Glencoe Science

Chapter Resources

Properties and Changes of Matter

Includes:

Reproducible Student Pages

ASSESSMENT

- ✔ Chapter Tests
- ✔ Chapter Review

HANDS-ON ACTIVITIES

- ✔ Lab Worksheets for each Student Edition Activity
- ✔ Laboratory Activities
- ✔ Foldables–Reading and Study Skills activity sheet

MEETING INDIVIDUAL NEEDS

- ✔ Directed Reading for Content Mastery
- ✔ Directed Reading for Content Mastery in Spanish
- ✔ Reinforcement
- ✔ Enrichment
- ✔ Note-taking Worksheets

TRANSPARENCY ACTIVITIES

- ✔ Section Focus Transparency Activities
- ✔ Teaching Transparency Activity
- ✔ Assessment Transparency Activity

Teacher Support and Planning

- ✔ Content Outline for Teaching
- ✔ Spanish Resources
- ✔ Teacher Guide and Answers

Glencoe

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Reproducible Student Pages

Reproducible Student Pages

■ Hands-On Activities

■ Meeting Individual Needs

Extension and Intervention

■ Assessment

■ Transparency Activities

Hands-On Activities

Mini LAB

Measuring Properties

Procedure

1. Measure the mass of a **10–mL graduated cylinder**.
2. Fill the graduated cylinder with water to the 10–mL mark and remeasure the mass of the graduated cylinder with the water.
3. Determine the mass of the water by subtracting the mass of the graduated cylinder from the mass of the graduated cylinder and water.
4. Determine the density of water by dividing the mass of the water by the volume of the water.

Analysis

1. Why did you need to measure the mass of the empty graduated cylinder?

2. How would your calculated density be affected if you added more than 10 mL of water?

Mini LAB

Identifying an Unknown Substance

Procedure

1. Obtain data from your teacher (mass, volume, solubility, melting or boiling point) for an unknown substance(s).
2. Calculate density and solubility in units of g/100 mL for your unknown substance(s).
3. Using Table 2 in your book and the information you have, identify your unknown substance(s).

Analysis

1. Describe the procedure used to determine the density of your unknown substance(s).

2. Identify three characteristics of your substance(s).

3. Explain how the solubility of your substance would be affected if the water was hot.

TRY AT HOME Mini LAB

Comparing Changes

Procedure

1. Separate a piece of **fine steel wool** into two halves.
2. Dip one half in **tap water**.
3. Place each piece of steel wool on a separate **paper plate** and let them sit overnight.

Analysis

1. Did you observe any changes in the steel wool? If so, describe them.

2. If you observed changes, were they physical or chemical? How do you know?

Finding the Difference

Lab Preview

Directions: *Answer these questions before you begin the Lab.*

1. Why is the safety symbol for a sharp object used in this lab?

2. List several ways to describe properties of matter.

You can identify an unknown object by comparing its physical and chemical properties to the properties of identified objects.

Real-World Question

How can you tell what makes objects different from each other?

Materials

meterstick
spring scale
block of wood
metal bar or metal ruler
plastic bin
drinking glass
water
rubber ball
paper
carpet
magnet
feather
rock
plant or flower
soil
sand
apple (or other fruit)
a vegetable
slice of bread
dry cereal
egg

Goals

- **Identify** the physical properties of objects.
- **Compare and contrast** the properties.
- **Categorize** the objects based on their properties.

Safety Precautions

Procedure

1. List at least six properties that you will observe, measure, or calculate for each object. Describe how to determine each property.

2. Record your data in the table on the next page.

3. Complete your table by determining the properties for each object.

LAB (continued)

Data and Observations

Table 1

Objects	Property	Property	Property	Property	Property	Property

Conclude and Apply

1. **Describe** Which properties were you able to observe easily? Which required making measurements? Which required calculations?

2. **Compare and contrast** the objects based on the information in your table.

3. **Draw Conclusions** Choose a set of categories and group your objects into those categories. Some examples of categories are large/medium/small, heavy/moderate/light, bright/moderate/dull, solid/liquid/gas, etc. Were the categories you chose useful for grouping your objects? Why or why not?

Communicating Your Data

Compare your results with those of other students in your class. **Discuss** the properties of objects that different groups included on their tables. Make a large table including all of the objects that students in the class studied.

Design Your Own

Battle of the Toothpastes

Lab Preview

Directions: *Answer these questions before you begin the Lab.*

1. What does the safety symbol showing a glove tell you?

2. What should the experiment you design in this lab test?

Your teeth are made of a compound called hydroxyapatite (hi DRAHK see A puh tite). The sodium fluoride in toothpaste undergoes a chemical reaction with hydroxyapatite to form a new compound on the surface of your teeth. This compound resists food acids that cause tooth decay, another chemical change. In this activity, you will design an experiment to test the effectiveness of different toothpaste brands. The compound found in your teeth is similar to the mineral compound found in eggshells. Treating hard-boiled eggs with toothpaste is similar to brushing your teeth with toothpaste. Soaking the eggs in food acids such as vinegar for several days will produce similar conditions as eating foods, which contain acids that will produce a chemical change in your teeth, for several months.

Real-World Question

How can you test the properties of a substance that helps protect your teeth?

Form a Hypothesis

Form a hypothesis about the effectiveness of different brands of toothpaste.

Goals

- **Observe** how toothpaste helps prevent tooth decay.
- **Design** an experiment to test the effectiveness of various types and brands of toothpaste.

Safety Precautions

Possible Materials

2 or 3 different brands and types of toothpaste
drinking glasses or bowls
hard boiled eggs
concentrated lemon juice
apple juice
artist's paint brush
water

Test Your Hypothesis

Make a Plan

1. **Describe** how you will use the materials to test the toothpaste.
2. **List** the steps you will follow to test your hypothesis.
3. **Decide** on the length of time that you will conduct your experiment.
4. **Identify** the control and variables you will use in your experiment.
5. **Create** a data table on a separate sheet of paper to record your observations, measurements, and results.
6. **Describe** how you will measure the amount of protection each toothpaste brand provides.

Follow Your Plan

1. Make sure your teacher approves your plan before you start.
2. **Conduct** your experiment as planned. Be sure to follow all proper safety precautions.
3. **Record** your observations in your data table.

(continued)

Analyze Your Data

1. **Compare** the untreated eggshells with the shells you treated with toothpaste.

2. **Compare** the condition of the eggshells you treated with different brands of toothpaste.

3. **Compare** the condition of the eggshells soaked in lemon juice and in apple juice.

4. **Identify** unintended variables you discovered in your experiment that might have influenced the results.

Conclude and Apply

1. **Identify** Did the results support your hypothesis? **Describe** the strengths and weaknesses of your hypothesis.

2. **Explain** why the eggshells treated with toothpaste were better protected than the untreated eggshells.

3. **Identify** which brands of toothpaste, if any, best protected the eggshells from decay.

4. **Evaluate** the scientific explanation for why adding fluoride to toothpaste and drinking water prevents tooth decay.

5. **Predict** what would happen to your protected eggs if you left them in the food acids for several weeks.

6. **Infer** why it is a good idea to brush with fluoride toothpaste.

Communicating Your Data

Compare your results with the results of your classmates. **Create** a poster advertising the benefits of fluoride toothpaste.

