movement of particles



Liquid

-Close together but not as structured as a solid
-Weak forces of attraction between particles
-Particles can slide over each other



Gas

-Far apart
-No forces of attraction between particles
-Move a lot!


# Characteristic vs Non-Characteristic Properties

# Characteristic vs Non-Characteristic Properties

- When identifying an unknown substance in the lab, we are dependent on the **observations that we make**

# Characteristic vs Non-Characteristic Properties

- We look at the **different properties** of the substance and use all of the information collected as **evidence** in order to identify what it could be
  - These properties can be **characteristic or non-characteristic**

# Non-Characteristic Properties

- A chemical or physical property that **is shared by many different substances**
  - Examples:

-Colour
-Shape
-Mass

-pH
-Temperature
-Volume

-Solubility
-Magnetism
-Electrical conductivity

# Physical vs Chemical Properties of Matter

- **Physical properties:** can be **observed or measured without modifying** the nature of the substance.
- Ex: color, smell, physical state, melting point, boiling point, mass, texture, taste, ductility, malleability, volume, density, conductivity, solubility.

# Physical vs Chemical Properties of Matter

- **Chemical properties:** describe how the substance **reacts with other substances**
- Ex. Combustible, reacts to water or acid, resistance to rusting, reacts to contact with a flame, reacts to limewater.

# Testing for Identification

- *Although non-characteristic properties can be shared by many different substances, they can still be useful in helping to identify an unknown*

# Characteristic Properties

- A property that is **unique to a particular substance**
  - **No other substance** shares this property
  - Examples of physical characteristic properties:
    - **Density (m/V)**
    - **Boiling point**
    - **Melting/Freezing point**

Examples of chemical characteristic properties

- **Reaction to litmus**
- **Reaction to cobalt chloride paper**
- **Reaction to limewater**
- **Reaction to glowing or burn paper**

# Physical vs Chemical Changes

# Physical vs Chemical Changes

- **Physical Changes**
  - Affects the **form** of a chemical substance, but **does not alter the chemical composition**
  - You can **separate mixtures by physical means** such as melting, cooling, bending, stretching and other means
  - Includes **phase changes**

# Physical vs Chemical Changes

- **Chemical Changes**
  - **Changes** the entire **chemical composition** of the substance
  - Involve **chemical reactions**

# Chemical or Physical Change?

Physical

Chemical

Chemical

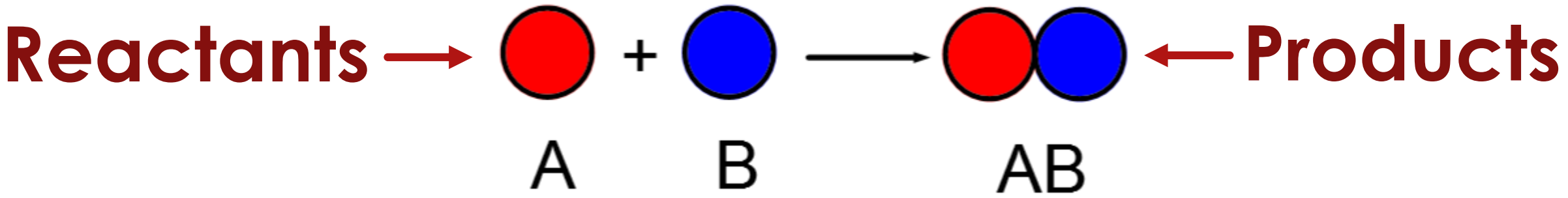
# Signs of a Chemical Changes

- What are some signs of a chem

1. **Precipitation** (forr
2. **Release of gas** (b
3. **Change in colou**
4. **Production of ligh**
5. **Release of heat**

# Types of Chemical changes

- Chemical changes involve **chemical reactions**
  - We represent these in the form of **equations**



