

# Matter—Properties and Changes

## Section 3.1 Properties of Matter

In your textbook, read about physical properties and chemical properties of matter.

Use each of the terms below just once to complete the passage.

~~chemical~~  
~~density~~

~~mass~~  
~~properties~~

~~physical~~  
~~substance~~

Matter is anything with (1) mass and volume. A (2) substance is a form of matter with a uniform and unchanging composition. Substances have specific, unchanging (3) properties that can be observed. Substances have both physical and chemical properties. (4) Physical properties can be observed without changing a substance's chemical composition. Color, hardness, and (5) density are examples. Other properties cannot be observed without changing the composition of a substance. These are called (6) Chemical properties. An example is the tendency of iron to form rust when exposed to air.

Label each property as either *physical* or *chemical*.

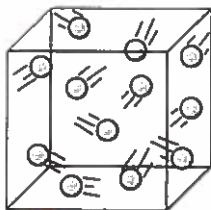
- C 7. Chemical formula  $H_2O$
- C 8. Forms green carbonate when exposed to moist air
- C 9. Remains unchanged when in the presence of nitrogen
- P 10. Colorless
- P 11. Solid at normal temperatures and pressures
- C 12. Ability to combine with another substance
- P 13. Melting point
- P 14. Liquid at normal temperatures and pressures
- P 15. Boiling point is  $100^\circ C$
- P 16. Conducts electricity
- P 17. Density is  $\frac{1g}{cm^3}$

Section 3.1 *continued*

In your textbook, read about states of matter.

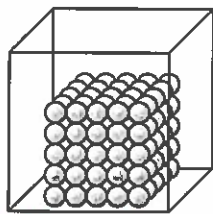
Label each drawing with one of these words: *solid, liquid, gas*.

18.



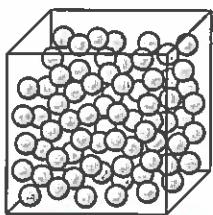
Gas

19.



Solid

20.



Liquid

For each statement below, write *true* or *false*.

- T   21. All matter that we encounter in everyday life exists in one of three physical forms.
- T   22. A solid has definite shape and volume.
- I   23. A liquid has a definite shape and takes on the volume of its container.
- T   24. A gas has both the shape and the volume of its container.
- F   25. The particles in a gas cannot be compressed into a smaller volume.
- F   26. Liquids tend to contract when heated.
- F   27. The particles in a solid are spaced far apart.
- F   28. The words *gas* and *vapor* can be used interchangeably.

### Section 3.2 Changes in Matter

In your textbook, read about physical change and chemical change.

What kinds of changes do these words indicate? Write each word under the correct heading. Use each word only once.

boil	crumple	crush	explode
burn	ferment	freeze	grind
condense	melt	oxidize	rot
corrode	rust	tarnish	vaporize

**Physical Change**

1. Boil
2. Condense
3. Crumple
4. Melt
5. Crush
6. Freeze
7. Grind
8. Vaporize

**Chemical Change**

9. Burn
10. Corrode
11. Ferment
12. Rust
13. Oxidize
14. Tarnish
15. Explode
16. Rot

These can be in any order as long as they are under the correct change.

For each item in Column A, write the letter of the matching item in Column B.

**Column A**

- ~~17.~~ The new substances that are formed in a chemical reaction
- A 18. A chemical reaction that involves one or more substances changing into new substances
- ~~19.~~ Shows the relationship between the reactants and products in a chemical reaction
- E 20. States that mass is neither created nor destroyed in any process
- ~~21.~~ The starting substances in a chemical reaction

**Column B**

- ~~a.~~ chemical change
- ~~b.~~ reactants
- ~~c.~~ products
- ~~d.~~ chemical equation
- ~~e.~~ law of conservation of mass

Answer the following question. Write an equation showing conservation of mass of reactants and products.

- ~~22.~~ In a laboratory, 178.8 g of water is separated into hydrogen gas and oxygen gas. The hydrogen gas has a mass of 20.0 g. What is the mass of the oxygen gas produced?

