Solutions

What is a solution?

A **solution** is a special type of mixture that is made when one substance dissolves and mixes fully with another.

For example, a cup of instant coffee is a solution.

The solid that dissolves (e.g. coffee granules) is called the **solute**.

The liquid that does the dissolving (e.g. hot water) is called the **solvent**.

How many other solutions can you think of?

Solvents and solutes

What is the solvent and what is the solute?

substance	solvent	solute
black tea	water	tea
lemonade	water	lemon juice and sugar
seawater	water	salt
soda	water	flavors/sugar/carbon dioxide

How many other examples of solutions can you think of?

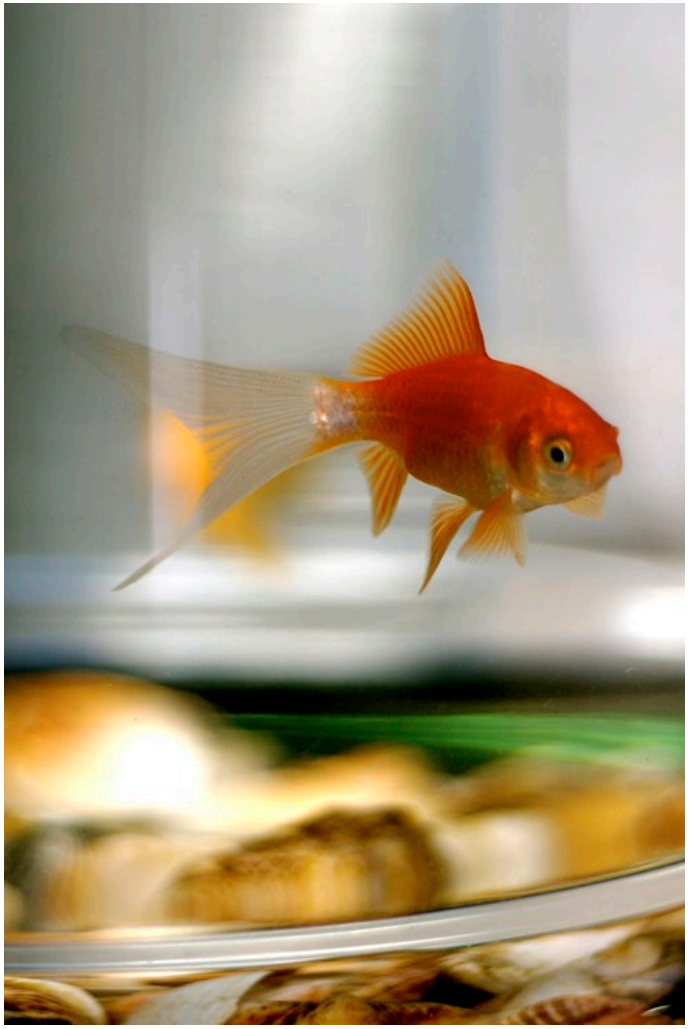
Special solutions

Solutions do not have to be made from a solid and a liquid.

Solutions can also be made by dissolving a gas into a solvent.

For example, it is the dissolved oxygen in water that allows fish to breathe.

Liquids can also be dissolved in other liquids, like concentrate in water, and solids can even dissolve in other solids.
For example, some alloys can be classified as solid solutions.

