Chapter 5. Separating Mixtures

Many of the substances we use everyday were actually once part of a mixture. Someone somewhere separated that substance from the mixture so we could use it. It turns out that many compounds and elements are not found in nature in their pure form, but are found as parts of mixtures.

Why do we want to separate mixtures ?

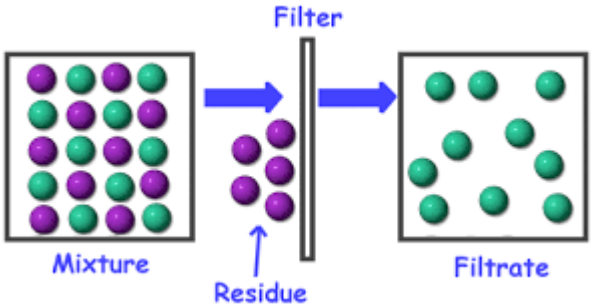
All the way back to Ancient History, industrious humans have separated mixtures in order to obtain the specific substances that they need. We will discuss some examples of separation below.

Separation Processes

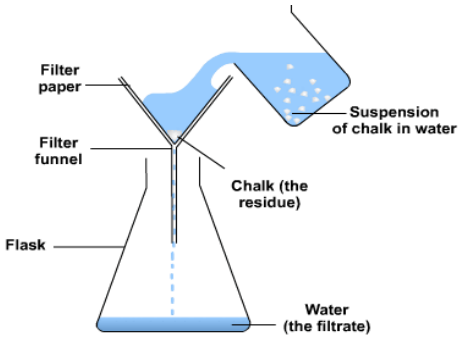
The way in which different substances in a mixture are separated is called a process. There are a number of different processes used for separation. A lot of important industries in the world today are based on separation processes.

Filtration

One common method of separation is filtration. Filters are s used everywhere. We use them in our houses to filter dust and mites out of the air we breathe. We use them to filter impurities from our water. We even have filters in our bodies such as our kidneys which act as filters to get bad stuff out of our blood.



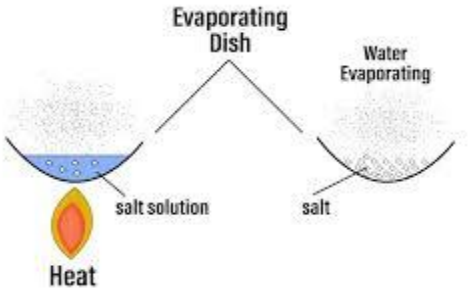
The filtration process is generally used to separate a suspension mixture where small solid particles



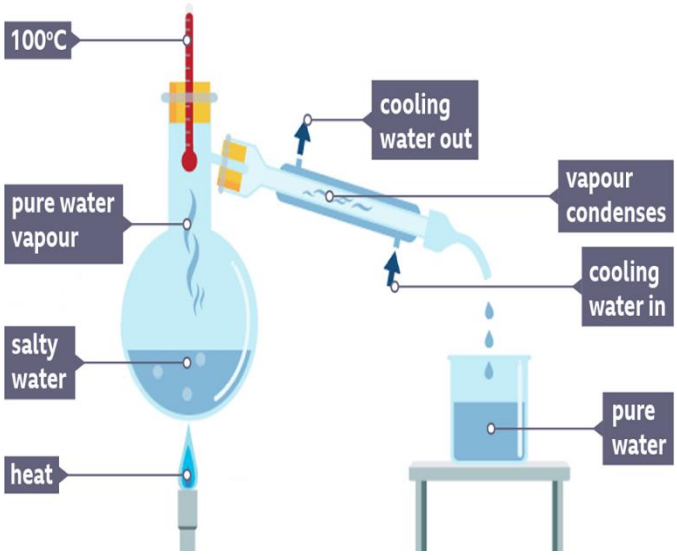
are suspended in liquid or air. In the case of filtering water, the water is forced through a paper that is made up of a very fine mesh of fibers. The water that has been run through the filter is called the filtrate. The particles that are removed from the water by the filter are called the residue.

Distillation

Another common separation process is called distillation. Distillation uses boiling to separate mixtures of liquid solutions. It takes into account that different substances in the mixture will have different boiling points.



For example, if you heat salt water the water in the solution will boil before the salt. The water will then evaporate leaving the salt behind. If the steam from the water is collected it will turn back into liquid as it cools. This cooled water will be pure water without any salt.



Centrifuge

In some cases, there are suspension mixtures where the solid particles are too fine to be separated with a filter. In these cases, sometimes a centrifuge is used. Centrifuges are mechanical devices that spin at very high speeds. These high speeds allow the solid particles in suspensions to settle very quickly. For example, rather than wait for sand to slowly settle to the bottom of water, a centrifuge can cause the sand to settle in a matter of seconds.

The centrifuge contains test-tubes that are spun around at high speed that causes the solid to sink to the bottom of the tube. The liquid is poured off leaving the solid behind.

Other Processes

There are many other separation processes such as sublimation, adsorption, crystallization, and chromatography. Sometimes it takes many stages of processes to get to the final result.

1) True or False : Many modern day industries are based on the process of separating mixtures.

A- True

B- False

2) Which of the following separation processes uses boiling to separate mixtures *?*

A- Filtration

B- Sublimation

C- Centrifuge

D- Crystallization

E- Distillation

3) Which of the following separation processes involves spinning the mixture at high speeds ?

A- Filtration

B- Sublimation

C- Centrifuge

D- Crystallization

E- Distillation

4) Which of the following separation processes uses fine mesh fibers to separate suspension mixtures ?

Ą- Filtration

B- Sublimation

C- Centrifuge

D- Crystallization

E- Distillation

5) In the filtration process, what is the substance that passes through the filter called ?

A- Sublimate

B- Mixture

C- Filtrate

D- Centrifuge

E- Residue

6) In the filtration process, what is the substance that is removed by the filter called ?

A- Sublimate

B- Mixture

C- Filtrate

D- Centrifuge

E- Residue

7) Boiling salt water to remove the salt from the water is an example of what type of separation process ?

A- Filtration

B- Sublimation

C- Centrifuge

D- Crystallization

E- Distillation

8) The process of separating blood into plasma and red cells is an example of what type of separation process ?

A- Filtration

B- Sublimation

C- Centrifuge

D- Crystallization

E- Distillation