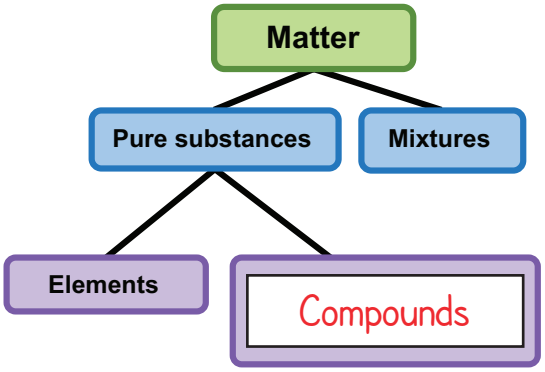
Warm-Up | Mixtures and Solutions

Pure Substances and Mixtures

Classification of matter

- Pure substance – element or compound
  - Element – one type of atom
  - Compound – substance chemically bonded with more than one atom
- Mixture – a combination of pure substances



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Warm-Up | Mixtures and Solutions

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Lesson Objectives

By the end of this lesson, you should be able to:

- Describe heterogeneous mixtures, including suspensions and colloids.
- Describe homogeneous mixtures, such as solutions.
- Identify the components of a solution.
- Identify nonaqueous solutions.

Science Practice: Build vocabulary by properly using the terms *mixture, solution, solute*, and *solvent*.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

alloy	a homogeneous mixture of metals
Brownian motion	the constant, random motion of particles

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Words to Know

centrifuge	a method of separating mixtures in which spinning is used to separate substances according to density
chromatography	a method of separating solutions in which the solute is separated by density or size of particles
colloid	a class of suspension with smaller particles that are dispersed in a manner that prevents them from being filtered easily or settling rapidly
crystallization	a method of separating solutions that involves evaporating the solvent from a solution, causing the solute(s) to crystallize
distillation	a process in which a mixture is separated using differences in boiling point between the different components of the mixture
heterogeneous mixture	a mixture that contains more than one phase and in which the characteristics of the particles vary throughout the mixture
homogeneous mixture	a mixture that appears as one phase and in which the particles have uniform characteristics throughout
long standing	a method of separating mixtures that involves leaving the mixture to stand over time
solute	a substance that gets dissolved by the solvent in a solution; a substance present in a relatively smaller amount in a solution
solution	a homogeneous mixture that is made up of two or more substances that appear as one phase
solvent	the substance that dissolves the solute in a solution; the substance present in the larger relative amount in a solution
suspension	a type of heterogeneous mixture containing particles large enough to settle out or capable of being filtered out
Tyndall effect	the scattering of light passing through a transparent medium

Instruction | Mixtures and Solutions

Slide 1

Lesson Question

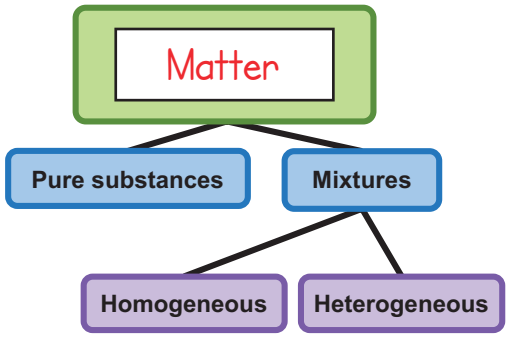
What are mixtures, and how are they classified?

Slide 2

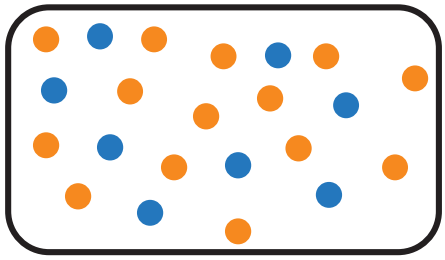
Homogeneous and Heterogeneous Mixtures

Homogeneous mixture: a mixture that appears as one [phase] and in which the particles have uniform characteristics throughout

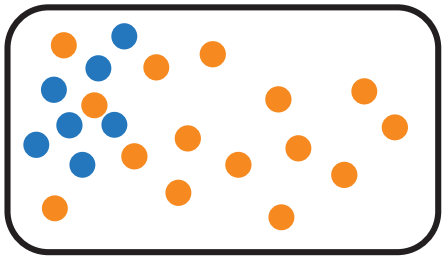
Heterogeneous mixture: a mixture that contains more than one phase and in which the characteristics of the particles vary throughout the mixture



Mixtures: A Microscopic View



[Homogeneous] mixture



[Heterogeneous] mixture

In the homogeneous mixture, the particles are evenly distributed.

