

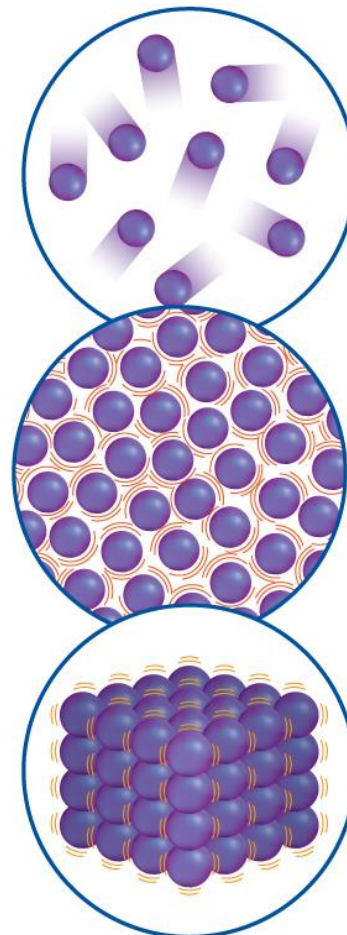
Chapter Menu

Chapter Introduction

Lesson 1 Matter and
Its Properties

Lesson 2 Matter and
Its Changes

Chapter Wrap-Up





What gives a substance its unique identity?



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Get Ready

What do you think?

Before you begin, decide if you agree or disagree with each of these statements. As you view this presentation, see if you change your mind about any of the statements.



Get Ready

Do you agree or disagree?

1. The particles in a solid object do not move.
2. Your weight depends on your location.
3. The particles in ice are the same as the particles in liquid water.



Get Ready

Do you agree or disagree?

4. Mixing powdered drink mix with water causes a new substance to form.
5. If you combine two substances, bubbling is a sign that a new type of substance might be forming.
6. If you stir salt into water, the total amount of matter decreases.



Lesson 1

Matter and Its Properties

Key Concepts

- How do particles move in solids, liquids, and gases?
- How are physical properties different from chemical properties?
- How are properties used to identify a substance?



Lesson 1

Matter and Its Properties

Vocabulary

- volume
- solid
- liquid
- gas
- physical property
- mass
- density
- solubility
- chemical property



What is matter?

- Matter is anything that has mass and takes up space.
- Matter can have both physical and chemical properties.

States of Matter

- Volume is the amount of space a sample of matter occupies.
- A solid is a state of matter with a definite shape and volume.
- A liquid is a state of matter with a definite volume but not a definite shape.
- A gas is a state of matter without a definite shape or a definite volume.

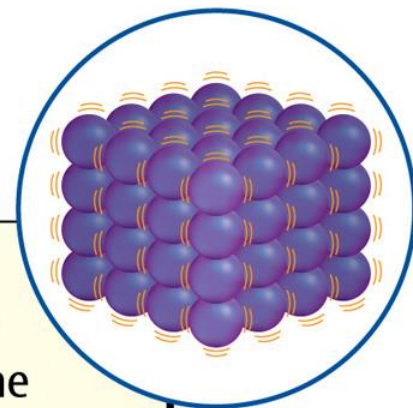


Solids, Liquids, and Gases



States of Matter (cont.)

- All matter is made of tiny particles that are constantly moving.
- In solids, particles vibrate back and forth in all directions.



Solid

- a definite shape
- a definite volume
- particles close together
- strong attractive forces between particles
- particles vibrate in all directions

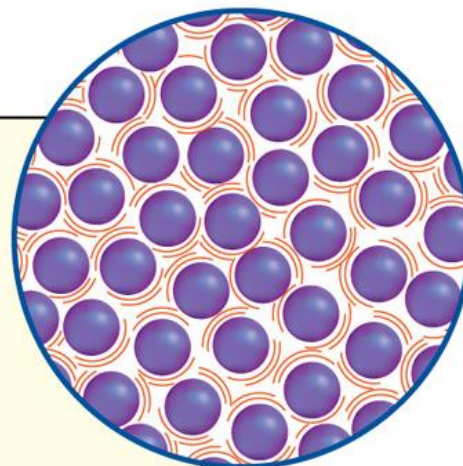


States of Matter (cont.)

