

A **mixture** is made from different substances that are **not chemically joined**. For example powdered iron and powdered sulfur mixed together makes a mixture of iron and sulfur. They can be separated from each other without a chemical reaction, in the way that different coloured sweets can be picked out from a mixed packet and put into separate piles.



## Mixture and compounds

Mixtures have different properties from compounds. The table summarises these differences.

	<b>Mixture</b>	<b>Compound</b>
<b>Composition</b>	Variable composition – you can vary the amount of each substance in a mixture.	Definite composition – you cannot vary the amount of each element in a compound.
<b>Joined or not</b>	The different substances are not chemically joined together.	The different elements are chemically joined together.
<b>Properties</b>	Each substance in the mixture keeps its own properties.	The compound has properties different from the elements it contains.
<b>Separation</b>	Each substance is easily separated from the mixture.	It can only be separated into its elements using chemical reactions.
<b>Examples</b>	Air, sea water, most rocks.	Water, carbon dioxide, magnesium oxide, sodium chloride.

## An example - iron, sulfur and iron sulfide

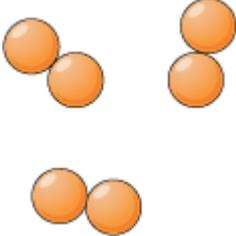
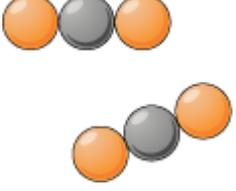
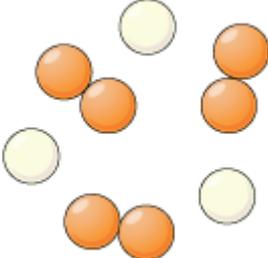
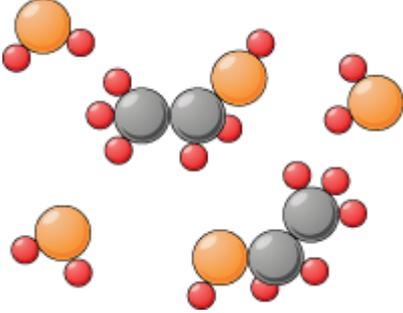
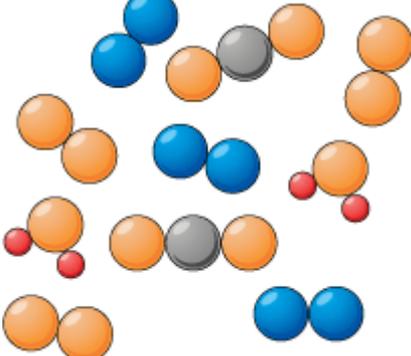
Remember that iron and sulfur react together when they are heated to make a compound called iron sulfide. What are the differences between a mixture of iron and sulfur, and iron sulfide? Here are some of them:

- The mixture can contain more or less iron, but iron sulfide always contains equal amounts of iron and sulfur.
- The iron and sulfur atoms are not joined together in the mixture, but they are joined together in iron sulfide.
- The iron and sulfur still behave like iron and sulfur in the mixture, but iron sulfide has different properties from both iron and sulfur.
- You can separate the iron from the mixture using a magnet but this does not work for iron sulfide.

Can you recognise elements, compounds and mixtures?

- An element contains just one type of atom.
- A compound contains two or more types of atom joined together.
- A mixture contains two or more different substances that are not joined together.
- The different substances in a mixture can be elements or compounds.

The table shows some examples.

<b>Description</b>	<b>Example</b>	<b>Diagram</b>
Pure element	oxygen	
Pure compound	carbon dioxide	
Mixture of elements	oxygen and helium	
Mixture of compounds	alcohol and water	
Mixture of elements and compounds	air	