LAB 1 Laboratory Activity

Comparing Viscosity

You have probably noticed that pushing a spoon with a small force moves it easily through a bowl of water. However, the same force moves a spoon through a thick milkshake much more slowly. Viscosity is a physical property of a fluid (liquids and gases) that tends to prevent it from flowing when it is subjected to an applied force. There are many ways to measure viscosity. One way is seeing how fast a fluid pours through a hole. The faster a fluid flows, the lower the viscosity of the fluid. Another way to measure viscosity is to see how fast a sphere falls through a fluid. If a fluid has a high viscosity, it strongly resists flow, so the sphere falls slowly. If the fluid has a low viscosity, it offers less resistance to flow, so the sphere falls faster. In this activity, you will use both methods to compare the viscosities of several liquids.

Strategy

You will construct a viscometer to determine the flow time for a specific volume of water.
You will use a viscometer to determine the flow times for other liquids.
You will rank the relative viscosities of the other liquids by comparing their flow times with that of water.
You will compare the viscosities of liquids by dropping glass marbles into samples of liquids.
You will observe how temperature affects the viscosity of a liquid.

Materials

clear-plastic dish detergent bottle with pull top, bottom removed
marking pen
ruler
modeling clay
glass jar
room temperature water
timer, or clock with second hand
vegetable oil
dishwashing liquid
corn syrup or molasses
4 50-mL graduated cylinders
4 glass marbles
long-handled spoon
2 25-mL graduated cylinders
2 large beakers
hot tap water
ice water
thermometer
paper towels

Procedure

Part A

1. Holding the detergent bottle upside down, use the marking pen to draw a straight line 2.5 cm from the bottom. Draw a second line 10 cm below the first line.
2. Label the first line *Start* and label the second line *Stop*.
3. Close the pull top on the bottle.
4. Place a ring of modeling clay around the top edge of the mouth of a jar.

Figure 1

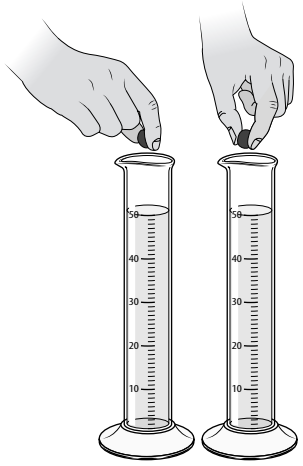
Laboratory Activity 1 (continued)

5. Stand the bottle upside down in the jar and mold the clay ring so that the bottle will stand upright without falling over. Do NOT push the bottle into the clay because you will need to be able to easily remove and replace the bottle. Your setup should look like Figure 1.
6. Fill the bottle to about 1 cm above the start line with room temperature tap water.
7. Lift the bottle and pull the top open. Immediately set the bottle back on the jar.
8. Start the timer when the water level reaches the S*tart* line. Stop the timer when the water level reaches the *Stop* line. Record the time in Table 1.
9. Repeat steps 6 through 8 two more times. Calculate the average flow rate of the water and record the times in Table 1.
10. Repeat steps 6–8 for the oil, dishwashing liquid, and syrup, remembering to thoroughly clean your viscometer components between each type of liquid. Record your observations in Table 1.

Part B

11. Pour 50 mL of water into one graduated cylinder. Pour 50 mL of oil into second, 50 mL of dishwashing liquid into a third, and 50 mL of syrup into a fourth graduated cylinder.
12. Put two of the graduated cylinders side by side and place them against a white background so you can clearly see what happens.

Figure 2



13. Hold a marble in each hand at the same distance above each of the graduated cylinders, as shown in Figure 2.
14. Release both marbles at exactly the same time and observe which reaches the bottom of the graduated cylinder first. Record your observations in Table 2.
15. Use a long-handled spoon to remove the marbles from the graduated cylinders.
16. Repeat steps 14 and 15, changing one liquid each time, until you can put the liquids in order of increasing viscosity.

Part C

17. Pour 25 mL of syrup into each of two 25-mL graduated cylinders.
18. Place one graduated cylinder in a large beaker of hot tap water. Place the other graduated cylinder in second beaker full of ice water.
19. Allow both graduated cylinders to sit for 15 minutes.
20. After 15 minutes, measure the temperature of both samples of syrup. Record the temperatures in Table 3.
21. Remove the graduated cylinders from the beakers.
22. Hold a marble in each hand at the same distance above each of the graduated cylinders.
23. Release both marbles at exactly the same time and observe which reaches the bottom of the graduated cylinder first. Record your observations in Table 3.

Laboratory Activity 1 (continued)

Data and Observations

Table 1

Liquid	Trial 1 time (s)	Trial 2 time (s)	Trial 3 time (s)	Average time (s)
Water				
Oil				
Dishwashing liquid				
Syrup				

Table 2

Liquids	Liquids in which marble reached the bottom of the jar first
Water and oil	
Water and dishwashing liquid	
Water and syrup	
Oil and dishwashing liquid	
Oil and syrup	
Dishwashing liquid and syrup	

Table 3

	Temperature (°C)	Rate of marble drop
Hot syrup		
Cold syrup		

Laboratory Activity 1 (continued)

Questions and Conclusions

1. Based on your data from Part A, rank the four liquids from lowest to highest viscosity.

2. Based on your data from Part B, rank the four liquids from lowest to highest viscosity.

3. Do your rankings in Part B agree with your rankings in Part A? If not, suggest a reason for the differences.

4. How does temperature affect the viscosity of syrup?

5. If the flow time of a sample of shampoo is 580 s and the flow time of an equal volume of water is 40 s, what does this tell you about viscosity of the shampoo relative to water?

Strategy Check

_____ Can you construct a viscometer to determine the flow time for a specific volume of water?

_____ Can you use a viscometer to determine the flow times for other liquids?

_____ Can you rank the relative viscosities of the other liquids by comparing their flow times with that of water?

_____ Can you compare the viscosities of liquids by dropping glass marbles into samples of liquids?

_____ Can you observe how temperature affects the viscosity of a liquid?

LAB 2 Laboratory Activity

Chemical Changes

When a chemical change takes place, something new is produced. Chemical changes can happen in living matter. Energy is often given off during a chemical change. Energy that is given off may be in different forms, but one form that is easily measured is heat.

Strategy

You will observe chemical changes produced by living matter.
You will measure and record changes in temperature when these chemical changes take place.

Materials

hydrogen peroxide (3%)
18 × 150 mm test tubes (8)
thermometer
liver (raw)
test-tube rack
clock or watch with second hand
potato (raw)

Procedure

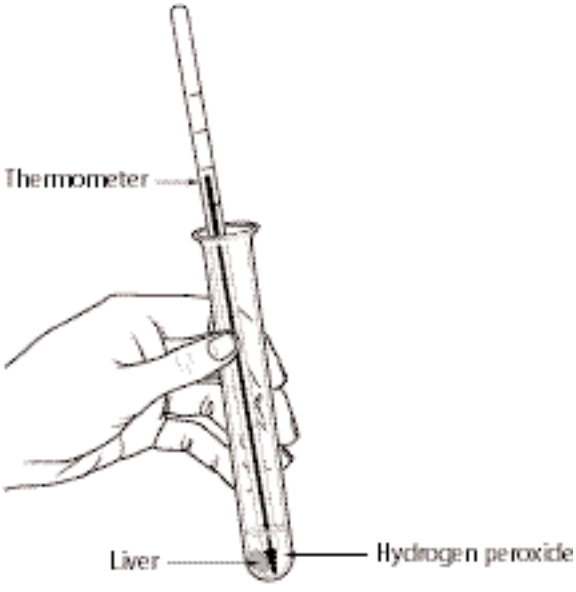
Part A

1. Add 5 mL of hydrogen peroxide to a test tube. **WARNING:** *Hydrogen peroxide is poisonous.*
2. Place a thermometer into the test tube. Find the temperature of the hydrogen peroxide and record this as the temperature before adding the liver. Record all of your results in Table 1 in the Data and Observations section.
3. Remove the thermometer from the test tube.
4. Add a small piece of liver to the test tube.
5. Replace the thermometer and begin to record the temperature of the liver and hydrogen peroxide every half minute for 6 min. See Figure 1.
6. Repeat the experiment three more times. Use new hydrogen peroxide, a new piece of liver, and a clean test tube for each trial.

