Name _____ Class _____ Date _____

CHAPTER 8 Solutions

SECTION 1

Solutions and Other Mixtures

KEY IDEAS

As you read this section, keep these questions in mind:

- What is a heterogeneous mixture?
- What is a homogeneous mixture?

What Is a Mixture?

Recall that matter can be classified into two main groups: 1) pure substances, such as elements and compounds, and 2) mixtures. Unlike the components of a compound, the components of a mixture can be separated by physical changes. In addition, the amount of each component in a mixture is not fixed. ☑

READING TOOLBOX

Organize As you read, make a chart that describes the different kinds of heterogeneous and homogeneous mixtures.

What Is a Heterogeneous Mixture?

Examine the two spoonfuls of fruit salad in the figure below. Notice that one spoonful has more strawberries than the other. Both samples came from the same mixture, but the samples are not exactly the same. Fruit salad is an example of a heterogeneous mixture. In a *heterogeneous mixture*, the components are not spread out, or *distributed*, evenly throughout the mixture. ☑

READING CHECK

1. Identify What are the two main groups of matter?

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The components of a heterogeneous mixture are not spread out evenly throughout the mixture. Different samples of the mixture have different amounts of each component.

READING CHECK

2. Describe How are the components of a heterogeneous mixture distributed?

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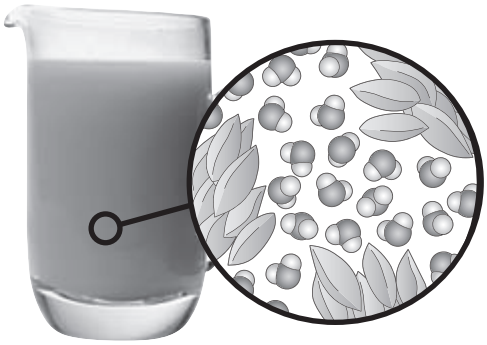
The amount of each component in different samples of the same heterogeneous mixture may vary. You can even add more of one component, or take out some of another component. You would still have a mixture. If you take out some of the strawberries or add more grapes, you will still have a fruit salad.

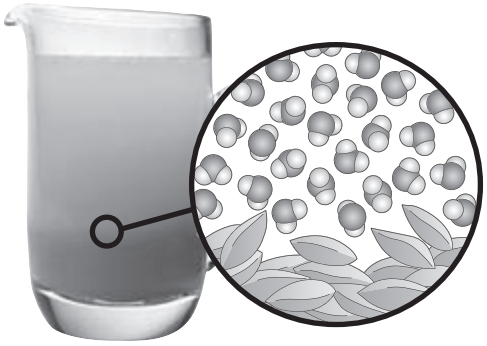
SUSPENSIONS

Have you ever forgotten to shake the orange juice carton? When you poured yourself a glass of orange juice, it was probably watery. Orange juice is a heterogeneous mixture. Shaking the mixture mixes the components of the orange juice. However, eventually the mixture will settle again into layers.

Orange juice is an example of a suspension. In a **suspension**, the components that make up the mixture may seem to be distributed almost evenly. However, when the mixture is allowed to sit, one component settles to the bottom. When orange juice sits for a while, the pulp settles to the bottom of the container.



Right after you shake the juice, the pulp is spread throughout the mixture.



Over time, the pulp settles out of the mixture, and two layers form.

LOOKING CLOSER

3. Explain What happens to the particles in a suspension over time?

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Particles in a suspension are large enough to be filtered out of the mixture. For example, to remove the pulp from orange juice, you can pour the juice through a filter of porous paper. This filter will catch the pulp but will let the juice pass through. ☑

READING CHECK

4. Explain Why is it generally easy to filter out particles in suspension?

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Suspensions

- ☑ Particles are relatively large.
- ☑ Particles settle out or can be filtered.

