

2.1

Solutes and Solvents

► Key Question: What are solutions and what are they made of?

Our daily lives are full of solutions. A solution is a mix of two or more kinds of particles. In a mixture, the two kinds of particles stay whole. In a solution, one kind of particle **dissolves** into the other.

dissolve

to mix one type of matter into another type of matter to form a solution

Think about the last time you had a glass of iced tea. One way to make iced tea is by mixing a powder and water (Figure 1). Iced tea may look like a pure substance. It really has at least two parts to it: water particles and powder particles.



Figure 1 This iced tea was made by mixing an iced tea powder into water.

solute

the smaller part of a solution; the part of a solution that dissolves in the solvent

solvent

the larger part of a solution; the part of a solution into which the solutes dissolve

dissolving

mixing completely with a solvent to form a solution

The parts of a solution are not usually equal. In iced tea, you use more water than powder. The powder particles in the iced tea dissolve into the water particles.

The two parts to a solution are

- solute
- solvent

The part that dissolves is the **solute**. The solute dissolves into the **solvent**. Solutions are usually made by **dissolving** solutes in a solvent. When you make iced tea, the powder is the solute. The water is the solvent. There is usually less solute than solvent in a solution.

LIQUID SOLUTIONS

You are probably most familiar with solutions that are liquid, like your iced tea. Liquid solutions all have liquid solvents like water. Common liquid solvents (shown in Figure 2) are

- turpentine
- ethanol (in perfume)
- ethyl acetate (in nail polish)



Figure 2 Turpentine, ethanol, and ethyl acetate may dissolve pure substances and mixtures that do not dissolve in water.

When a solute dissolves, both the solute and solvent particles are still in the solution. They are usually mixed evenly in the solution (Figure 3).

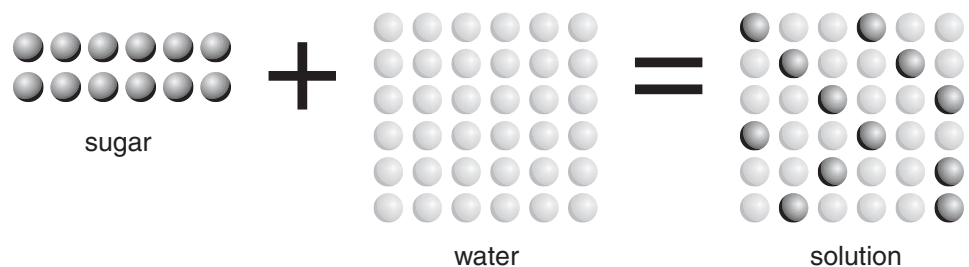


Figure 3 Sugar particles dissolve into water to create a solution made of both sugar and water particles.

Liquid solutions can have solutes that are solids, gases, or other liquids. Some common solutes that dissolve in liquid are listed in Table 1:

Table 1 Common Solutes that Dissolve in Liquid

Solute	State of solute	Solvent (liquid)
salt	solid	water
sugar	solid	water
acetic acid	liquid	water (forms vinegar)
oxygen	gas	blood
carbon dioxide	gas	blood

WATER: THE UNIVERSAL SOLVENT

You may think that water from your tap is pure water. Tap water is actually a solution. It has many different solutes.

Water flows in rivers, lakes, and underground. Gases from the air and minerals from rocks and soil dissolve in the water. Pollutants can also dissolve in the flowing water (Figure 4).



Figure 4 As water flows in a stream, it dissolves many substances.

Before tap water gets to your home, it is made safe to drink. Chlorine and fluorine can be added to water. Chlorine kills bacteria. Fluorine helps keep your teeth healthy.

Water is often called the “universal solvent.” It dissolves more substances than any other solvent.

Water in Your Body

Your body is about 70 % water. Water is the solvent of many solutions in your body, including

- blood plasma
- sweat
- urine
- tears

Many solutes travel around your body because they are dissolved in water. Some solutes in your body are

- salt
- oxygen
- sugars
- calcium

Water around Earth

About 70 % of Earth's surface is covered by water. The amount of water on Earth does not change.

