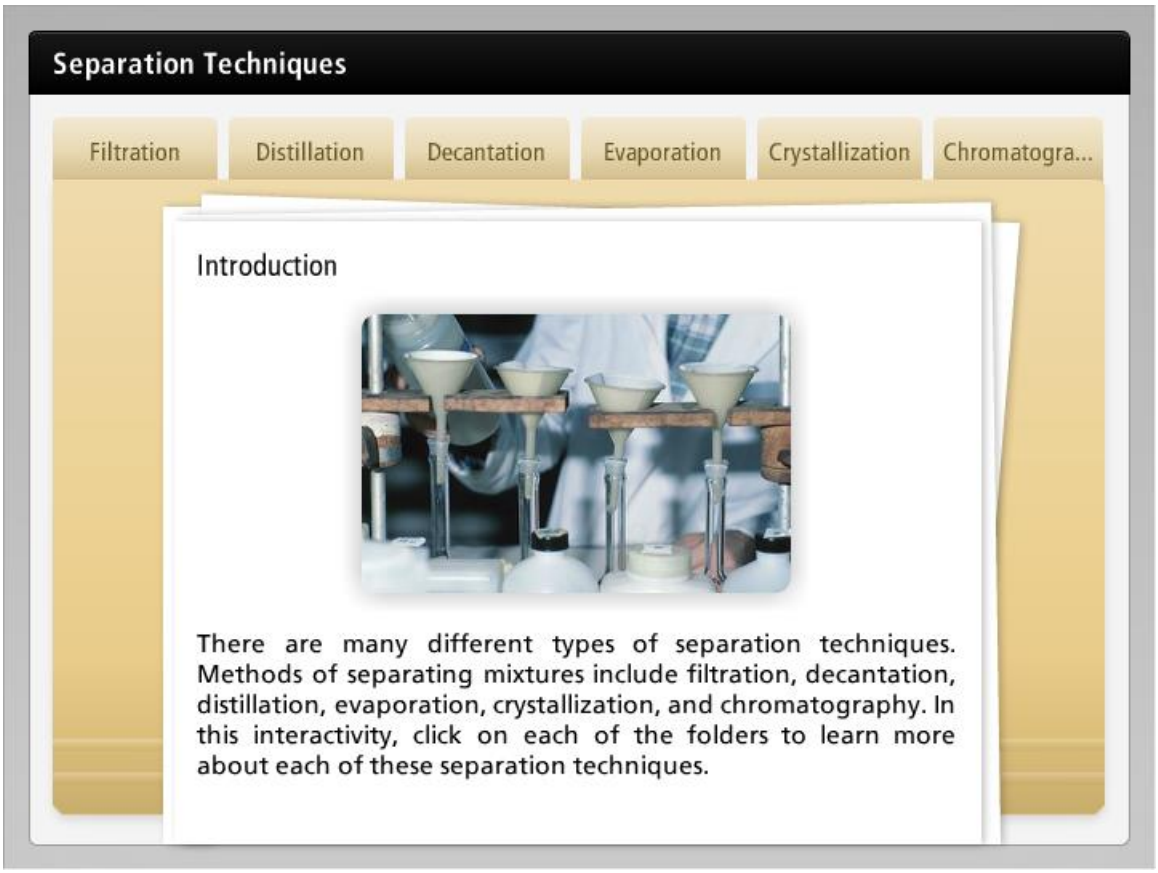
Module 1: What is Chemistry?
Topic 3 Content: Separation Techniques Presentation Notes

