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Chapter 2

Matter



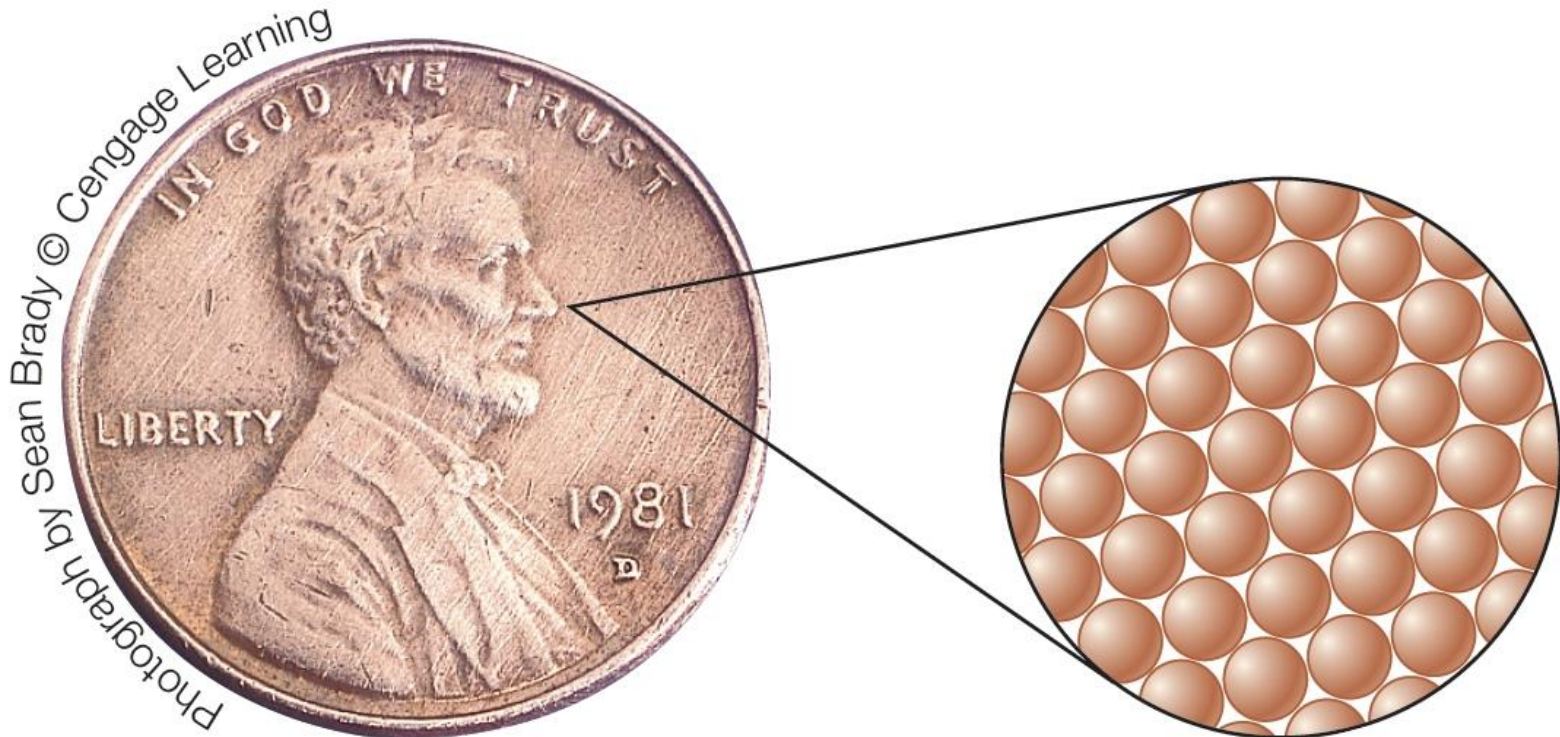
Objectives

1. To learn about the composition of matter
2. To learn the difference between elements and compounds
3. To define the three states of matter



A. The Particulate Nature of Matter

- Matter has mass and occupies space.
- It is composed of tiny particles called atoms.



