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Lesson 2.2: Pure Substances and Mixtures

You learned in the last lesson that different substances are made of different kinds of molecules. Molecules of each substance have their own size, shape, and weight, and they are different from the molecules of all other substances. We can use this idea to help us study the difference between a pure substance and a mixture. We can tell a pure substance from a mixture by thinking about molecules.

A pure substance has only one kind of molecule. Pure substances can be solids, liquids, or gases. Pure sugar is an example of a pure substance. It is made only of sugar molecules. Lead, water, and alcohol are also pure substances. They each have only one kind of molecule.

A mixture has two or more different kinds of molecules mixed together. Mixtures can also be solids, liquids, or gases. The Kool-Aid that you drink is an example of a mixture: It contains water molecules and other molecules mixed together. Sometimes you can tell that something is a mixture by looking at it, but not always! Try by looking at some mixtures next!

Activity 2.2: Looking at Mixtures

Look at each mixture with a magnifying glass, then describe it using the chart below. Try to look at the “center” of the liquid drops (not the edges) as the edges can distort the image.

Mixture	Can you see different substances in the mixture?		What does the mixture look like? (write or draw)
Salt & pepper	YES	NO	
Salt & sugar	YES	NO	
Dirty water	YES	NO	
Sugar & water	YES	NO	
Syrup & water	YES	NO	

1. What is a pure substance? What is a mixture? Talk about molecules in your answer.

2. Did you see molecules in the mixtures today? YES NO

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3. Can you always tell that a substance is a mixture by looking at it? Provide one or more examples from today's activity.

4. Can you tell a pure substance from a mixture by looking at molecules with a magnifying lens? Explain your answer.

5. What do you think happened to the sugar grains when you mixed it with water? Talk about molecules in your answer.

6. Suppose you could actually see the molecules in the sugar water. What do you think you could see? Draw and label or write your answer.

It is easy to tell that some things are mixtures because you can see the separate particles: salt and pepper, for example. Sometimes, though, the substances when mixed together break up into individual molecules: sugar and water, for example. You can no longer see the different substances, but their molecules are still there, just all mixed together!

Most of the materials around us are mixtures, made of two or more different kinds of molecules. Very few substances are pure substances. Even substances that look pure may actually be mixtures.

For example, you might think that glass is a pure substance because it is clear, and you can see through it. But glass is actually a mixture of many different kinds of molecules. Milk is a mixture, and ocean water, too. Your body is a mixture containing thousands of different kinds of molecules.

What about air and water? Are they pure substances or mixtures? Water is a pure substance, made of only water molecules. Air, on the other hand, is a mixture, made of many different kinds of molecules mixed together. You will study more about air in Lesson Cluster 4, but for now the important point to remember is that it is very hard to tell whether a substance is a pure substance or a mixture just by looking at it, tasting it, or smelling it.

All pure substances are solids, liquids, or gases. But some mixtures such as muddy water are not easily classified as a solid, a liquid, or a gas. This is because mud contains solid particles of dirt mixed with liquid water. So mud is partly solid and partly liquid. Mud and many other mixtures contain two different states of matter.