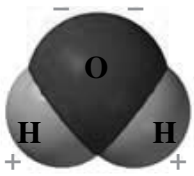
Name: _____

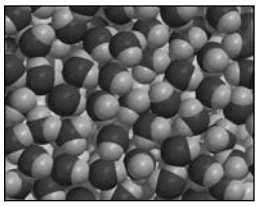
What's going on here?

In this investigation you saw that solids, liquids, and gases can all dissolve. You also saw that just because a substance dissolves in one liquid, it won't necessarily dissolve in another. Also, increasing the temperature of water affects the amount of a substance that dissolves. You also saw that dissolved gas tends to come out of a solution faster when the solution is warmed.

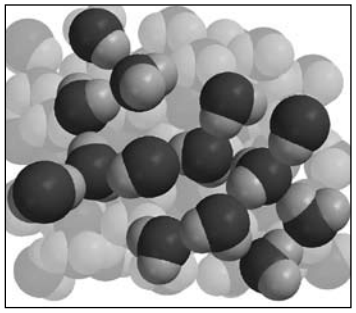
Water molecules

Because of the characteristics of the oxygen and hydrogen atom and how they are bonded together, there is a negatively charged area near the oxygen and a positively charged area near the hydrogens.





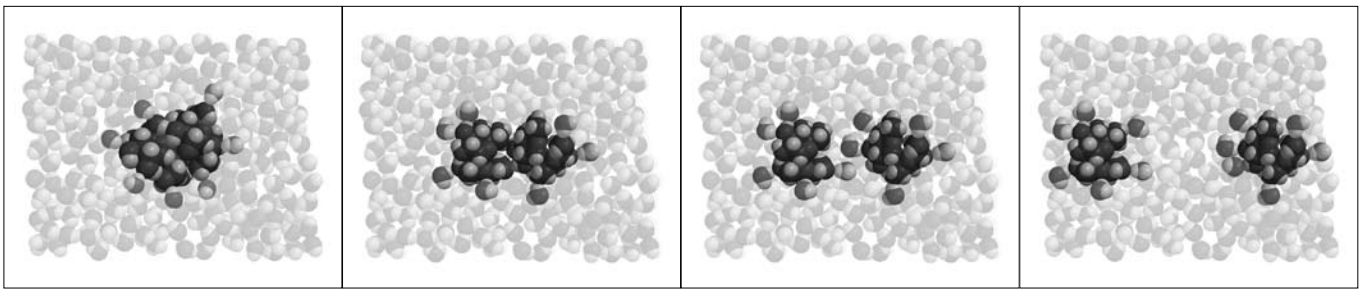
Water



The smaller illustration at the right shows that the molecules in liquid water associate very closely with one another. The larger illustration shows how the positive part of one water molecule is attracted to the negative part of another. And the negative part of one water molecule is attracted to the positive part of another. Water molecules are also attracted to the oppositely charged areas of other molecules. This is why water is such a good dissolver.

Dissolving colored sugar in different liquids

When you put colored sugar in water, the positive and negative areas of the water molecules were attracted to the oppositely charged areas of the color and the sucrose molecules. In fact, there was so much mutual attraction between the water and the color that the color came off the sugar and dissolved into the water. There was also enough mutual attraction between the water and sucrose molecules to overcome the attraction that the sucrose molecules had for each other. In the series of pictures below, water molecules separate two sucrose molecules from each other causing them to dissolve.



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What's going on here? (*continued*)

But sugar did not dissolve in alcohol and oil as well as it did in water. This is because the molecules of alcohol and oil are different from water molecules. They are made of different atoms, their shape is different, and the strength and number of positive and negative areas are different. The mutual attraction between these molecules and the sugar molecules was not strong enough to overcome the attraction of sugar molecules for each other and therefore, the sugar did not dissolve.

Dissolving different liquids in water

You normally think of dissolving as a solid dissolving in a liquid like water, but liquids can dissolve in liquids too.

A solid will dissolve in water if there is enough mutual attraction between the molecules of the solid and the water molecules. When these attractions overcome the attractions the molecules of the solid have for each other, the solid dissolves.

The same is true for liquids. Liquid molecules are also attracted to each other. A liquid will dissolve in water when there is enough mutual attraction between the molecules of the liquid and the water molecules. When these attractions overcome the attractions the molecules of the liquid have for each other, the liquid dissolves.

For example, isopropyl alcohol and corn syrup will dissolve in water because there is enough attraction between their molecules and the water molecules. Vegetable oil will not dissolve because there is very little mutual attraction between the molecules of oil and the water molecules.

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What's going on here? (*continued*)

Gas dissolved in water

A gas can dissolve in a liquid. Just like the attraction between water molecules and the molecules of a solid or liquid, there can be attraction between water molecules and the molecules of a gas. The molecules of carbon dioxide in carbonated water are mixed in and spread throughout the water so they are actually dissolved in the water.

Adding heat makes molecules vibrate and move faster. This movement helps overcome the attractions holding one molecule to another in a solid like sugar or salt. But adding heat has the opposite effect on gases, like carbon dioxide, dissolved in water. Adding heat makes molecules vibrate and move faster. This movement helps overcome the attractions between the carbon dioxide molecules and the water molecules. These faster-moving gas molecules can break away from the liquid and go into the air.

Cooling carbonated water slows the motion of the molecules. This slower movement allows the carbon dioxide molecules and the water molecules to stay together better. So the carbon dioxide stays dissolved longer.

Dissolving solids, liquids, and gases to make a soda

The carbonated water you used to make lemon soda had quite a bit of carbon dioxide gas dissolved in it. Gas that is dissolved in water tends to cling to any surface. When enough gas builds up, a little bubble forms, rises to the surface, and pops, sending the gas out of the water.

When sugar is added to carbonated water, there are many surfaces for the gas to attach to and make bubbles. Dissolving sugar in lemon juice eliminates the surfaces, so fewer bubbles form. This keeps more carbon dioxide gas in your soda.

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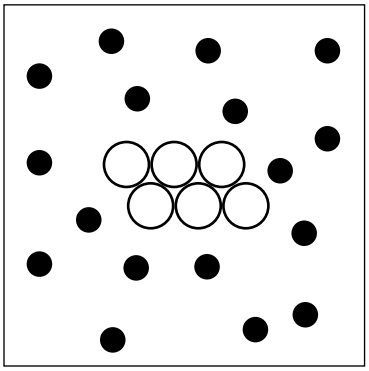
Name: _____

What's going on here? (*continued*)

1. Imagine that the six circles represent molecules of a solid. The black dots represent water molecules. Draw pictures and write captions to explain how a solid dissolves in water.

	Drawings	Captions
Before		The molecules of the solid are attracted to each other. There is also mutual attraction between the molecules of this solid and the water molecules.
During		
After		

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Name: _____

What's going on here? (*continued*)

2. Why does sugar dissolve better in hot water than in cold water?

_____

_____

_____

_____

3. Most solids dissolve better in hot water than in cold, but the opposite is true for gases. Why does carbon dioxide gas leave water faster when carbonated water is warmed?

_____

_____

_____

Cool factoid

Almost all soda pop that does not contain artificial sweeteners is sweetened with high-fructose corn syrup (HFCS). In the *Think about it* section, you read that HFCS is made from corn starch. To make HFCS, chemicals called *enzymes* are used to break the starch down into the sugars glucose and fructose. Of the three different enzymes that are used, two come from bacteria and the other comes from a fungus.

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