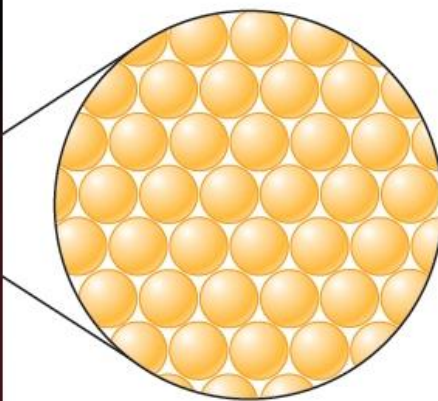
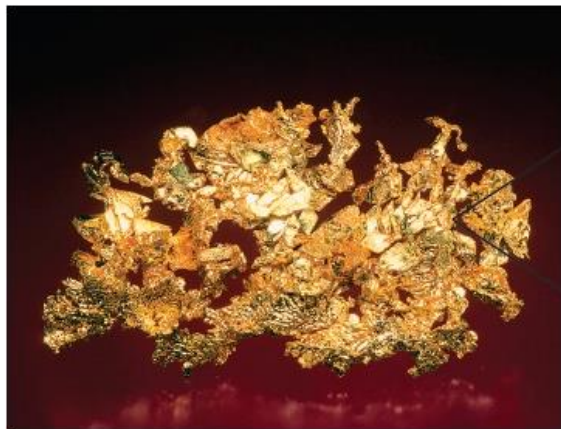
Section 2.1

The Nature of Matter

B. Elements and Compounds

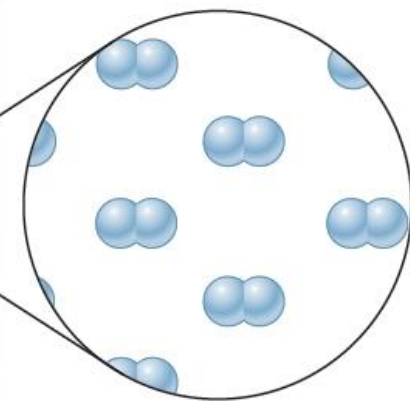
Elements


- Elements contain only one kind of atom – elemental copper contains only copper atoms and elemental gold contains only gold atoms.



 Gold atom

Daniel Templeton/Alamy Images



 H₂ molecule

Section 2.1

The Nature of Matter




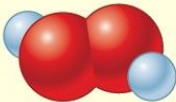


B. Elements and Compounds

Compounds

- Compounds are substances that contain two or more kinds of atoms.

Table 2.1 Some Common Compounds

Atom Combinations	Name	Characteristics
	carbon monoxide	Carbon monoxide is a poisonous gas.
	carbon dioxide	You breathe out carbon dioxide as a waste material, and plants use carbon dioxide to make oxygen.
	water	Water is the most important liquid on the earth.
	hydrogen peroxide	Hydrogen peroxide is used to disinfect cuts and bleach hair.



Concept Check

How many of the following are considered **elements** (as opposed to compounds)?

He, F₂, HCl, S₈

a) 0

b) 1

c) 2

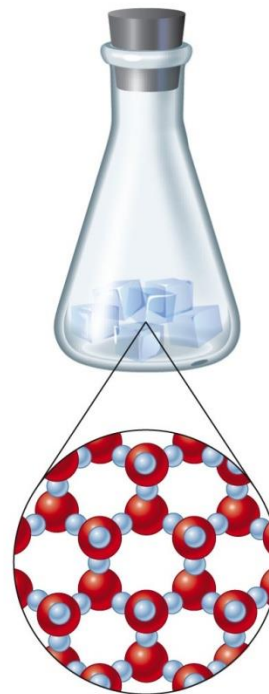
d) 3

e) 4



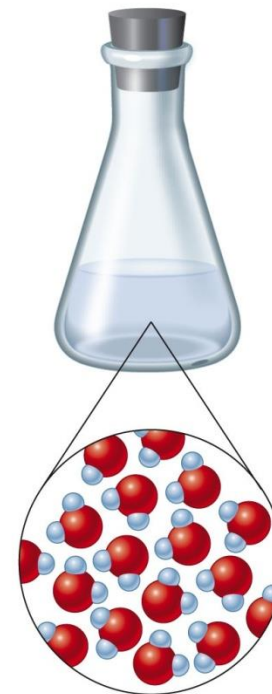
C. The States of Matter

- Matter exists in three states:
 - Solid: a rigid substance with a definite shape
 - Liquid: has a definite volume but takes the shape of its container
 - Gas: takes the shape and volume of its container



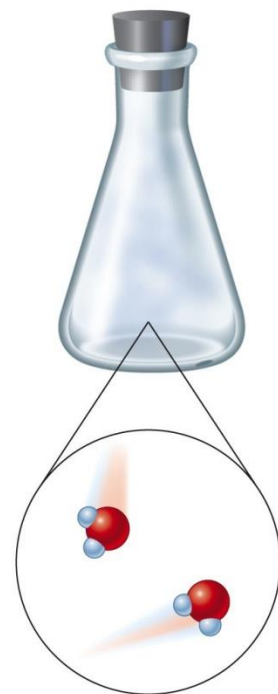
Ice

Solid: The water molecules are locked into rigid positions and are close together.



