

## What's going on here?

In a chemical reaction, atoms are rearranged and then bond together in different ways to create new substances. In a chemical reaction, the atoms, ions, or molecules reacting together are called the *reactants*. The new substances formed as a result of the chemical reaction are called the *products*.

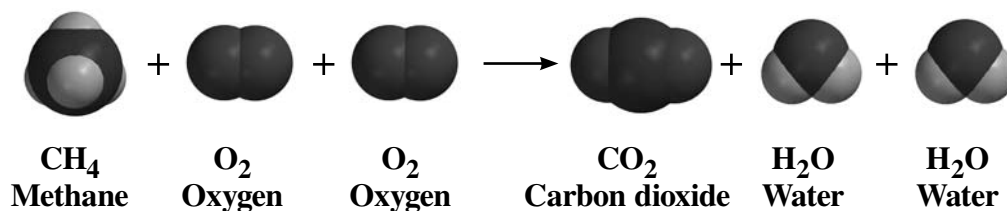
Different words are sometimes used to talk about the substances in a chemical reaction. The term *element* is used for a substance made from only one type of atom. For example, you could have a sample, or piece, of the element carbon. That means that your sample is made of only carbon atoms.

Another word used to describe a substance is *compound*. A compound is a substance made up of all the same molecules. Also, these molecules are made up of more than one type of atom. For example water is a compound because it is made up of all H<sub>2</sub>O molecules. Another example of a compound is carbon dioxide. Carbon dioxide (CO<sub>2</sub>) is made up of only carbon dioxide molecules, and each molecule is made of more than one type of atom.

Something that is always true in a chemical reaction is that the atoms that make up the reactants always show up in the products. No atoms from the reactants are ever destroyed or disappear, and no atoms are ever newly created in the products. Since the same number of atoms are in the reactants as in the products, a chemical reaction can be described in a mathematical way called a *chemical equation*. In a chemical equation, the reactants are written on the left side of an arrow and the products are written on the right. The arrow means that the reactants *form* the products.

### Examples of chemical reactions

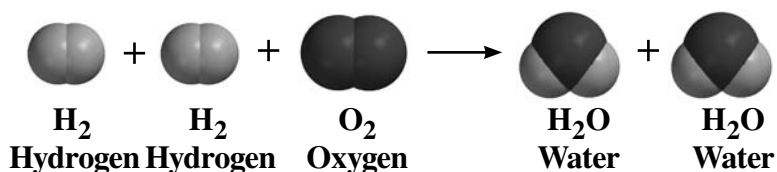
A common example of a reaction between two molecules is the reaction that happens when a gas stove is used to cook. The methane gas in the stove has a chemical formula of CH<sub>4</sub>. It reacts with oxygen (O<sub>2</sub>) from the air to produce carbon dioxide gas (CO<sub>2</sub>), water (H<sub>2</sub>O), and a great deal of heat. Notice how all of the atoms on the left side of the arrow also appear on the right side of the arrow. They are just rearranged to form different molecules.



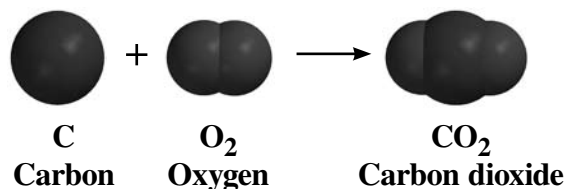
## What's going on here? (continued)

In the reaction between methane and oxygen, the carbon that was in the methane becomes part of the carbon dioxide. The hydrogen atoms from the methane become part of the water. And the oxygen atoms from the air end up in both the carbon dioxide and the water.

In the following reaction hydrogen combines with oxygen to form water.



Here, carbon and oxygen combine to create carbon dioxide gas.



In all of these reactions, the bonds that hold one atom to another in the reactants are broken, the atoms rearrange themselves, and bond together in new ways to form the products.

1. What is the difference between *reactants* and *products* in a chemical reaction?

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2. What is the difference between an *element* and a *compound*?

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## What's going on here? *(continued)*

3. In chemical reactions one or more new substances are created.

Are new *atoms* created? \_\_\_\_\_

Use one of the examples of a chemical reaction described in this article to justify your answer.

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### Cool factoid

It's pretty amazing how chemical reactions can work. Hydrochloric acid (HCl) is a very strong acid. Sodium hydroxide (NaOH) is a very strong base. Both are dangerous for us to even touch. However, if you combine solutions containing the same number of HCl molecules as NaOH molecules, a chemical reaction will take place, producing something neutral and safe—salt water!