Introduction



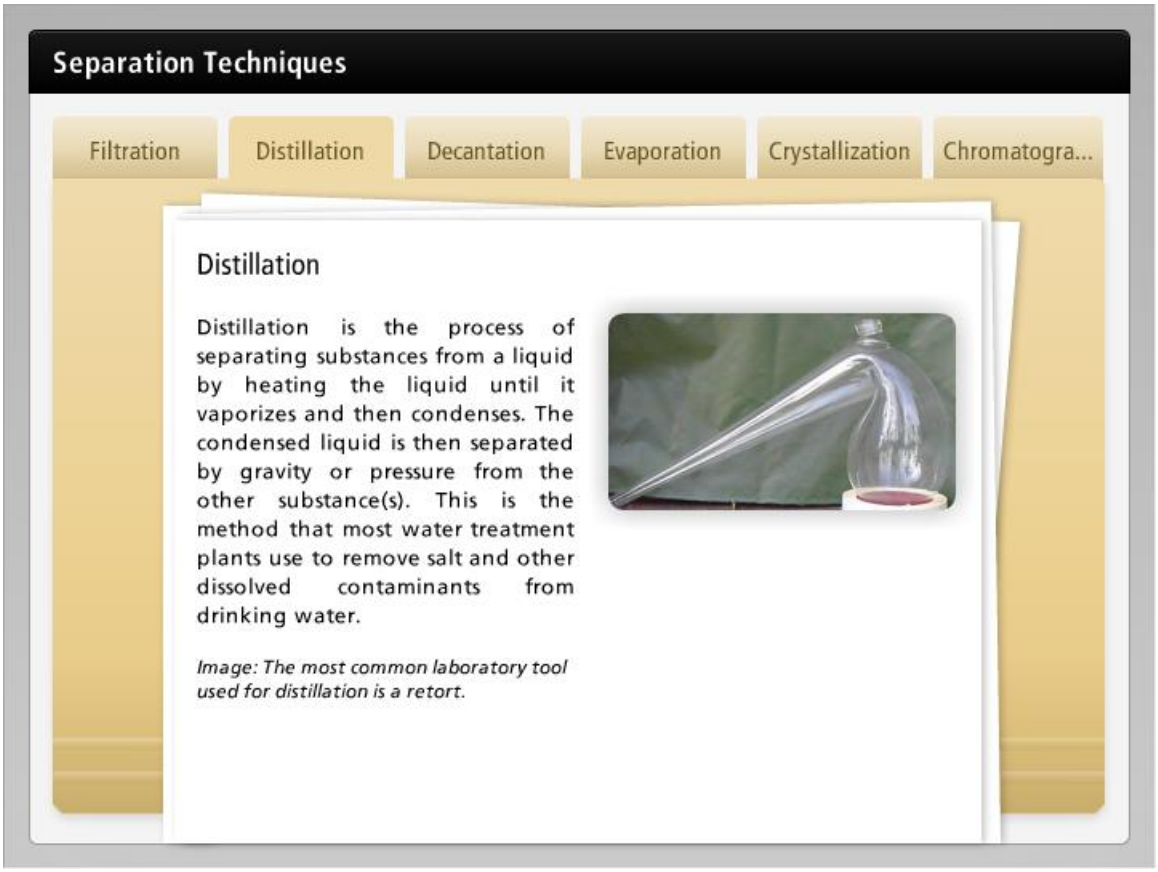
There are many different types of separation techniques. Methods of separating mixtures include filtration, decantation, distillation, evaporation, crystallization, and chromatography. In this interactivity, click on each of the folders to learn more about each of these separation techniques.

Filtration

Filtration occurs when a substance is passed through a filter and separates a solid material from the filtrate. Depending on the nature of the filter, it can separate out varying sizes of solids. This is the method that most water treatment plants use to remove large solids from drinking water.

Image: A water filtration system that prepares water for pharmaceutical uses.

