

Chemical equations must be balanced.

Remember, chemical reactions follow the law of conservation of mass. Chemical equations show this conservation, or equality, in terms of atoms. The same number of atoms of each element must appear on both sides of a chemical equation. However, simply writing down the chemical formulas of reactants and products does not always result in equal numbers of atoms. You have to balance the equation to make the number of atoms equal on each side of an equation.

Balancing Chemical Equations

To learn how to balance an equation, look at the example of the combustion of natural gas, which is mostly methane (CH_4). The reactants are methane and oxygen. The products are carbon dioxide and water. You can write this reaction as the following equation.

Unbalanced Equation

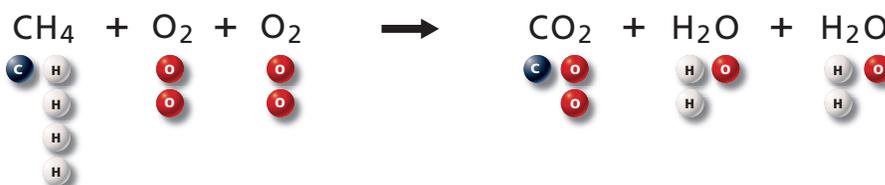


This equation is not balanced. There is one C on each side of the equation, so C is balanced. However, on the left side, H has a subscript of 4, which means there are four hydrogen atoms. On the right side, H has a subscript of 2, which means there are two hydrogen atoms. Also, there are two oxygen atoms on the left and three oxygen atoms on the right. Because of the conservation of mass, you know that hydrogen atoms do not disappear and oxygen atoms do not suddenly appear.

You can balance a chemical equation by changing the amounts of reactants or products represented.

- To balance H first, add another H_2O molecule on the right. Now, both C and H are balanced.
- There are now two oxygen atoms on the left side and four oxygen atoms on the right side. To balance O, add another O_2 molecule on the left.

Balanced Equation



REMINDER

Oxygen is always a reactant in a combustion reaction.

READING TIP

As you read how to balance the equation, look at the illustrations and count the atoms. The number of each type of atom is shown below the formula.