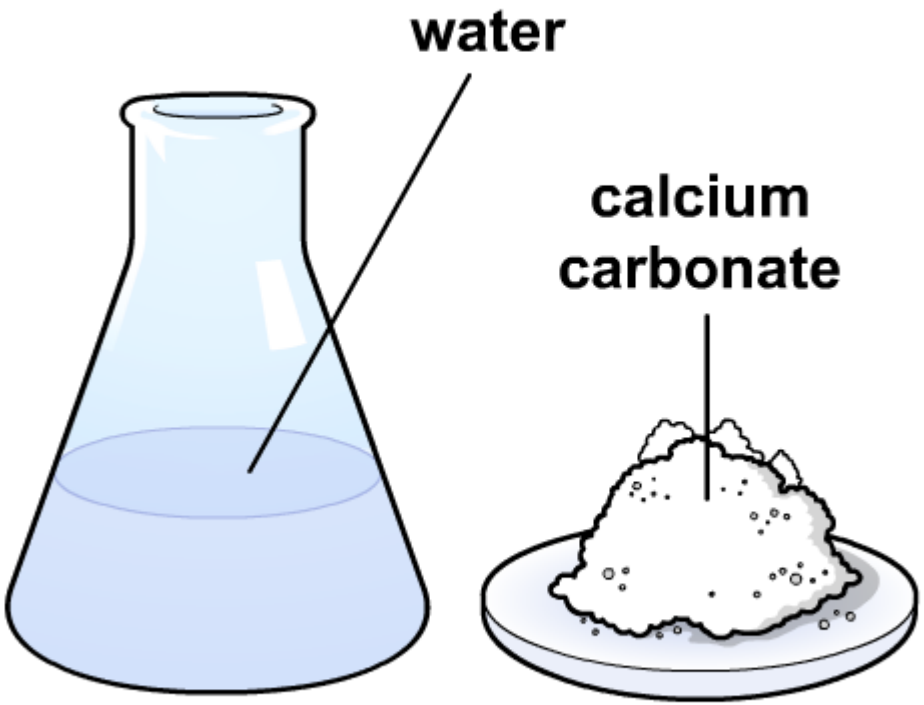


Does everything dissolve?

Are calcium carbonate and copper sulfate soluble in water?

What happens when calcium carbonate and copper sulfate are mixed with water?

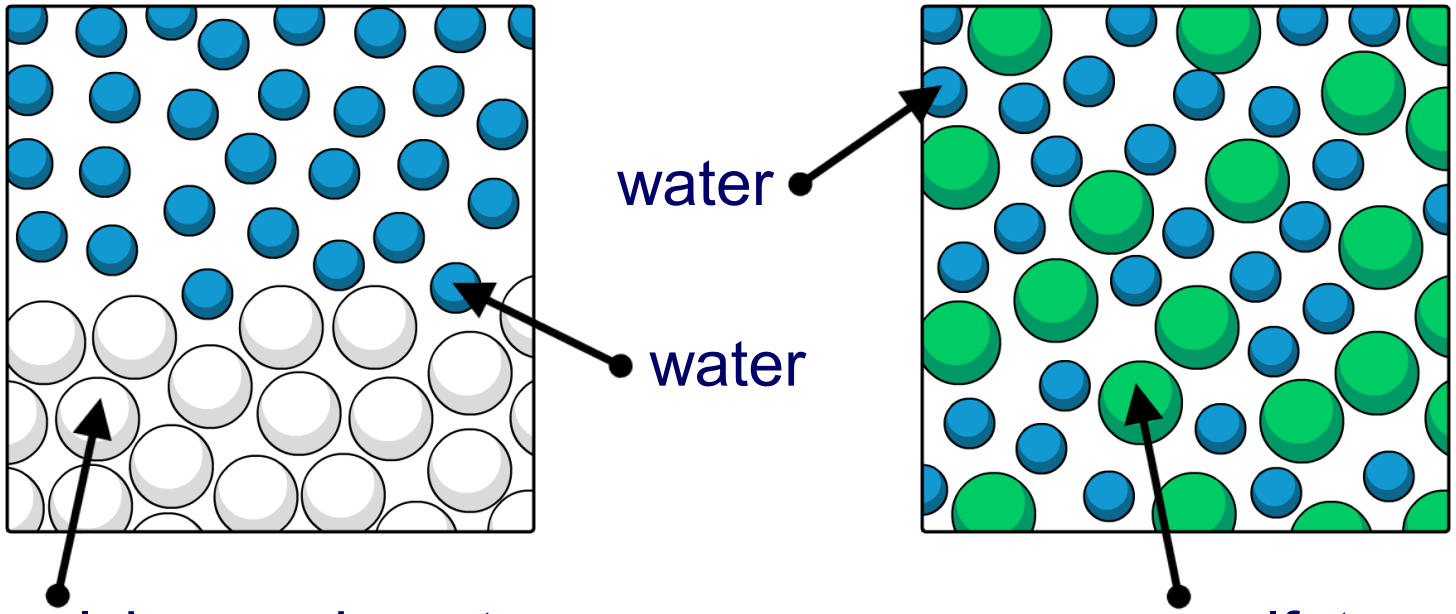
Click "**play**" to find out.



