

Solutions (Homogeneous)



Solutions



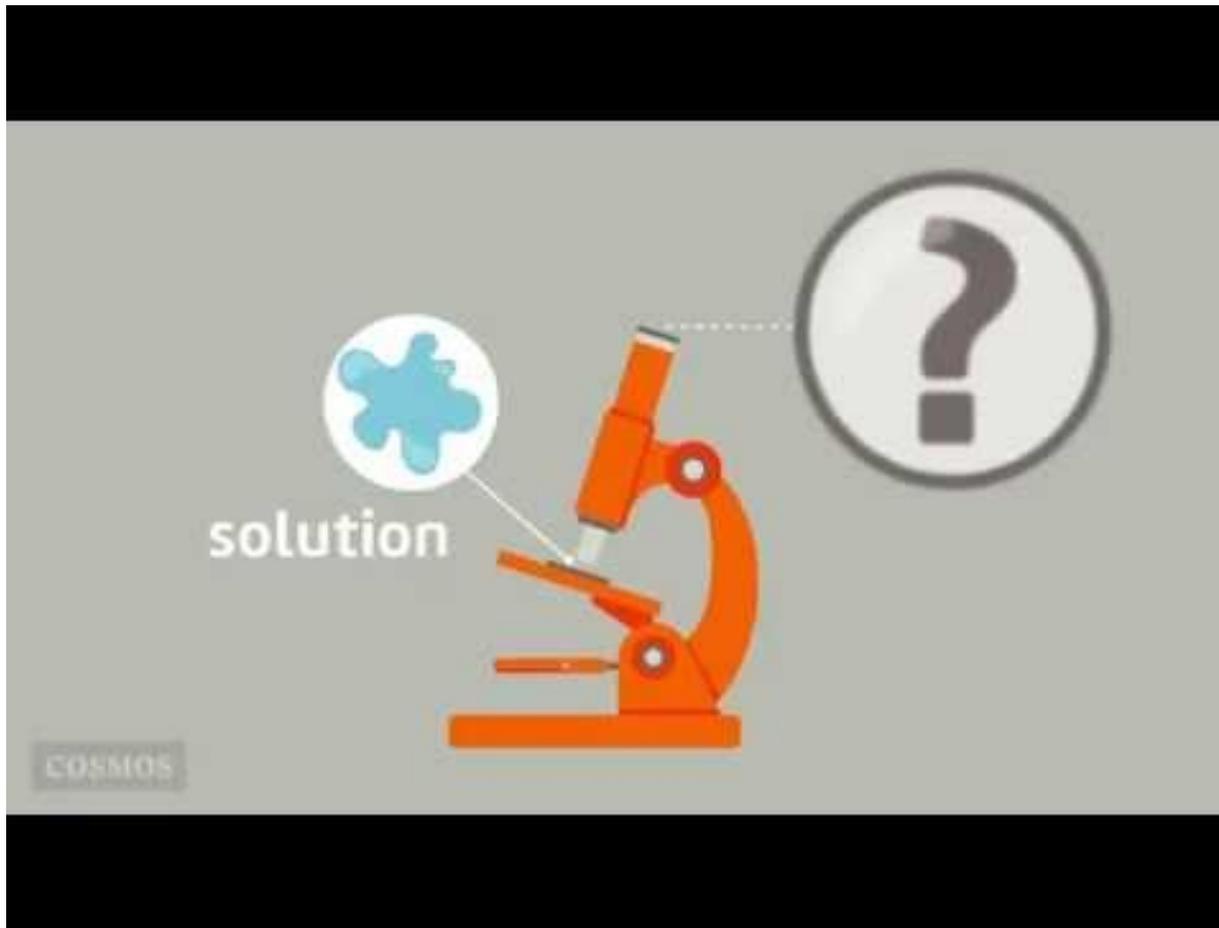
There are two important parts to a solution:

- The **solute**, which is the substance being dissolved (eg. salt)
- The **solvent**, which is the substance doing the dissolving (eg. water)



Solute + Solvent = Solution





<https://www.youtube.com/watch?v=QNyQGTHa2hM>

Mechanical Mixtures (Heterogeneous)



Let's Review:



The water from your kitchen faucet comes out clear, and has a few other substances mixed in with it. On the other hand, the water by the wharf is sometimes murky brown, and has many things mixed in with it.