In the heterogeneous mixture, the particles are [unevenly] distributed.

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Slide 6

Solutions

Solution: a homogeneous mixture that is made up of two or more substances that appear as one phase

- Solvent: the substance that dissolves the solute in a solution
- Solute: the substance that gets dissolved by the solvent in a solution
- Solutes and solvents can be solids, liquids, or gases.

Slide 11

Suspensions

Suspension: a type of heterogeneous mixture containing particles large enough to settle out or capable of being filtered out

Examples:

- Muddy river
- Flour-and-water mixture
- Blood

Colloids

Colloid: a class of suspension with smaller particles that are dispersed in a manner that prevents them from being filtered easily or settling rapidly

Examples:

- Milk
- Fog
- Mayonnaise

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Slide 11

Differentiating Colloids from Suspensions and Solutions

How can you tell colloids, suspensions, and solutions apart?

- Brownian motion: constant, random motion of particles
  - Observed in colloids and solutions
  - Not observed in suspensions
- Quick settling
  - Observed in suspensions
  - Not observed in most colloids or solutions

The Tyndall Effect

Tyndall effect: the scattering of light passing through a transparent medium

- Exhibited by colloids and some suspensions
- Not exhibited by solutions

Slide 13

Techniques to Separate Solutions

Common techniques to separate a solution

Distillation: a method of separating solutions that involves boiling a mixture of liquids and collecting the vapor of each liquid as it forms

Crystallization: a method of separating solutions that involves evaporating the solvent from a solution, causing the solute(s) to crystallize

Instruction | Mixtures and Solutions

Slide 13

Techniques to Separate Solutions Continued:

Common techniques to separate a solution

Chromatography: a method of separating solutions in which the solute is separated by density or size of particles

Settling Out of Colloids

Techniques to separate mixtures

- Centrifuge: spinning to separate according to density
- Long standing: leaving the mixture to stand over time
- Boiling/heating: using heat and electricity to coagulate a colloid

Summary | Mixtures and Solutions

Lesson Question

What are mixtures, and how are they classified?

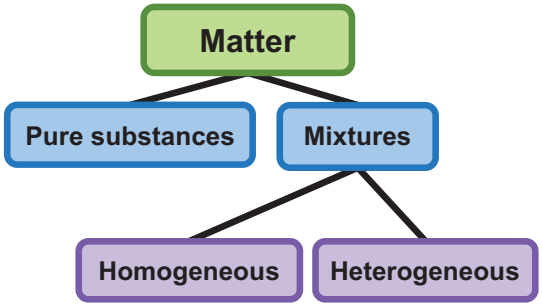
Answer

(Sample answer) Mixtures are a combination of two or more than two substances. Mixtures are classified as homogeneous mixtures or heterogeneous mixtures.

Slide 2

Types of Mixtures

- Mixtures can be classified as [homogeneous] mixtures or heterogeneous mixtures.
- The components of a homogeneous mixture are evenly distributed.
- The components of a heterogeneous mixture are unevenly distributed.



Summary | Mixtures and Solutions

Slide 2

Solutions

- Solutions are homogeneous mixtures.
- The solvent is the substance that dissolves the solute(s).
- A solute is a substance that is dissolved in a solvent to make a mixture.
- An alloy is an example of a homogeneous mixture of metals.
- Solutions can be separated (solute from solvent) using distillation, crystallization, and chromatography.

Heterogeneous Mixtures

- Suspensions and colloids are two types of heterogeneous mixtures.
- The particles in a suspension will settle out naturally due to gravity.
- The particles in a colloid typically stay suspended much longer.
- Colloids exhibit the Tyndall effect and Brownian motion.
- One can separate a colloid by using a centrifuge, by allowing the colloid to stand over a long period of time, or by boiling or heating the colloid.

Summary | Mixtures and Solutions

Use this space to write any questions or thoughts about this lesson.