

Understanding Chemical and Physical Reactions

Did you know that nothing on Earth ever really disappears? It may seem like snow disappears in the sun, or that the flames make wood vanish in a fire, but that is not what is happening. Snow melts and becomes gas that rises into the atmosphere, and burned wood turns into ash and smoke. Matter is never created or destroyed. It just changes form! All matter is made up of tiny molecules, and when these molecules are changed or moved around, the matter changes form. Today you will learn about the two ways matter can change. These changes are called **reactions**.

Physical Reactions

The first way matter can change is through a **physical reaction**. A physical reaction causes the matter to shift shape or state. For example, if you crush a cardboard box, only the shape changes. It has the same molecules, and is still a cardboard box, even if it is flat. This is a physical reaction. Another kind of physical reaction is an ice cube melting. As it melts, the ice changes from a solid to a liquid state. Even though it is no longer frozen, the matter is still water. That makes it a physical change.

Physical changes are usually caused by some form of motion or pressure, or a change in temperature. When water boils and turns into steam, it is undergoing a physical change caused by a change in temperature. When wool is spun into thread, the physical change is caused by a motion. A sheet of metal is the result of powerful pressure machines that flatten the steel.

When trying to determine if a change is a physical reaction or not, ask yourself: *Is this change reversible?* In other words, can you go backwards or change the matter into its original form. For most physical reactions, the answer is 'Yes.' The cardboard box can be straightened out, and water can be frozen once again into ice. Steam can condense and return to its liquid state of water, and wool thread can be taken apart. However, not all physical reactions are easily reversed.

Chemical Reactions

The second way matter can change is through a **chemical reaction**. Chemical changes occur when two or more substances combine and react to each other. In a chemical reaction, matter doesn't just change form as it does in a physical reaction. Chemical reactions cause the *molecules* of matter to change. This is more than a change in shape or state. Most of the time, an entirely new kind of matter is created.

Baking is a perfect example of a chemical reaction. Imagine all of the ingredients needed to make a batch of brownies. Eggs, flour, oil, water, and cocoa are stirred together. After heating the mixture to a high temperature for a set period of time, you have something very different than the parts you put into the bowl. Burning a piece of paper is also a chemical reaction. The basic substance of the paper is changed into something new: smoke and ashes. These new substances have very different molecules than the original piece of paper.

When trying to determine if a change is a chemical reaction, it helps to look at what was produced as a result of the change. If the reaction creates energy like light or heat, or if a gas or solid is produced, the change is a chemical reaction. Other signs of a chemical reaction include an odor or change in color.

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Understanding Chemical and Physical Reactions (Cont'd)

Another way to identify a chemical reaction is to examine whether or not the change can be reversed. Unlike physical reactions, chemical reactions can not be performed backwards to produce the original parts. For example, after those brownies come out of the oven, it is impossible to separate the oil, eggs, flour, and other ingredients ever again. They have been chemically changed into a new substance.

Summing Up

Remember, in a physical reaction, the matter changes form, but keeps the same molecules. Molecules are simply rearranged so the matter has a new shape or state. Physical reactions are often reversible. Chemical reactions cause the molecules of the substances to change, creating a new kind of matter. Chemical reactions usually produce new colors, energy, gases, odors, solids, or liquids. They are not reversible.

Chemical and physical changes are going on around us all the time. By studying the natural way these changes occur, scientists have found ways to use chemical and physical changes to create building materials, medicines, and thousands of other helpful tools. Reactions can be as complex as creating a cure for a disease, and as simple as brushing your teeth.

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Understanding Chemical and Physical Reactions Questions

Read each sentence. If the statement is true, write a T in the blank. If the statement is false, write an F.

1. ____ Chemical and physical changes can also be called chemical and physical reactions.
2. ____ Chemical change and physical change are two names for the same reactions.
3. ____ A physical reaction occurs when the molecules of a substance are changed.
4. ____ Chemical reactions sometimes yield a product such as gas or solids.
5. ____ Physical reactions can be caused by motion, pressure, or a change in temperature.
6. ____ Chemical reactions do not change the color of matter.
7. ____ Physical reactions can sometimes be reversed.
8. ____ If a substance changes from a liquid to a gas without any other differences, the reaction is physical.
9. ____ In order to be a chemical reaction, matter must be used up or destroyed.
10. ____ Matter changes form, but is never used up.

1. Give two ways a chemical reaction is different from a physical reaction. Use the space below:

2. Two colors of paint are mixed together and can not be separated. Is this a physical or chemical change? Why?

Identify the following reactions by writing a C if the change is chemical and a P if it is physical.

- | | |
|------------------------------------|--|
| 1. ____ A bowl of cereal and milk | 6. ____ Mixing baking soda and vinegar |
| 2. ____ Detergent removing a stain | 7. ____ Lighting a match |
| 3. ____ Roasting a marshmallow | 8. ____ Crushing aluminum cans |
| 4. ____ Fireworks | 9. ____ Shredding paper |
| 5. ____ Using hot glue | 10. ____ Digesting food |

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Understanding Chemical and Physical Reactions Answers

True or False

1. T
2. F
3. F
4. T
5. T
6. F
7. T
8. T
9. F
10. T

Short answer (answers will vary)

1. Physical reactions are sometimes reversible; chemical reactions are not reversible.

Physical reactions cause a change in state or shape; chemical reactions cause change on a molecular level.

Physical reactions do not yield a product; chemical reactions produce gases, solids, liquids, energy, and color changes.

Etc.

2. The change is physical. Although the reaction can not be reversed, the paint molecules have not been changed.

Identifying Reactions

- | | |
|------|-------|
| 1. P | 6. C |
| 2. C | 7. C |
| 3. C | 8. P |
| 4. C | 9. P |
| 5. P | 10. C |