Which is a solution, and which is a mechanical mixture?





The water by the wharf is a mechanical mixture. The water is still water, the soil is still soil, and the plants are still plants!



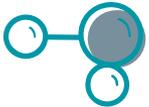


Types of Heterogeneous Mixtures



There are three further categories of heterogeneous mixtures:

1. Suspensions
2. Emulsions
3. Colloids





Suspensions

In a suspension, particles of a substance are lightly held or “suspended” in another substance. Suspensions slowly separate if not constantly mixed.

Examples: lake water, homemade salad dressing, sand and water





<https://www.youtube.com/watch?v=EsUDC2dblgA>



Colloids



A colloid is a heterogeneous mixture that does not separate easily. It can look like a solution, but the particles are suspended (rather than dissolved).

Examples: milk, smoke





<https://www.youtube.com/watch?v=aDEaqCMQzF0>



Emulsion



An emulsion is a heterogeneous mixture made up of two or more liquids, where one ends up as very tiny droplets inside the other. The liquids do not completely mix.

An emulsion is similar to a colloid, but an emulsion must be two or more **liquids** (a colloid can contain solids).



Examples: homemade mayonnaise, margarine, hand lotion



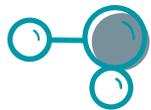


Separating Mixtures



There are several ways to separate mixtures:

1. Filtration
2. Centrifuge (density)
3. Distillation



And more, such as magnetism, evaporation, paper chromatography, etc. ...





Filtration



We see filters everywhere! Can you name a few?

- Coffee makers
- Water filters
- Vacuums
- Air conditioning
- Kidneys





Filtration

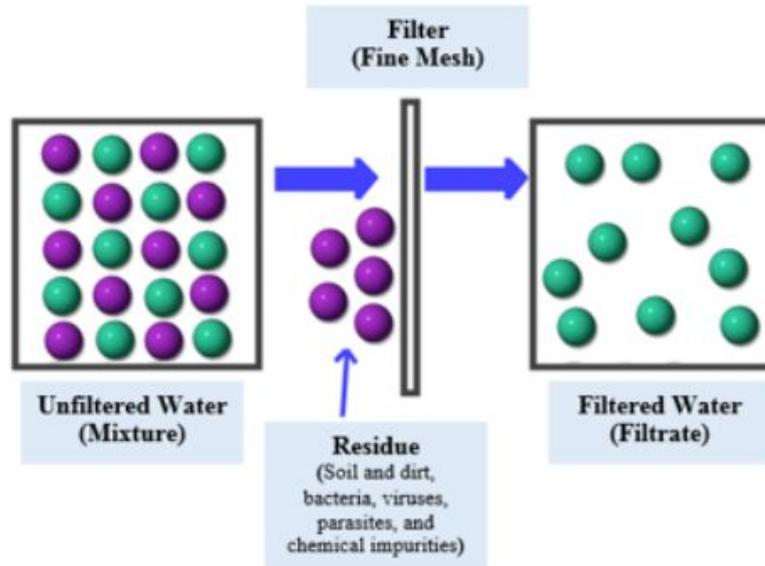
Filtration is generally used to separate a **suspension** mixture where small solid particles are mixed with liquid or air. Generally, the particles in colloids are too small to filter out.

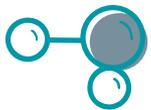
Filters can be made from sand, gravel, coal, or granular activated carbon (charcoal). **Residue** is the material or substance left in the filter. The newly filtered mixture is called the **filtrate**.



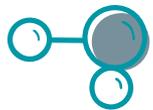


Water is forced through a paper that is made up of a very fine mesh of fibers. These fine fibers trap substances like soil and dirt, bacteria, viruses, parasites, and chemical impurities. This is a simplified version of water filtration, there are many more steps involved before it reaches your home and is safe to drink.





