Vocabulary: Chemical Equations

Vocabulary

- Avogadro's number – the number of atoms or molecules in a *mole* of a substance.
  - Avogadro's number is equal to 6.0221415×10^{23}.
- Chemical equation – a symbolic representation of a chemical reaction.
  - In a chemical equation, reactants are shown on the left, and products are shown on the right.
  - For example, the chemical equation $Na + Cl_2 \rightarrow NaCl$ describes the reaction of sodium (Na) and chlorine gas (Cl_2) to form table salt.
  - In a balanced chemical equation, there are the same numbers of each type of atom on each side of the equation: $2Na + Cl_2 \rightarrow 2NaCl$ is balanced because there are two sodium atoms and two chlorine atoms on each side of the equation.
- Chemical formula – a symbolic representation of an element or compound.
  - Chemical formulas use *subscripts* and parentheses to denote the number of atoms in a molecule of the substance.
  - Examples of chemical formulas include NaCl (table salt), H_2O (water), and $Ca(OH)_2$ (calcium hydroxide).
- Chemical reaction – a process in which one or more substances are transformed into others.
  - In a chemical reaction, bonds between atoms are broken and new bonds are formed, joining atoms into different combinations.
  - No atoms are created or destroyed in a chemical reaction.
- 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.
- Combination – a chemical reaction in which two or more reactants form a single product.
  - Combination reactions are also called *synthesis* reactions.
  - For example, hydrogen (H_2) combines with oxygen (O_2) to form water (H_2O).
- Combustion – a chemical reaction in which a fuel is burned.
  - Most examples of combustion involve the burning of a hydrocarbon in oxygen, producing water and carbon dioxide.
  - For example, methane burns in oxygen to form water and carbon dioxide:

$$CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$$

- Conservation of matter – a scientific law that states that the total amount of matter in a closed system remains constant.
    - A chemical equation satisfies conservation of matter if it is balanced.

- Decomposition – a chemical reaction in which a single substance is broken down into two or more products.
    - For example, salt (NaCl) can be decomposed into sodium (Na) and chlorine gas (Cl_2).

- Double replacement – a chemical reaction in which two compounds exchange elements or molecules with one another.
    - For example, sodium sulfide (Na_2S) and hydrochloric acid (HCl) react to form salt (NaCl) and hydrogen sulfide (H_2S).

- Molar mass – the mass of one mole of a substance.
    - The molar mass of an element or compound in grams is equal to the atomic mass of the atom or molecule of which it is composed.
    - For example, the atomic mass of an oxygen molecule (O_2) is 32 universal mass units. The molar mass of oxygen gas is 32 grams.

- Mole – a unit amount of substance.
    - A mole of a substance has the same number of particles as 12.0 grams of carbon-12.
    - The SI symbol for the mole is “mol.”

- Molecular mass – (M) the mass of a molecule of a substance, as measured in universal mass units (u).

- Molecule – a stable particle made of two or more atoms.
    - A water molecule (H_2O) is made of two hydrogen atoms and one oxygen atom.

- Product – a substance that is formed in a chemical reaction.

- Reactant – a substance that takes part in a chemical reaction.

- Single replacement – a chemical reaction in which an element reacts with a compound to form a new compound and a different element.
    - For example, aluminum (Al) reacts with hydrochloric acid (HCl) to form aluminum chloride ($AlCl_3$) and hydrogen gas (H_2).

- Subscript – a number in a chemical formula representing the number of atoms of a particular element in one molecule of the compound.
    - For example, the subscript “2” in H_2O indicates that there are two hydrogen atoms in a water molecule.