**Grade 8 Understanding Chemical Reactions**

**New Vocabulary**

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| --- | --- |
| **English Word** | **Definition** |
| Chemical Bond | Chemical bond attraction between atoms when electrons are shared, transferred, or pooled |
| Coefficient | Number placed in front of an element symbol or chemical formula in an equation |
| Chemical Reaction | Process in which atoms of one or more substances rearrange to form one or more new substances |
| Chemical Equation | Description of a reaction using element symbols and chemical formulas |
| Reactant | Starting substance in a chemical reaction |
| Product | New substance produced by a chemical reaction |
| Endothermic Reaction | Chemical reactions that absorb thermal energy |
| Exothermic  Reaction | Chemical reactions that release thermal energy |
| Activation Energy | Minimum amount of energy needed to start a chemical reaction |
| Catalyst | Substance that increases the reaction rate by lowering the activation energy of a reaction |
| Enzyme | Catalyst that speeds up chemical reactions in living cells |
| Inhibitor | Substance that slows down, or even stops, a chemical reaction |

**Changes in Matter**

**Physical Changes**

Does not produce a new substance – Water freezing to become Ice – it only changes from a liquid to a solid but the water does not change into a different substance.

**Chemical Changes**

Substances change into a new substance. The starting substance (Reactant) and the produced substance (Product) have different physical and chemical properties. This is called a chemical reaction – where atoms of one substance rearrange to form a new substance.

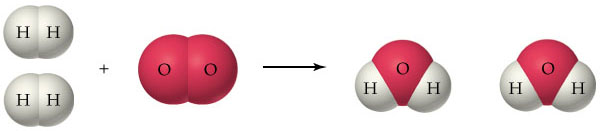
**Signs of Chemical Reactions**

|  |  |
| --- | --- |
| **Changes in Properties** | |
| Change in color | Formation of Bubbles |
| Change in smell | Formation of a Precipitate (a solid formed) |

|  |  |
| --- | --- |
| **Changes in Energy** | |
| Warming and Cooling | Production of Light |

**What happens in chemical reactions?**

**Atoms rearrange** to form new Substances and **bonds break and new bonds form**. Look at the formation of water molecules in the diagram below. See how the atoms rearranged and where bonds broke and new bonds have formed.



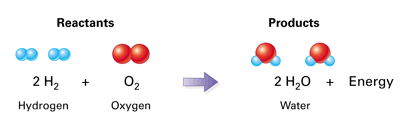
**Chemical Equations**

A description of a chemical reaction using element symbols and chemical formulas. Element symbols like **Cu** for copper and **O2** for Oxygen. Chemical Formulas like **CO2** for carbon dioxide and **H2O** for Water.

**Writing chemical Reactions**

The starting substance in a chemical reaction is a **REACTANT** where the produced substances are **PRODUCTS.** Chemical formulas are used to describe the reactants and products

Reactants are written on the left 🡪 Products are written on the right



**Conservation of Mass in Chemical Reactions**

The law of conservation of mass states that the total mass of the reactants before the chemical reaction is the same as the total mass of the products after the chemical reaction.

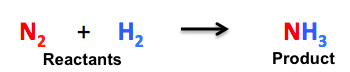
This is because atoms are not destroyed or created. All atoms at the start of the chemical reaction are present at the end of the chemical reaction and therefore the mass will be exactly the same.

**Balancing Chemical Equations**

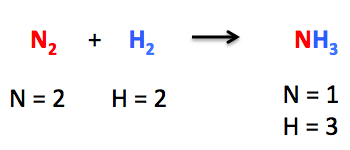
Like discussed before the amount of atoms in the reactants has to be the same as the amount of atoms in the products at the end of a chemical reaction. To achieve this we have to balance the equation to make sure it is the same.

You add coefficients in front of an element or compound

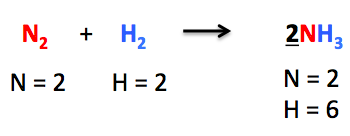
1. **Write the unbalanced equation**



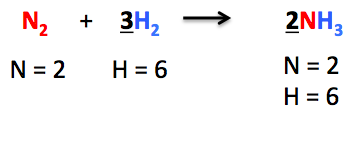
1. **Count atoms of each element in the reactants.**



1. **Add Coefficients to balance the atoms**
   1. Pick an element that is not balanced and ad a coefficient in front of the reactant or product
   2. Recount the atoms on both sides



* 1. Repeat until balanced



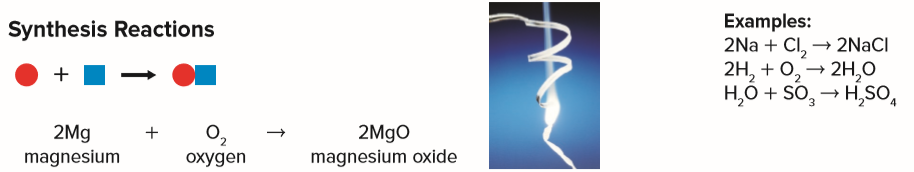
1. Write the balanced chemical reaction including the coefficients.

