

Chemical properties describe how substances form new substances.



Learn about the chemical properties of matter.

If you wanted to keep a campfire burning, would you add a piece of wood or a piece of iron? You would add wood, of course, because you know that wood burns but iron does not. Is the ability to burn a physical property of the wood? The ability to burn seems to be quite different from physical properties such as color, density, and shape. More important, after the wood burns, all that is left is a pile of ashes and some new substances in the air. The wood has obviously changed into something else. The ability to burn, therefore, must describe another kind of property that substances have—not a physical property but a chemical property.

Chemical Properties and Changes

Chemical properties describe how substances can form new substances. Combustibility, for example, describes how well an object can burn. Wood burns well and turns into ashes and other substances. Can you think of a chemical property for the metal iron? Especially when left outdoors in wet weather, iron rusts. The ability to rust is a chemical property of iron. The metal silver does not rust, but eventually a darker substance called tarnish forms on its surface. You may have noticed a layer of tarnish on some silver spoons or jewelry.

INFER The bust of Abraham Lincoln is made of bronze. Why is the nose a different color from the rest of the head?

The chemical properties of copper cause it to become a blue-green color when it is exposed to air. A famous example of tarnished copper is the Statue of Liberty. The chemical properties of bronze are different. Some bronze objects tarnish to a dark brown color, like the bust of Abraham Lincoln in the photograph on the left.

Chemical properties can be identified by the changes they produce. The change of one substance into another substance is called a chemical change. A piece of wood burning, an iron fence rusting, and a silver spoon tarnishing are all examples of chemical changes. A chemical change affects the substances involved in the change. During a chemical change, combinations of atoms in the original substances are rearranged to make new substances. For example, when rust forms on iron, the iron atoms combine with oxygen atoms in the air to form a new substance that is made of both iron and oxygen.

A chemical change is also involved when an antacid tablet is dropped into a glass of water. As the tablet dissolves, bubbles of gas appear. The water and the substances in the tablet react to form new substances. One of these substances is carbon dioxide gas, which forms the bubbles that you see.



Not all chemical changes are as destructive as burning, rusting, or tarnishing. Chemical changes are also involved in cooking. When you boil an egg, for example, the substances in the raw egg change into new substances as energy is added to the egg. When you eat the egg, further chemical changes take place as your body digests the egg. The process forms new molecules that your body then can use to function.

Check Your Reading

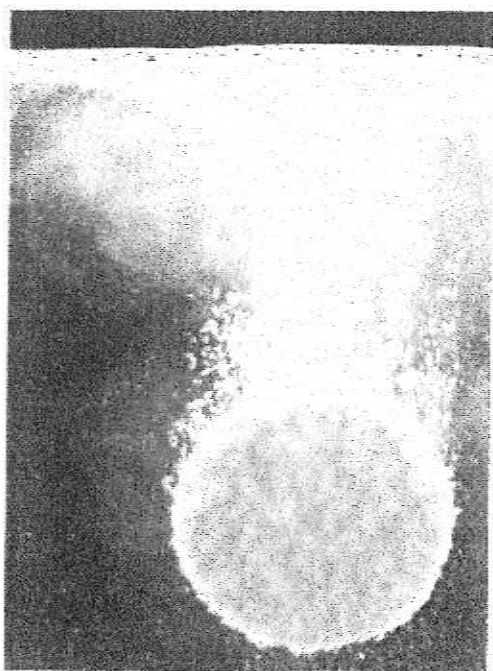
Give three examples of chemical changes.

The only true indication of a chemical change is that a new substance has been formed. Sometimes, however, it is difficult to tell whether new substances have been formed or not. In many cases you have to judge which type of change has occurred only on the basis of your observations of the change and your previous experience. However, some common signs can suggest that a chemical change has occurred. You can use these signs to guide you as you try to classify a change that you are observing.

Signs of a Chemical Change

You may not be able to see that any new substances have formed during a change. Below are some signs that a chemical change may have occurred. If you observe two or more of these signs during a change, you most likely are observing a chemical change.

Carbon dioxide bubbles form as substances in the tablet react with water.



Production of an Odor Some chemical changes produce new smells. The chemical change that occurs when an egg is rotting produces the smell of sulfur. If you go outdoors after a thunderstorm, you may detect an unusual odor in the air. The odor is an indication that lightning has caused a chemical change in the air.

Change in Temperature Chemical changes often are accompanied by a change in temperature. You may have noticed that the temperature is higher near logs burning in a campfire.

Change in Color A change in color is often an indication of a chemical change. For example, fruit may change color when it ripens.

Formation of Bubbles When an antacid tablet makes contact with water, it begins to bubble. The formation of gas bubbles is another indicator that a chemical change may have occurred.