Water

Liquid: The water molecules are still close together but can move around to some extent.



Steam

Gas: The water molecules are far apart and move randomly.

Section 2.2

Properties of Matter



Objectives

1. To learn to distinguish between physical and chemical properties
2. To learn to distinguish between physical and chemical changes



A. Physical and Chemical Properties and Changes

- Matter has both physical and chemical properties.
 - Chemical properties describe a substance's ability to change to a different substance.
 - Physical properties are the characteristics of a substance that do not involve changing to another substance.
 - Examples are: shape, size and color

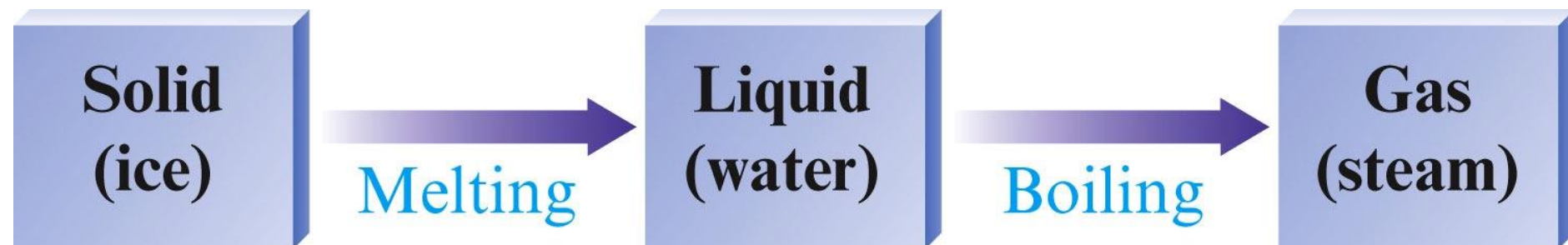
Section 2.2

Properties of Matter



A. Physical and Chemical Properties and Changes

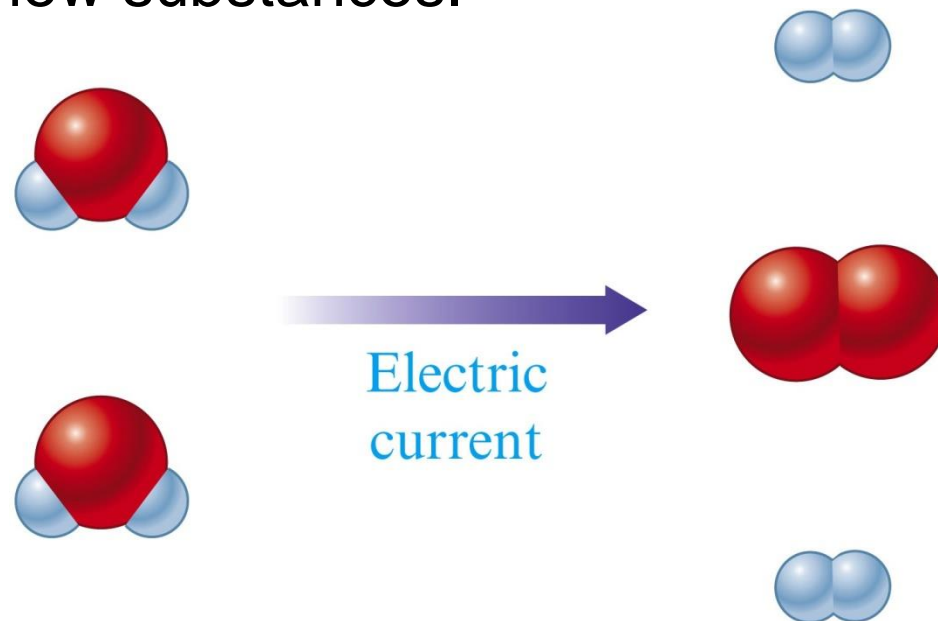
- Matter undergoes physical and chemical changes.
 - A physical change involves a change in one or more physical properties but no change in composition.





