



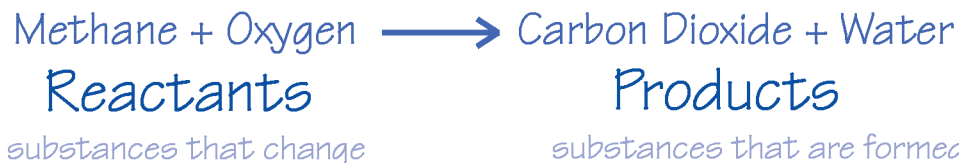
20.2 Chemical Equations

All of the chemical changes you observed in the last Investigation were the result of **chemical reactions**. A chemical reaction involves a rearrangement of atoms in one or more **reactants** to form one or more **products**. All chemical reactions involve the rearrangement of atoms and either use or produce energy. In this section, you will learn how to write “recipes” for such reactions, called **chemical equations**.

What happens during a chemical reaction?

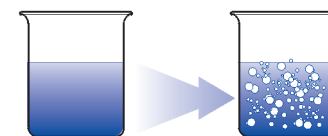
Did a chemical change take place? In the last Investigation, you observed several chemical reactions. For example, in one of the reactions, you mixed vinegar with baking soda. When you mixed these two substances, you observed a fairly violent bubbling as the baking soda appeared to dissolve into the vinegar. You may have noticed a drop in temperature as the reaction proceeded. These observations provide *evidence* that a chemical change has occurred (figure 20.7).

Proving chemical change In order to prove that a chemical change has occurred, you need to be able to confirm that the chemical and physical properties of one or more of the products are different from those of the reactants. For example, when methane (natural gas) is burned, it reacts with oxygen to form carbon dioxide and water. This is a common reaction used to heat homes, cook food—or heat up chemistry experiments! Upon careful examination, you would conclude that carbon dioxide has different chemical and physical properties from methane.



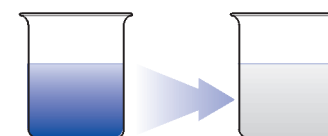
Where does the new substance come from? In ordinary chemical reactions, atoms are rearranged through the breaking and reforming of chemical bonds. In the methane reaction, the bonds between carbon and hydrogen in methane are broken. Carbon reforms a bond with the oxygen to form carbon dioxide, one of the products. Hydrogen also forms a bond with additional oxygen atoms to produce water. In addition, heat and light are produced.

Bubbling



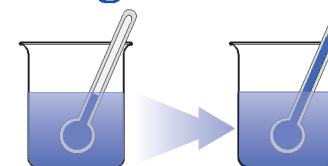
A new gas is forming?

Turns cloudy



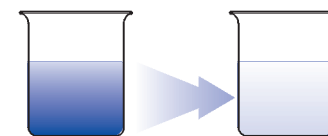
A new solid is forming?

Temperature change



Chemical bonds are changing?

Color change



A new substance is forming?

Figure 20.7: Different kinds of evidence that chemical reactions are occurring.