

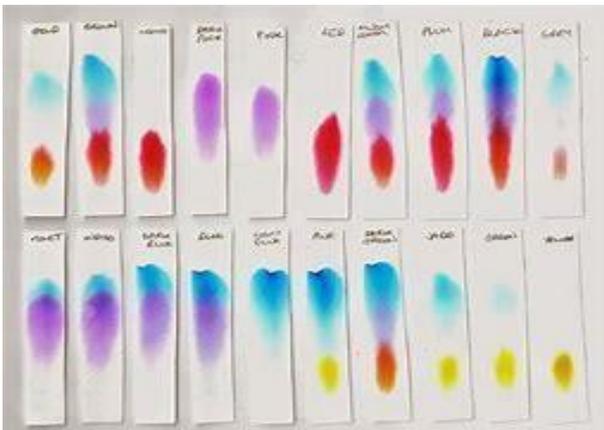
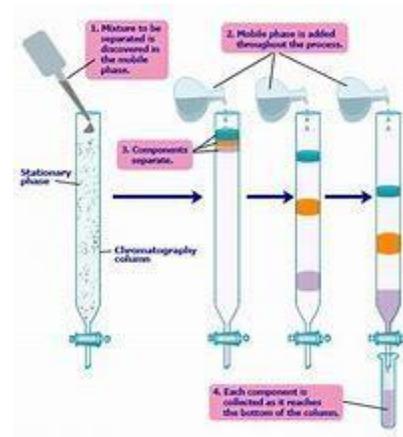
### Chromatography

Imagine a race. Now imagine all of the runners lined up at the starting line. The gun goes off indicating for all 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.



Chromatography is a way of separating a mixture of chemicals. In this technique, there is a substance that is either solid, liquid or gas, moving over another stationary substance that is in a different phase than the first. The overlapping of these two substances 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.

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. The technical term for this sticking is known as polarity, so material which is polar is going to attract to polar material better than a nonpolar material.



Chromatography is important in the field of engineering. One important application of chromatography is in forensics. Many chemical engineers are hired by forensic companies to try and figure out what components make up a piece of evidence. Chromatography is also used in the pharmaceutical industry. It is used to analyze the compounds in a particular medicine and to see if it is contaminated or not.





### This Project

The varying densities of the different liquids allows for layering without mixing, thereby creating a “rainbow in a jar.” The liquids layered in the rainbow jar are honey, corn syrup, dish soap, water, olive oil, and rubbing alcohol, added in that order. To create the rainbow effect, food coloring was added to some of the liquids. When the liquids were added to the jar, some of them mixed together at first, but because of their differing densities, they separated from each other over a period of time.



### Societal Impact



**Density** is a measure of how much matter occupies a given amount of space. We use the formula  $\rho = \frac{m}{V}$  to calculate density. The symbol  $\rho$ , pronounced rho, is used to describe the density of a mass ( $m$ ) divided by its volume ( $V$ ).

Liquids with a greater density, like honey and corn syrup, will sink to the bottom of the jar. If two liquids have a great difference in density, they will separate from each other! Even if these liquids are mixed, over time they will separate again! You can also use density to help identify a substance when comparing to other liquids with different densities.



### Real-World Applications

Differences in density can be one method engineers use to separate liquids. These separation processes can be important in a manufacturing environment, but also in big problems like **oil spills** which require a big clean up process. Density is also important for safety, knowing how to properly store chemicals, and other chemical processes!

### Additional Resources

<https://tinyurl.com/tuh8y7ej> - General Overview

<https://tinyurl.com/j64ynbts> - In Depth Supplementary Information

<https://tinyurl.com/2xrtrvs8> - Youtube Video

