

Mechanical Mixtures and Solutions

Mixtures are an important part of food preparation. Figure 1 shows a mixture of eggs, vegetables, and cheese cooking on a stove to make an omelette. Figure 2 shows a glass of grape juice. How are these mixtures the same? How are they different?



Figure 1 This omelette is a mixture of eggs, vegetables, and cheese. You can see the different parts of this mixture.



Figure 2 Grape juice is a mixture of water, sugar, and flavour particles. This mixture looks like just one kind of matter.

Scientists classify mixtures into two main groups: mechanical mixtures and solutions. Both are mixtures because both are made up of two or more different kinds of particles.

Mechanical Mixtures

Sometimes it is easy to tell whether something is a mixture, but at other times it is more difficult. You can tell that the soil in Figure 3 is a mixture because you can see the different parts. If you can see different kinds of matter in a mixture, it is called a **mechanical mixture**. Mechanical mixtures are also called **heterogeneous mixtures**.



Figure 3 You can see sand, little stones, twigs, and bits of leaves mixed together in this mechanical mixture.

mechanical mixture or **heterogeneous mixture**: a mixture with different parts that you can see

LINKING TO LITERACY

During Reading: Monitoring Comprehension

As you read through this page, stop from time to time to think about what you are reading. Can you put the pieces of information together to make sense? Good readers stop to think when something does not make sense. They look for key words to help their understanding. Often they reread text and locate information from titles, pictures, captions, and tables.

You see and use mechanical mixtures almost every day. To find a mechanical mixture, you could look inside your closet at home, or inside your pencil case at school. Maybe you ate a mechanical mixture for breakfast, such as cereal and milk, or a raisin bran muffin. Figure 4 shows three more examples of mechanical mixtures.



Figure 4 How can you tell that each example is a mechanical mixture?

Solutions

Some mixtures do not look like mechanical mixtures. They look like pure substances. Like the grape juice in Figure 2, clear shampoo looks like only one kind of matter. However, both grape juice and clear shampoo are mixtures. Grape juice contains water particles, sugar particles, and flavour particles. Shampoo contains water particles, detergent particles, colour particles, and scent particles.

Mixtures that look as though they are pure substances are called solutions. A **solution** contains more than one kind of particle, but it looks like a pure substance. Solutions are sometimes called **homogeneous mixtures**. Both steel and seawater are solutions. Think back to the black marker ink that you tested in Section 1.4. What evidence do you have that marker ink is a solution, rather than a pure substance or a mechanical mixture?

Clear apple juice is a solution. The air you breathe is also a solution. More examples of solutions are shown in Figure 5. Try to think of three solutions that you have seen today.

solution or homogeneous mixture:
a mixture that looks like a single pure substance; a uniform mixture of two or more pure substances



Figure 5 Stainless steel is made of iron, chromium, and nickel particles. Tea is made of water, caffeine, and flavour particles. Clear nail polish is made of nitrocellulose, resin, colour, and acetate particles.

You have probably realized that homogeneous mixtures, or solutions, can be in any of the three states: solid, liquid, or gas. However, in any one solution, there is only one state visible. This is not the case for heterogeneous mixtures, which can include different states in one mixture.

TRY THIS: Explore Mixtures at Home

SKILLS MENU: observing, communicating

In this activity, you will explore mixtures in your home.

- Search your home for at least four different mixtures. Try to find a variety of mixtures, including the following:
 - a mixture of two or more solids
 - a mixture of two or more liquids
 - a mixture made by mixing a solid and a liquid
 - a mixture made by mixing a liquid and a gas
- Copy and complete Table 1 in your notebook, adding details about the four mixtures. If you do not know the components of the mixture, look at the container or label (if there is one) to find out.

Table 1 Mixtures at Home

	Mixture 1	Mixture 2	Mixture 3	Mixture 4
Name of mixture				
Mechanical mixture or solution?				
Components of the mixture				
Safety warning (if present)				

Particles of Mixtures

Maybe it surprises you that clear apple juice, air, and steel are homogeneous mixtures, and not pure substances. The different kinds of matter are not visible in a solution like apple juice. Why not? Figure 6 may help you to answer this question. It compares the distribution of the particles of a solution with the distribution of the particles of a mechanical mixture.

