Separating Mixtures

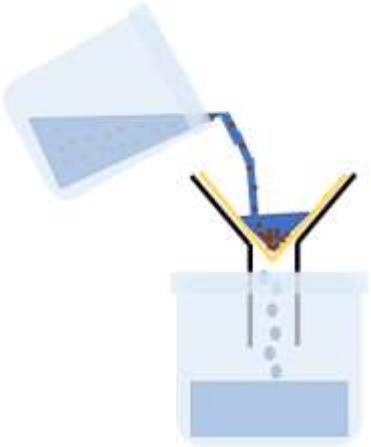
A mixture has elements or compounds that are not chemically bonded but are none the less mixed together. It is often useful to separate these different elements or compounds either because one particular element or compound is valuable/useful or to remove impurities in an substance. There are lots of different methods for separating mixtures:

To separate magnetic materials use a magnet.

This is really only a very limited method but if we have macroscopic (opposite to microscopic so on scales bigger than particles) mixture like iron fillings mixed we sand we can separate the iron fillings using a magnet.

To separate insoluble solids from liquids use filtration

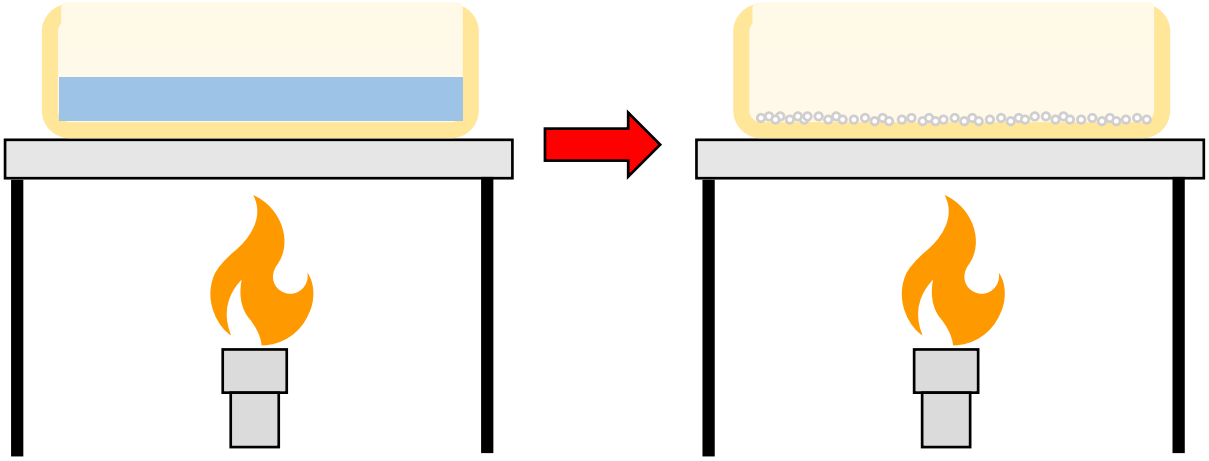
When a solid is added to a liquid sometimes it dissolves, like when you add sugar to a cup of tea. Sometimes it doesn't dissolve, like when you add sand to water – we call this insoluble.



Assuming a solid has **not** been dissolved we can separate the solid and liquid by filtration. If we pass a mixture of water and sand through filter paper, the water passes through but the sand is left on the filter paper.

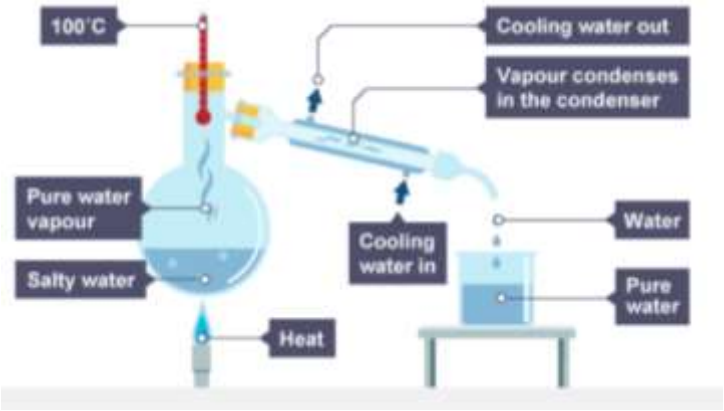
To separate soluble solids from liquids use evaporation

Simply place the mixture in an evaporating basin and heat with a Bunsen burner. The liquid will evaporate leaving only the dissolved solid in the basin. This would work with sea water for example. The water would evaporate leaving the previously dissolved salt in the basin.



To separate the solvent from a solution use distillation

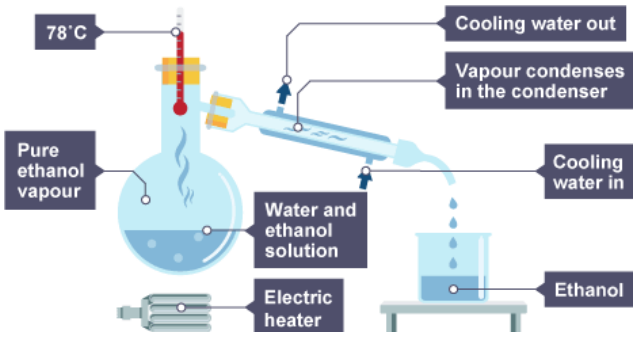
The solvent is the liquid that the solid has dissolved into. This is very similar to the above but instead of just collecting the solid and letting the liquid evaporate away, we are going to collect the liquid as well. To do this we send the evaporated liquid down a "condensing tube". A condensing tube is a tube that has cold water circulating around the outside of the tube to keep it cold so that when the hot gases of the evaporated liquid hit it, they condense back into a liquid, this liquid is then collected separate from the solid.



Credit BBC Bitesize

To separate a liquid from a mixture use fractional distillation

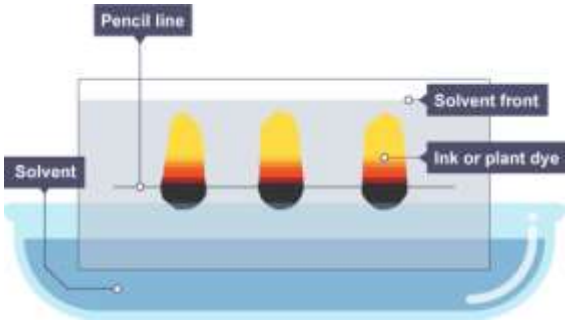
This is very similar to the previous distillation and is identical in experimental set up. Here we have a mixture of two liquid rather than a solid dissolved in a liquid. The key here is that the different liquids have different boiling points. So we heat the mixture to a temperature that is above the boiling point of liquid 1 but is below the boiling point of liquid 2, so liquid 1 evaporates and is collected in a beaker after being condensed whilst liquid 2 will be left in the flask.



Credit BBC Bitesize

To separate dissolved solids use chromatography.

A pencil line is drawn on a piece of chromatography paper and spots of ink are placed on the line. The paper is then dipped into the solution (a liquid with multiple solids dissolved in it). The solvents in the solution travel up the paper and takes some of the ink with it. The height and colour of the mark is indicative of each solvent (like a fingerprint). If a substance is completely pure it'll make one dot per solvent (like right) but in reality, it normally looks like the image on the left but this is sufficient to determine what the solvents are.



Credit BBC Bitesize