Water in lakes, rivers, and oceans evaporates into the air. This evaporated water then condenses to form clouds. It also forms rain and snow.

Water around Earth dissolves many different solutes. The solutes in water are moved all over the world. Living things can absorb these solutes.

SOLID SOLUTIONS

Solutions can also be solids. In a solid solution, both the solvent and the solute are solids. Metals are often used in solid solutions.

Pure gold is 24 karats. If gold is 14 karats, it is 14 parts gold. The other 10 parts are other metals. Silver, copper, nickel, and palladium are metals that can be mixed with gold. Gold is the solvent. The other metals are the solutes.

A solution with two or more metals is called an alloy. Metals are heated until they melt. Then, they are mixed.

Brass is an alloy of zinc dissolved in copper. Bronze is also an alloy made of tin dissolved in copper.

GAS SOLUTIONS

The air you breathe is a gas solution. Air is made of nitrogen, oxygen, argon, and other gases.

In all gas solutions, the solutes and solvent are both gases. Some other gas solutions are

- gasoline-air mixture in a car's engine
- perfume smell in the air

WATER POLLUTION

Plants and animals get nutrients from water. Water can also dissolve pollutants. **Pollution** is any substance that contaminates the natural environment. Pollution can be a pure substance, a mixture, or part of a mixture.

Polluted water is a mixture of pure water and pollutants. There are many ways pollutants can get in water (Figure 5).

pollution

contaminants in the environment that could harm living things

Hint

A *contaminant* is any substance that makes another substance impure, or spoiled.

It is important that rivers, lakes, and oceans stay clean. If not, plants and animals may die.

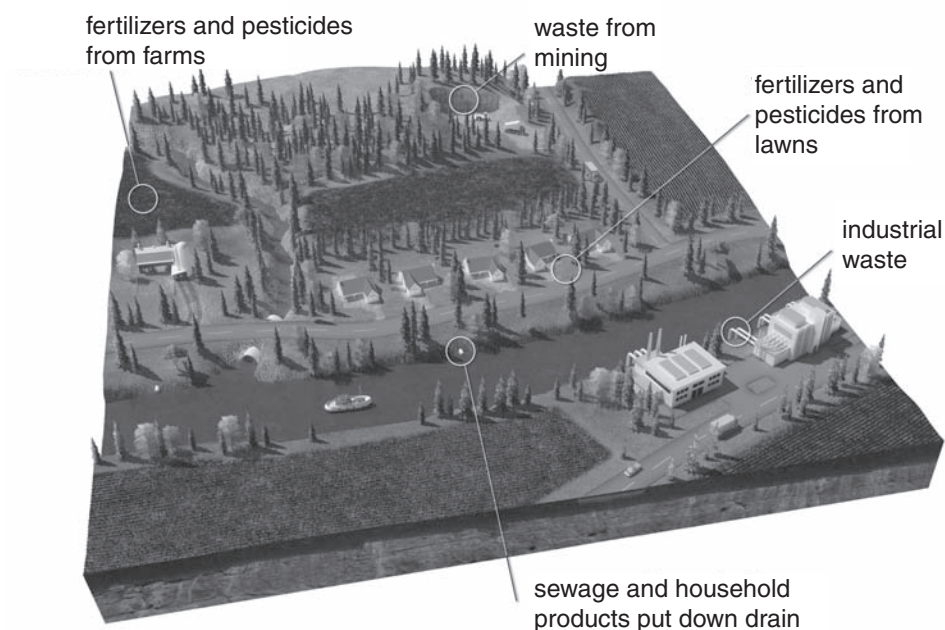


Figure 5 When pesticides are used on plants, they mix with rainwater and pollute rivers and streams.

Name: _____ Date: _____



CHECK YOUR UNDERSTANDING

1. In your own words, write a definition for solute and solvent.

2. Why do we say water is an important solvent on Earth?

3. Complete the table. The first one has been done for you.

Solution	Solute	Solvent	State of solution
coffee with milk	milk	coffee	liquid
salt water			
air freshener (scent + air)			
brass			

4. Name two ways pollution can get into water.

5. Think back to the Key Question. Name the two parts that make up a solution. How are these parts different than the parts of a mixture?
