

Physical and Chemical Changes

Pre-Lab Discussion

Matter is constantly changing. The two kinds of changes that occur in matter are physical and chemical changes. In a physical change, no new substances are formed. However, physical properties such as size, shape, color, or phase may change. Dissolving, melting, evaporating, and grinding are physical changes.

As a result of a chemical change, one or more new substances with new and different properties are formed. The new substances are different from the original substance. Chemical changes, which are often called chemical reactions, are taking place around you and even inside you all the time. Respiration and digestion are chemical changes you could not live without. Photosynthesis, or the food-making process in green plants, is a chemical change. Burning, the rusting of iron, and the changing colors of leaves in autumn are other examples of chemical changes.

In this investigation, you will observe physical and chemical changes and learn to recognize each type of change when it occurs.

Problem

What are the differences between physical and chemical changes?








Materials (per group)

Birthday candle	Celsius thermometer
Aluminum foil (10 cm x 10 cm)	10-mL graduated cylinder
Modeling clay	Antacid tablet
Test tube rack	Magnesium ribbon (2 cm long)
3 test tubes	10 mL 1 M hydrochloric acid
Matches	Table salt
Scoop	Dropper bottle of 0.1 M silver nitrate

Safety

Put on a laboratory apron if one is available. Put on safety goggles. Handle all glassware carefully. Always use special caution when working with laboratory chemicals, as they may irritate the skin or cause staining of the skin or clothing. Never touch or taste any chemical unless instructed to do so. Note all safety alert symbols next to the steps in the Procedure and review the meanings of each symbol by referring to the symbol guide on page 10.

Procedure

-  1. Take a small piece of modeling clay and place it on the square of aluminum foil. Firmly place a candle in the clay so that it is well supported. Light the candle and allow it to burn while you continue the rest of the investigation. Record your observations of the burning candle.
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 2. Add a small scoop of table salt to a test tube that has been half-filled with tap water. Place your thumb over the top of the test tube and shake to dissolve the salt. Record your observations. Using the dropper, add 5 drops of silver nitrate to the salt water. Record your observations.
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 3. Place 10 mL of hydrochloric acid in a test tube. Place the thermometer in the solution and record the temperature. Cut off a small piece of magnesium ribbon and place it in the test tube. Record your observations of the reaction. Record the temperature of the hydrochloric acid at the end of the reaction.
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 4. Place 10 mL of water in a test tube. Place the thermometer in the water and record the temperature. Break the antacid tablet into small pieces and add them to the test tube of water. Record your observations of the reaction. Record the temperature of the water at the end of the reaction.

Observations

1. What did you observe as the candle burned? _____

What was left after the candle burned? _____

2. What did you observe when you added the salt to the water in the test tube and shook it?

What did you observe when the silver nitrate was added to the salt water?

3. Original temperature of the hydrochloric acid = _____

Temperature of the hydrochloric acid after
magnesium is added = _____

What did you observe when the magnesium was added to the hydrochloric acid?

4. Original temperature of the water = _____

Temperature of the water after
antacid is added = _____

What did you observe when the antacid tablet was added to the water?

Analysis and Conclusions

1. Identify each of the following as either a physical change or a chemical change. Give a reason for your answer.

a. Melting candle wax _____

b. Burning a candle _____

c. Dissolving salt in water _____

d. Adding silver nitrate to salt water _____

e. Cutting a piece of magnesium ribbon _____

f. Adding magnesium metal to hydrochloric acid _____

g. Breaking an antacid tablet into small pieces _____

h. Adding an antacid tablet to water _____

2. What happened to the temperature of the hydrochloric acid when you added the magnesium to it? _____

3. What happened to the temperature of the water when you added the antacid tablet to it?

4. Describe two observations you might make when a physical change occurs.

5. Describe two observations you might make when a chemical change occurs.

Critical Thinking and Application

1. How could you prove that dissolving the salt in water resulted in only a physical change?

2. How could you prove that adding magnesium to hydrochloric acid resulted in a chemical change?

3. The following changes often indicate that a chemical change has occurred. But they can also indicate the occurrence of a physical change. Explain how each change might result from a physical, not a chemical, change.

a. Change of color _____

b. Loss of mass _____

c. The substance seems to "disappear." _____

Going Further

Write out a recipe that involves cooking or baking. Identify each step in the recipe as resulting in either a physical change or a chemical change in the ingredients.