In liquids, the distance between particles is greater and they can slide past one another.

Liquid

- no definite shape; takes the shape of its container
- definite volume
- particles close together
- weaker attractive forces between particles than in solids
- particles free to move past neighboring particles

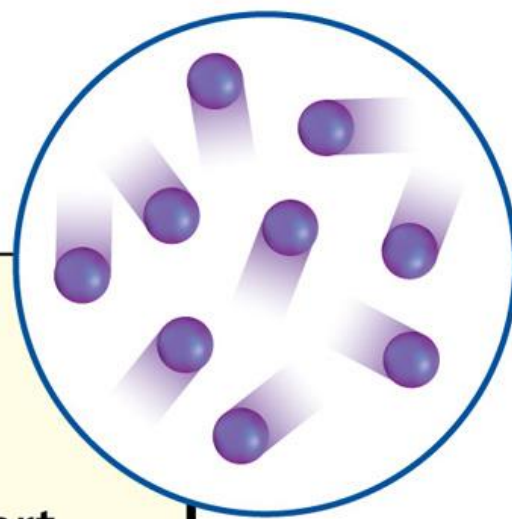


States of Matter (cont.)

In a gas, particles move freely rather than staying close together.

Gas

- no definite shape
- no definite volume
- particles very far apart
- very weak attractive forces between particles
- particles move freely



States of Matter (cont.)



KEY CONCEPT CHECK

How do particles move in solids, liquids, and gases?



States of Matter (cont.)

- Particles of matter that are close together exert an attractive force on each other.
- The strength of the attraction depends on the distance between particles.



What are physical properties?

- Any characteristic of matter that you can observe without changing the identity of the substances that make it up is a physical property.
- State of matter, temperature, and the size of an object are all examples of physical properties.

What are physical properties? (cont.)

SCIENCE USE V. COMMON USE

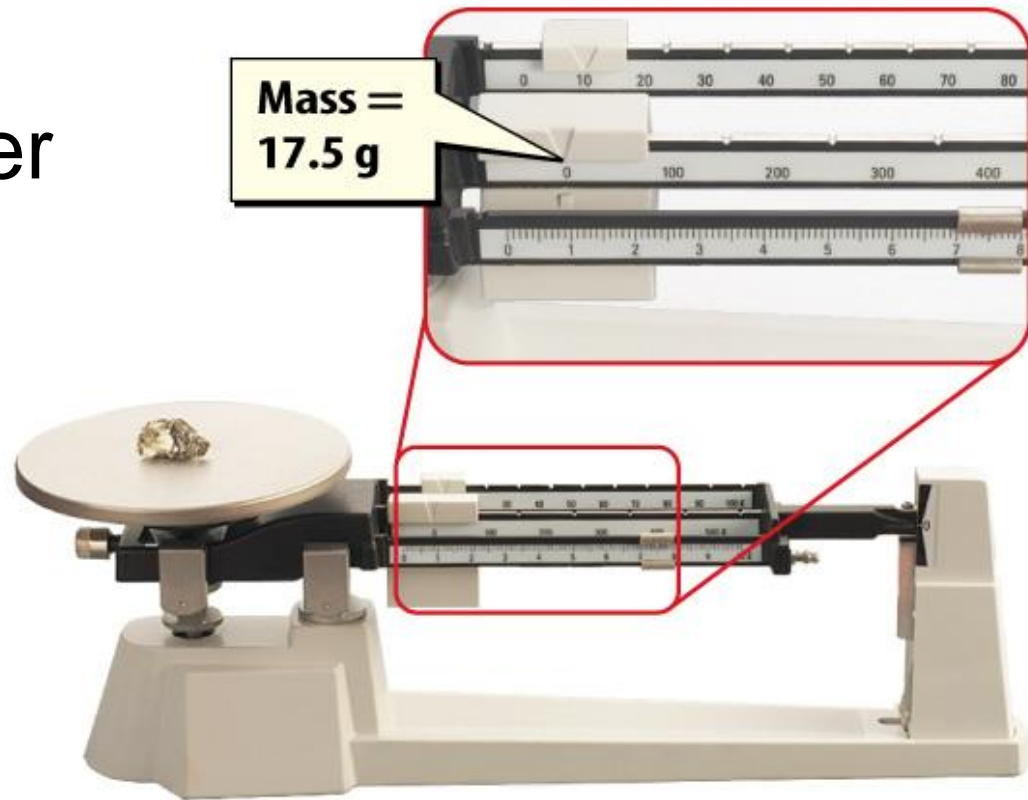
state

Science Use a condition or physical property of matter

Common Use an organized group of people in a defined territory, such as one of the fifty states in the United States



Mass is the amount of matter in an object.