Part B

1. Add 5 mL of hydrogen peroxide to a test tube.
2. Find the temperature of the hydrogen peroxide. Record your results in Table 2 in the Data and Observations section.
3. Add a small piece of potato to the test tube.
4. Replace the thermometer and record the temperature of the potato and the hydrogen peroxide every half minute for 6 min.
5. Repeat the procedure three more times. Use new hydrogen peroxide, a new piece of potato, and a clean test tube for each trial.

Figure 1



Laboratory Activity 2 (continued)

Data and Observations

1. Record your results in the tables.
2. For each table, total each column and find the average for each column.

Table 1

Trial	Starting temperature	Temperature after adding liver											
		Minutes											
		1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
1													
2													
3													
4													
Total													
Average													

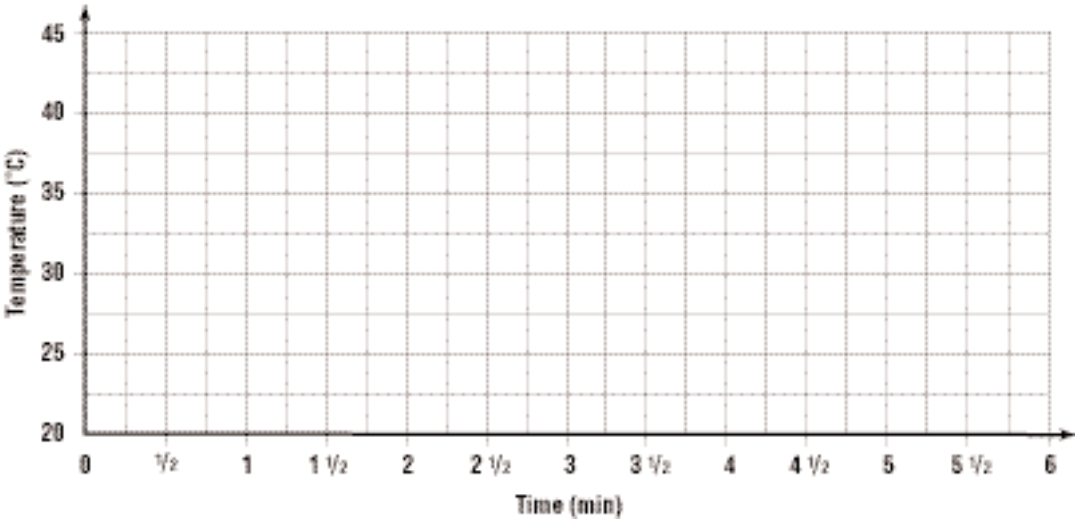
Table 2

Trial	Starting temperature	Temperature after adding potato											
		Minutes											
		1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
1													
2													
3													
4													
Total													
Average													

Laboratory Activity 2 (continued)

3. Graph your average results for each table. Place a dot on the graph in Figure 2 for the average starting temperature and for each average temperature 1/2 min through 6 min. Connect the dots with lines. Use different colors for each line.

Figure 2



Questions and Conclusions

1. Is there any evidence that energy was given off when liver was added to the hydrogen peroxide?

2. What is the evidence?

3. Is there any evidence that energy was given off when the potato was added to the hydrogen peroxide?

4. What is the evidence?

5. How does the evidence indicate that a physical or chemical change has taken place?

Laboratory Activity 2 (continued)

6. Why were four trials used for each part of the experiment?

7. Why were both liver and potato used in the experiment?

8. Which showed the greatest temperature change, potato or liver?

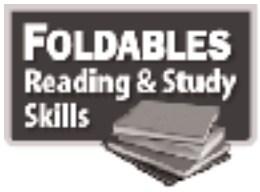
9. During the experiment, hydrogen peroxide was changed into water and oxygen. Did you see anything during the experiment that shows that oxygen was given off?

10. Explain your answer.

Strategy Check

_____ Can you observe chemical changes produced by living matter?

_____ Can you measure and record changes in temperature when chemical changes took place?



Properties and Changes of Matter

Directions: *Use this page to label your Foldable at the beginning of the chapter.*

Physical Properties

Physical Changes

Chemical Properties

Chemical Changes

During this change, the composition of the matter stays the same, but the appearance is changed in some way. An example would be folding a newspaper.

These properties also include the state of matter—solid, liquid, or gas.

These properties are characteristics that cannot be observed without altering the sample.

These properties include shape, smell, color, taste, and texture.

These properties include volume, density, mass, boiling point, and melting point.

This change occurs when the composition of matter changes. An example would be a rusting nail.

When this change occurs you might observe a change in color, odor, energy, or the production of gases or solids.

