Chapter Eight: Matter and Temperature

- 8.1 The Nature of Matter
- 8.2 Temperature
- 8.3 The Phases of Matter

Chapter 8.1 Learning Goals

- Define matter.
- Identify the atom as the building block of matter.
- Explain the basis for classifying matter as either pure substances or mixtures.

8.1 The nature of matter

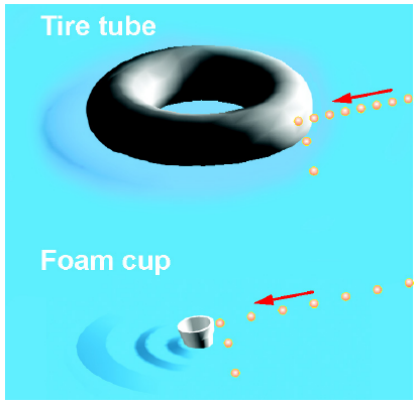
What is the smallest particle of sugar this is still sugar?

- **Matter is a term used to describe anything that has mass and takes up space.**
- **From a distance, a sugar cube looks like a single piece of matter.**

8.1 The nature of matter

- Greek philosophers Democritus and Leucippus proposed that matter is made of tiny particles called atoms.
- Atoms were an idea that few believed.
- The first evidence was called Brownian motion for Robert Brown, who first noticed the jerky motion of tiny particles.

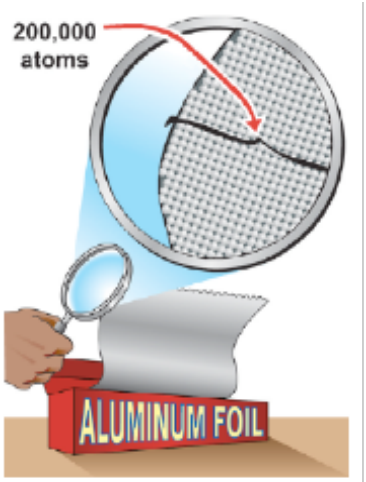
8.1 The nature of matter



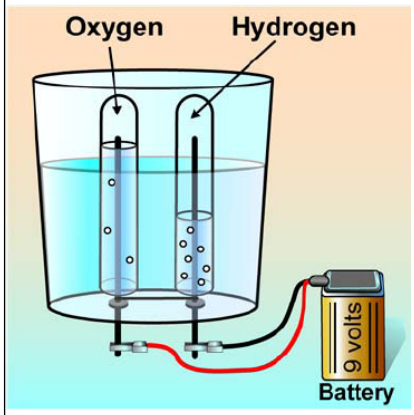
- Throwing marbles at a tire tube moves the tube smoothly.
- Throwing the same marbles at a foam cup moves the cup in a jerky way, like Brownian motion.
- Varying the mass and size of particles that collide can have different effects.

8.1 Elements

- An element is a pure substance that cannot be broken down into other substance by chemical or physical means.
- All of the matter you are ever likely to experience is made from one or more elements in nature.



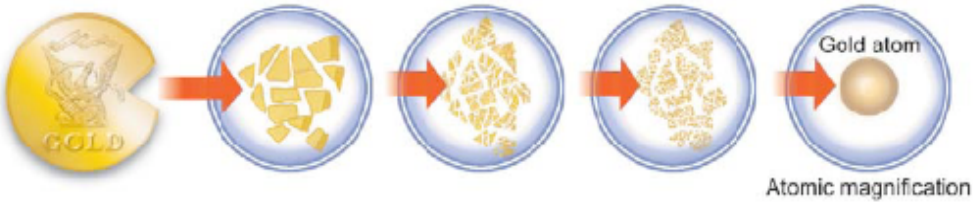
8.1 Elements



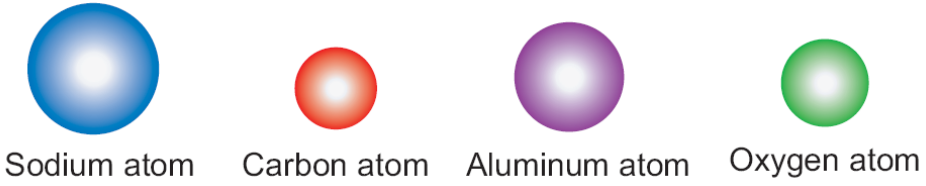
- For example, water can be broken down into its elements, hydrogen and oxygen, when energy is added.

8.1 Atoms

- A single atom is the smallest particle that retains the chemical identity of the element.



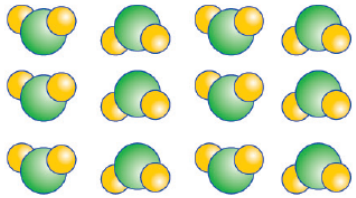
8.1 Atoms



- Carbon atoms are different from sodium, aluminum, or oxygen atoms.
- They have different masses.

8.1 Compounds and elements

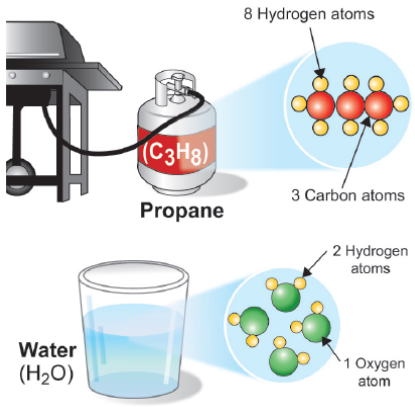
- Compounds are two or more different elements chemically bonded together.