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Mass

A balance measures an object's mass by comparing it to the known mass of the slides on the balance. Common units for measuring mass are the kilogram (kg) and the gram (g).



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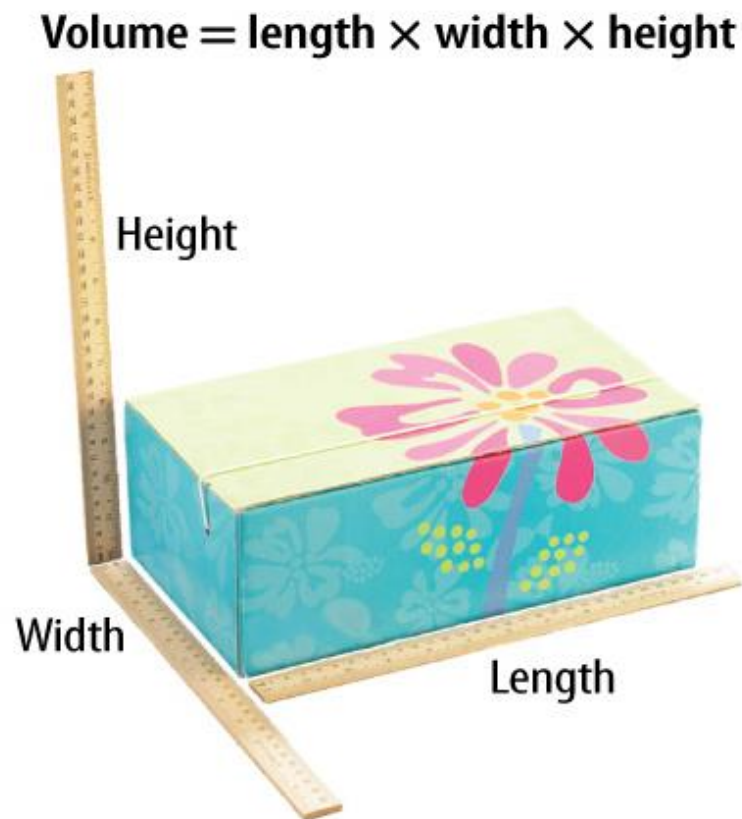


What are physical properties? (cont.)

- Weight is the gravitational pull on the mass of an object.
- Weight depends on the location of an object, but its mass does not.



Volume depends on the amount or size of the sample of matter.



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Volume of a Rectangular-Shaped Solid

If a solid has a rectangular shape, you can find its volume by multiplying its length, its width, and its height together. A common unit of volume for a solid is the cubic centimeter (cm^3).



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What are physical properties? (cont.)

- Density is the mass per unit volume of a substance.
- Density is constant for a given substance, regardless of the size of the sample.



Density Equation

$$\text{Density (in g/mL)} = \frac{\text{mass (in g)}}{\text{volume (in mL)}}$$

$$D = \frac{m}{V}$$

To find the density of the rock, first determine the mass and the volume of the rock:

mass: $m = 17.5 \text{ g}$

volume: $V = 73.5 \text{ mL} - 70.0 \text{ mL} = 3.5 \text{ mL}$

Then, divide the mass by the volume:

$$D = \frac{17.5 \text{ g}}{3.5 \text{ mL}} = 5.0 \text{ g/mL}$$

Density Calculation

Density can be calculated using the density equation. The common units of density are grams per milliliter (g/mL) or grams per cubic centimeter (g/cm³). 1 mL = 1 cm³.



What are physical properties? (cont.)

Solubility is the ability of one material to dissolve in another.