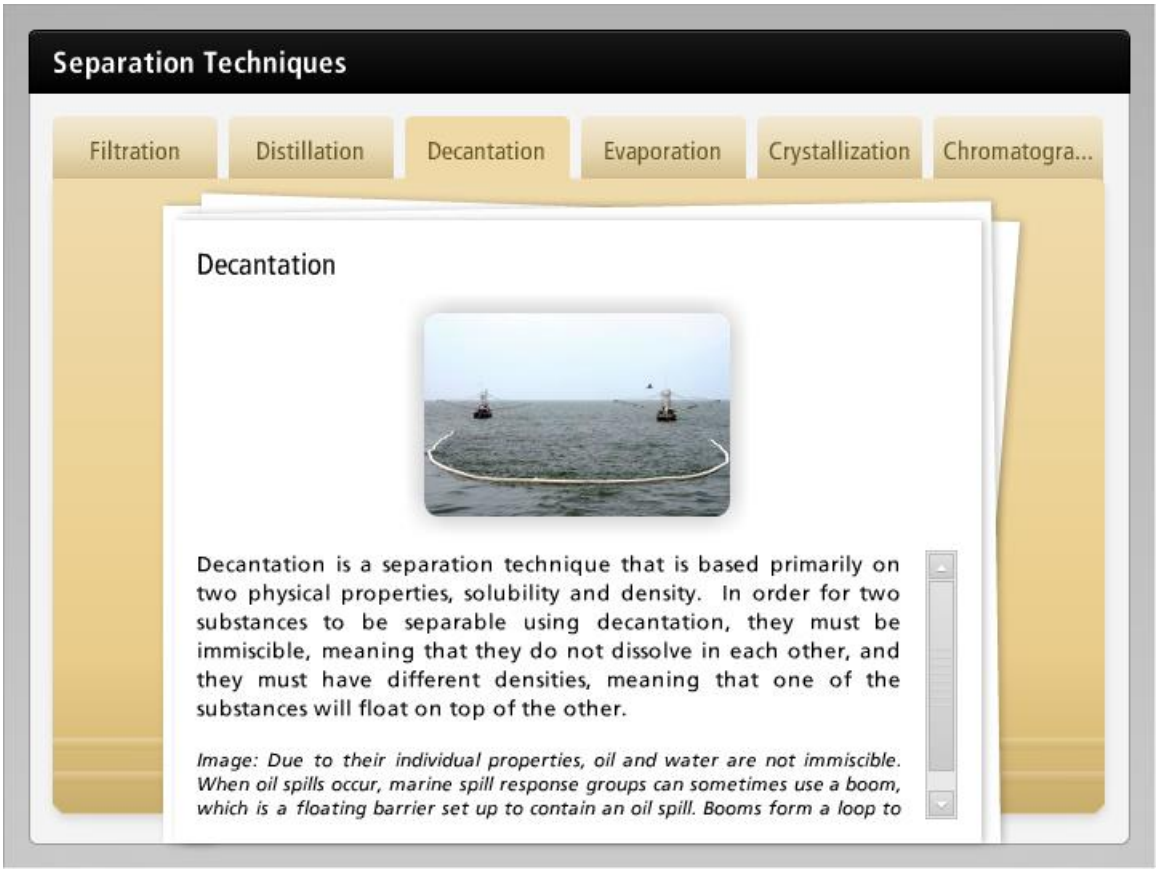
Distillation



Distillation is the process of separating substances from a liquid by heating the liquid until it vaporizes and then condenses. The condensed liquid is then separated by gravity or pressure from the other substance(s). This is the method that most water treatment plants use to remove salt and other dissolved contaminants from drinking water.

Image: The most common laboratory tool used for distillation is a retort.

