

Phase Changes

Vocabulary

vaporization (vay puh ruh ZAY shuhn)

process of a liquid changing into a gas

condensation (kon den SAY shuhn)

process of changing from a gas to a liquid

sublimation (suhb li MAY shuhn) process

of a solid changing directly to vapor without forming a liquid

Using Science Words

1. The process of a gas changing into a liquid is called _____.
 - A. sublimation
 - B. vaporization
 - C. condensation

- 1 Every day you come across matter in one of three states: solid, liquid, or gas. For example, imagine a glass of ice water. Ice in the glass is frozen water, a solid, and water is liquid. Water can also be a gas, or water vapor, which is in the air around you.
- 2 All matter is made up of very tiny particles. These particles are atoms or molecules. The state of the matter is determined by the movement of particles in matter and the way they are arranged. Particles in most solids are very close together and move very slowly. Particles in liquids are not as close to one another as particles in a solid, and they move faster. Particles in a gas are very far apart and move very quickly.
- 3 The state of matter can change without the matter changing. When ice melts, it becomes liquid water. When water is heated, it becomes a gas. When a material changes from one state to another, it is called a phase change. There are six phase changes: melting, freezing, vaporization, condensation, sublimation, and deposition. These changes take place when energy is either lost or gained by the material.
- 4 When thermal energy is added to a solid, particles gain energy and begin to move more quickly. As the solid gets warmer, it begins to melt. The melting point is the temperature at which a solid becomes a liquid. The melting point for water is 0°C . When the water is cooled, thermal energy is taken away. Particles slow down and change back into a solid. The freezing point for water is the same as its melting point. The melting point and freezing point are determined by how closely held the particles are.
- 5 **Vaporization** is the process of a liquid changing into a gas. In order for a liquid to vaporize, it must absorb energy. Energy allows the liquid to change into a gas. The amount of energy a substance needs to vaporize is called the heat of vaporization. There are two types of vaporization processes—evaporation and boiling.
- 6 Evaporation is the process that changes a liquid to a gas at the liquid's surface. You see evaporation when the sun dries up puddles. The sun heats the surface of the water enough to cause particles to break free into the air. This is evaporation.
- 7 Unlike evaporation, boiling takes place throughout the liquid, not just at the surface. As the temperature of the liquid increases, particles move faster and faster and eventually move far enough apart to change into a gas. The boiling point of a liquid is the temperature at which it becomes a gas.
- 8 What happens when you leave a glass of cold lemonade in the sun on a warm summer day? Drops of water form on the outside of the glass. This is condensation. **Condensation** is the process of changing a gas to a liquid. When water vapor in the air touches the cold glass, particles of water slow down. As the particles get slower, the attraction between them grows stronger, and liquid drops of water form.
- 9 **Sublimation** is the process of a solid changing directly to a vapor without forming a liquid first. Have you ever seen fog used as a special effect? The fog was created by dry ice, which is the solid form of carbon dioxide. Dry ice turns into a vapor at room temperature.
- 10 The process of a gas changing directly into a solid without becoming a liquid is called deposition. Frost on a window in winter is an example of deposition. Water vapor on the cold window loses energy so quickly that it changes into ice without changing into liquid water first.

Comprehension

Write the letter of the best answer.

2. Three states of matter are _____.
 - a. ice, water, and solid
 - b. solid, liquid, and gas
 - c. vapor, gas, and liquid
3. A phase change takes place when matter _____.
 - a. changes from one state to another
 - b. stays in the same state
 - c. changes into a different kind of matter
4. The two processes of vaporization are _____.
 - a. deposition and melting
 - b. condensation and sublimation
 - c. evaporation and boiling
5. Condensation occurs when _____.
 - a. particles in a gas slow and form a liquid
 - b. water changes into a gas
 - c. a liquid moves faster
6. Dry ice changing directly into a gas is an example of _____.
 - a. deposition
 - b. vaporization
 - c. sublimation

Word Study

Context Clues You can often tell the meaning of a term by reading the words around it. Look in other sentences for clues about the meaning.

Look at each number in parentheses. Find the paragraph in the reading with the same number. Then find the term that fits the given meaning. Write the term.

7. change from one state to another (3)
8. temperature at which a solid becomes a liquid (4)
9. liquid changing into a gas (5)
10. gas changing to a liquid (8)
11. solid changing directly into a gas (9)

Nouns The words in **bold type** are nouns. A noun is a word that indicates a person, place, or thing.

The **teacher** helped **Greg**. (persons)
The **laboratory** is in **Chicago**. (places)
The **particles** in a **solid** move slowly. (things)

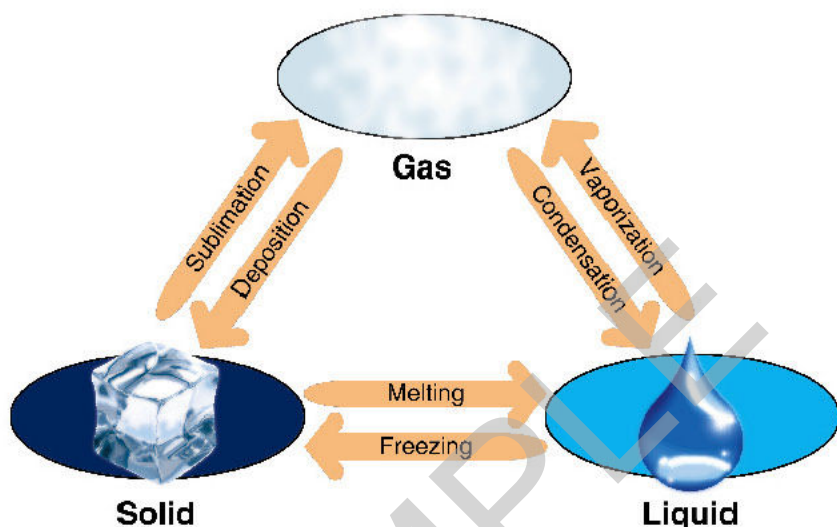
Each phrase below contains one noun. Write the noun.

12. when a material changes
13. is working in the classroom
14. touches the cold glass
15. the scientist experiments
16. loses energy so quickly

Standardized Test Practice

Test Tip

Order and Sequence A sequence is one step that occurs after another. Follow the arrows in the diagram to see what happens first and what happens next.



Multiple Choice Use the diagram to answer the questions.

17. What processes take place between a liquid and a solid?
 - A. condensation and vaporization
 - B. sublimation and condensation
 - C. melting and freezing
 - D. deposition and vaporization
18. What processes take place when a solid changes to a gas and a gas changes to a liquid?
 - A. condensation and vaporization
 - B. sublimation and condensation
 - C. melting and freezing
 - D. deposition and vaporization
19. Which statement best summarizes the diagram?
 - A. There are six ways in which matter can change from one state to another.
 - B. A solid can change into a liquid but not into a gas.
 - C. The arrows show only one way a solid, liquid, or gas can change.
 - D. Matter changes into a different material when it changes state.

Using Science Words

1. C

Comprehension

2. b
3. a
4. c
5. a
6. c

Word Study

7. phase change
8. melting point
9. vaporization
10. condensation
11. sublimation
12. material
13. classroom
14. glass
15. scientist
16. energy

Standardized Test Practice

17. C
18. B
19. A

Writing About Science

Explain the phase change that occurs when a puddle dries up on a hot, sunny day.