WORD ORIGIN

solubility

from Latin *solubilis*, means
“capable of being dissolved”



What are physical properties? (cont.)

- Melting point and boiling point are physical properties.
- The melting point is the temperature at which a solid changes to a liquid.
- The boiling point is the temperature at which a liquid boils, or changes to gas.
- Magnetism, malleability, and electrical conductivity are also physical properties.



What are chemical properties?

- A chemical property is the ability or inability of a substance to combine with or change into one or more new substances.
- A chemical property is a characteristic of matter that you observe as it reacts with or changes into a different substance.



What are chemical properties? (cont.)



KEY CONCEPT CHECK

How do chemical properties and physical properties differ?



What are chemical properties? (cont.)

- Flammability and the ability to rust are both chemical properties.
- Flammability is the ability of a type of matter to burn easily.
- Rust is a substance that forms when iron reacts with water and oxygen.



Identifying Matter Using Physical Properties

- Physical properties are useful for identifying unknown substances.
- When you identify matter using physical properties, consider how the properties are alike and how they are different.



Identifying an Unknown Material by its Physical Properties

Substance	Color	Mass (g)	Melting Point (°C)	Density (g/cm ³)
Table salt	white	14.5	801	2.17
Sugar	white	11.5	148	1.53
Baking soda	white	16.0	50	2.16
Unknown	white	16.0	801	2.17



Identifying Matter Using Physical Properties (cont.)



KEY CONCEPT CHECK

How are properties used to identify a substance?



Sorting Materials Using Properties

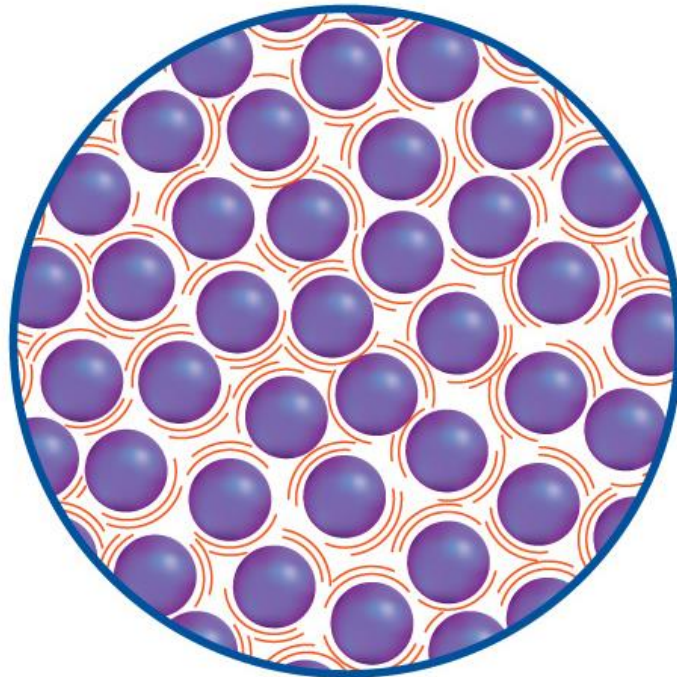
Physical properties and chemical properties are useful for sorting materials.

Separating Mixtures Using Physical Properties

Physical properties, such as a material's melting point, are useful for separating different types of matter that are mixed.

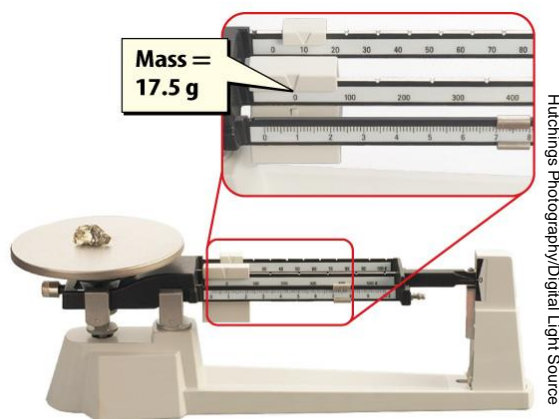
Summary

- The movement of particles is different in a solid, a liquid, and a gas.



