Science Experiment:
Seven Layer Density Column
Project: Arts & Crafts, Food Science

INTRODUCTION:
Anyone can stack blocks, boxes, or books, but only those with a steady hand and a little understanding of chemistry can stack liquids. What if you could stack seven different liquids in seven different layers? Think of it as a science burrito!

MATERIALS:
Light Karo syrup
Water
Vegetable oil
Dawn dish soap (blue)
Rubbing alcohol
Lamp oil
Honey
Graduated cylinder
Food Coloring or True Color Coloring Tablets
Food baster
9 oz portion cup

EXPERIMENT
Measure 8 ounces of each type of liquid into the 9 ounce portion cups. You may want to color each of the liquids to make a more dramatic effect in your column. Light Karo syrup is easier to color than dark syrup. The only liquids that you may not be able to color are the vegetable oil and the honey.

Start your column by pouring the honey into the cylinder. Now, you will pour each liquid SLOWLY into the container, one at a time. It is very important to pour the liquids slowly and into the center of the cylinder. Make sure that the liquids do not touch the sides of the cylinder while you are pouring. It's okay if the liquids mix a little as you are pouring. The layers will always even themselves out because of the varying densities. Make sure you pour the liquids in the following order:
Honey
Karo syrup
Dish soap
Water
Vegetable oil
Rubbing alcohol
Lamp oil
As you pour, the liquids will layer on top of one another. After you pour in the liquids you will have a seven-layer science experiment - a science burrito!

HOW DOES IT WORK?

The same amount of two different liquids will have different weights because they have different masses. The liquids that weigh more (have a higher density) will sink below the liquids that weigh less (have a lower density).

To test this, you might want to set up a scale and measure each of the liquids that you poured into your column. Make sure that you measure the weights of equal portions of each liquid. You should find that the weights of the liquids correspond to each different layer of liquid. For example, the honey will weigh more than the Karo syrup. By weighing these liquids, you will find that density and weight are closely related.

** NOTE: The numbers in the table are based on data from manufacturers for each item. Since each manufacturer has its secret formula, the densities may vary from brand to brand. You'll notice that according to the number, rubbing alcohol should float on top of the lamp oil, but we know from our experiment that the lamp oil is the top layer. Chemically speaking, lamp oil is nothing more than refined kerosene with coloring and fragrance added. Does every brand of lamp oil exhibit the same characteristics? Sounds like the foundation of a great science fair project.
The table shows the densities of the liquids used in the column as well as other common liquids (measured in g/cm^3 or g/mL).

Density is basically how much "stuff" is smashed into a particular area... or a comparison between an object's mass and volume. Remember the all-important equation: Density = Mass divided by Volume. Based on this equation, if the weight (or mass) of something increases but the volume stays the same, the density has to go up. Likewise, if the mass decreases but the volume stays the same, the density has to go down. Lighter liquids (like water or rubbing alcohol) are less dense than heavy liquids (like honey or Karo syrup) and so float on top of the more dense layers.

Material	Density
Rubbing Alcohol	.79
Lamp Oil	.80
Baby Oil	.83
Vegetable Oil	.92
Ice Cube	.92
Water	1.00
Milk	1.03
Dawn Dish Soap	1.06
Light Corn Syrup	1.33
Maple Syrup	1.37
Honey	1.42

Adapted from: https://www.stevespanglerscience.com/lab/experiments/seven-layer-density-column. Find this experiment and more at this website.