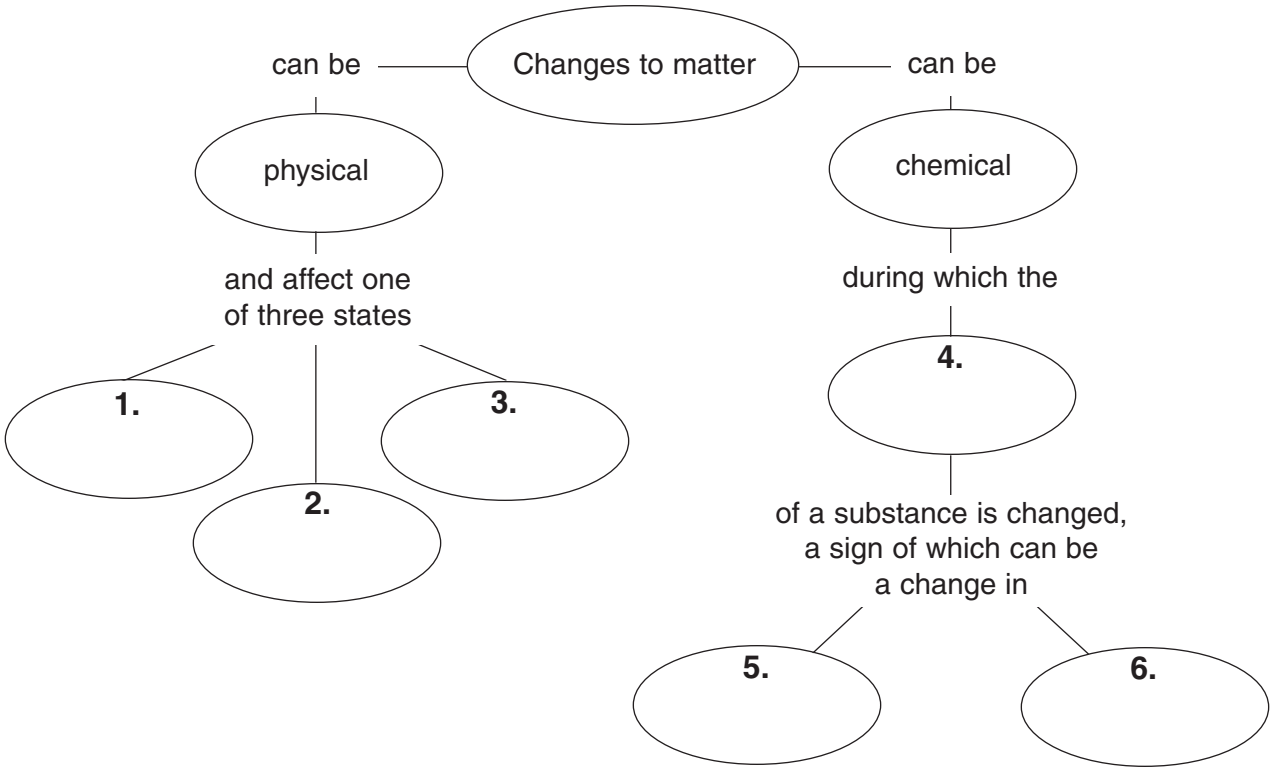
Meeting Individual Needs

Directed Reading for Content Mastery

Overview
Properties and Changes of Matter

Directions: *Use the following terms to complete the concept map below.*

liquid **color** **odor**
composition **gas** **solid**



Directions: *Write a* **T** *or* **F** *beside each number to indicate whether the statement is true or false.*

_____ **7.** When a substance undergoes a physical change its composition remains the same.

_____ **8.** A substance produced during a chemical change cannot easily be changed back into the original substance.

_____ **9.** Both chemical and physical changes may result in a change in appearance.

_____ **10.** The total mass of matter is either reduced or increased after a physical or chemical change.

_____ **11.** Whenever you cut, tear, grind, or bend matter, you are causing a chemical change.

Name Date Class

Directed Reading for Content Mastery

Section 1 ▪ Physical and Chemical Properties

Directions: *Match the terms in Column II with the definitions in Column I. Write the letter of the correct term in the blank at the left.*

Column I	Column II
_____ **1.** a characteristic of a substance	**a.** mass
_____ **2.** properties detected by the senses	**b.** melting point
_____ **3.** measurement of how much matter an object contains	**c.** appearance
_____ **4.** solid, liquid, gas	**d.** property
_____ **5.** temperature at which a solid becomes a liquid	**e.** state

Directions: *For each of the objects, list as many physical properties as possible.*

6. brick _____

_____

7. banana _____

_____

8. pencil _____

9. horseshoe magnet _____

_____

10. sheet of paper _____

11. can of soda _____

_____

12. your science book _____

_____

13. glass of water _____

_____

14. your index finger _____

15. paper clip _____

_____

Meeting Individual Needs

Name Date Class

Directed Reading for Content Mastery

Section 2 ▪ Physical and Chemical Changes

Directions: *Identify each process below as a chemical or physical change with a check (✓) in the correct column.*

Chemical Change	Physical Change	
_____	_____	**1.** wind erosion of rocks
_____	_____	**2.** food digesting in your body
_____	_____	**3.** burning match
_____	_____	**4.** melting ice
_____	_____	**5.** copper penny turning dark
_____	_____	**6.** color changing in leaves
_____	_____	**7.** rusting car
_____	_____	**8.** boiling water
_____	_____	**9.** rotting fruit
_____	_____	**10.** breaking a plate
_____	_____	**11.** cutting paper

Directions: *Answer the following questions on the lines provided.*

12. Explain the difference between a physical and a chemical change.

_____

_____

_____

13. If you could measure the oxygen consumed and the gases released by a burning candle, you would observe that the total mass of material remains the same as before the candle was lit. What law does this example describe?

_____

_____

Meeting Individual Needs

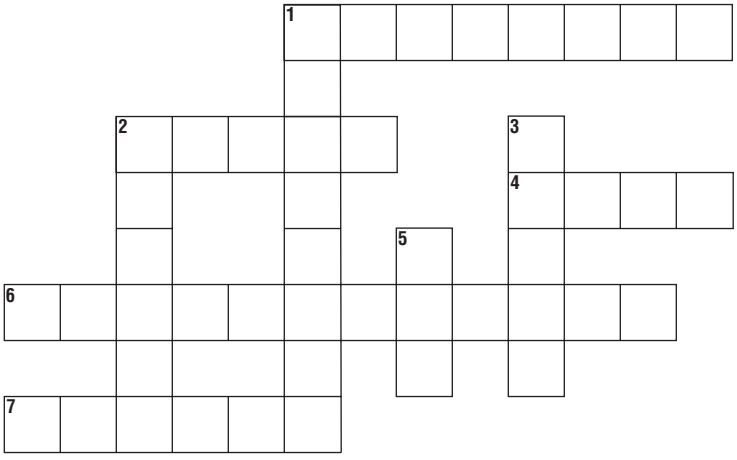
Directed Reading for Content Mastery

Key Terms
Properties and Changes of Matter

Directions: *Use the following terms to complete the crossword puzzle.*

change **gas** **conservation** **physical** **property**

solid **energy** **color** **odor**



Across

1. Properties of matter might be _____ or chemical.

2. A property we can see

4. A property we can smell

6. The law of _____ of mass states that the total mass of matter is the same before and after a physical or chemical change.

