

6.3

Mixtures

Most of the substances you use in your daily life are not pure substances. For example, hand lotion, shampoo, and soap are made of many substances, such as colouring and perfumes, mixed together. Foods contain preservatives and other additives. Even fruit juice that is labelled “100% pure” is actually a mixture of water, citric acid, and other substances (Figure 1).

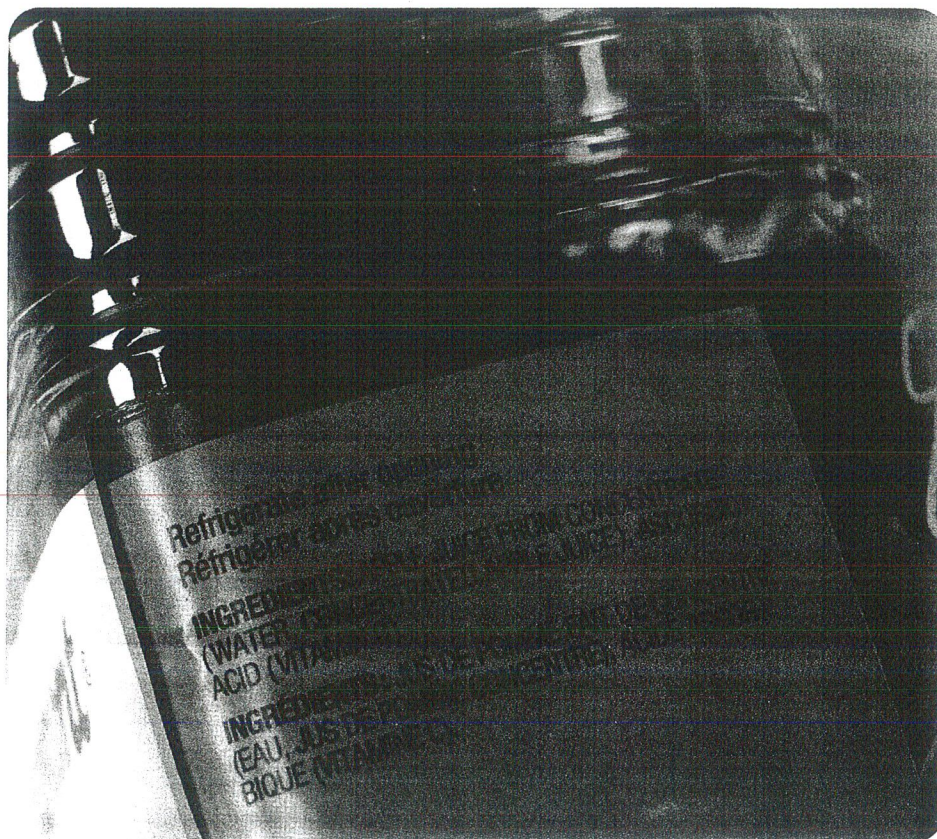


Figure 1
This “pure” apple juice is a mixture.

Classifying Mixtures

If you were asked to name some pure substances, you might think of common substances such as sugar, water, salt, and oxygen gas. Other substances you might think of may seem to be pure, even though they are not. For example, how would you classify vinegar? Is it a pure substance or a mixture? To be able to classify matter, you need to know more about mixtures. One way that scientists classify mixtures is to group them according to their appearance.

▶ LEARNING TIP

Before you read further, look at the subheadings on the next two pages. Predict how many categories scientists use to classify mixtures.

Mechanical Mixtures

A **mechanical mixture** is a mixture in which two or more different parts can be seen with the unaided eye. Granola cereal is an example of a mechanical mixture (Figure 2). Concrete is another example.



Figure 2

This cereal is a mechanical mixture. What other foods can you classify as mechanical mixtures?

Suspensions

A **suspension** is a cloudy mixture in which clumps of a solid or droplets of a liquid are scattered throughout a liquid or gas. Muddy water and tomato juice are suspensions. The parts of a suspension may separate into layers if the suspension is not stirred.

Farm-fresh milk is a suspension. If the milk is left standing, the fatty part (the cream) floats to the top and the watery part sinks to the bottom (Figure 3). Commercially available milk does not separate. It is a special kind of suspension, called an **emulsion**, which has been treated to keep it from separating. In a process called homogenization, the milk is sprayed through very small openings. This breaks down the fat into droplets that are so tiny they stay suspended.

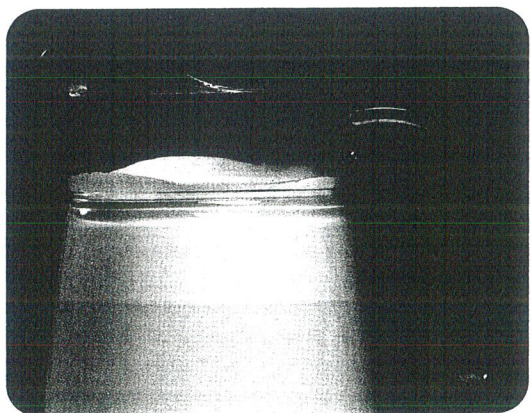


Figure 3

Cream floats to the top of farm-fresh milk.