Summary

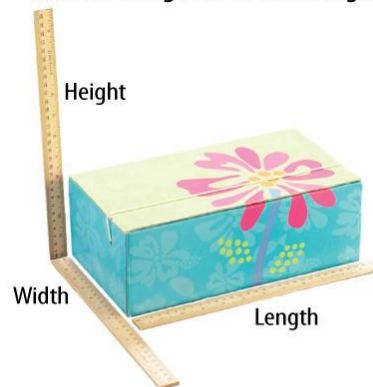
- Physical properties and chemical properties are used to describe types of matter.



Mass

A balance measures an object's mass by comparing it to the known mass of the slides on the balance. Common units for measuring mass are the kilogram (kg) and the gram (g).

$$\text{Volume} = \text{length} \times \text{width} \times \text{height}$$



Volume of a Rectangular-Shaped Solid

If a solid has a rectangular shape, you can find its volume by multiplying its length, its width, and its height together. A common unit of volume for a solid is the cubic centimeter (cm^3).



Summary

- Physical properties such as magnetism can be used to separate mixtures.

Identifying an Unknown Material by its Physical Properties

Substance	Color	Mass (g)	Melting Point (°C)	Density (g/cm ³)
Table salt	white	14.5	801	2.17
Sugar	white	11.5	148	1.53
Baking soda	white	16.0	50	2.16
Unknown	white	16.0	801	2.17



Lesson Review

Which of these refers to a state of matter with a definite volume but not a definite shape?

A. particle

B. solid

C. gas

D. liquid



Lesson Review

What is the amount of space a sample of matter occupies?

- A. mass
- B. volume**
- C. weight
- D. density



Lesson Review

Solubility refers to one substance's ability to do what in the presence of another substance?

- A. rust
- B. burn
- C. dissolve**
- D. change shape



Lesson Review

What do you think **NOW?**

Do you agree or disagree?

1. The particles in a solid object do not move.
2. Your weight depends on your location.
3. The particles in ice are the same as the particles in liquid water.



Lesson 2

Matter and Its Change

Key Concepts

- How are physical changes different from chemical changes?
- How do physical and chemical changes affect mass?



Lesson 2

Matter and Its Change

Vocabulary

- physical change
- chemical change
- law of conservation of mass



What are physical changes?

- Matter can change in many physical and chemical ways.
- A change in the size, shape, form, or state of matter that does not change the matter's identity is a physical change.
- When a physical change occurs, the chemical properties of the matter stay the same.

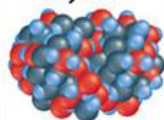


Dissolving: A Physical Change

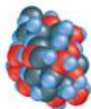
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Key