N2 + **3**H2  🡪 **2**NH3

**Types of Chemical Reactions**

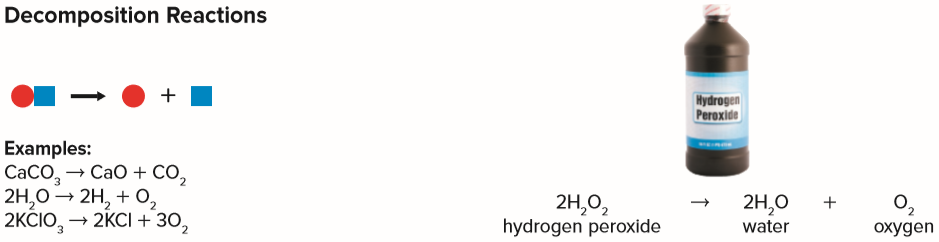
1. **Synthesis**

A type of chemical reaction in which two or more substances combine and form one compound



1. **Decomposition**

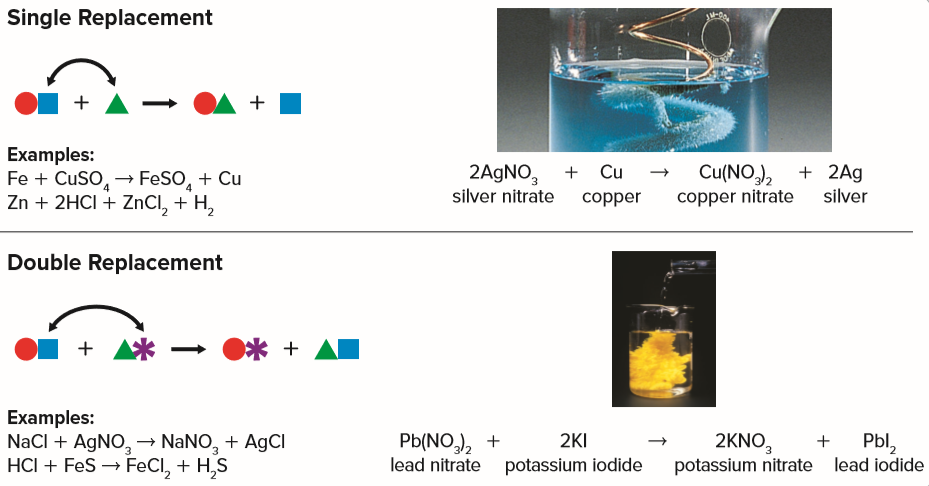
One compound breaks down and forms two or more substances.

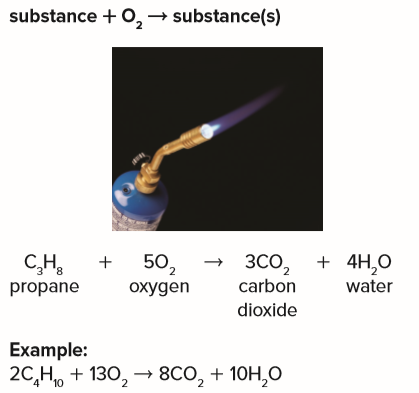


1. **Replacement**

An atom or group of atoms replaces part of a compound.

1. **Single replacement reaction**, one element replaces another element in a compound.
2. **Double-replacement reaction**, the negative ions in two compounds switch places, forming two new compounds.



1. **Combustion**

A chemical reaction in which a substance combines with oxygen and releases energy.

**Chemical Energy in Bonds**

When chemical reaction occur bonds in the reactant break and new bonds form, these bonds contain chemical energy

**Breaking a bond requires energy**

**Forming a bond release energy**

**Endothermic Reactions – Energy Absorbed**

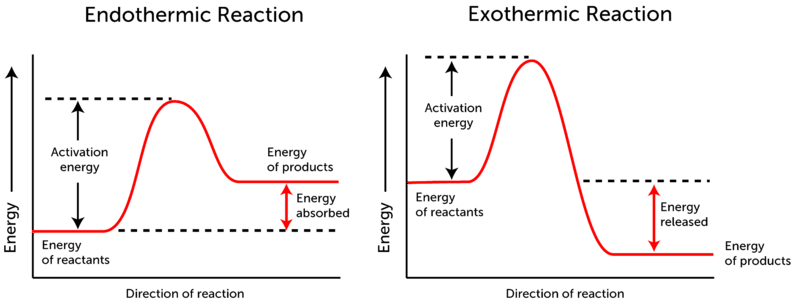
Chemical reactions that absorb thermal energy are Endothermic Reactions

**Reactants + Thermal Energy 🡪 Products**

**Exothermic Reactions – Energy Released**

Chemical reactions that release thermal energy are Exothermic Reactions

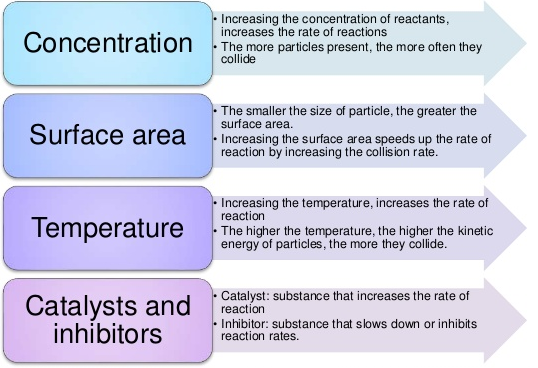
**Reactants 🡪 Products + Thermal Energy**



**Activation Energy**

Some chemical reactions do not just start by themselves, they require energy to start the breaking of bonds and this is called **Activation Energy** – the minimum amount of energy needed to start a chemical reaction.

**Factors that affect Reaction Rates**

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