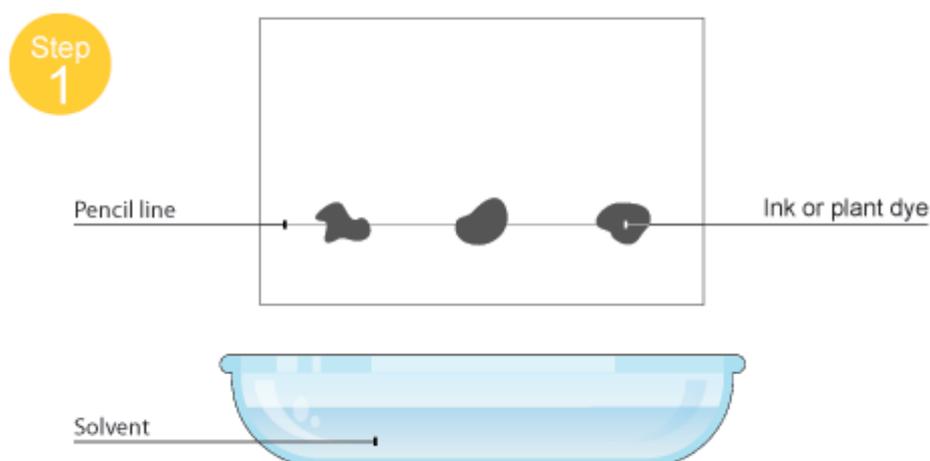
Notice that the different substances in a mixture can be single atoms, molecules of elements or molecules of compounds.

The different substances in mixtures are usually easily separated from one another. The method you use depends upon the type of mixture you have.

## Chromatography

This is good for separating dissolved substances that have different colours, such as inks and plant dyes. It works because some of the coloured substances dissolve in the liquid better than others, so they travel further up the paper.

### Separating dissolved substances



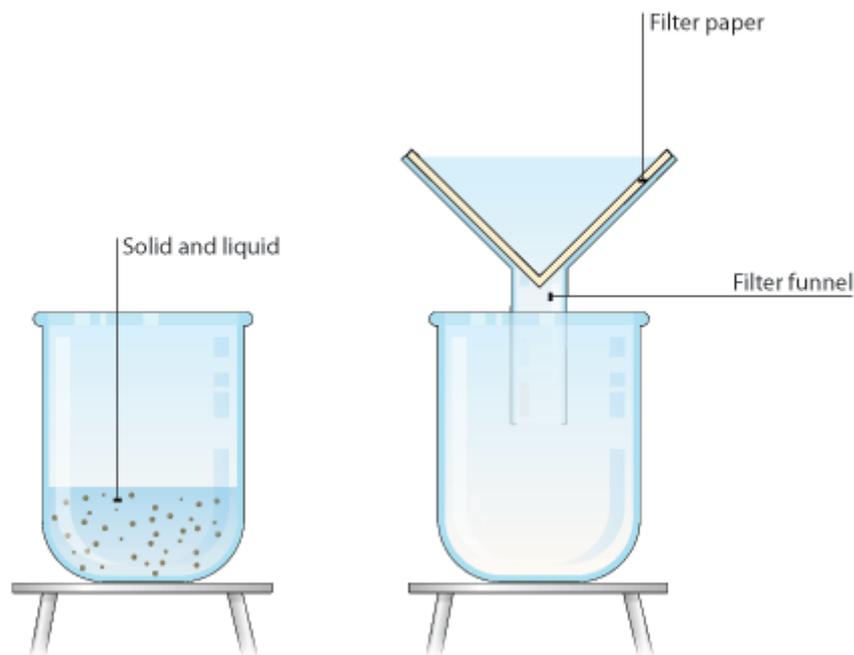
## Filtration

Filtration is good for separating an **insoluble solid** from a liquid. (An insoluble substance is one that does not dissolve).

Sand, for example, can be separated from a mixture of sand and water using filtration. That's because sand does not dissolve in water.

## Separating insoluble solids

Step  
1



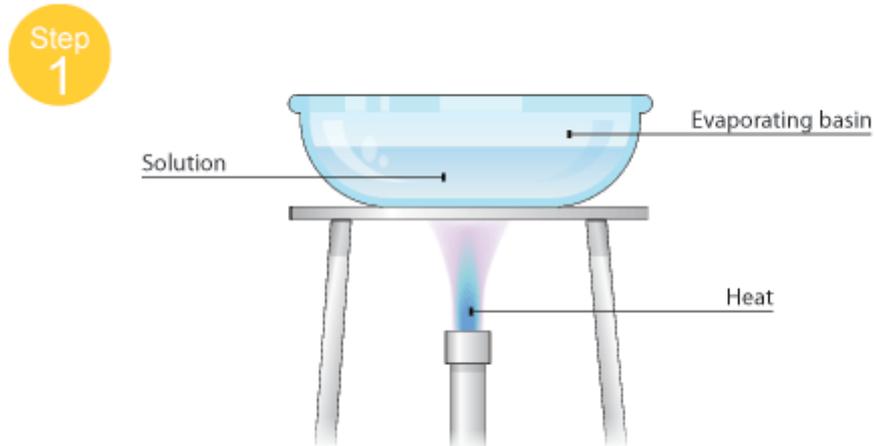
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## Evaporation

This is good for separating a **soluble solid** from a liquid (a soluble substance does dissolve, to form a solution).

