

## CHAPTER 5 LESSON 1: MATTER AND ITS PROPERTIES

### Vocabulary

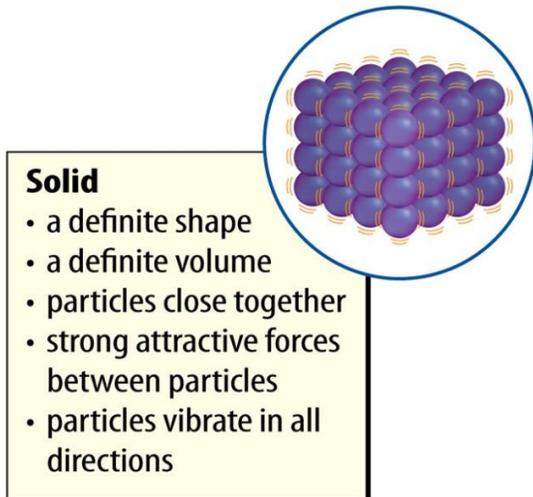
<ul style="list-style-type: none"><li>• Volume</li><li>• Solid</li><li>• Liquid</li><li>• Gas</li></ul>	<ul style="list-style-type: none"><li>• Physical property</li><li>• Mass</li><li>• Density</li></ul>	<ul style="list-style-type: none"><li>• Solubility</li><li>• Chemical property</li></ul>
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### What is matter?

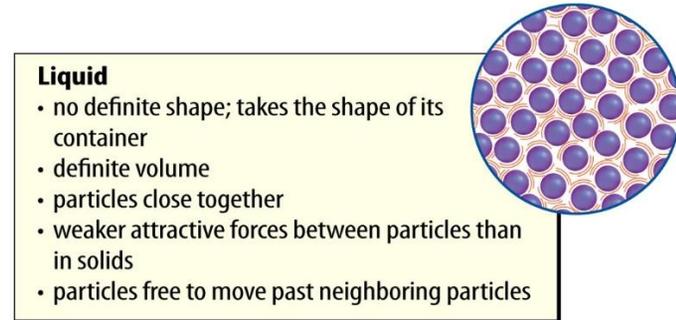
- **Matter** is anything that has a mass and takes up space, and can have both physical and chemical properties.

### States of Matter

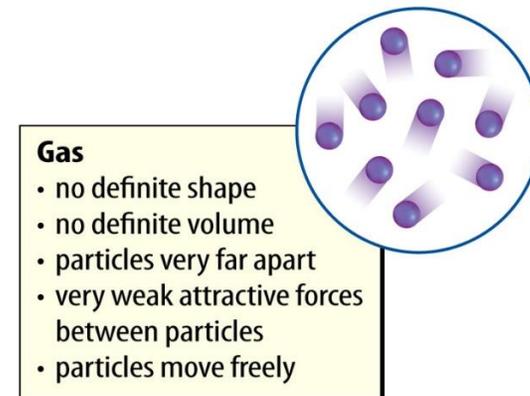
- All matter is made of tiny particles that are constantly moving!
- **Volume** is the amount of space a sample of matter occupies
- A **solid** is a state of matter with a definite shape and volume
  - In solids, particles vibrate back and forth in all directions



- A **liquid** is a state of matter with a definite volume but not a definite shape
  - In liquids, the distance between particles is greater and they can slide past one another



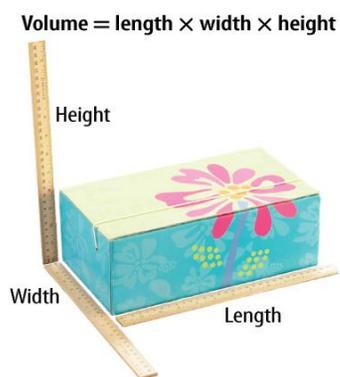
- A **gas** is a state of matter without a definite shape or definite volume
  - In gas, particles move freely rather than staying close together



- Particles of matter that are close together exert an attractive force on each other. The strength 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.
- **Mass** is the amount of matter in an object.
- 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.



**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<sup>3</sup>).

- **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:

$$\text{Density (in g/mL)} = \frac{\text{Mass (in grams)}}{\text{Volume (in mL)}}$$

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

- 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.
- Flammability and 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 <sup>3</sup> )
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

## 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.

## KEY CONCEPT CHECK

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

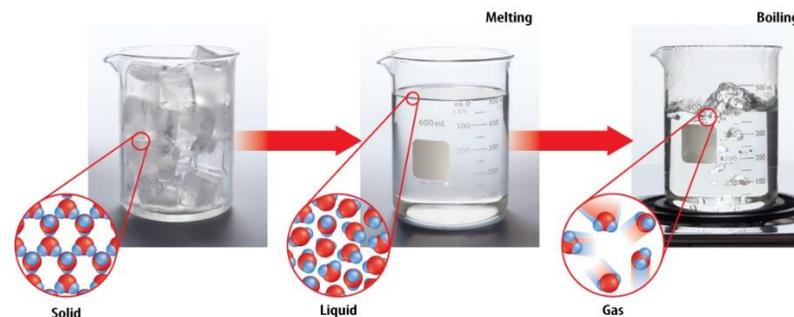
## CHAPTER 5 LESSON 2: MATTER AND ITS CHANGES

### Vocabulary

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|---|---|
| <ul style="list-style-type: none"><li>Physical change</li><li>Chemical change</li></ul> | <ul style="list-style-type: none"><li>Law of conservation of mass</li></ul> |
|---|---|

### What are physical changes?

- Matter can change in many physical and chemical ways.
- A change in 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.
- Examples:
  - Dissolving – molecules remain unchanged after dissolving
  - Melting and boiling – changes in state of matter
  - Changes in energy – cause changes in the state of matter



### 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.