What happens when something dissolves?

Calcium carbonate is not soluble in water because the calcium carbonate and water particles are not able to mix.

Copper sulfate is soluble in water because the copper sulfate and water particles are able to interact and mix together.

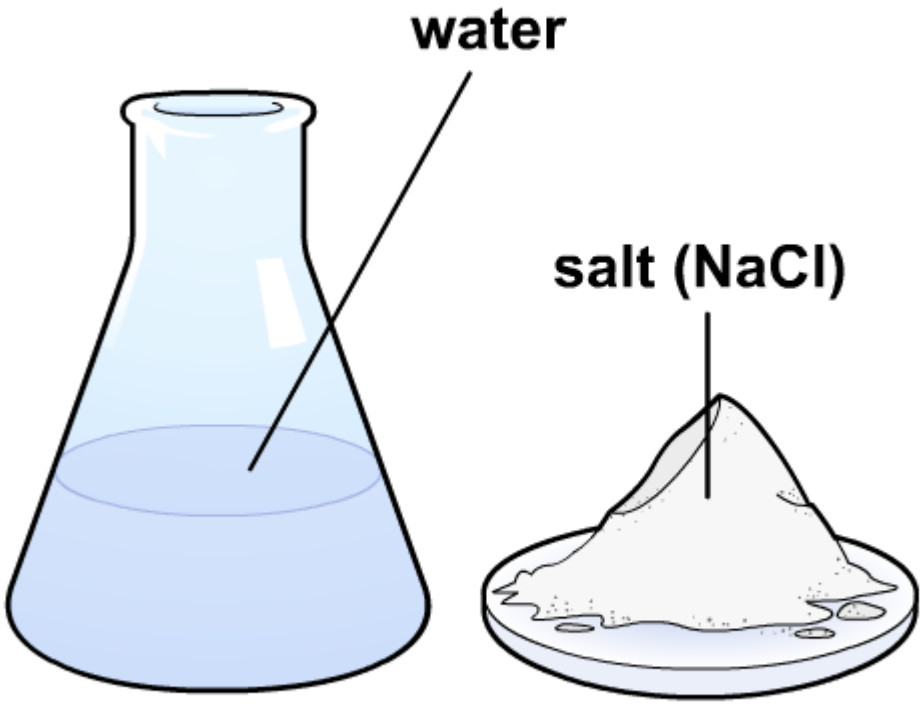


Dissolving in action?

What happens when something dissolves?

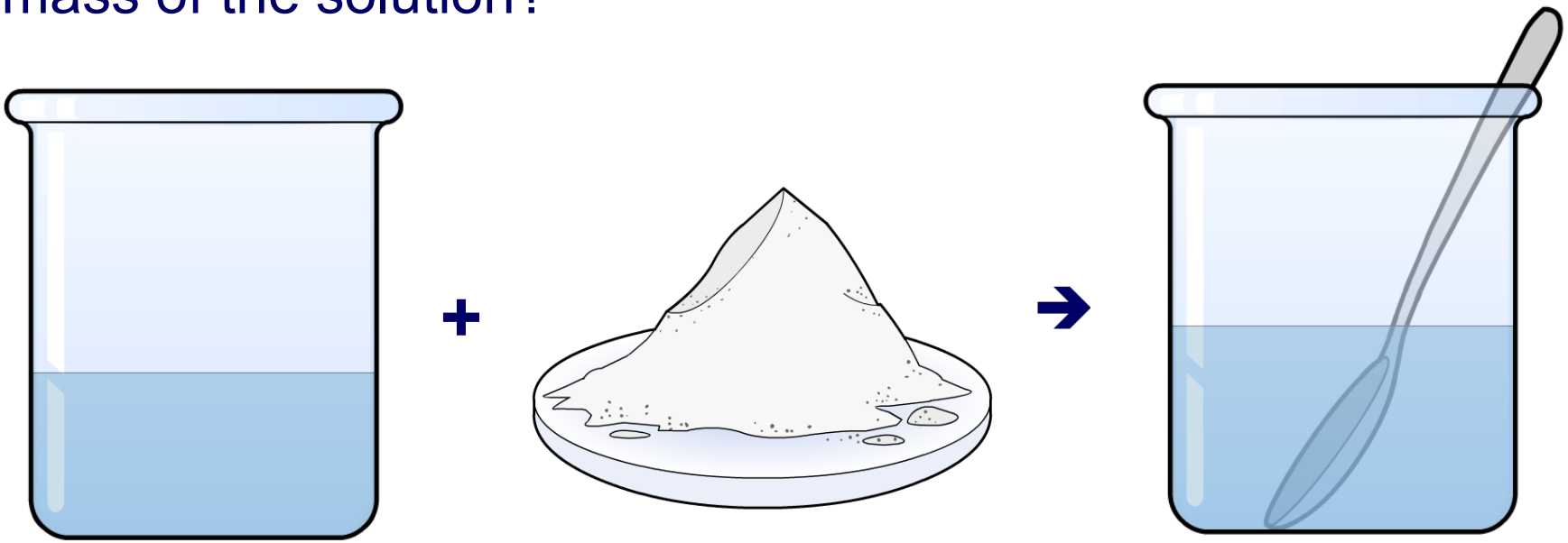
What happens to the particles in salt (sodium chloride, NaCl) as it dissolves in water?