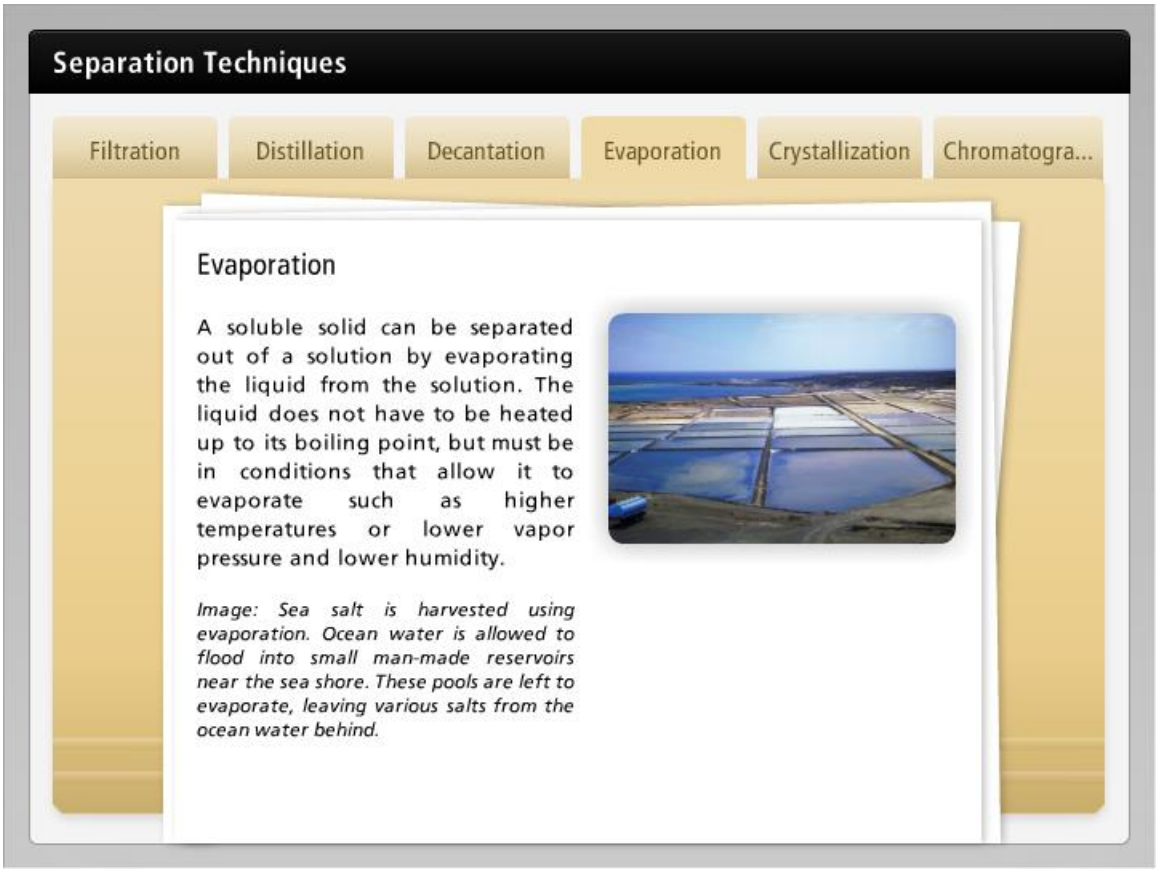
Decantation



Decantation is a separation technique that is based primarily on two physical properties, solubility and density. In order for two substances to be separable using decantation, they must be immiscible, meaning that they do not dissolve in each other, and they must have different densities, meaning that one of the substances will float on top of the other.

Image: Due to their individual properties, oil and water are not immiscible. When oil spills occur, marine spill response groups can sometimes use a boom, which is a floating barrier set up to contain an oil spill. Booms form a loop to enclose the oil and decant it from the water.

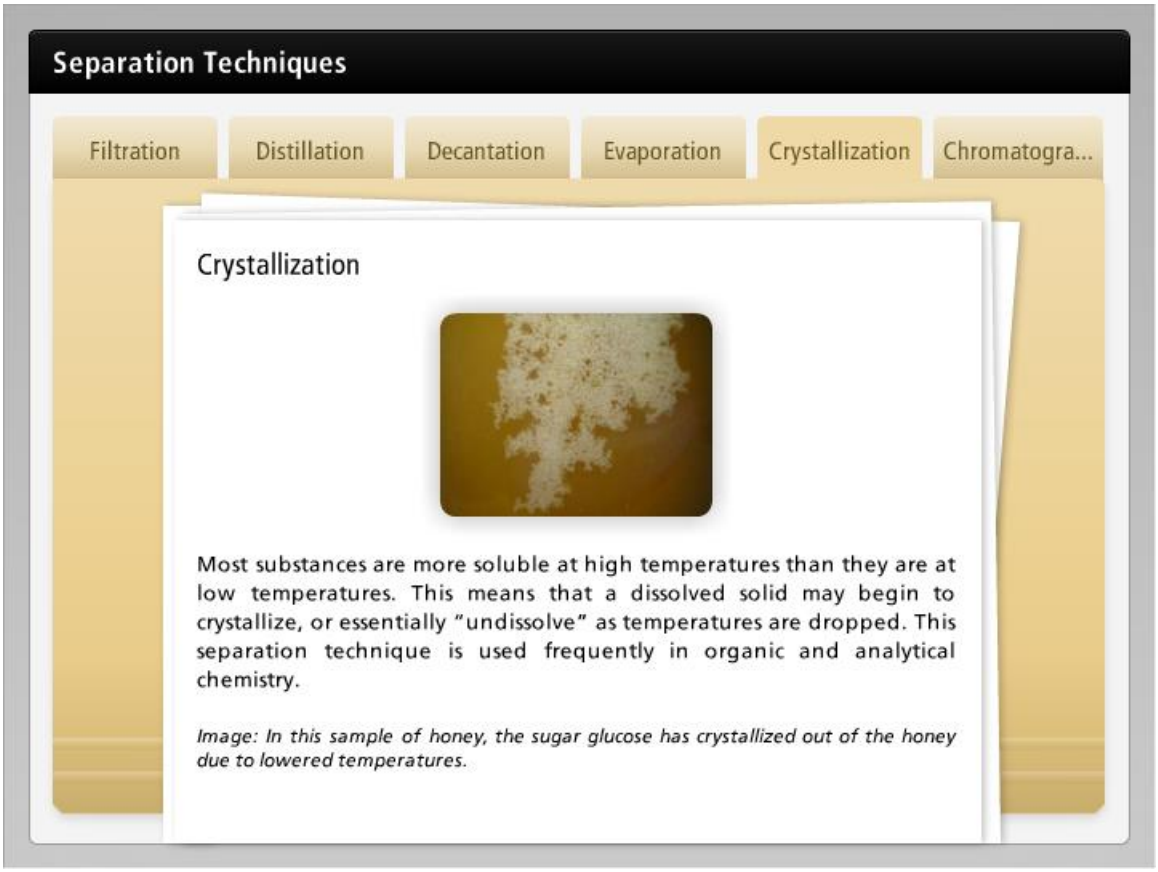
Evaporation



A soluble solid can be separated out of a solution by evaporating the liquid from the solution. The liquid does not have to be heated up to its boiling point, but must be in conditions that allow it to evaporate such as higher temperatures or lower vapor pressure and lower humidity.