7. Many substances absorb _____ in order to undergo a chemical change.

Down

1. Another word for a characteristic of a substance

2. The explosion of fireworks is an example of a chemical _____.

3. The _____ state of water is ice.

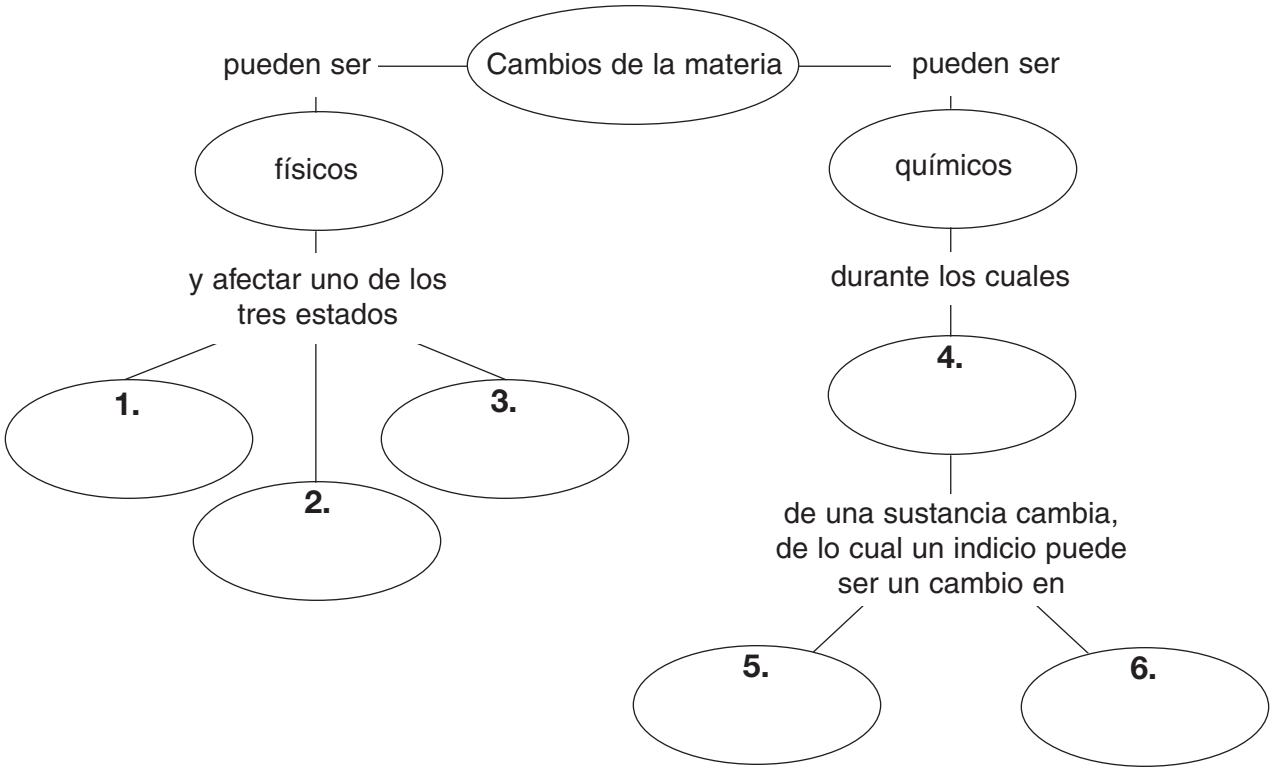
5. One state of matter

Lectura dirigida para Dominio del contenido

Sinopsis Propiedades y cambios de la materia

Instrucciones: *Usa los siguientes términos para completar el mapa de conceptos.*

líquido **el color** **el olor**
composición **gas** **sólido**



Instrucciones: *Escribe* **V** *o* **F** *al lado de cada número para indicar si piensas que el enunciado es verdadero o falso.*

_____ **7.** Cuando una sustancia pasa por un cambio físico su composición no sufre cambio.

_____ **8.** Una sustancia producida durante un cambio químico no se puede convertir fácilmente en la sustancia original.

_____ **9.** Tanto los cambios químicos como los físicos pueden resultar en un cambio en apariencia.

_____ **10.** La masa total de la materia no disminuye ni aumenta después de un cambio físico o químico.

_____ **11.** Siempre que cortas, rasgas, mueles o doblas la materia, estás causando un cambio químico.

Satisface las necesidades individuales

Lectura dirigida para Dominio del contenido

Sección 1 ▪ Propiedades físicas y químicas

Instrucciones: *Coordina los términos de la Columna II con las definiciones de la Columna I. Escribe la letra del término correcto en los espacios de la izquierda.*

Columna I	Columna II
_____ **1.** característica de una sustancia	**a.** masa
_____ **2.** propiedades que se detectan con los sentidos	**b.** punto de fusión
_____ **3.** medida de la cantidad de materia que contiene un objeto	**c.** apariencia
_____ **4.** sólido, líquido, gas	**d.** propiedad
_____ **5.** temperatura a la cual un sólido se hace líquido	**e.** estado

Instrucciones: *Enumera tantas propiedades como te sea posible para cada uno de los siguientes objetos.*

6. ladrillo _____

_____

7. banana _____

_____

8. lápiz _____

9. imán de forma de herradura _____

_____

10. hoja de papel _____

11. lata de gaseosa _____

_____

12. tu libro de ciencias _____

_____

13. vaso de agua _____

_____

14. tu dedo índice _____

15. clip para papel _____

_____

Satisface las necesidades individuales

Lectura dirigida para Dominio del contenido

Sección 2 ▪ Cambios físicos y químicos

Instrucciones: *Identifica cada proceso como un cambio físico o químico haciendo un (✓) en la columna correcta.*

Cambio químico	Cambio físico	
_____	_____	**1.** erosión de las rocas por acción del viento
_____	_____	**2.** digestión del alimento en tu cuerpo
_____	_____	**3.** cerilla que arde
_____	_____	**4.** hielo que se derrite
_____	_____	**5.** moneda de cobre que se ennegrece
_____	_____	**6.** cambio de color en las hojas
_____	_____	**7.** auto que se oxida
_____	_____	**8.** agua que hierve
_____	_____	**9.** fruta que se pudre
_____	_____	**10.** quebrar un plato
_____	_____	**11.** cortar papel

Instrucciones: *Contesta las siguientes preguntas en los espacios dados.*

12. Explica la diferencia entre un cambio físico y un cambio químico.

_____

_____

_____

13. Si pudieras medir el oxígeno consumido y los gases que despide una vela que arde, observarías que la masa del material permanece igual que antes de que la vela fuera encendida. ¿Cuál ley describe este ejemplo?

_____

_____

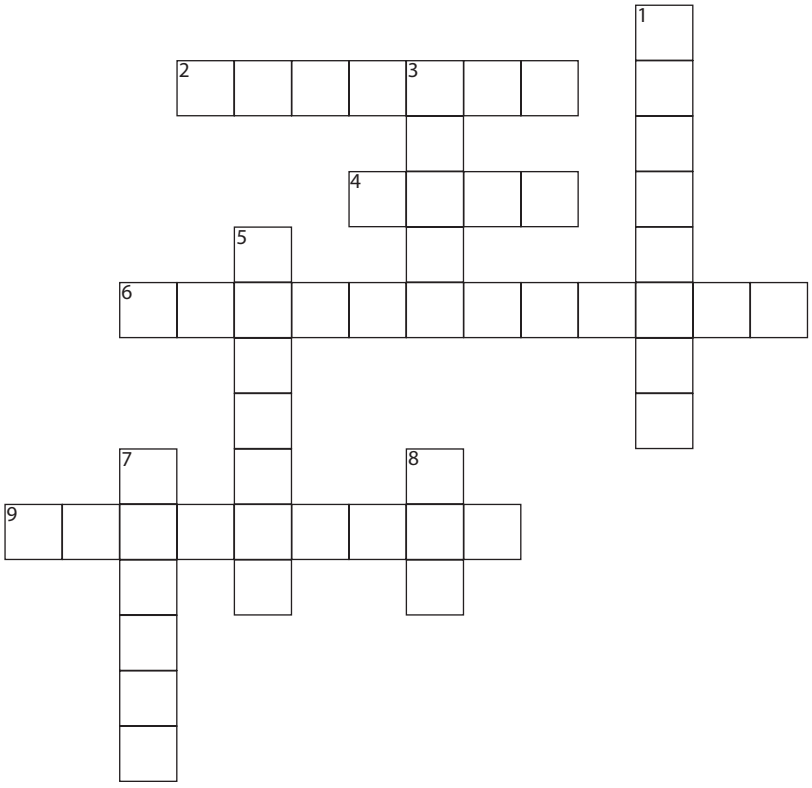
Satisface las necesidades individuales

Lectura dirigida para Dominio del contenido

Términos claves Propiedades y cambios de la materia

Instrucciones: *Usa los siguientes términos para completar el crucigrama.*

cambio	**gas**	**conservación**	**físicas**	**propiedad**
sólido	**energía**	**color**	**olor**	



Horizontales

3. Las propiedades de la materia pueden ser _____ o químicas.

4. Propiedad que puedes oler

6. La ley de _____ de la masa establece que la masa total de la materia es la misma antes y después de un cambio físico o químico.

