7.P.2B.5

Develop and use models to explain how chemical reactions are supported by the law of conservation of matter.

Chemical equation

- **Used to represent a chemical reaction that has occurred.**
- **It contains the chemical names or the chemical formulas of the substances that are involved in the reaction.**

Reactant

- **Substances broken apart or combined in a chemical reaction.**
- **Reactants are located on the left side of the arrow.**

Yields

- **An arrow is used to distinguish between the substances that are broken apart or combined from the substances that are formed in the reaction.**
- **The arrow can be translated as “yields” or “makes.”**

Product

- **New substances formed in a chemical reaction.**
- **Products are located on the right side of the arrow.**

For Example…

Reactant		Product
Hydrogen gas + Oxygen gas	Yields/Makes	Water
$2H_2 + O_2$	→	$2H_2O$

Law of Conservation of Matter

States that matter can neither be created nor destroyed, but can be *changed* in form.

- Because matter is neither created nor destroyed, the total mass of the material(s) before the reaction is the same as the total mass of material(s) after the reaction.

Balanced Chemical Equation

Has the same number of each kind of atom on the reactant side as on the product side.

- To determine whether a chemical equation is balanced, two numbers are considered: the subscript and the coefficient.

Coefficient

- the number that comes before the chemical formula and indicates the number of particles that participate in the reaction

- To determine whether an equation is balanced, **multiply** the number in front of the chemical formula in the equation (coefficient) by the number written below the symbol for the element(s) (subscript) in the formula.
- What if there is no coefficient?
- The number of each kind of atom on the left side of the arrow must equal the number of each kind of atom on the right side of the arrow for the equation to be balanced.

- For example, in the chemical equation for the reaction of water (liquid) breaking into hydrogen (gas) and oxygen (gas) as represented by the balanced chemical equation:
- $2H_2O \rightarrow 2H_2 + O_2$

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- There are four hydrogen atoms on the reactant side (coefficient of 2 x subscript 2) and four hydrogen atoms on the product side (coefficient 2 x subscript 2).
- There are two oxygen atoms on the reactant side (coefficient 2 x (understood) subscript 1) and two oxygen atoms on the product side ((understood coefficient 1 x subscript 2).
- There are the same number of hydrogen atoms (4) and oxygen atoms (2) on both sides of the equation; therefore, the equation is said to be balanced.
- Since there are the same number of each kind of atom on both sides of the arrow and atoms represent kinds of matter, the amount of matter is the same on both sides of the equation, which supports the law of conservation of matter.

1. $N_2 \rightarrow 2N$
2. $2Na + Cl \rightarrow$
3. $H_2O + 2H \rightarrow$
4. $2H_2O + 3H_2 \rightarrow$
5. $4N_2O_3 + 3NaCl \rightarrow$