Sugar crystal



1 Sugar molecule



$C_{12}H_{22}O_{11}$

1 Water molecule

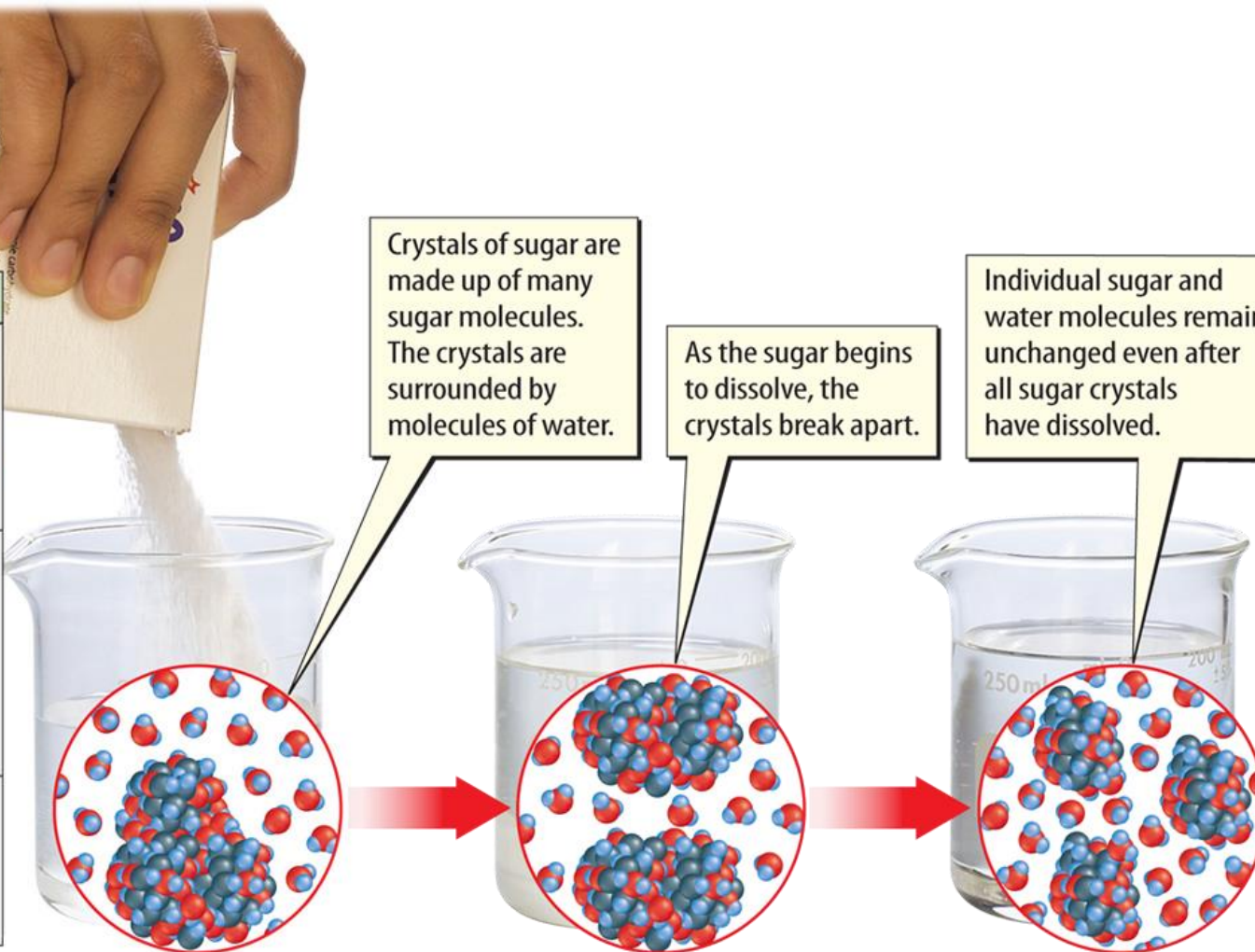


H_2O

Crystals of sugar are made up of many sugar molecules. The crystals are surrounded by molecules of water.

As the sugar begins to dissolve, the crystals break apart.

Individual sugar and water molecules remain unchanged even after all sugar crystals have dissolved.

