

## Vocabulary: Chemical Changes



### Vocabulary

- **Acid** – a compound that donates protons ( $H^+$  ions) to a base.
  - Acids are often sour in taste, can burn the skin and eyes, and react with a base to produce a salt and water.
  - The chemical formula of an acid usually begins with “H.” Examples are hydrochloric acid (HCl), sulfuric acid ( $H_2SO_4$ ), and nitric acid ( $HNO_3$ ).
- **Base** – a chemical compound that accepts protons ( $H^+$  ions) from an acid.
  - Bases such as detergent and bleach are bitter in taste, have a slippery texture, and react with acids to produce a salt and water. Strong bases can cause burns.
  - The chemical formula of a base always ends with “OH.” Examples are sodium hydroxide (NaOH), potassium hydroxide (KOH), and calcium hydroxide ( $Ca(OH)_2$ ).
- **Catalyst** – a substance that increases the rate of a chemical reaction without being permanently altered by the reaction.
  - A catalyst usually lowers the energy required to start the reaction.
- **Chemical change** – a change that results in the formation of new substances.
  - Chemical changes may be indicated by changes in appearance, color, texture, state, temperature, or other clues.
  - When a chemical change occurs, bonds holding atoms together are broken and new bonds are formed.
  - Chemical changes are also known as chemical reactions.
- **Coefficient** – a number that multiplies a term in an equation.
  - In a chemical equation, the coefficients indicate the number of each type of molecule. For example,  $6H_2O$  means that there are six water molecules.
- **Conservation of matter** – a scientific law that states that the total amount of matter in a closed system remains constant.
  - No atoms are created or destroyed when a chemical reaction occurs. Therefore, the total mass of the *products* is equal to the total mass of the *reactants*.
- **Decomposition** – a chemical reaction in which a single substance is broken down into two or more products.
  - For example, salt (NaCl) is decomposed into sodium (Na) and chlorine gas ( $Cl_2$ ).

- Dissolve – to pass into solution. For example, salt or sugar can dissolve into water.
  - When a salt such as NaCl dissolves in water, it separates into  $\text{Na}^+$  and  $\text{Cl}^-$  ions. Most chemists consider this to be a chemical change.
  - When sugar dissolves in water, it separates into individual sugar molecules. Because each sugar molecule remains whole, this is not a chemical change.
- Double replacement – a reaction in which two compounds exchange elements or molecules with one another.
  - For example, sodium sulfide ( $\text{Na}_2\text{S}$ ) and hydrochloric acid (HCl) react to form salt (NaCl) and hydrogen sulfide ( $\text{H}_2\text{S}$ ).
- Endothermic– a process that absorbs heat energy.
  - In an endothermic reaction, the temperature of the system decreases.
- Exothermic– a process that releases heat energy.
  - In an exothermic reaction, the temperature of the system increases.
- Indicator – a substance that changes color when in contact with an acid or base.
  - For example, phenol red turns yellow in an acid, orange in a neutral solution, and reddish pink in a base.
- Ion – a charged atom or molecule that results from gaining or losing electrons.
  - Atoms or molecules that gain electrons have a negative charge, such as  $\text{Cl}^-$ .
  - Atoms or molecules that lose electrons have a positive charge, such as  $\text{H}^+$ .
- Physical change – a change that affects the shape or phase of a substance but does not produce new substances. For example, ice melting into water is a physical change.
- Product – a substance that results from a chemical reaction.
- Reactant – a substance that takes part in and is changed by a chemical reaction.
- Single replacement – a reaction in which an element reacts with a compound to form a new compound and a different element.
  - For example, aluminum (Al) can react with hydrochloric acid (HCl) to form aluminum chloride ( $\text{AlCl}_3$ ) and hydrogen gas ( $\text{H}_2$ ).
- Subscript – a number representing the number of atoms of an element in one molecule.
  - For example, the subscript “2” in  $\text{H}_2\text{O}$  indicates that there are two hydrogen atoms in a water molecule. (If there is no subscript, there is one atom of that element in the molecule.)
- Synthesis– a chemical reaction in which two or more reactants form a single product. Synthesis reactions are also called “combination” reactions.
  - For example, hydrogen ( $\text{H}_2$ ) combines with oxygen ( $\text{O}_2$ ) to form water ( $\text{H}_2\text{O}$ ).