Click "**play**" to find out.



Conservation of mass

If 10 g of **salt** is added to 50 g of **pure water**, what is the mass of the solution?



50 g + **10 g** → **60 g**

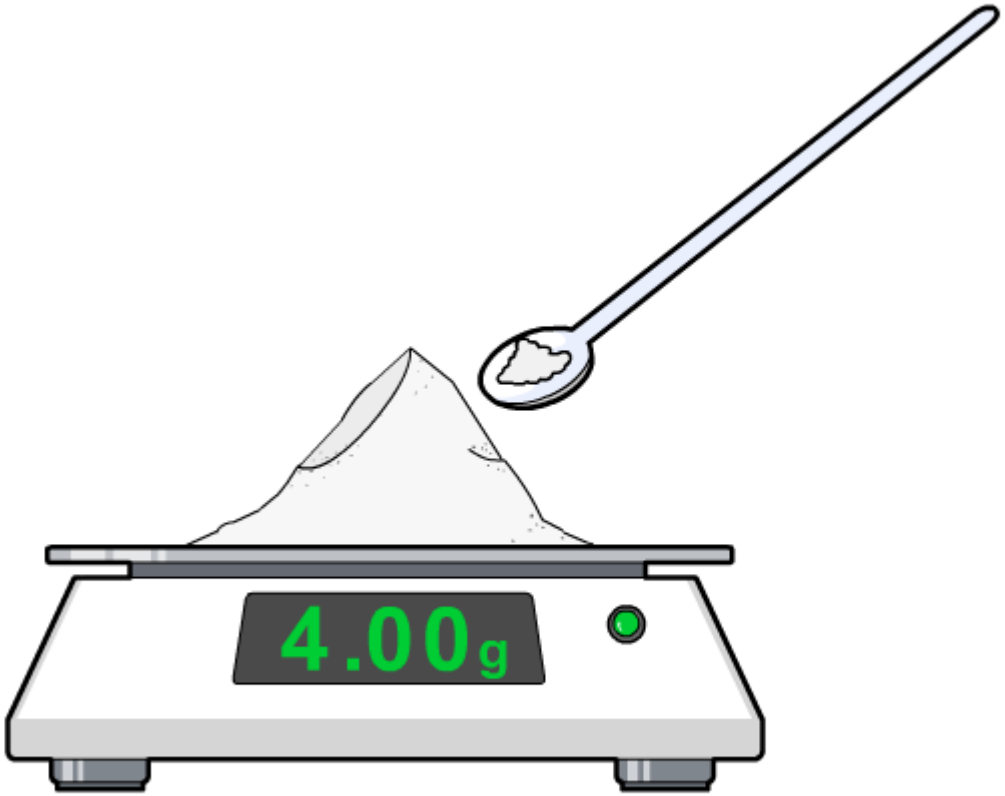
When the salt has dissolved, you can't see it any more. How could you check that the salt is still there?

How much salt?

What is conservation of mass?

Can all of a solid be recovered once it has been dissolved in a solution?