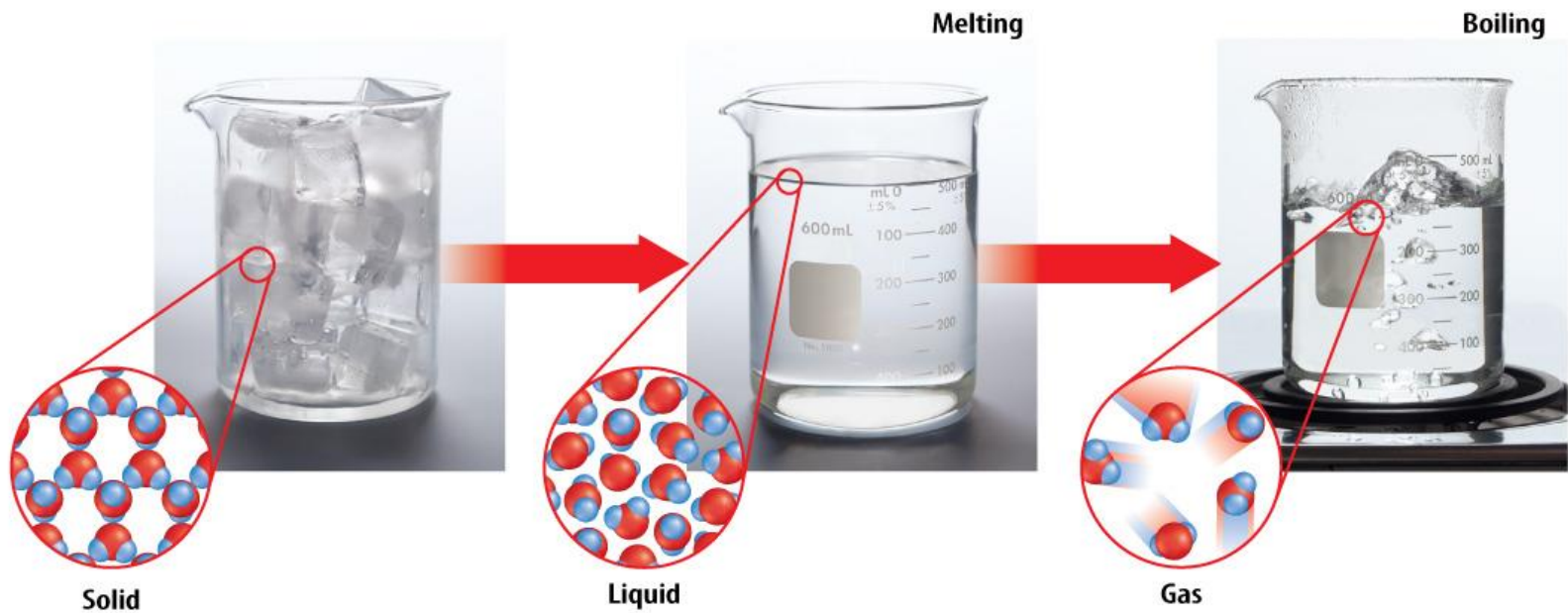


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What are physical changes? (cont.)

- Changes in the state of matter are physical changes.
- Melting and boiling are both changes in state.
- Changes in energy cause changes in the state of matter.



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What are chemical changes?

- A chemical change is a change in matter in which the substances that make up the matter change into other substances with different chemical and physical properties.
- The new substance produced during a chemical change has different chemical and physical properties.



What are chemical changes? (cont.)

The only sure sign of a chemical change is the formation of a new substance.



KEY CONCEPT CHECK

How are chemical changes different from physical changes?



What are chemical changes? (cont.)

- For many reactions, changes in physical properties, such as color or state of matter, are signs that a chemical change has occurred.
- All chemical reactions involve energy changes.
- Thermal or light energy is often needed for a chemical reaction to take place.

What are chemical changes? (cont.)

- Most chemical changes cannot be reversed.
- Some physical changes can be easily reversed, but others cannot.



What are chemical changes? (cont.)

The law of conservation of mass states that the total mass before a chemical reaction is the same as the total mass after the chemical reaction.

WORD ORIGIN

conservation

from Latin *conservare*, means “to keep, preserve”



What are chemical changes? (cont.)



KEY CONCEPT CHECK

How do physical and chemical changes affect mass?



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Comparing Physical and Chemical Changes

- Sometimes deciding if a change is physical or chemical is easy, but often many factors must be compared and considered.
- Chemical changes produce a new substance, but physical changes do not.



Comparing Physical and Chemical Changes

Type of Change	Examples	Characteristics
Physical change		
Chemical change		

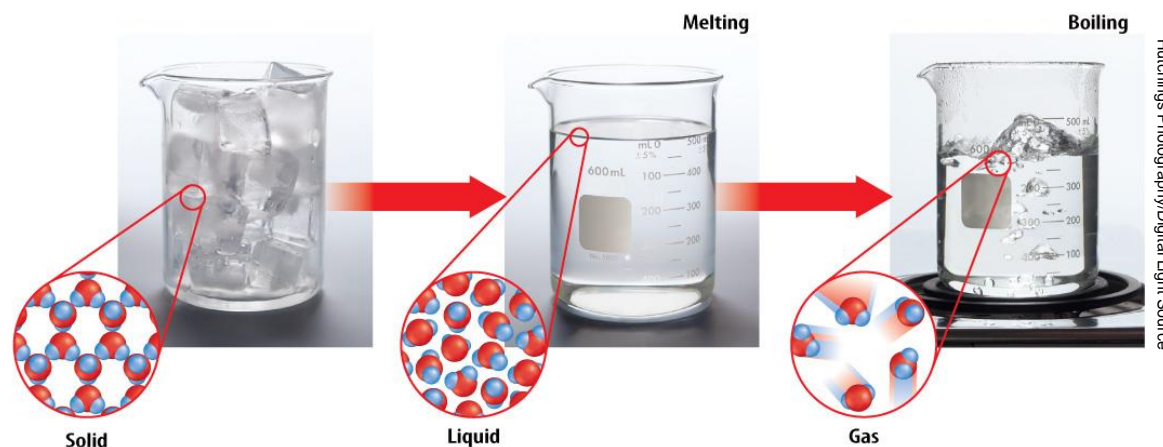
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Summary