LIQUIDS IN SUSPENSION

Many suspensions, such as orange juice, are a mixture of a liquid and a solid. However, some mixtures are made up of two liquids. For example, you can combine oil, vinegar, and spices to make salad dressing. If you shake the ingredients, they will mix. However, if the dressing sits for a while, the liquids will separate into layers. Why? Oil and vinegar are immiscible. Liquids that are *immiscible* do not mix or do not stay mixed. ☑

READING CHECK

5. Define What are immiscible liquids?

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Many salad dressings are made of oil and vinegar, which form a suspension when shaken. Oil is less dense than vinegar. When the salad dressing sits for a while, the oil rises and floats on top of the vinegar.

LOOKING CLOSER

6. Explain Why does the oil rise above the vinegar?

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COLLOIDS

Colloids are another type of heterogeneous mixture. Like a suspension, a **colloid** has particles dispersed throughout the mixture. However, the particles of a colloid are smaller than the particles of a suspension. The particles of colloids are so small that they can pass through most filters and remain spread throughout the mixture.

Latex paint is an example of a colloid. The color in latex paint comes from particles of colored pigments in water. Gelatin, egg whites, and blood plasma are all examples of colloids. Whipped cream is a colloid made by dispersing gas in a liquid. Fog is a colloid of water droplets in air. Smoke is a colloid of small solid particles in air.

Critical Thinking

7. Compare What is the main difference between a suspension and a colloid?

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Colloids

- ☑ Particles are relatively small.
- ☑ Particles cannot be filtered easily.

LOOKING CLOSER

8. Describe What is the Tyndall effect?

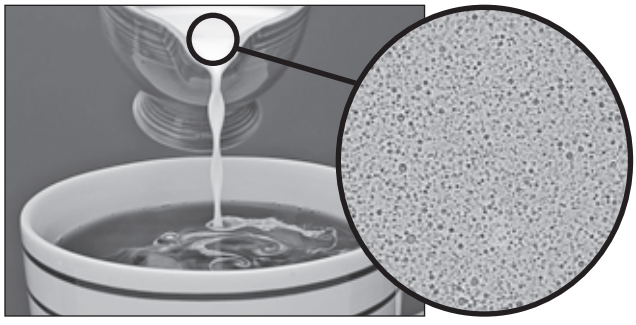
The liquid in the jar on the right is a colloid. A colloid may look clear, but the particles may be large enough to scatter light. This scattering of light is called the *Tyndall effect*.

EMULSIONS

An **emulsion** is a colloid made of liquids that are generally immiscible. Mayonnaise is made of tiny droplets of oil suspended in vinegar. Unlike the oil and vinegar of salad dressing, the oil and vinegar in mayonnaise stay mixed because of egg yolks. Egg yolks act as an emulsifier. An *emulsifier* coats one type of particles in the mixture so that they cannot join to form a separate layer. ☑

READING CHECK

9. Explain How is an emulsion different from other colloids?



Like other colloids, an emulsion, such as cream, has particles so small that the mixture looks like a pure substance. However, cream is a mixture of fats, proteins, and carbohydrates dispersed in water. Proteins act as emulsifiers to coat the droplets of fats and keep them dispersed.

Emulsions

- ☑ An emulsion is a colloid made of immiscible liquids.
- ☑ Emulsifiers keep layers from separating.

What Is a Homogeneous Mixture?

In a *homogeneous mixture*, the particles are dispersed evenly throughout. In other words, a homogeneous mixture is *uniform*. A sample from one part of a homogeneous mixture is the same as any other sample of the mixture. A homogeneous mixture looks uniform even under a microscope. ☑

If you stir a small amount of salt into water, the mixture will look like pure water. Every part of the mixture has the same relative amounts of salt and water particles. Like any mixture, a mixture of salt and water can be separated physically into its components. The components of a mixture also keep their separate identities. Thus, you can separate the salt from the mixture by evaporating the water.