For example copper sulfate crystals can be separated from copper sulfate solution using evaporation. Remember that it is the water that evaporates away, not the solution.

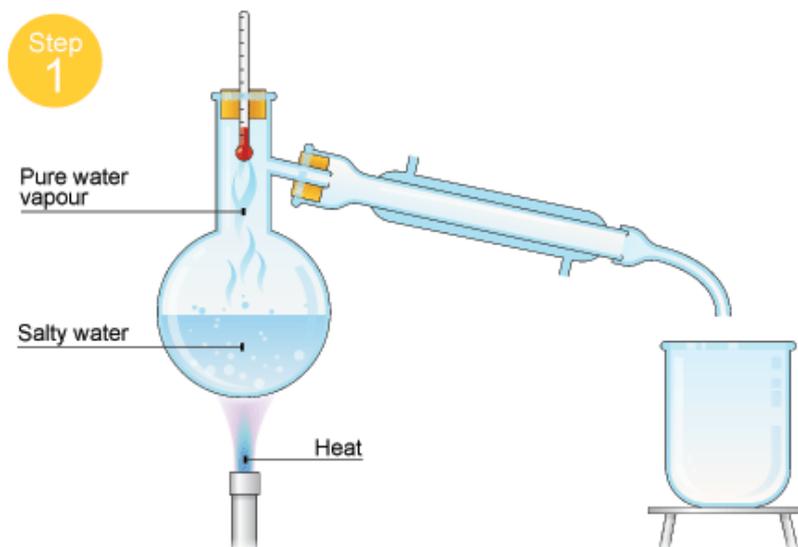
## Separating a soluble solid



### Simple distillation

This is good for separating a **liquid** from a solution. For example, water can be separated from salty water by simple distillation. This method works because the water evaporates from the solution, but is then cooled and condensed into a separate container. The salt does not evaporate and so it stays behind.

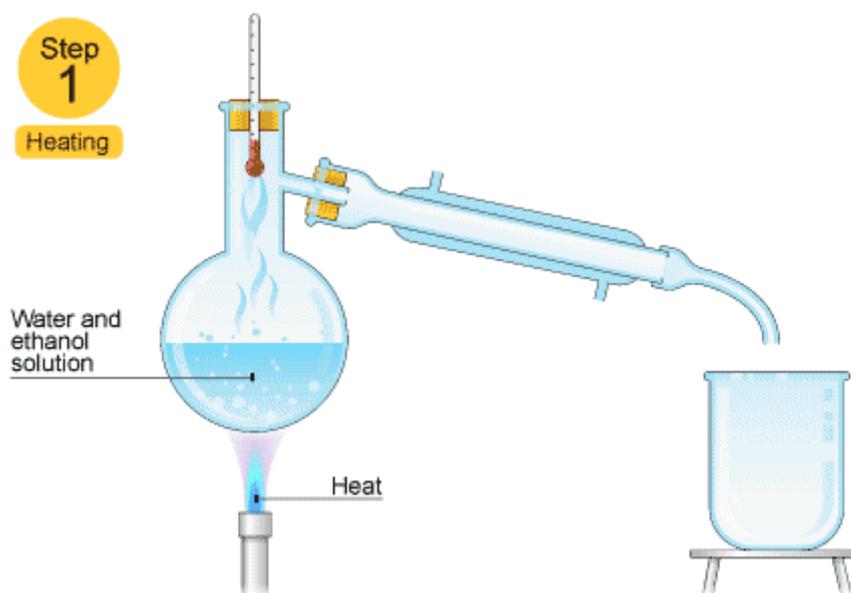
## Separating a liquid from a solution



## Fractional distillation

This is good for separating **two or more liquids** from each other. For example, ethanol (alcohol) can be separated from a mixture of ethanol and water by fractional distillation. This method works because the two liquids have different boiling points.

## Separating two or more liquids



Water and ethanol solution is heated.