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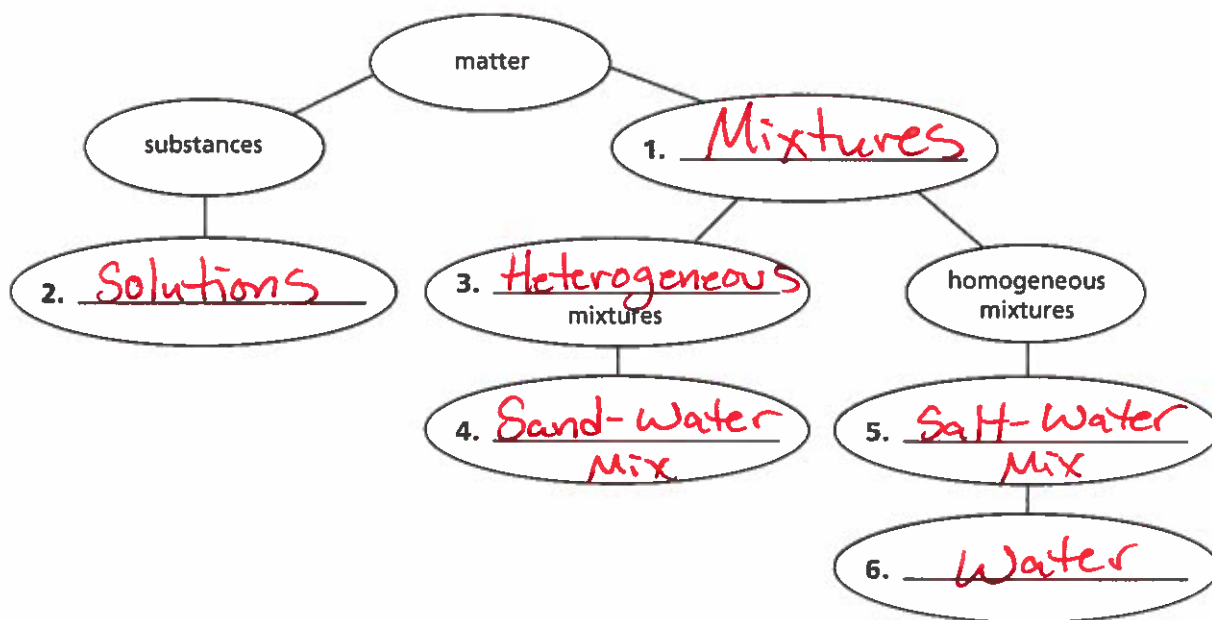
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### Section 3.3 Mixtures of Matter

In your textbook, read about pure substances and mixtures.

Use the words below to complete the concept map.

heterogeneous mixtures	salt-water solutions	sand-water mixture water
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In your textbook, read about separating mixtures.

For each item in Column A, write the letter of the matching item in Column B.

- | Column A  | Column B                      |
|---|-------------------------------|
| <u>B</u> 7. Separates substances on the basis of the boiling points of the substances | <del>a.</del> filtration      |
| <u>C</u> 8. Separates by formation of solid, pure particles from a solution           | <del>b.</del> distillation    |
| <u>A</u> 9. Separates substances based on their movement through a special paper      | <del>c.</del> crystallization |
| <u>D</u> 10. Separates solids from liquids by using a porous barrier                  | <del>d.</del> chromatography  |

### Section 3.4 Elements and Compounds

In your textbook, read about elements and compounds.

Circle the letter of the choice that best completes the statement or answers the question.

- A substance that cannot be separated into simpler substances by physical or chemical means is a(n)
  - compound.
  - mixture.
  - element.
  - period.
- A chemical combination of two or more different elements is a(n)
  - solution.
  - compound.
  - element.
  - period.
- Which of the following is an example of an element?
  - water
  - air
  - sugar
  - oxygen
- Which of the following is an example of a compound?
  - gold
  - silver
  - aspirin
  - copper
- What are the horizontal rows in the periodic table called?
  - block elements
  - groups or families
  - grids
  - periods
- What are the vertical columns in the periodic table called?
  - block elements
  - groups or families
  - grids
  - periods

Label each substance as either an *element* or a *compound*.

- |                 |                    |                 |            |
|-----------------|--------------------|-----------------|------------|
| <u>Element</u>  | 7. silicon         | <u>Element</u>  | 10. nickel |
| <u>Compound</u> | 8. sodium chloride | <u>Compound</u> | 11. ice    |
| <u>Element</u>  | 9. francium        |                 |            |

Write the symbol for each element. Use the periodic table on pages 72–73 in your textbook if you need help.

- |           |             |           |              |
|-----------|-------------|-----------|--------------|
| <u>Ne</u> | 12. neon    | <u>Ti</u> | 15. titanium |
| <u>Ca</u> | 13. calcium | <u>F</u>  | 16. fluorine |
| <u>Fe</u> | 14. iron    |           |              |

← Don't need to do these.

In your textbook, read about the law of definite proportions.

Use the law of definite proportions and the equation below to answer the questions.

The law of definite proportions states that regardless of the amount, a compound is always composed of the same elements in the same proportion by mass.

$$\text{Mass percentage of an element (\%)} = \frac{\text{mass of element}}{\text{mass of compound}} \times 100\%$$

- A 20.0-g sample of sucrose contains 8.4 g of carbon. What is the mass percentage of carbon in sucrose? Show your work.