READING CHECK

10. Describe How are the components of a homogeneous mixture distributed?

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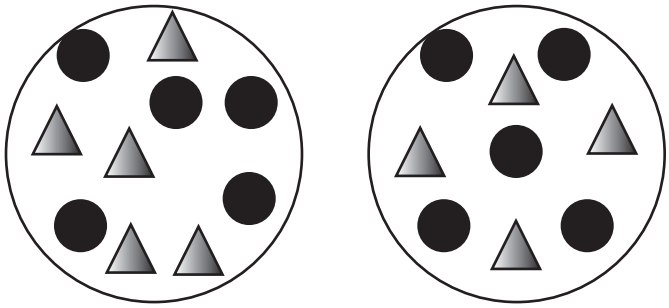

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LOOKING CLOSER

11. Label Use *homogeneous mixture* and *heterogeneous mixture* to label the diagrams.

SOLUTIONS

Solutions are homogeneous mixtures. A **solution** is a homogenous mixture in which one or more components dissolves in another. For examples, if you stir salt into water, the salt dissolves in the water and seems to disappear. What happens to the salt when it dissolves?

When a substance *dissolves*, it separates into the smallest particles that make up the substance. These particles may be atoms, ions, or molecules. For example, in water, salt separates into Na^+ and Cl^- ions. In this solution, salt is called the solute. A **solute** is the substance that dissolves. In a saltwater solution, water is the solvent. A **solvent** is the substance in which the solute dissolves. Together, a solute and solvent make up a solution. ☑

READING CHECK

12. Describe What happens to a substance when it dissolves?

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LOOKING CLOSER

13. Identify Into what small particles does salt separate when it dissolves?

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14. Apply Concepts What kind of mixture is the gravel at the bottom of the fish tank?

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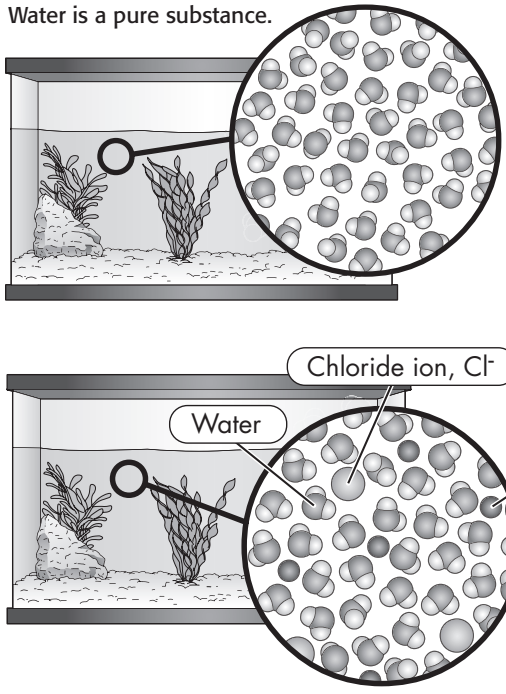

Saltwater is a homogeneous mixture. The water molecules, sodium ions, and chloride ions are distributed evenly throughout the mixture.

Solutions

- ☑ One substance dissolves in another.
- ☑ Solute separates into atoms, ions, or molecules when it dissolves.

SOLUTIONS OF LIQUIDS

A solution may be made up of liquids. Two or more liquids that mix easily and stay mixed are *miscible*. For example, water mixes with isopropanol to form a solution called rubbing alcohol. Water and isopropanol are miscible, so they stay mixed. You can use rubbing alcohol to disinfect cuts and scrapes. ☑

READING CHECK

15. Define What does miscible mean?

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Window cleaner, rubbing alcohol, and gasoline are all mixtures of liquids

OTHER KINDS OF SOLUTIONS

Water is not the only liquid that can be a solvent. For example, gasoline is a homogeneous mixture of liquids that contains no water. Nail polish remover is another solution that contains no water.

Other states of matter can also form solutions. Gases can dissolve in liquids, and solids can dissolve in solids. For example, many carbonated drinks are solutions of a gas (carbon dioxide), a liquid (water), and a solid (sugar).