9. Otra palabra para una característica de una sustancia

Verticales

1. La explosión de fuegos artificiales es un ejemplo de un(a) _____ química.

2. Propiedad que puedes ver

5. Muchas sustancias absorben _____ para poder pasar por un cambio químico.

7. El estado _____ del agua es hielo.

8. Un estado de la materia

Satisface las necesidades individuales

Name Date Class

SECTION 1 Reinforcement

Physical and Chemical Properties

Directions: *Match the terms in Column II with the descriptions in Column I. Write the letter of the correct term in the blank at the left.*

Column I

_____ **1.** often the first physical property noticed; for example, a lemon is yellow

_____ **2.** a physical property measured by how much matter an object contains

_____ **3.** physical properties detected by sight

_____ **4.** how something acts

_____ **5.** temperature at which solid changes to liquid

_____ **6.** a relationship between mass and volume

_____ **7.** properties such as color and texture that can be observed without changing the makeup of the material

_____ **8.** how often you should taste lab experiments

_____ **9.** a characteristic that cannot be observed without altering the substance

_____ **10.** you use these to detect the properties of matter

_____ **11.** our atmosphere is this state

_____ **12.** temperature at which a liquid changes into a gas

Column II

a. physical

b. mass

c. behavior

d. color

e. melting point

f. appearance

g. never

h. density

i. senses

j. chemical

k. gas

l. boiling point

Directions: *Match the definition of the process on the left with the correct term on the right. Write the letter of the correct term in the blank at the left.*

_____ **13.** a liquid changing into a gas

_____ **14.** a gas changing into a liquid

_____ **15.** a solid changing directly into a gas, without ever becoming a liquid

a. deposition

b. condensation

c. vaporization

d. sublimation

Meeting Individual Needs

Name Date Class

SECTION 2 Reinforcement

Physical and Chemical Changes

Directions: *Complete the paragraphs using the terms listed below.*

liquid	**ice**	**color changes**	**energy**
different	**shape**	**appearance**	**gas**
gain	**solid**	**state**	**freezes**

Physical change involves changes in **1.** _____. A common physical change occurs when matter changes from one **2.** _____ to another, such as from a gas, to a **3.** _____ or a **4.** _____. One example of this kind of physical change takes place when water **5.** _____, changing from a liquid to a solid to form **6.** _____. One easy way to determine if a physical change has taken place is to note changes in **7.** _____ or size.

When a chemical change takes place, a substance is changed into a **8.** _____ substance. Two examples of chemical changes are fireworks explosions and **9.** _____ in leaves. A sign of a chemical change is the release or **10.** _____ of **11.** _____. Other signs of a chemical change are an odd odor or the formation of a **12.** _____ or a solid.

Directions: *List three changes that are physical changes. Do not include the examples listed above.*

13. a. _____

b. _____

c. _____

Directions: *List three changes that are chemical changes. Do not include the examples listed above.*

14. a. _____

b. _____

c. _____

Meeting Individual Needs

SECTION 1 Enrichment

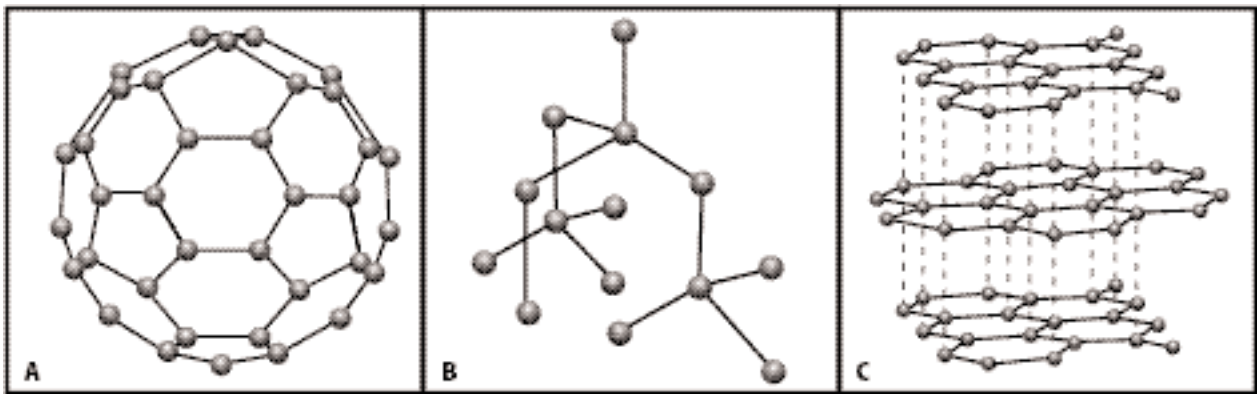
Properties of Carbon

Carbon is one of the most common elements in the world. It forms the tissue of every living creature from an elephant to a spinach leaf. It makes up the products we use to fuel our cars and heat our homes. In one form, it is so soft that it easily rubs off on paper. In another form, it is the hardest natural material known. For years, scientists have explored how the same element can make such very different substances.

One answer is that each carbon atom has four electrons in its outer shell (or orbit). Because the outer shells of most atoms can hold eight electrons, carbon atoms easily form bonds with many other kinds of atoms—including other carbon atoms. However, carbon atoms can bond in several different ways. The drawings below show three different forms of carbon. The circles represent atoms; the lines represent chemical bonds holding the atoms together.

Which properties do you think go with each form of carbon?

Directions: *On the line to the left of each form's name, write the letter of its sketch. Then on the lines after each form's name, write the letter of the descriptive phrase from the list below that fits that form. Each description will be used once.*



1. _____ Diamond—_____, _____, _____

2. _____ Graphite—_____, _____, _____

3. _____ Fullerene—_____, _____, _____

a. the hardest natural structure
b. a recently discovered type of carbon, also known as "buckeyballs"
c. a soft type of carbon that rubs off easily on paper
d. clear crystal
e. used in pencil lead
f. conducts heat and electricity
g. scientists use it as a "cage" to hold other atoms
h. used to cut glass and steel
i. added lubricants

Name Date Class

SECTION 2 Enrichment

Things Are Heating Up

Burning a piece of wood causes a chemical change to occur. The matter in the wood changes to produce gases and charcoal. Heat can cause many kinds of chemical changes, but not all changes caused by heat are chemical changes. Often, heat causes a physical change.

Heating or cooling materials can change their state from solid to liquid, liquid to gas, or back again. These changes in the state of matter are physical changes. When water freezes or melts, a physical change has occurred.

Most materials expand when they are heated and contract as they cool. Two exceptions to this rule are water and rubber. These substances expand when they are cooled and contract when they are heated. For example, when water freezes, it expands to fill a larger space than the liquid water did.

1. Why should you never put a full, sealed bottle of water in the freezer?

2. Why are many bridges built with gaps (called expansion joints) in them?

3. Why should you never pour hot liquids into a cold drinking glass?

4. During the winter, potholes—holes or large cracks in the pavement—appear in the street. What causes them?

Meeting Individual Needs

Name Date Class

Note-taking Worksheet

Properties and Changes of Matter

Section 1 Physical and Chemical Properties

A. _____ **property**—characteristic that can be observed without changing the composition of a substance

1. _____ includes things that can be observed with the senses.
2. Substances can be in a liquid, solid, or gas _____.
3. Volume, mass, and density are _____ that can describe physical properties.
4. _____ point and _____ point are physical properties of a substance.
5. _____ describes the way some substances behave.

B. _____ **property**—characteristic that cannot be observed without altering the substance

1. Ability to _____
2. Tendency to _____
3. _____ to other substances such as acids

Section 2 Physical and Chemical Changes

A. _____ **change**—Form or appearance of matter changes, but composition stays the same.

1. _____ can change, but substance does not.
2. _____ a solid into a liquid is a physical change.
3. Changing _____ through vaporization, condensation, sublimation, or deposition does not change the composition of matter.

B. _____ **change** results in a change in the substance's composition.

1. _____ can change as a chemical reaction occurs.
2. _____ may be gained or released during a chemical change.
3. Substances may change _____ as a result of a chemical change.
4. Formation of a _____ or the precipitation of a _____ can indicate a chemical change.
5. Chemical changes are not easily _____.

