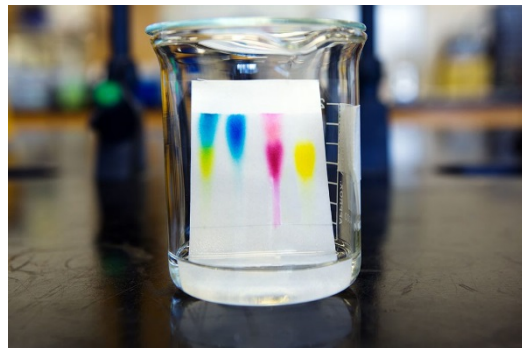


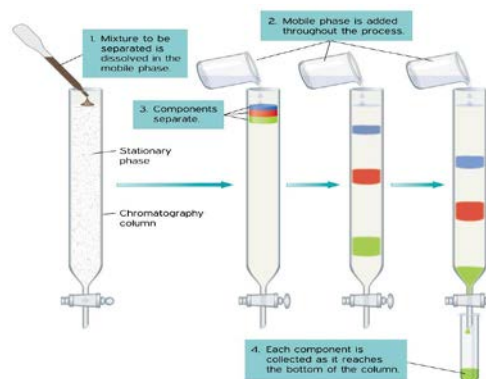
Chromatography:

Imagine a race. Now imagine all of the runners lined up at the starting line. The gun goes off indicating for all the runners to begin. In the middle of the race, all the runners are spread apart because they all have different abilities. Some move faster than others. This is the same idea behind chromatography. Since all particles have different 'abilities' they will move at their own speeds and some will go farther than others.



You might have observed that when you accidentally spill water onto a piece of paper, the writing on the paper smudges. Do you know why? Chromatography is the answer. When the paper is dipped in water, some of the particles in the ink stick to the water and the water pulls it along with it. This spreading happens because some particles stick better to the liquid than others.

Chromatography is a way of separating a mixture of chemicals. In this technique, there is a substance that is either a solid, liquid or gas, moving over another stationary substance that is in a different phase than the first. The overlapping of these two substance causes them to separate. The substance that is moving is called the mobile phase and the substance that is not moving is called the stationary phase.



Chromatography is really important in the field of engineering. One very important application of this is in forensics. Many chemical engineers are hired by forensic companies to try to figure out what components an important piece of evidence is made of. Chromatography can be used to separate the particles in that evidence. Chromatography is also used in the pharmaceuticals industry. It is used to analyze the compounds in a particular medicine and to see if it is contaminated or not.

Cornstarch Monster

What is cornstarch from a scientific perspective? It is something called a non-Newtonian fluid. It is a liquid whose 'stickiness' changes based on the force that is applied to it. If you punch a bowl full of a non-Newtonian fluid, the force of your hand will cause the small particles in the fluid to rearrange themselves. Instead of behaving like a fluid, a non-Newtonian fluid will behave like a solid and your hand will not go through the substance.



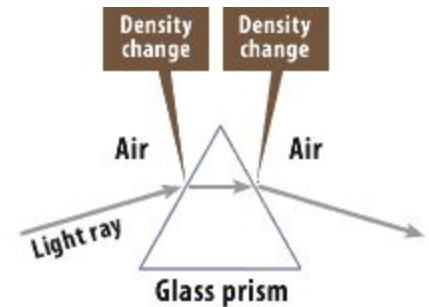
Concrete is another example of a non-Newtonian fluid. This is really important in creating safe and reliable infrastructures. If engineers could create a mixture that can better withstand the winter there would be fewer potholes. Chemical Engineers could also make concrete in a way that decreases the damage caused to structures by earthquakes and hurricanes. Concrete designed in this way could more effectively support the structures and make them less likely to move when impacted by destructive forces.

Why is this important? Let's assume that we are building a house. If a house is built on certain types of clays and an earthquake puts stress on this material through the sudden movement, the apparently solid clay can turn into a runny liquid. This is known as liquefaction. Another example of a non-Newtonian fluid is blood. There have been a lot of studies on the effects of an electric force on blood.



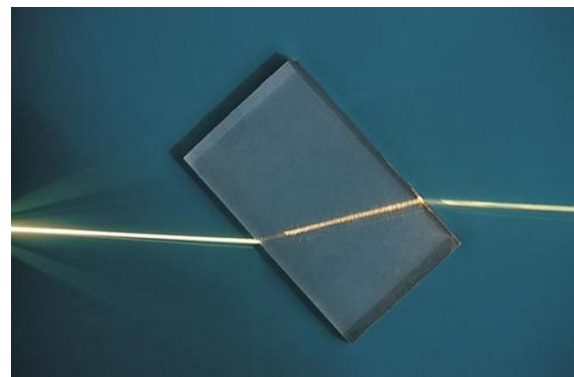
Disappearing Glass

Refraction is the phenomenon of light, radio waves, etc., being deflected in passing obliquely through the interface between one medium and another or through a medium of varying density. Refraction is important because it explains how we see everything around us, whether it is through water, air or any other medium.



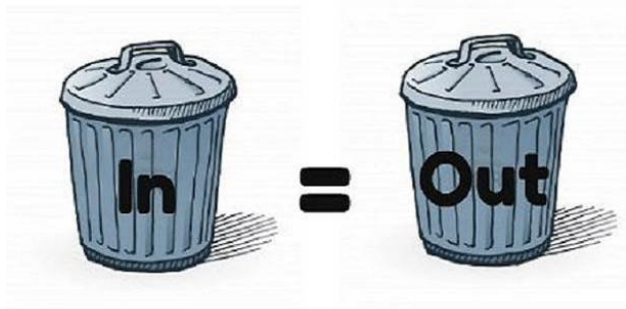
Refraction can be seen in many different chemical experiments including knowing the purity of a substance, or how concentrated it is. These experiments are important building blocks to becoming a chemical engineer.

The principal of refraction can also be seen in many different industries, since reflected light can affect different materials. It is also important to the prescription eye-ware industry as refraction is an important part of testing vision or knowing what lenses to wear.



Steady State Process:

A steady state process is a situation where everything is constant even though there is a process going on. For a steady state to occur, there has to be something entering a system as well as something exiting the system. In other words, the flow rate has to remain constant for a period of time. When a system is not in steady state, it has the potential to overflow or drain completely.



Understanding when a process is at steady state can prevent overflow and draining. Chemical engineers use this to understand all flow processes. When a large amount of product is needed, a reactor will function at continuous steady state. This means that the inflow will equal the outflow and the process will continue steadily for a given time period. This is the most efficient way to mass produce a chemical product.

There are many examples of a steady state process in everyday life! Take your shower for example. Water enters the bathtub through the shower head, however it drains through the drain on the floor.

So water enters from the top and exits from the bottom. Another example of a steady state process would be a water filter. Water is put into the top of a water filter, the filter cleans the water and the pure water exits the bottom!

