Changing Properties of Matter

Reflect

Have you ever wondered what happens to the ingredients in a cake when you bake it? Why does it change color, taste different, and smell different? What about when you slice an apple? Does that alter the taste of the apple? Cutting an apple and baking a cake both cause changes in the properties of the substances. Changes in matter can be classified in two ways: a physical change or a chemical change.

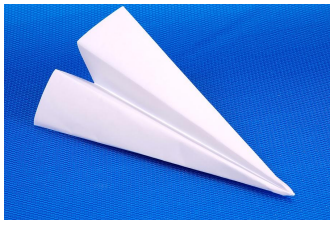
Physical Change

A physical change is a change in the physical properties of a substance, such as its size or shape.

After a physical change has occurred, the matter is still the same material. Some examples of physical changes are cutting bananas and folding paper. Both substances still have their original properties and have the same chemical makeup as before. Changing the size of the pieces of an apple does not turn it into another substance. It is still an apple. Folding paper does not make the paper into something else. It is still paper, and it has all the properties it had before.

Some other examples of physical changes are freezing water into ice cubes, cutting grass, and melting butter. All these substances still keep their original properties.

Cutting grass is considered a physical change.



Folding paper is a physical change, because it is still paper, even after it is folded.

Chemical Change

A chemical change is a change in the chemical makeup of a substance. A new substance is formed, which has different properties.

In chemical changes, the matter is made of different materials. To tell if a chemical change has occurred, look for a change in smell, taste, or color, and see if the substance bubbles (gives off a gas). An example of a chemical change would be baking a cake.

Baking a cake is an example of a chemical property.

The ingredients are combined and heat is applied to form a new substance with different properties from the ingredients with which you started. The cake looks, smells, and tastes completely different from the initial ingredients. The ingredients are no longer in their original form and cannot be turned back into their original state.

Another example of a chemical change might be happening right now in your driveway! If you leave your bicycle out when it rains, the metal parts might start to rust. Rust is a new substance that forms from the metal on your bicycle when combined with oxygen after it has gotten wet. It is red or brown in color and can be rubbed off on your hand or clothes. Can you change the rust back into the metal from your bike? No; once your bike has rusted, it cannot be changed back into the original metal.

What about burning wood? Would that be a chemical change? The ash formed after the wood burns has different properties than the original piece of wood with which you started, so it is a chemical change. It looks and smells different than wood and is not hard like wood. It is soft and falls apart when you touch it. Chemical changes occur all around us.

Have you ever helped Mom or Dad with a **compost** pile? Do the fruits and vegetables that are put into the pile look the same after a few weeks?

decay – decompose or rot

Leftover vegetables and plant clippings can be put in the compost bin to **decay** and later be used to fertilize a garden or flower bed.

Is this plant material still the same after it decays? After plants decay, they no longer have the same properties as they once did. Instead of being green and crunchy, the plants turn brown and soft, breaking apart easily. This makes for great fertilizer to grow new plants!

Have you noticed a dead animal outside or by the side of the road? The body of the animal decays over time and becomes part of the soil. As the body decays, it changes and no longer looks like the original animal.

Decaying plant and animal matter is a chemical change. The new substances have a different chemical makeup than the original substances have.

compost – decaying plant matter that can be used to fertilize plants

These wolves are eating a deer's decaying body.

What Do You Think?

In the image below, one of the cans has been crushed.

What do you think? Is this a physical or chemical change?

_____

_____

_____

Has the aluminum of the can changed into a new substance, or did it just change shape? The can is still made of the same substance, so this is a physical change. You know a physical change has occurred if the matter is still composed of the same material.

Look Out!

Look out for temperature changes. A change in temperature is often an indicator of a chemical change. However, a temperature change by itself does not always mean a chemical change has occurred. For example, ice melting is a physical change, because the substance is still water. The ice absorbs heat, causing it to change states. It changed states, but the chemical makeup of the water is still the same.

Water changing to water vapor in a boiling pot is also a physical change. The water in the pot absorbs heat until it becomes a vapor. The water vapor is still chemically the same as the water in the pot. It has only changed states.

Try Now

Look at the pictures below. Decide whether each would be a **physical** or **chemical** change. Write your answer on the line below.

_____

_____

_____

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Rusty Nail: Which nail will rust the most?

In this simple experiment, you will predict and then discover which nail rusted the most.

You will need:

- 3 Uncoated nails
- 3 Clear plastic cups
- Water
- A chart or journal to record findings

Procedure:

1. Place each nail in a cup.
2. Leave the first cup empty, with no water.
3. Fill the second cup half full of water, so that some of the nail is not covered by water.
4. Fill the third cup full, enough to completely cover the nail.
5. Predict which nail will rust the most in five days.
6. Record your findings everyday for five days.

Compare your final results with your predictions. Which nail rusted the most? Why do you think this happened?

Connecting With Your Child

Physical and chemical changes are happening all around us. Have your child look for physical and chemical changes around your home. Discuss whether it is a physical change or a chemical change, and have your child provide evidence for his or her conclusion.

Some things your child can look for:

- Rusty nails or metal (these contain iron)
- Cut grass or plants
- Cooking food
- Melting ice
- Washing hair
- Painting a fence
- Cutting paper
- Burning a candle

Here are some questions to discuss with your child:

1. Is the change a physical or chemical change?
2. Did it change shape?
3. What is the evidence for a chemical change?
4. Is it a new substance?
5. Is it still the same substance?
6. Did it change color, change temperature, or produce a gas?