

MATTER - NOTES

1. Ions

- When an atom loses or gains electrons it becomes a charged atom. A charged atom is called an **ion**.
- Elements tend to acquire the configuration of the inert gas closest to them in the periodic table.

Example:

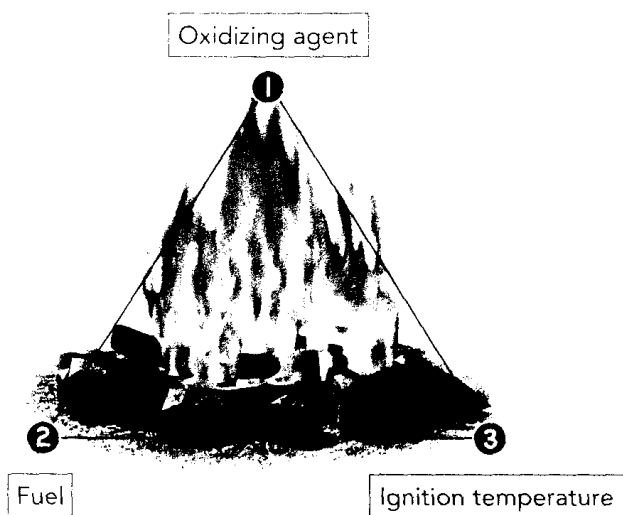
Calcium has 20 protons and 20 electrons. When it loses its two valence electrons, what charge does it have?

It becomes a positive ion with a charge of +2.

Chemical Changes

1. Combustion

- Signs (heat and light)
- Fire triangle



- ① An oxidizing agent, or oxidant, is a substance that can cause a fuel to react. Oxygen is the most common oxidizing agent on Earth.
- ② A fuel is a substance that releases a large amount of energy by reacting with an oxidizing agent. Wood and propane are excellent fuels.
- ③ The ignition temperature is the minimum temperature at which the energy present is sufficient to start combustion. Ignition temperatures vary from one fuel to another.

Types of Combustion:

A. Rapid

- Large amounts of heat and energy are released, often results in a flame!

B. Spontaneous

- Type of combustion that starts without an external ignition source
- The "heat" side of the fire triangle; in rapid and slow combustions you need an external source of ignition to start off the reaction; once started the heat produced fuels it along

C. Slow

- Reaction is slow and have gradual release of energy over time. Usually does not produce a flame.

2. Photosynthesis and respiration

- Producers carry out photosynthesis to make their own food
 - Carbon dioxide + water + sunlight → glucose (food) + oxygen
- Respiration takes place in the cells of most living organisms
 - Glucose + oxygen → carbon dioxide + water + energy
 - The energy produced is used to keep the body warm and/or used to carry out tasks

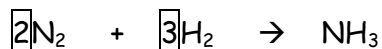
3. Acid-base neutralization

- Acids neutralize bases and bases neutralize acids
 - Acid + base → salt + water
 - ex. "Liming" a lake means adding a base to lake water to decrease its acidity (increase its pH)

4. Balancing chemical equations

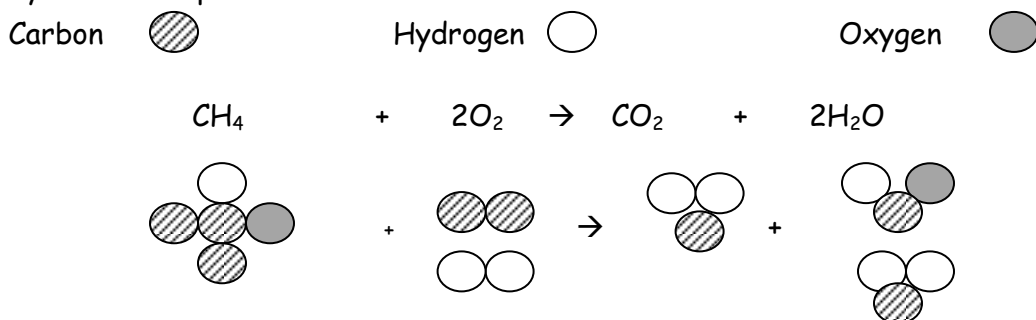
- The number of each type of atom on each side of a chemical equation must remain constant.

Example: Balance the following equation: $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$



Particle models

Example: Draw a particle model of the following chemical reaction. Use these symbols to represent the atoms.



Conservation of mass

- The mass of the reactants equals the mass of the products.

Example:

Eight grams of methane (CH_4) is burned in 32 grams of oxygen (O_2) according to the following equation: $\text{CH}_4 + 2 \text{O}_2 \rightarrow \text{CO}_2 + 2 \text{H}_2\text{O}$

Along with a certain quantity of water, 22 grams of carbon dioxide (CO_2) is obtained. What is the mass of water obtained?

Mass of reactants = Mass of products

$$\begin{array}{rclcl} 8\text{g} & + & 32\text{g} & = & 22\text{g} & = & ? \\ & & 40\text{g} & = & & 40\text{g} \end{array}$$

$$40\text{g} - 22\text{g} = \underline{18\text{g}}$$

TYPES OF REACTIONS:

- $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy (light)} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
– **PHOTOSYNTHESIS**
- $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$
– **RESPIRATION**
- $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
– **COMBUSTION**
- $\text{HNO}_3 + \text{LiOH} \rightarrow \text{H}_2\text{O} + \text{LiNO}_3$
– **NEUTRALIZATION**
- $\text{NH}_4\text{OH} \rightarrow \text{NH}_3 + \text{H}_2\text{O}$
– **DECOMPOSITION**
- $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
– **SYNTHESIS**
- $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
– **REPLACEMENT**