- The identity of a substance does not change during a physical change such as a change in the state of matter.



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Summary

- A new substance is produced during a chemical change.
- The law of conservation of mass states that the mass of a material does not change during a chemical change.



Lesson Review

Which of these processes is a physical change in which the identities of the substances do not change when they are mixed?

A. rusting

C. color change

B. burning

D. dissolving



Lesson Review

The only sure sign of a chemical change is the formation of which of the following?

- A. liquid
- B. precipitate
- C. a new substance
- D. gas



Lesson Review

Which law states that the total mass before a chemical reaction is the same as the total mass after the chemical reaction?

- A.** conservation of mass
- B.** conservation of volume
- C.** conservation of matter
- D.** conservation of size



Lesson Review

What do you think **NOW?**

Do you agree or disagree?

4. Mixing powdered drink mix with water causes a new substance to form.
5. If you combine two substances, bubbling is a sign that a new type of substance might be forming.
6. If you stir salt into water, the total amount of mass decreases.



Menu

[Key Concept Summary](#)

[Interactive Concept Map](#)

[Chapter Review](#)

[Standardized Test Practice](#)



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Physical and chemical properties give a substance its unique identity. The matter that makes up a substance can change physically or chemically.



Lesson 1: Matter and Its Properties

- Particles of a solid vibrate about a definite position. Particles of a liquid can slide past one another. Particles of a gas move freely within their container.
- A physical property is a characteristic of matter that you can observe without changing the identity of the substances that make it up. A chemical property is the ability or inability of a substance to combine with or change into one or more new substances.
- Some properties of matter do not depend on size or amount of the sample. You can identify a substance by comparing these properties to those of other known substances.



Lesson 2: Matter and Its Changes

- A change in the size, shape, or form of matter in which the identity of the matter stays the same is a physical change. A change in matter in which the substances that make it up change into other substance with different chemical and physical properties is a chemical change.
- The law of conservation of mass states that the total mass before a chemical reaction is the same as the total mass after the reaction.

Chapter Review

Which of these is a state of matter without a definite shape or volume?

- A. liquid
- B. gas
- C. solid
- D. chemical



Chapter Review

What term describes any characteristic of matter that you can observe without changing the identity of the substances it's made of?

- A.** physical property
- B.** chemical property
- C.** density
- D.** weight



Chapter Review

Color change can be an indication of which of these?

- A. a physical change
- B. a chemical change
- C. a chemical or physical change**
- D. no change



Chapter Review

During a physical change what characteristic of matter changes?

- A. chemical properties
- B. colors
- C. physical properties**
- D. density



Chapter Review

When a substance is heated to its boiling point, the bubbles indicate that liquid is turning into which of these?

- A.** a gas
- B.** a new liquid
- C.** a solid
- D.** a precipitate



Standardized Test Practice

What term describes anything that has mass and takes up space?

- A. water
- B. gas
- C. matter
- D. a solid



Standardized Test Practice

Depending on the size and shape of its container, a gas changes both shape and which of the following?

- A.** volume
- B.** color
- C.** mass
- D.** density



Standardized Test Practice

Which refers to a change in a substance where no new substances are formed?

- A.** physical change
- B.** conservation of mass
- C.** chemical change
- D.** physical and chemical change



Standardized Test Practice

What kind of change has occurred when substances change into other substances?

- A. physical
- B. color
- C. chemical
- D. identity



Standardized Test Practice

What is another name for a chemical change?

- A. melting
- B. boiling
- C. physical reaction
- D. chemical reaction**