Compound

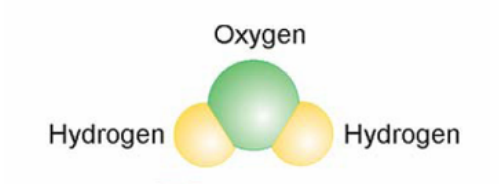
8.1 Examples of compounds

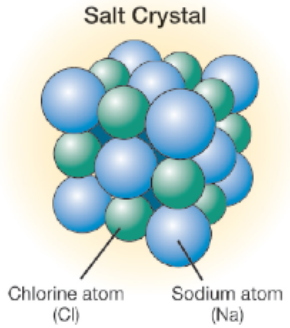
- Compounds contain more than one type of atom joined together.



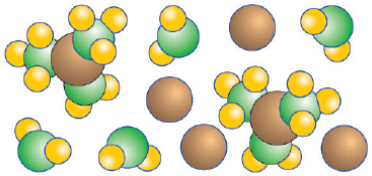
8.1 Molecules

- A molecule is a group of two or more atoms joined together chemically.





8.1 Mixtures

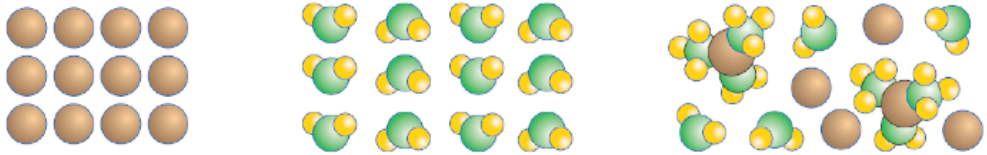


Mixture

- Many substances you encounter are a mixture of different elements and compounds.

How many atoms are in this mixture? How many molecules are in this mixture?

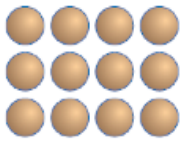
8.1 Elements, compounds, and mixtures



Can you distinguish between atoms and molecules in these diagrams?

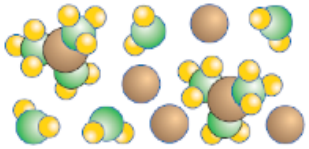
cpo science making it real.

Elements, Compounds, and Mixtures



Element
One single kind of atom

Compound
One type of molecule

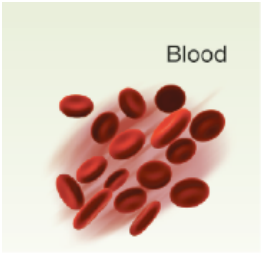


Mixture
Combination of different compounds and/or elements

8.1 Classifying matter

- Matter can be divided into two categories: pure substances and mixtures.
- A pure substance cannot be separated into different kinds of matter by physical means such as sorting, filtering, heating, or cooling.

8.1 Classifying matter



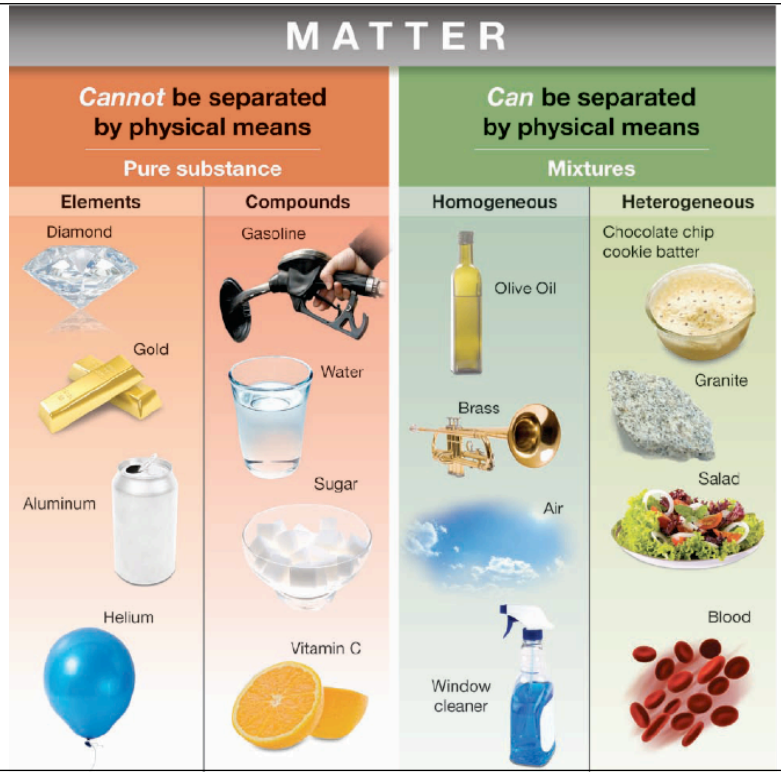
- A mixture contains a combination of different elements and/or compounds.
- All mixtures share one common property: They can be physically separated.

8.1 Classifying matter

- A homogeneous mixture is the same throughout.
- Most brass is made of 70 percent copper and 30 percent zinc.
- If you cut a brass candlestick into ten pieces, each piece would contain the same percentage of copper and zinc.

8.1 Classifying matter

- A heterogeneous mixture is one in which different samples are not necessarily made up of exactly the same proportions of matter.
- One spoonful of chicken soup might contain broth, nood[illegible]hile another contains or


MATTER
Cannot be separated by physical means
Pure substance
Elements
Diamond
Gold
Aluminum
Helium
Compounds
Gasoline
Water
Sugar
Vitamin C
Can be separated by physical means
Mixtures
Homogeneous
Olive Oil
Brass
Air
Window cleaner
Heterogeneous
Chocolate chip cookie batter
Granite
Salad
Blood