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Physical and Chemical Changes

Change is a part of life. You can see changes in things all around you, in your environment and in yourself. In fact, change is happening more than you might even notice. While you can notice big changes like leaves turning colors in autumn or flowers blooming in spring, there are plenty of other changes that are happening on a daily and minute-by-minute basis. Essentially, there are two types of changes: physical change and chemical change. Let's take a moment to learn a bit more about each of these changes.

Physical changes might alter the shape or feel of something, but the thing is mostly the same. For example, if you have a piece of paper and fold it into a paper airplane, you have caused a physical change. The paper looks different than when you started, but it is still a piece of paper. (It has not, in fact, turned into an actual airplane, right?) Then, if that paper airplane didn't fly very far, and you crumpled it up into a ball, you made another physical change. It is still paper, but now it is in the shape of a ball for you to toss in the trash. Another key characteristic of physical changes is that the changes are reversible. So, if you realize that paper had your math homework, you would try to smooth it flat to turn it in to your teacher. Yet another physical change, right? It's still paper, but it is crumpled and feels different than the smooth piece of paper that you originally started out with.

Sometimes, you can alter a substance down to the molecules and create something entirely different. This is called a chemical change. Let's think about cookies. When you make cookies from scratch, you combine your flour and baking powder, chocolate chips and butter together with a few other ingredients. Once you mix everything up, you pop the batter into the oven and it comes out as cookies. The cookies are an entirely different thing than the flour and baking powder it started with. The cookies are now, well, cookies. And while physical changes are reversible, chemical changes are irreversible. Once you have cookies, you can't reverse the process and break them back down into the batter and the individual ingredients. The ingredients bound together and chemically changed into delicious cookies. There's no going back. Though, would you want to? Cookies are delicious.

The next time you notice a change around you, try to determine if it is a physical (and reversible) change or a chemical (and irreversible) change.

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A Closer Look at Chemical Changes

Chemical changes are changes that create a new substance. The change to the substance occurs to the molecules of the substance. The results of a chemical change cannot be reversed. Some common examples of chemical changes are baking cakes, rust forming on a nail, or a banana rotting. Not all chemical changes are as obvious. However, there are signs that you can look for to help you determine if a chemical change has occurred. If two or more of these signs are present, chances are you have a chemical change on your hands.

A change in color may be an indication of a chemical change. Have you ever seen a rotting banana? The banana changes color as it rots. This is an example of a chemical change. Another example is that shiny new bicycle that will rust outside in the rain. Over time, the iron from the bicycle interacts with oxygen and water, creating hydrated iron oxide, otherwise known as rust. The bike has just undergone a chemical change and will now be a yucky orange color.

Another less desirable sign of a chemical change is when an odor, or smell, is released. This does not occur with every chemical change, but some do produce a new smell. Think of that milk sitting in your refrigerator past its expiration date. The milk undergoes a chemical change when it spoils and releases a very yucky smell in the process.

Light or heat given off from a change or reaction is another sign of a chemical change. Some people celebrate a summer holiday with lots of chemical changes all around. Have you ever noticed all the fireworks going off on the Fourth of July? Fireworks are chemical changes because they are essentially burning chemicals that create light and heat.

Some other signs of a chemical change are when gas bubbles or a solid are formed. A common example of gas bubbles forming are the volcano experiments where baking soda is added to vinegar. This mixture is a chemical reaction because it creates carbon dioxide gas. Sometimes liquids can mix together to form a solid. When two or more liquids react with one another and form a solid, a chemical change has taken place. Two liquids that create a solid are baking soda and calcium chloride.

The next time you watch fireworks or throw out a rotten piece of fruit, remember to notice the chemical changes taking place right in front of you.

Physical or Chemical Change?

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Directions: Determine if the images show a physical change or a chemical change.

1. Melting Ice



2. Roasting a Marshmallow



3. Rusted Nail



4. Frying an Egg



5. Boiling Water



6. Melting Popsicle



Physical or Chemical Change?

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Directions: Determine if the images show a physical change or a chemical change.

1. Bending Wire



2. Fireworks



3. Baking a Cake



4. Folding Paper



5. Cutting Paper



6. Digesting Food



Which Change?

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Directions: Determine if the change described is a physical change or chemical change.

1. A new substance is not produced.

2. Two liquids react with each other and a solid is formed.

3. Liquid water freezes into solid water.

4. One or more new substances are created.

5. Food rots, causing it to change color and begin to smell.

6. The change that occurs to a substance is reversible.

7. A piece of paper is folded and then unfolded and crumpled into a ball.

8. A gas in the form of bubbles is released.

Physical and Chemical Assessment

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1. Which of the following describes a chemical change?

- a. melting butter
- b. milk spoiling
- c. cutting paper
- d. water evaporating

2. An ice cream cone melting on a counter top is an example of

- a. a chemical change
- b. a physical change
- c. no change
- d. both a physical change and a chemical change

3. Which statement is true?

- a. Physical changes can be reversed.
- b. Chemical changes can be reversed.
- c. Physical changes create a new substance.
- d. Chemical changes create a new substance.

4. Which of the following describes a physical change?

- a. digesting food
- b. a nail rusting
- c. breaking a pencil
- d. frying an egg

5. What type of change is involved when a nail rusts? Explain and prove your answer.

6. What type of change is involved in the cutting and folding of paper? Explain and prove your answer.