Critical Thinking

16. Apply Concepts What states of matter are present in a seawater solution? Give examples of each state.

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ALLOYS

An **alloy** is a homogeneous mixture that is made up of two or more metals. Liquid metals are mixed together, and a solid solution of metals forms when the mixture cools.

Alloys are important because they have properties that the individual metals do not have. For example, copper is very soft and bends easily. Copper could not be used to make a sturdy musical instrument. However, when zinc is dissolved in copper, the brass that forms is harder than copper, but bends more easily than zinc. ☑

READING CHECK

17. Explain Why are alloys sometimes more useful than pure metals?

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Some solutions are made of two or more metals. For example, brass is a solution of zinc metal dissolved in copper.

Alloys

- ☑ An alloy is one or more metals dissolved in another.
- ☑ Properties differ from those of the individual metals.

Name _____ Class _____ Date _____

Section 1 Review

SECTION VOCABULARY

alloy a solid or liquid mixture of two or more metals

colloid a mixture consisting of tiny particles that are intermediate in size between those in solutions and those in suspensions and that are suspended in a liquid, solid, or gas

emulsion any mixture of two or more immiscible liquids in which one liquid is dispersed in the other

solute in a solution, the substance that dissolves in the solvent

solution a homogenous mixture throughout which two or more substances are uniformly dispersed

solvent in a solution, the substance in which the solute dissolves

suspension a mixture in which particles of a material are more or less evenly dispersed throughout a liquid or gas

1. Compare What is the main difference between a heterogeneous and a homogeneous mixture?

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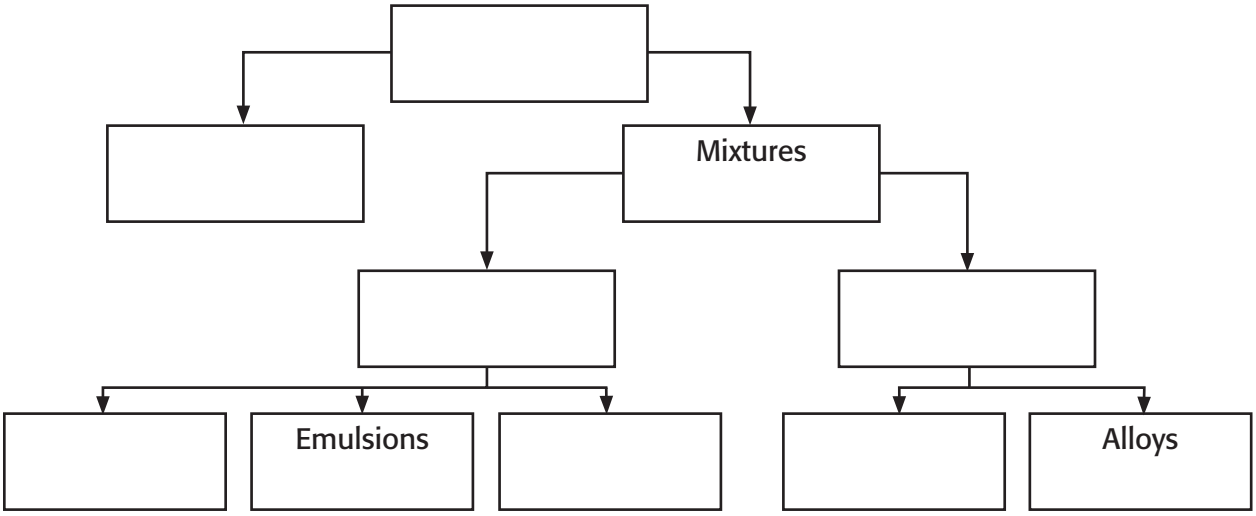
2. Organize Complete the concept map to show the relationships between alloys, colloids, emulsions, heterogeneous mixtures, homogeneous mixtures, matter, mixtures, pure substances, solutions, and suspensions.



3. Apply Concepts You suspect that a clear liquid is actually a colloid. How could you find out?

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4. Apply Concepts Imagine you have dissolved a small amount of baking soda in a glass of water. Identify the solute and solvent.

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