Image: Sea salt is harvested using evaporation. Ocean water is allowed to flood into small man-made reservoirs near the sea shore. These pools are left to evaporate, leaving various salts from the ocean water behind.

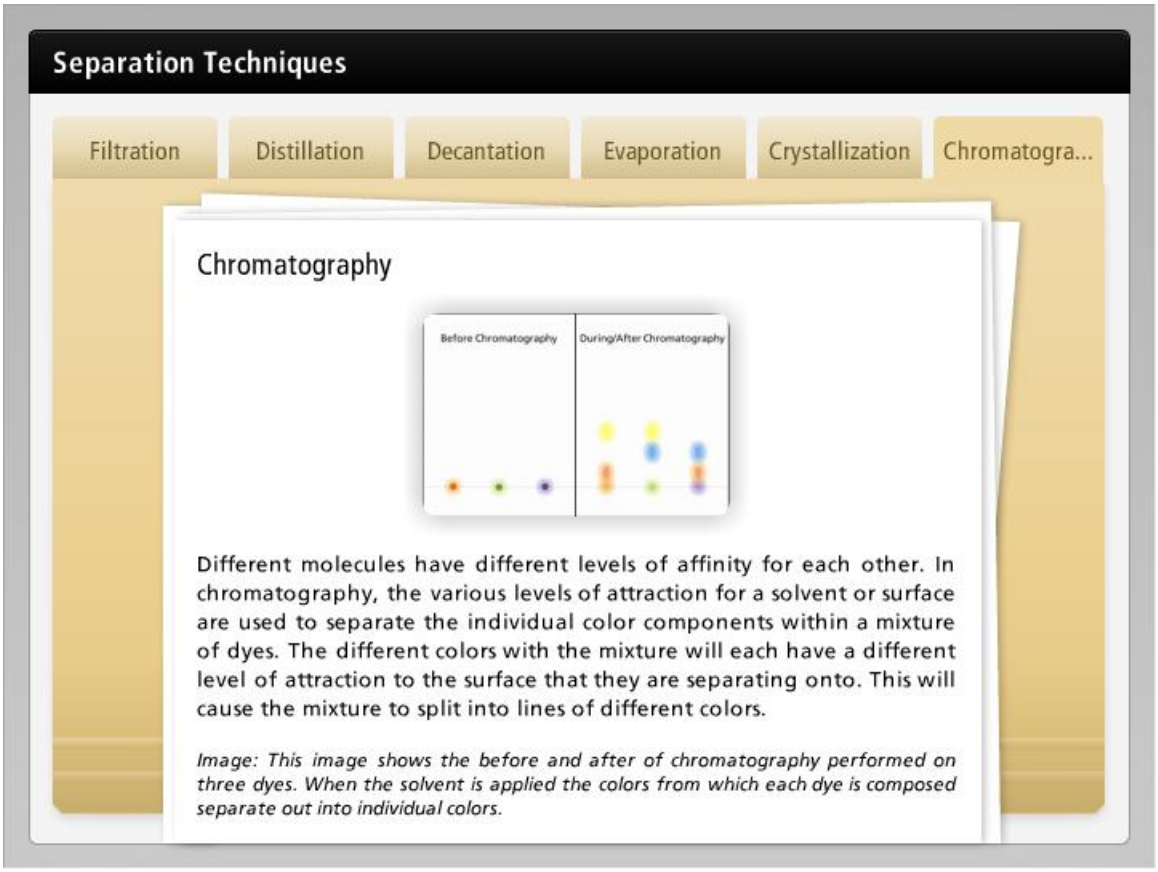
Crystallization



Most substances are more soluble at high temperatures than they are at low temperatures. This means that a dissolved solid may begin to crystallize, or essentially "undissolve" as temperatures are dropped. This separation technique is used frequently in organic and analytical chemistry.

Image: In this sample of honey, the sugar glucose has crystallized out of the honey due to lowered temperatures.

Chromatography



Different molecules have different levels of affinity for each other. In chromatography, the various levels of attraction for a solvent or surface are used to separate the individual color components within a mixture of dyes. The different colors with the mixture will each have a different level of attraction to the surface that they are separating onto. This will cause the mixture to split into lines of different colors.

Image: This image shows the before and after of chromatography performed on three dyes. When the solvent is applied the colors from which each dye is composed separate out into individual colors.