<https://www.youtube.com/watch?v=y97gfqlZ7mE>



<https://www.youtube.com/watch?v=60Big9Ut6Mc>



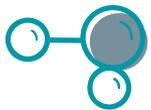
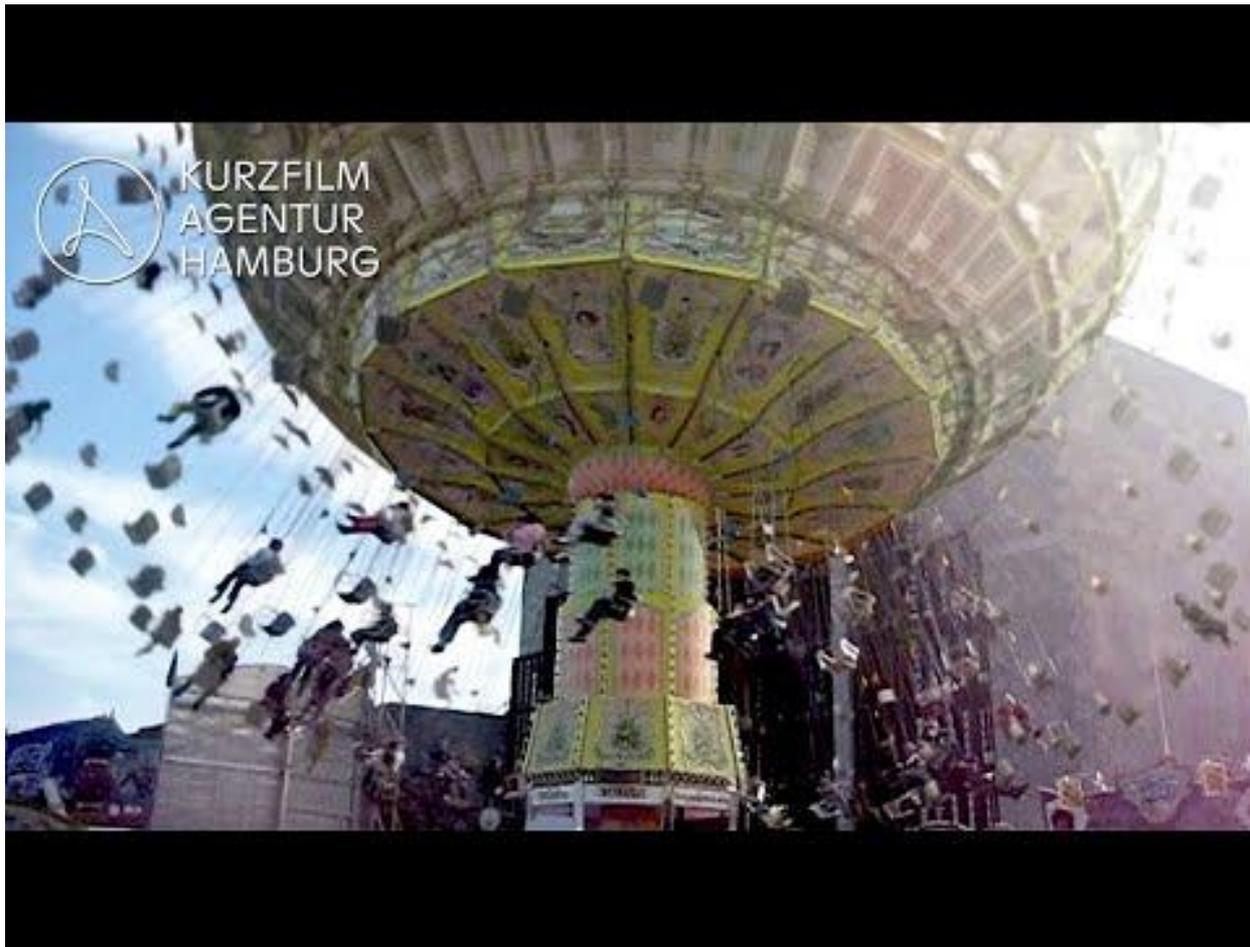
Centrifuge