A. Physical and Chemical Properties and Changes

- Matter undergoes physical and chemical changes.
 - A physical change involves a change in one or more physical properties but no change in composition.
 - A chemical change transforms a substance into one or more new substances.



Section 2.2

Properties of Matter



Concept Check

How many of the following are examples of a **chemical change**?

- Pulverizing (crushing) rock salt
- Burning of wood
- Boiling of water
- Melting a popsicle on a warm summer day



Objectives

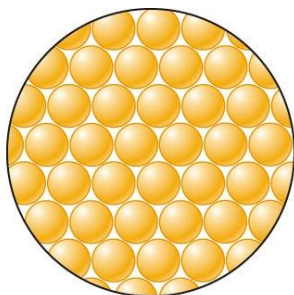
1. To learn to distinguish between mixtures and pure substances
2. To learn two methods of separating mixtures

Section 2.3

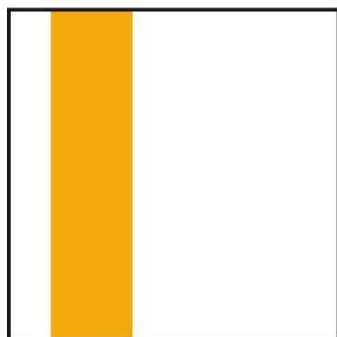
Classifying Matter

A. Mixtures and Pure Substances

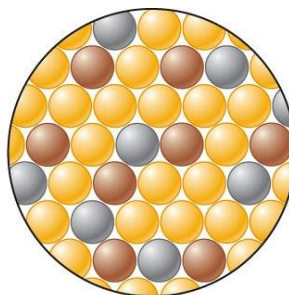
- Matter can be classified as a mixture or a pure substance.



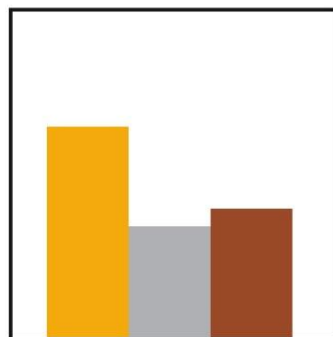
24-karat gold



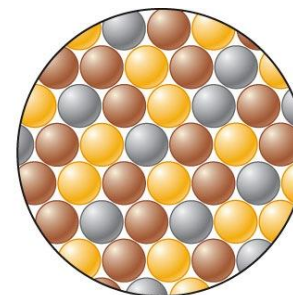
100%



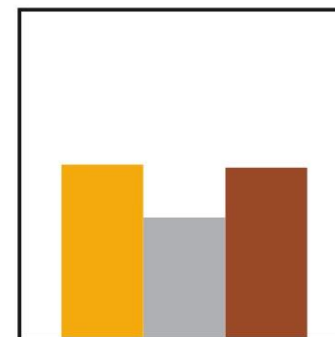
18-karat gold



56% 20% 24%



14-karat gold



36% 25% 37%





A. Mixtures and Pure Substances

Mixtures

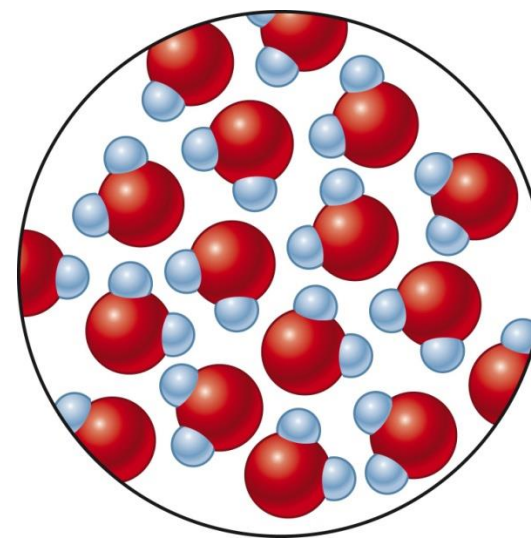
- A mixture has variable composition.
 - A homogeneous mixture has the same properties throughout.
 - A heterogeneous mixture has different properties in different parts of the mixture.



A. Mixtures and Pure Substances

Pure Substances

- A pure substance always has the same composition.
- Pure substances are of two types:
 - Elements which cannot be broken down chemically into simpler substances
 - Compounds which can be chemically broken down into elements



Water is a compound. All the components are the same—H₂O molecules.



Concept Check

Which of the following is a **homogeneous mixture**?