Solutions

A **solution** is a mixture that appears to be only one substance. The parts of a solution are so completely mixed that they cannot be seen, even under a microscope. This is because the particles of the substance that dissolves fill in the spaces between the particles of the substance it dissolves in. Clear apple juice (a liquid) (Figure 4), clean air (a gas), and stainless steel (a solid mixture of metals) are all solutions.

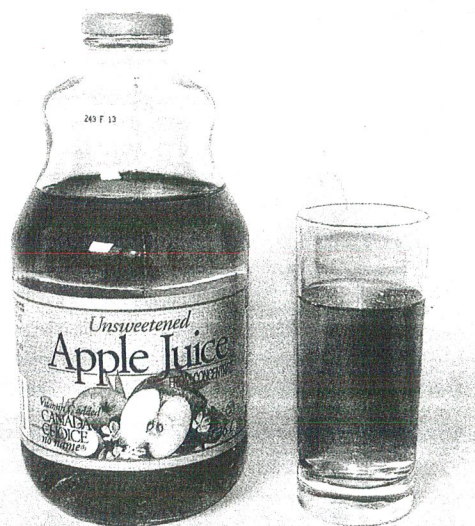


Figure 4
Apple juice is a solution.

LEARNING TIP

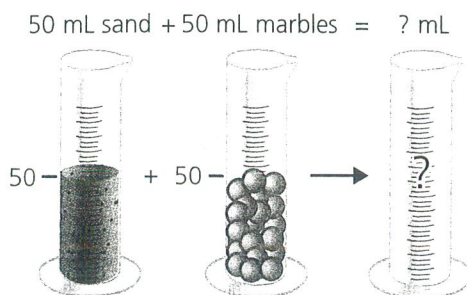
For a review on models, see "Creating Models" in the Skills Handbook.

TRY THIS: MODEL A SOLUTION

Skills Focus: modelling, predicting, observing

You can make a model to show how particles mix in a solution. The advantage of making a model is that you can observe a process you would not normally be able to see.

1. Half fill a clear plastic container with marbles. On the outside of the container, mark the level of the marbles with a marker. Then half fill a second, identical container with sand.
2. Predict the total volume that will result when you combine the marbles and the sand by marking the level you think will result.
3. Carefully pour the sand into the container with the marbles, and shake gently. How accurate was your prediction of the total volume? Explain.
4. How is the container of sand and marbles like a solution? How is it different?

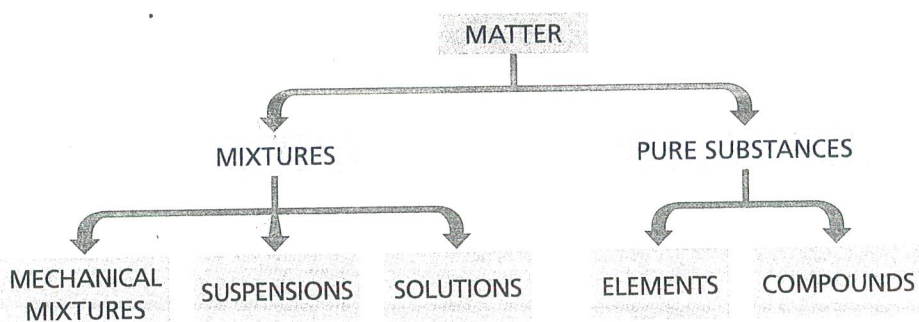


Examples of Mixtures

Table 1 gives examples of mechanical mixtures, suspensions, and solutions. Can you explain the classification of each substance listed?

Table 1 Examples of Mechanical Mixtures, Suspensions, and Solutions

Mechanical mixtures	Suspensions	Solutions
snow falling through the air	foggy air	clean air
salad	salad dressing	vinegar
cornflakes and milk	orange juice	tea
concrete (cement, sand, and gravel)	muddy water	tap water
abrasive skin cleanser	hand lotion	clear shampoo



LEARNING TIP

Go back to the graphic organizer you started in section 6.1. Complete it by adding "mechanical mixtures," "suspensions," and "solutions" under "mixtures." Your graphic organizer should now look like the one on the left.

CHECK YOUR UNDERSTANDING

- List at least three mechanical mixtures and three solutions from your everyday life that were not mentioned in this section.
- State whether each substance is a mechanical mixture, a suspension, or a solution. Explain your reasoning.
 - green relish
 - freshly squeezed orange juice
 - soda pop in a glass
 - bubble tea
 - trail mix
 - traditional Aboriginal paint, made of red ochre and grease
 - vegetable soup
- How are suspensions and solutions similar? How are they different?
- Suppose that you dissolve 250 mL of drink crystals in 1000 mL of water. You get 1175 mL of drink rather than 1250 mL. How can you use the particle model of matter to explain this?