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Recognizing Chemical and Physical Changes

Background Information

Some chemical and physical changes are easy to recognize. Other changes may be easy to observe, but difficult to classify as a chemical or a physical change just by observation. Many events that occur in nature, such as volcanic eruptions, include both chemical and physical changes. When you observe a complicated event, you may need more information before you can identify the chemical and physical changes that have occurred.

In this investigation, you will observe several events and identify the chemical and physical changes involved in each.

Problem

How can you identify chemical and physical changes?

Pre-Lab Discussion

Read the entire investigation. Then, work with a partner to answer the following questions.

1. **Observing** What evidence of chemical changes will you look for in this investigation?

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2. **Inferring** What are some examples of physical changes that you might observe in this investigation?

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3. **Predicting** In which step of this investigation is a physical change most likely to occur? Explain your answer.

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4. **Predicting** In which step of this investigation is a chemical change most likely to occur? Explain your answer.

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_____

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Materials *(per group)*

4 test tubes
glass-marking pencil
test-tube rack
magnesium chloride solution
sodium carbonate solution
copper sulfate solution
white vinegar (acetic acid solution)
aluminum foil
calcium carbonate chip
paraffin candle
matches
clock or watch

Safety

Put on safety goggles and a lab apron. Be careful to avoid breakage when working with glassware. Always use caution when working with laboratory chemicals, as they may irritate the skin or stain skin or clothing. Never touch or taste any chemical unless instructed to do so. Be careful when using matches. Tie back loose hair and clothing when working with flames. Do not reach over an open flame. Wash your hands thoroughly after carrying out this investigation. Note all safety alert symbols next to the steps in the Procedure and review the meaning of each symbol by referring to the Safety Symbols on page xiii.

Procedure

1. Use the glass-marking pencil to label the test tubes *1* to *4.* Place the test tubes in a test-tube rack.
2. Fill each test tube one-third full with the solution indicated in Data Table 1.
3. Observe each of the solutions and record your observations in Data Table 1.
4. Observe the appearance of the aluminum foil, the calcium carbonate chip, and the paraffin candle. Record your observations in Data Table 1.
5. Pour the sodium carbonate solution from test tube 2 into the magnesium chloride solution in test tube 1. Observe what happens and record your observations in Data Table 2.
6. Crumple up the aluminum foil and drop it into the copper sulfate solution in test tube 3. Observe test tube 3 every 2 minutes for 10 minutes. Record your observations in Data Table 2.
7. Carefully drop the calcium carbonate chip into the vinegar (acetic acid solution) in test tube 4. Record your observations in Data Table 2.

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8. Use a match to light the paraffin candle. Observe what happens to the candle for 5 minutes. In Data Table 3, record what happens to the candle. **CAUTION:** *Be careful not to burn yourself or others.*

9. Complete Data Tables 2 and 3, identifying each change you observed as chemical or physical.

10. Follow your teacher's instructions for disposing of the used chemicals. Wash your hands thoroughly with warm water and soap or detergent before leaving the laboratory.

Observations

DATA TABLE 1

Material	Observations
Test tube 1: magnesium chloride solution	
Test tube 2: sodium carbonate solution	
Test tube 3: copper sulfate solution	
Test tube 4: vinegar (acetic acid solution)	
Aluminum foil	
Calcium carbonate	
Paraffin candle	

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DATA TABLE 2

Materials	Observations	Type of Change (chemical or physical)
Magnesium chloride and sodium carbonate solutions		
Copper sulfate solution and aluminum foil		
Calcium carbonate and vinegar		

DATA TABLE 3

Observation	Type of Change (chemical or physical)

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Analysis and Conclusions

1. **Inferring** What type of change occurred when you mixed the magnesium chloride solution with the sodium carbonate solution? Explain your answer.

2. **Inferring** What type of change occurred in the copper sulfate solution when you placed the aluminum foil in it? Explain your answer.

3. **Inferring** What type of change occurred in the acetic acid solution when you placed the calcium carbonate chip in it? Explain your answer.

4. **Evaluating** What evidence was there that new substances formed as the candle burned?

5. **Evaluating** What evidence of a physical change did you observe as the candle burned?

6. **Drawing Conclusions** What signs of chemical changes did you observe in this investigation?

7. **Evaluating and Revising** Formation of a solid, formation of a gas, and a color change can also occur during some physical changes. Give examples of physical changes that could produce these clues. What evidence suggests that the changes you observed in test tubes 1–3 were, in fact, chemical changes?

Go Further

Many activities that people do at home on a regular basis can involve both physical and chemical changes. Examples include cooking or gardening. Pick an activity that you participate in at home and make a list of tasks for that activity. Divide the list into tasks during which a physical change occurs and tasks during which a chemical change occurs. Give reasons for your classifications.