Some suspension mixtures have particles that are too small to be separated by natural settling or using filters. This is when a **centrifuge** may be used. A centrifuge is a mechanical device that **spins at extremely high speeds**. It is like a very fast spin dryer. These high speeds cause the solid particles in suspension mixtures to settle (separate) very quickly. This is called Centrifugal Force.





https://www.youtube.com/watch?v=KEXWd3_fm94



<https://www.youtube.com/watch?v=RVeHxUVkW4w>





Distillation

Another process used to separate mixtures is called distillation. Distillation uses boiling to separate mixtures of liquid solutions. When the mixture reaches boiling point, evaporation will occur. The liquid will turn to vapour (steam). The vapour travels up to the condensing tube, cools and condenses back into liquid in a different container. You are left with the minerals in the original condensing flask and pure water in the other flask.

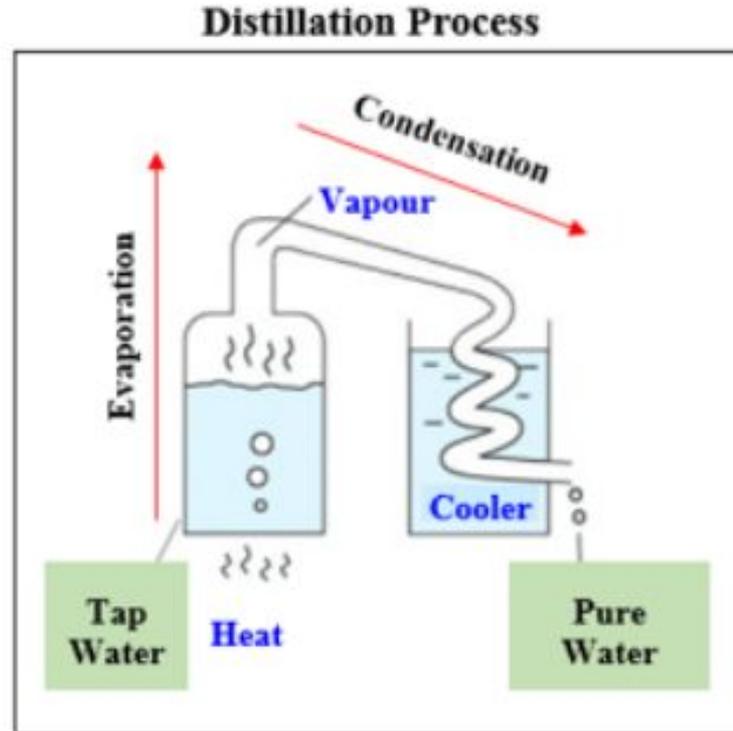




Distillation



Remember: evaporation happens when a liquid substance becomes a gas. When water is heated, it evaporates. The molecules move and vibrate so quickly that they escape into the atmosphere as molecules of water vapor.





https://www.youtube.com/watch?v=0IWy_hdgKJM



IRL: Eulachon Oil Production and Trade



Eulachon are a small ocean fish that return to the BC coast annually to spawn. When spawning these little fish or smelts can have a body composition that is 15% fat. If dried and strung with a wick they will burn and so are sometimes called candlefish.

Indigenous Peoples have a long history of harvesting Eulachon to eat but also to render Eulachon Oil that was traded in the interior of BC where the fish did not spawn. The Eulachon oil or "grease" was a dietary staple and was traded along "grease trails". The oil is a solid at room temperature and resembles soft butter in appearance. The oil was also mixed with berries to preserve them, used to make paint and used as medicine.



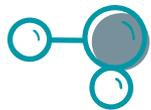


IRL: Eulachon Oil Production and Trade



The separation process used large pits or containers that would hold the Eulachon and allow them to ripen or decompose for about a week. Decomposing is a chemical change that releases the fat and other nutrients from the fish. For the purpose of this Chemistry unit, we can consider the pit of decomposing smelts a mechanical mixture. Boiling water was then added. It turned the mixture into more of a suspension. Water was added and the suspension was churned until the large sticks used for the churning the suspension could just stand up in it. Then the suspension was left alone to let the Eulachon oil separate to the top of the pit so it can be skimmed off.





<https://www.youtube.com/watch?v=wEMQujyzHQA>

