

In addition to changes of state, there are other physical changes. Dissolving is a physical change. Have you ever thought about what happens when you dissolve a spoonful of sugar in a cup of tea or coffee? The sugar particles spread out, but they are still there as sugar particles.

You can reverse the dissolving process by evaporating the tea or coffee and collecting the sugar again. Most physical changes can be reversed. Can you think of one that cannot be easily reversed?

Chemical Changes

In a **chemical change**, the original substance is changed into one or more different substances. The new substances have different properties from the original substance.

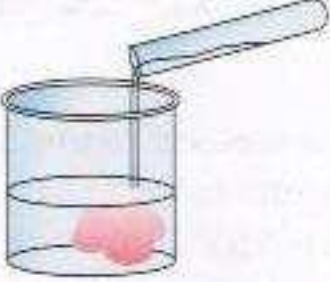


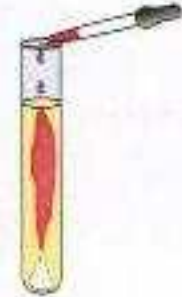
Think about what happens as the candle in **Figure 2** continues to burn. The candle becomes shorter as it continues to burn. Where did the wax go? To answer this question, review the **chemical properties** listed in section 1.2. Some of the wax reacted with oxygen in the air to produce water vapour, carbon dioxide gas, heat, and light. The wax that seemed to disappear actually **changed** into new substances in a **combustion reaction**. The wax is combustible.

Most chemical changes are difficult to reverse. The new substances formed are unlikely to combine again to form the original substance. In addition to combustion, or burning, examples of **chemical change** include rusting and cooking.

When you observe a chemical change, often you cannot “see” the chemical change. Instead, you can observe only the results of the chemical change—the heat and light produced by a **burning candle**, for example. Heat and light are **clues** that a chemical change has happened.

Table 1 contains additional clues. But remember, they are just clues. They *suggest* that a new substance has formed. You must consider several clues to determine what type of change has taken place.

Table 1 Chemical Change Clues

<p>A new colour appears.</p> 	<p>Heat or light is given off.</p> 
<p>Bubbles of gas are formed.</p> 	<p>A solid material (called a precipitate) forms in a liquid.</p> 

Understanding Concepts

1. Explain in your own words how a physical change and a chemical change are different.
2. Identify each of the following as a physical or chemical change. Explain your choice.
 - (a) shattering glass
 - (b) baking cookies in the oven
 - (c) lights left on in a room
 - (d) burning leaves in the fall

Making Connections

3. Why should you never operate a gas or charcoal barbecue inside your home?

Reflecting

4. Look at your observation table for Part 2: Kitchen Chemistry in section 1.1. Which combinations of kitchen chemicals produced physical changes, and which produced chemical changes?

Challenge

- 1, 3 What chemical changes were used to produce the new substance that you are marketing? Which scientist produced this new substance for the first time?
- 1, 2 Does the new substance that you have chosen undergo any chemical changes that might make it harmful to anyone who comes in contact with it?