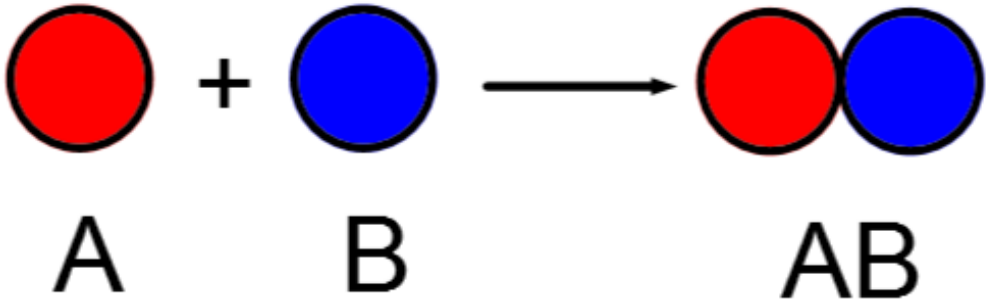

The substances on the left are the **reactants**, and on the right are the **products**

# Types of Chemical changes

- There are several different types of chemical reactions:
  - Synthesis reactions
  - Decomposition reactions
  - Oxidation reactions
  - Precipitation reactions

# Synthesis Reactions

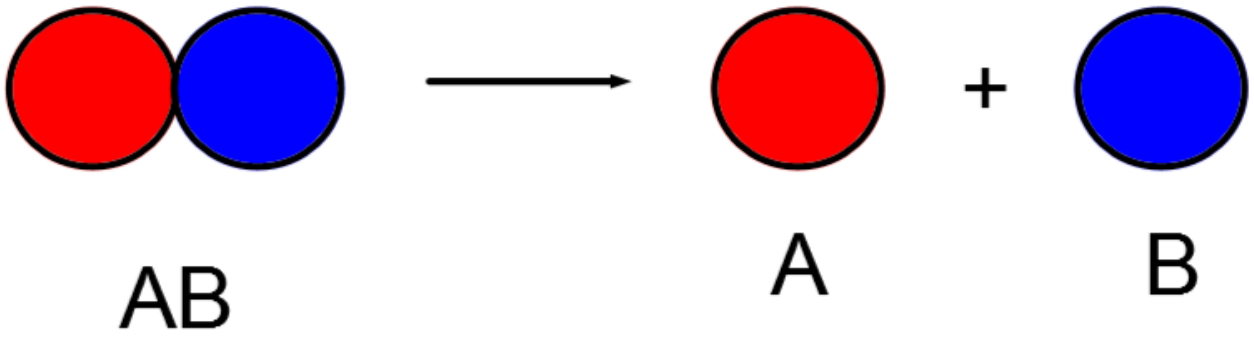
- When **two or more substances combine to produce a new substance**




- Resulting product has a greater mass than the each of the **original reactants**

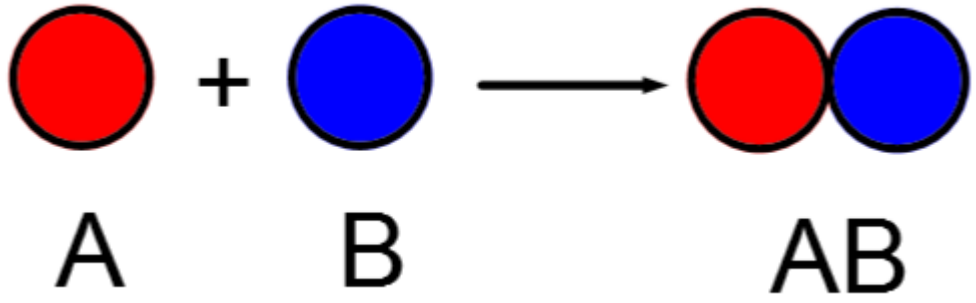
# Decomposition Reactions

- When a **compound is broken down** into two or more **simpler** substances
  - Basically the **opposite of a synthesis reaction**



# Oxidation Reactions

- Any reaction where **oxygen is one of the reactants**




**One of these has to be $O_2$**

# Precipitation Reactions

- When **two solutions** are combined to form a new **solid substance (the precipitate)** that is **insoluble** in the solution
  - Insoluble: **cannot be dissolved**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