Meeting Individual Needs

Note-taking Worksheet (continued)

C. Chemical changes alter the _____ of substances; _____ changes do not alter the composition of substances.

1. Water _____ or _____ —amount of matter stays the same; physical change

2. Wood burns—_____, _____, and _____ still total the same amount of matter; chemical change

D. Law of _____—particles of matter are not created or destroyed as the result of physical or chemical changes.

Assessment

Name Date Class

Chapter Review

Properties and Changes of Matter

Part A. Vocabulary Review

Directions: *Unscramble the letters to form the correct word for each definition.*

_____ **1.** *hacclime preptory:* allows a substance to change to a new substance

_____ **2.** *malceich hagcen:* original material is transformed into a new material

_____ **3.** *aeioocnnrstv fo sams:* total mass is the same before and after a physical or chemical change

_____ **4.** *chyplais gnache:* any alteration in size, shape, or form of matter

_____ **5.** *tendisy:* relates an object's mass to the amount of space it takes up

_____ **6.** *saphicly toppyrer:* most of these characteristics can be observed with the senses

_____ **7.** *liigbon tnpoi:* temperature at which a liquid turns into a gas

_____ **8.** *vhaiebro:* how something acts

_____ **9.** *ulmove:* how much space an object takes up

_____ **10.** *mtlgnei iotpn*: temperature at which a solid turns into a liquid

_____ **11.** *ttsae:* solid, liquid or gas

_____ **12.** *aaaceenrpp:* properties you detect with your senses

Part B. Concept Review

Directions: *Complete each sentence by filling in the blanks with the correct term or terms.*

1. Shape, color, and texture are examples of _____.

2. You can tell a(n) _____ has occurred when energy is taken in or given off.

3. The rusting of metal is an example of a(n) _____ change.

4. A change of _____ is an example of a physical change.

5. Milk and gasoline are examples of the _____ of matter.

6. Mass and volume depend on the _____ of matter.

7. _____ measures how much mass is in a given volume.

8. You can use a table to find the _____ point of most substances.

9. The fact that something is magnetic can be determined by watching its _____.

Assessment

Chapter Review (continued)

10. A _____ can only be determined by changing a substance.

11. _____ is when a gas changes into a solid.

12. _____ can indicate physical or chemical changes depending on the cause of the change.

13. Energy is _____ in a chemical change.

14. Formation of a(n) _____ is an indication of chemical change.

15. The total _____ of the matter is the same before and after a physical or chemical change. This is the _____.

Directions: *Classify the following changes by writing* **physical** *or* **chemical** *in the blank before each item.*

_____ **16.** tearing paper

_____ **17.** wax melting

_____ **18.** wood burning

_____ **19.** peeling a potato

_____ **20.** iron rusting

_____ **21.** sanding wood

_____ **22.** milk souring

_____ **23.** silver tarnishing

Directions: *Answer the following questions on the lines provided.*

24. List some physical properties that are size dependent.

_____

_____

25. List some physical properties that are size independent.

_____

_____

Assessment

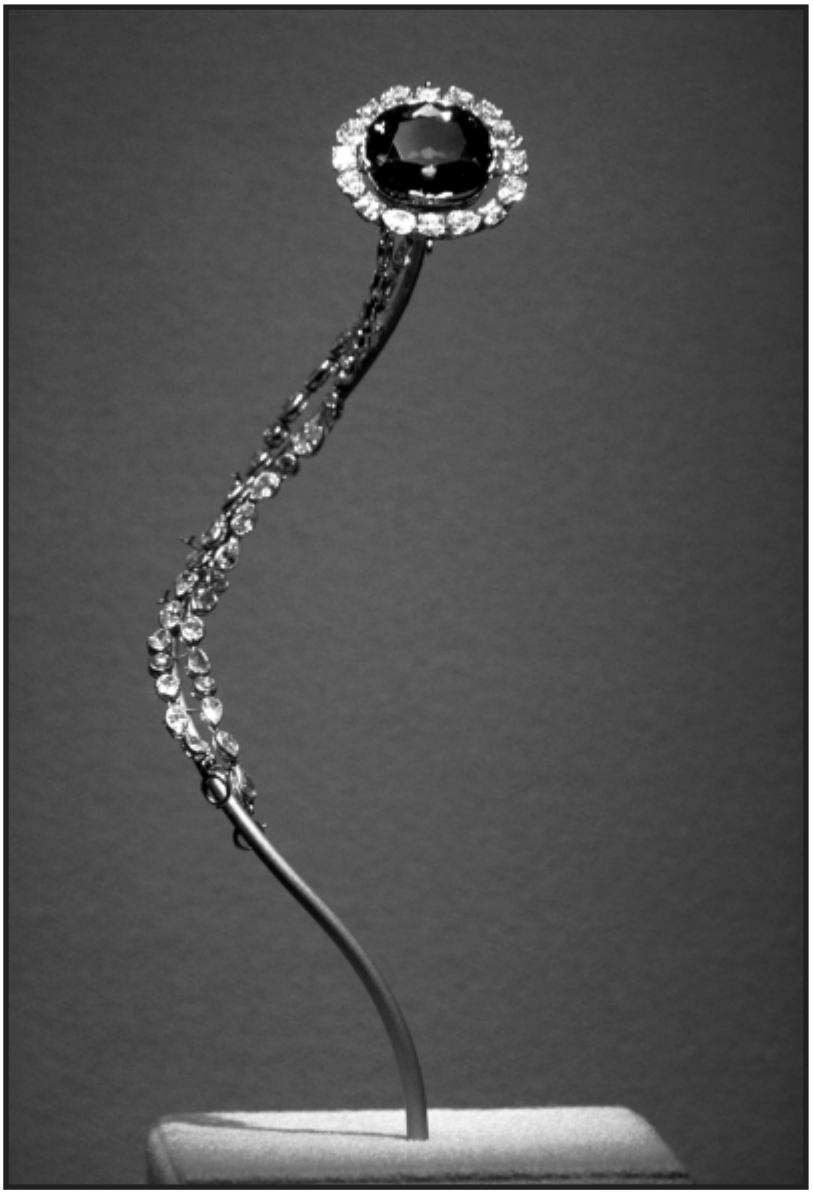
Transparency Activities

Name Date Class

SECTION 1 Section Focus Transparency Activity

A Costly Trinket, Indeed

Diamonds are not only beautiful, but also are the hardest substances in the world! The Hope diamond, shown below, is the largest deep blue diamond ever discovered. Since it was found in 1688, it has been lost, recovered, cut, sold, and even pawned for ransom money.