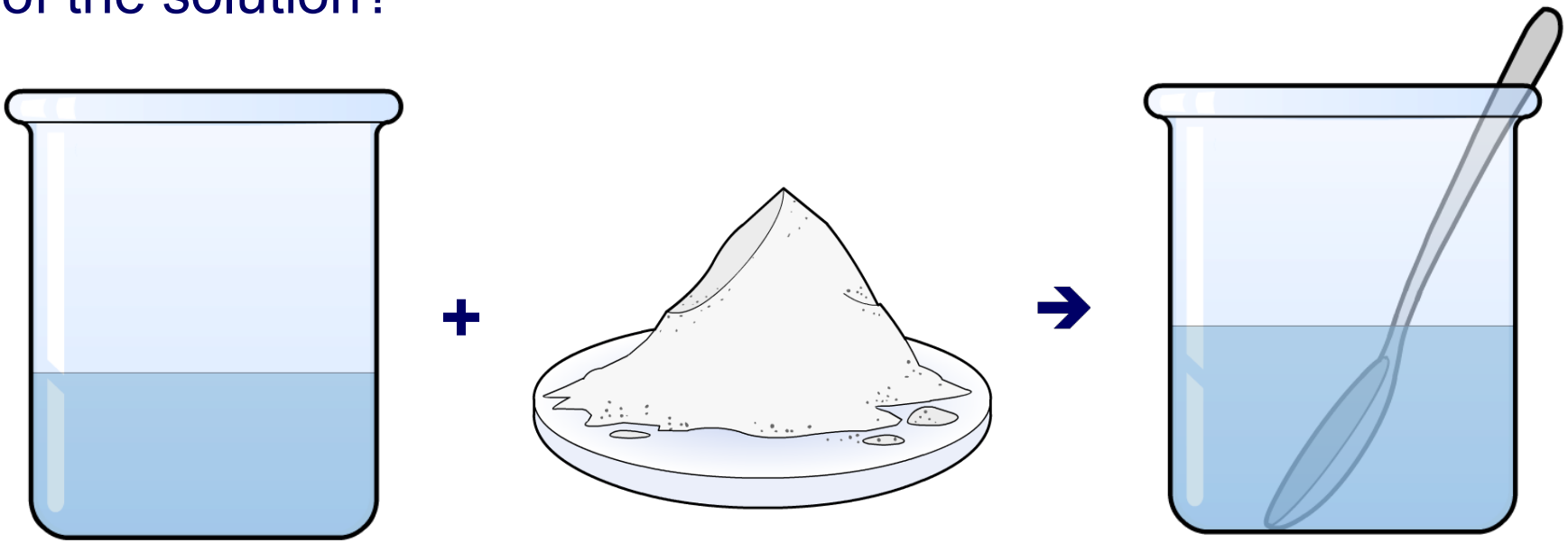
Click "**start**" to find out.



start

Conservation of mass – extension

If 10 g of salt is added to 50 g of **seawater**, what is the **mass** of the solution?



50 g + **10 g** → **60 g**

How much salt will be recovered if the mixture is separated by evaporation?

Does a solid keep dissolving?

When a spoonful of sugar is added to hot tea it dissolves.

But what would happen if you tried to pour a whole bag of sugar into the tea?

Click "**play**" to find out.

How does temperature affect solubility?

Does sugar dissolve in **cold** tea?

It does, but not as much as in a cup of **hot** tea.

The sugar is more soluble at higher temperatures.

The amount of a solute that can dissolve at a given temperature is called its **solubility**.

How does temperature affect the solubility of a substance?

The solubility of a substance usually increases as the temperature increases.

Supersaturated solutions

Supersaturated solutions are very saturated indeed.

The solute will stay in solution until a ‘seed’ crystal is added, and then it will crystallize out of the solution very quickly.

When it does this, it gives out heat energy. Supersaturated solutions are therefore used in heat packs.

Supersaturated solutions in action

Solubility of gases

Gases are unusual because their solubility **decreases** when the solvent gets hotter.

Fish and other organisms that live in water survive by taking in oxygen that has dissolved in the water.

Some scientists think that global warming is causing ocean temperatures to rise.

What effect do you think rising temperatures will have on the creatures that live in the ocean?