- Pure water
- Gasoline
- Jar of jelly beans
- Soil
- Copper metal

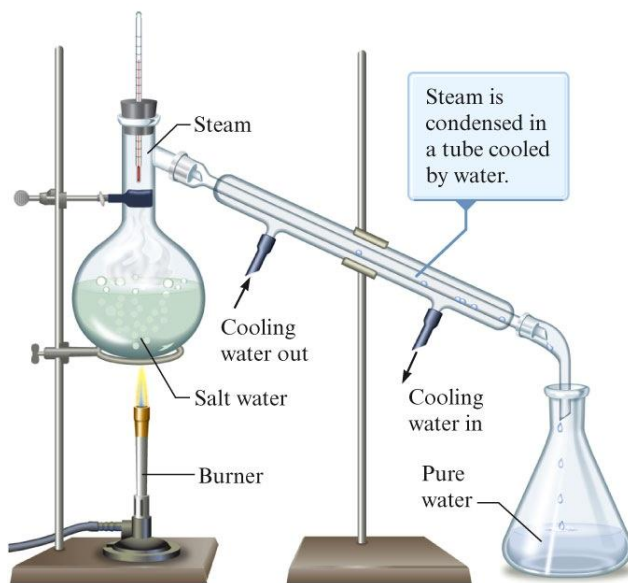
Section 2.3

Classifying Matter

B. Separation of Mixtures

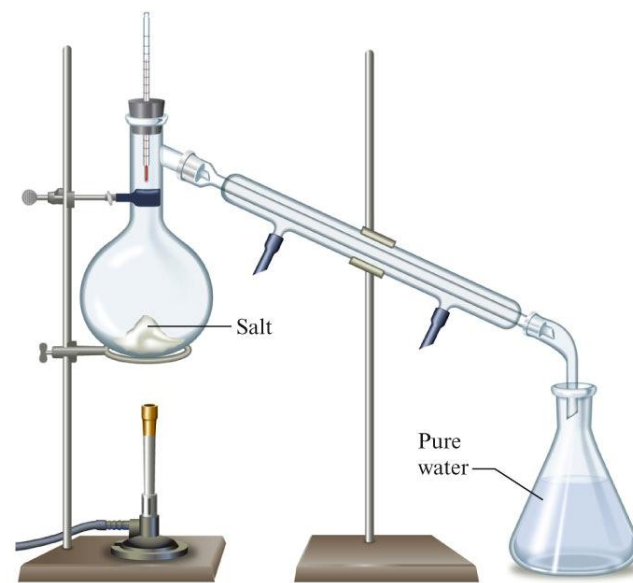
Mixtures can be separated into pure substances by various means.

- Distillation



a

When the solution is boiled, steam (gaseous water) is driven off. If this steam is collected and cooled, it condenses to form pure water, which drips into the collection flask as shown.



b

After all of the water has been boiled off, the salt remains in the original flask and the water is in the collection flask.

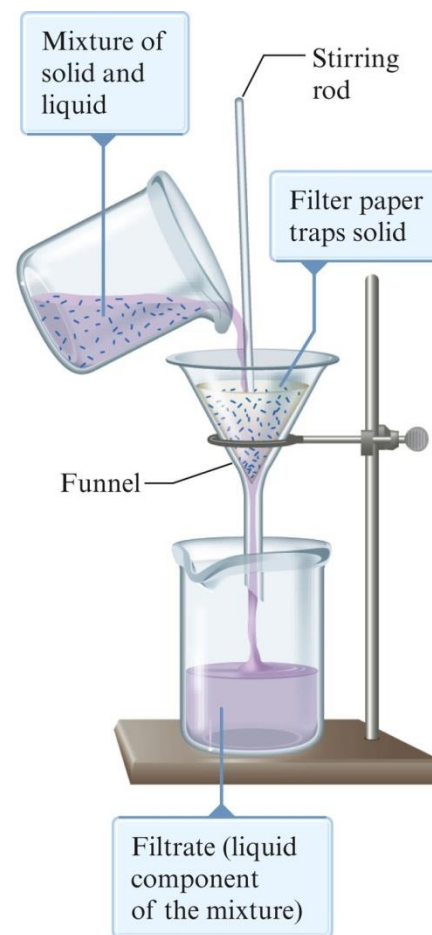
Section 2.3

Classifying Matter

B. Separation of Mixtures

Mixtures can be separated into pure substances by various means.

- Filtration



Summary: The Organization of Matter

