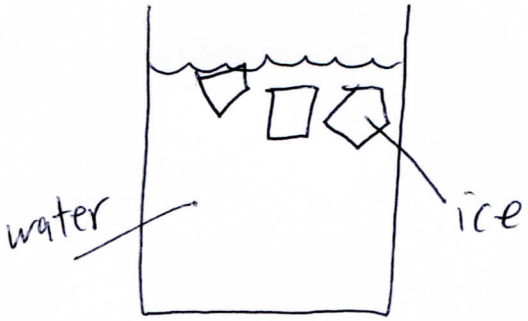
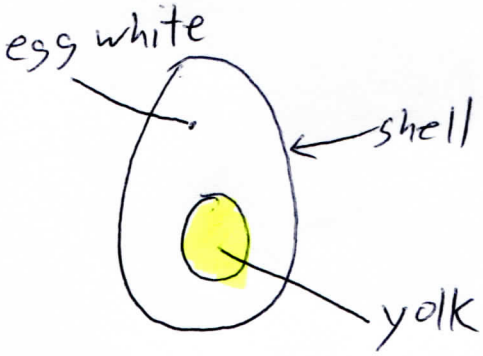
Chemistry Lecture #13: Mixtures of Matter

Mixture: Blend of 2 or more substances. The substances are in physical contact, but are not chemically bonded.

For example, a container filled with both oil and water is a mixture of the two. The oil is in contact with the water, but is not chemically bonded to the water.

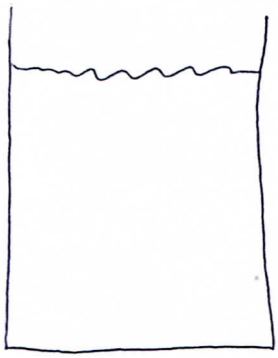
Ice floating in water is another example of a mixture. So is a hard-boiled egg.





If you can look at a mixture and see different sections or regions, the sections are called *phases*. All of the above examples are mixtures with different sections/phases.

Here's another mixture: sugar dissolved in water.



The mixture is not divided into different sections. There is only one phase. It is still a mixture because the sugar and water are in contact with each other, but are not bonded. The sugar is still sugar (you can taste it) and the water is still water.

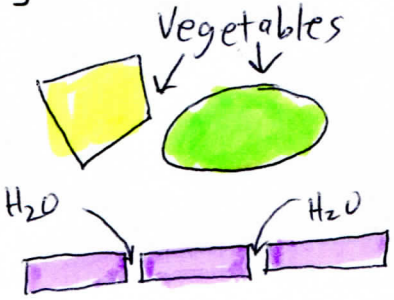
Heterogeneous mixture: Composition is not uniform (it has 2 or more phases).

Homogeneous mixture: Composition is uniform (it has only one phase). Homogeneous mixtures are also called solutions.

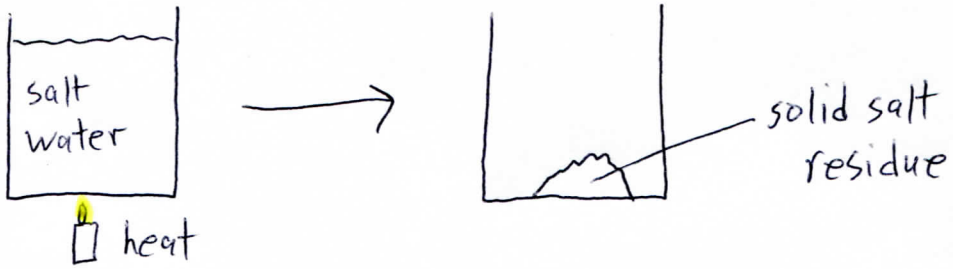
Thus, sugar dissolved in water is a homogeneous mixture. Oil and water, ice in water, and a hard-boiled egg are examples of heterogeneous mixtures.

The components of a mixture are only in physical contact with each other. Thus, components of a mixture can be separated by physical means. Methods of physically separating components of a mixture include filtration, distillation, crystallization, magnetism, and gravitational separation.

Filtration involves separating big particles from smaller particles with a filter. Particles are separated by size. For example, vegetables can be separated from water by pouring the mixture through a colander. The larger chunks of vegetables will be blocked by the colander, while the water molecules can easily pass through the holes in the colander.



Distillation uses heat to separate substances that easily evaporate from those that don't evaporate. For example, if salt is dissolved in water, the mixture can be separated by boiling the solution. The water will boil away, but the salt will be left behind since salt does not easily evaporate.



Crystallization occurs when too much solid has been dissolved into a liquid. When this occurs, solid that has been dissolved will start to come out of solution and form crystals. This is how rock candy is made. Lots of sugar is dissolved in hot water. When the water cools, the sugar will crystallize.

Magnetism can be used to separate magnetic substances from non-magnetic substances. For examples, iron nails can be separated from sand with a magnet.

Gravitational separation can be used to separate substances if one substance is heavier than another. Heavier substances move more slowly than lighter substances, and this allows for the separation of mixtures.

For example, chromatography is a technique that can separate fluids such as blood and urine. A spot of the liquid mixture is placed at the end of a piece of paper, and the end of the paper is placed in a liquid solvent. As the solvent is absorbed up into the paper, the components of the mixture are swept along with the solvent.

The heavier components of the mixture will move more slowly while the lighter components will move faster. The heavier components will separate and end up closer to the bottom of the paper, while the lighter components will end up closer to the top of the paper.

Chromatography can also be used to separate the components of ink. Ink is often a mixture of pigments, and some pigments are heavier than others.