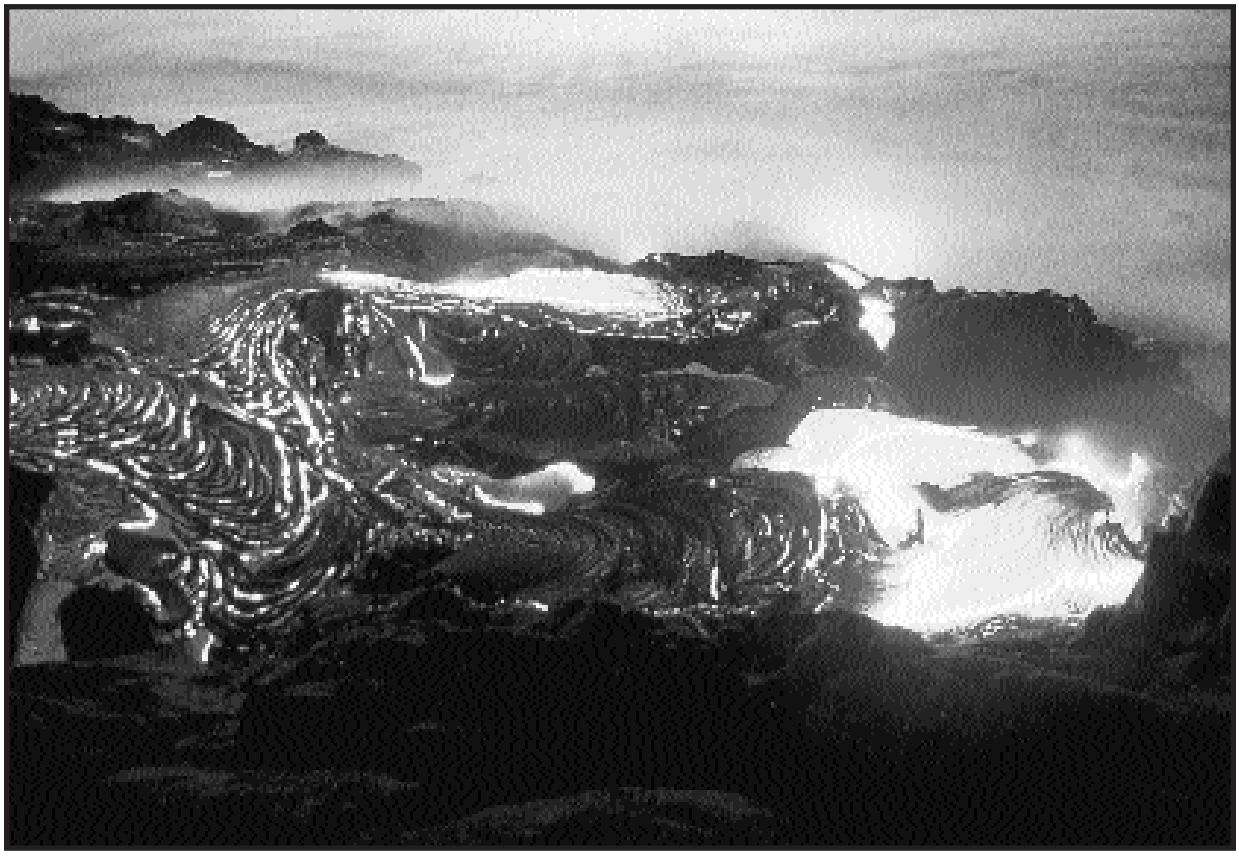


1. **Describe this diamond. What are its most obvious characteristics?**
2. **Aside from jewelry, what other ways might diamonds be used?**

SECTION 2 Section Focus Transparency Activity

About Due for a Vacation

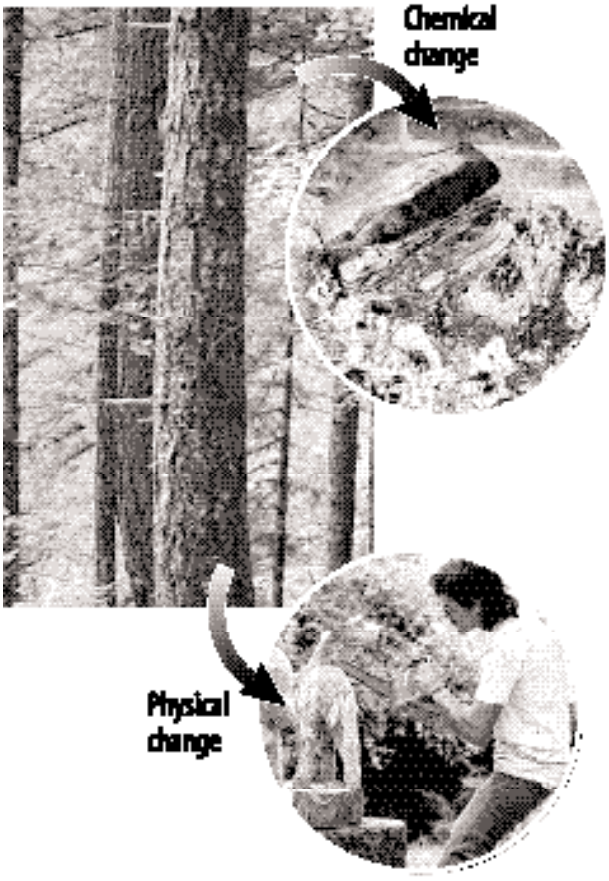
Kilauea is a volcano located on the island of Hawaii. It is one of the most active volcanoes in the world; it has been erupting continuously since 1983.

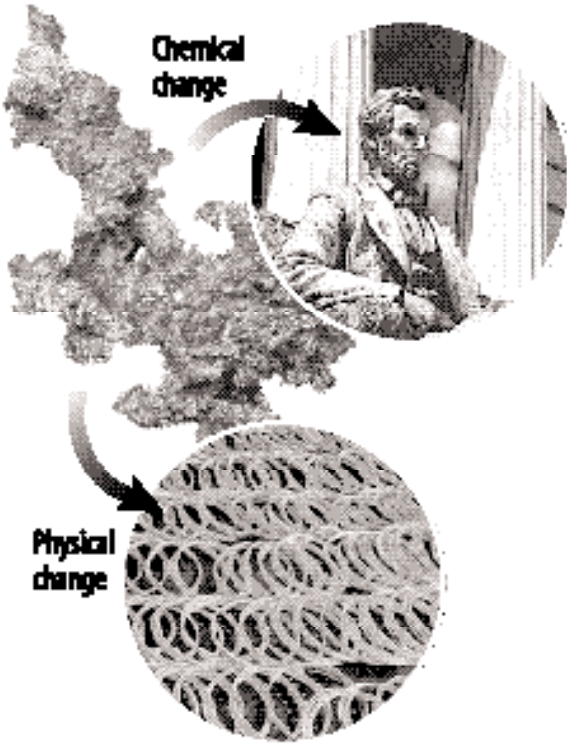


1. **Describe what you see in the photo.**
2. **How is lava cooling similar to water turning to ice?**

SECTION 2 Teaching Transparency Activity

Chemical Changes





Teaching Transparency Activity (continued)

1. In what type of a change is a substance permanently altered and a new substance created?

2. What type of a change do you have if you cut down a tree and make a chair?

3. What principle states that particles within matter can rearrange to form new substances, but they are not destroyed and new particles are not created?

4. What type of change causes leaves to change color?

5. What changes in a chemical change?

6. What changes in a physical change?

Assessment Transparency Activity

Properties and Changes of Matter

Directions: *Carefully review the table and answer the following questions.*

Physical Properties			
Substance	**Odor**	**Boiling point (°C)**	**Melting point (°C)**
Hydrogen	None	−253	−259
Lead	Pungent	1,740	327
Nitrogen	None	−196	−210
Iron	None	2,750–3,000	1,535
Sulfur	Boiled eggs	445	119

1. According to the table, if an unknown substance begins to melt at 119°C, it is probably ___.

A hydrogen
B nitrogen
C iron
D sulfur

2. According to the table, which of the following substances cannot remain solid at room temperature (about 24°C)?

F Lead
G Nitrogen
H Iron
J Sulfur

3. According to the table, which of the following substances must exist as a gas at room temperature (about 24°C)?

A Hydrogen
B Lead
C Iron
D Sulfur