Conservation Law: Balancing Chemical Equations

Chemical Equations

- When two or more chemicals are combined, they may react to form new substances that have **_____** different from the original chemicals

Two ways to write chemical equations:

1. **Word Equations:** uses written chemical names for reactants and products
    - Example: sodium + oxygen → **_____**
2. **Symbolic/Formula Equations:** uses chemical formula for reactants and products
    - Example: $Na + O_2$ → **_____**

Law of Conservation of Mass:

- States that mass is **_____** in a chemical reaction
    - mass of **_____** = mass of **_____**
- Since matter cannot be **_____** nor **_____**, then all of the atoms in the reactants must exist as atoms in the products

Balancing Chemical Equations

- Chemical equations are balanced to show that the total number of each type of atom is **_____** on both sides of the chemical equation.

Tips for Balancing Equations:

1. Balance pure elements last.
2. Double odd number of atoms if there is an even number on the other side.
3. Balance complex ions by counting groups of that ion. e.g., how many groups of SO_4^{-2} on each side of the equation?
4. When balancing compounds, balance any oxygen and hydrogen last.

1. Write out the full formula equation (called a **skeleton** equation).

2. Draw a separating column or line under the "yields" sign of the reaction and write the unique atoms.

$$Na + O_2 \longrightarrow Na_2O$$

3. Write the number of each unique atom for the reactant (left) side and for the product (right) side.

$$Na + O_2 \longrightarrow Na_2O$$

Na
O

4. Pick an atom that has a **different** number of reactants than products (an imbalance).

$$Na + O_2 \longrightarrow Na_2O$$

1	Na	2
2	O	1

5. Use coefficients (numbers in **front** of each element or compound) to increase quantities of a particular element and mark the change by the separating column or line.

* DO NOT change the subscript number; if you do, you change the **substance**.

$$Na + O_2 \longrightarrow Na_2O$$

1	Na	2
2	O	1

6. Repeat steps 4-5 until complete

$$2Na + O_2 \longrightarrow Na_2O$$

2 ✗	Na	2
2	O	1

7. Double check when finished.