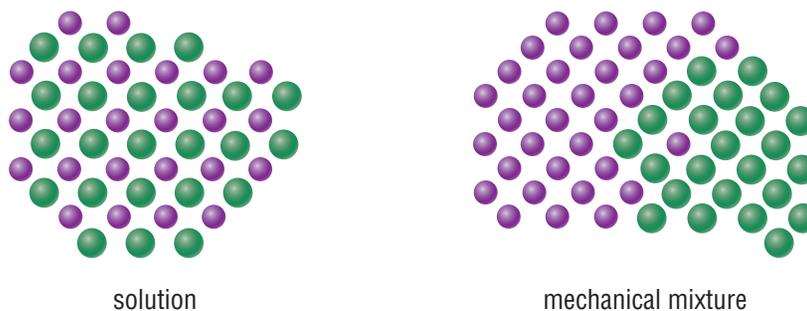


Figure 6 The different particles of a solution are evenly mixed. The different particles of a mechanical mixture are unevenly mixed.

In a solution, the different kinds of particles are mixed together evenly. Individual particles are too small to see, so when you look at a solution, it looks like just one kind of matter. You will learn more about the particles of solutions in Chapter 2.

In a mechanical mixture, the different kinds of particles are not mixed evenly. Instead, they stay together in groups and are distributed unevenly. As a result, when you look at a mechanical mixture, you can usually see the different kinds of matter.

To learn more about mechanical mixtures and solutions,

Go to Nelson Science





TRY THIS: Make a Mixture

SKILLS MENU: observing, analyzing, communicating

In this activity, you will make your own mixture and observe its properties.

Equipment and Materials: apron; clear drinking glass or beaker; spoon; water; cooking oil; food colouring; liquid dish detergent

- Put on your apron. Pour water into a glass until it is half full.
 - Add a spoonful of oil to the water and stir. Record your observations.
 - Add a few drops of food colouring to the mixture and stir. Record your observations.
 - Add a few drops of dish detergent to the mixture and stir. Record your observations.
- In step 2, what kind of mixture did you make?
 - In step 3, did the food colouring mix with the water or the oil? What kind of mixture did the food colouring form?
 - What happens to the mixture when the dish detergent is added in step 4?

Classifying Matter

You have learned that matter can be classified as either a pure substance or a mixture. Mixtures can be further classified as mechanical mixtures or solutions. Pure substances can combine to form mixtures. Figure 7 summarizes what you have learned about classifying matter.

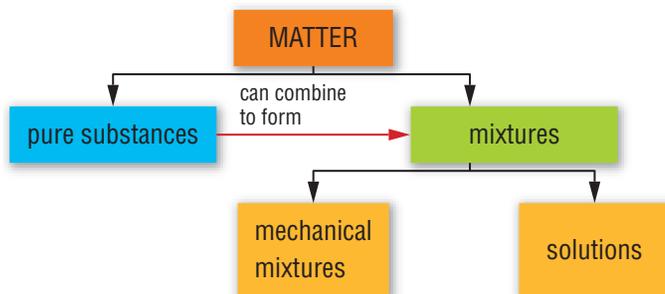


Figure 7 Classification of matter

Unit Task

How do you think this information about mechanical mixtures and solutions will be useful as you work on the Unit Task?

CHECK YOUR LEARNING

- Which ideas did you find easiest to understand as you learned about the arrangements of the particles of in mixtures?
 - Which ideas did you find most difficult to understand as you learned about the arrangements of the particles of in mixtures? Explain why.
 - Suggest a strategy to help you better understand the arrangement of the particles of mixtures.
- Describe each of the following types of mixture:
 - a mechanical mixture
 - a solution
- Copy Figure 7 (above) into your notebook. Add two examples of each type of mixture, and two examples of a pure substance.
- What is the difference between the arrangement of the different particles of a mechanical mixture and the arrangement of the different particles of a solution?
 - Draw diagrams of the particles of a mechanical mixture and the particles of a solution.
- Identify each of the following as a mechanical mixture or a solution:
 - stainless steel
 - a granola bar
 - clear apple juice
 - an omelette
 - soil from your backyard