

Density Explorations

Introduction

Why do some liquids float on other liquids? Use ingredients found in your home to create a layered column to explore density.

Think About This

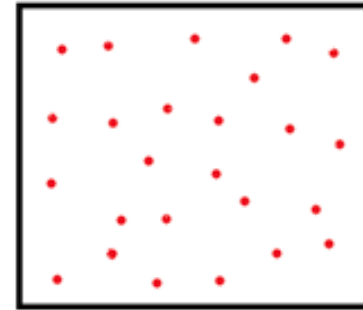
What makes liquids and solids float? What makes them sink?

Materials

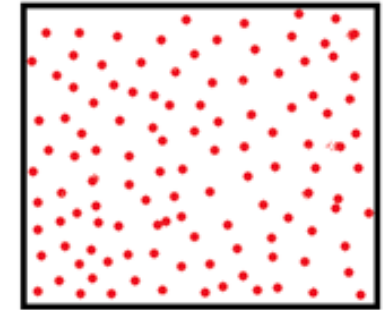
- A clear cup or jar—a regular water glass works well!
- One thick, syrupy liquid, such as:
 - Honey, maple syrup
- One soap-based product, such as:
 - Dish soap, shampoo, laundry detergent
- One oil product, such as:
 - Baby oil, olive oil, vegetable oil
- Water
- 2-3 small solid items, such as:
 - Rock, screw, ping pong ball, cherry tomato, ice cube, bottle cap
- Food coloring (optional)

Directions

Density is a measurement of how much stuff is packed into a certain space. Carefully add household liquids and solids to create a density column with separate layers.



Less Dense



More Dense

- 1 Choose which liquids and solids to use for the investigation. The column will work best with one liquid from each category (syrup, soap, water, oil) and 2-3 small solids.
- 2 Start the density column with a syrupy liquid. Slowly pour in a few tablespoons, or enough to cover the bottom and form a layer. Try not to get any on the sides of the cup.
- 3 Next, add a soap. Slowly pour in a few tablespoons, trying not to get any on the sides of the cup.
- 4 Next add water. Slowly pour a few tablespoons down the side of the cup. Adding a few drops of food coloring to the water before pouring it in will make this layer easier to see.
- 5 Lastly, add an oil. Slowly pour a few tablespoons down the side of the cup. Admire your liquid density column!

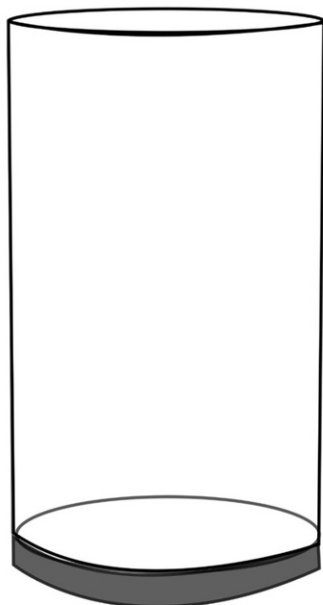
What liquids did you choose to pour in? What happened?

Density Explorations Continued

6 Next, experiment with solids. Gently drop solids into the column one at a time. Do they sink, float, or hover in between?

What solids did you drop in? What happened?

Once you are finished creating your density column, draw and label it.



What's Happening?

Density is a measurement of how much stuff is packed into a certain space, or a measurement of mass per unit volume. If combined gently, liquids will form layers based off of their densities. Liquids with the highest density will sink to the bottom because they are heavier. Liquids with the lowest densities will float to the top because they are lighter.

Water has a density of 1 gram (mass) per milliliter (volume), or 1.00 g/mL. Water will float above honey (about 1.45 g/mL) but will sink below vegetable oil (about 0.93 g/mL).

Solids also have density. When solids are added in, they will sink or float to the layer with the density closest to their own. When an ice cube is dropped in a glass of water, it floats to the top because it is less dense than liquid water. When a rock is dropped in a glass of water, it sinks to the bottom because it is more dense than water.

Take it Further!

Density isn't the only property at play when stacking liquids! Viscosity and polarity affect whether liquids will mix or separate when combined.

Viscosity is a measure of a liquid's resistance to flow, or how thick or hard to pour it is. Honey is an example of a very viscous liquid. Viscous liquids will resist mixing unless stirred.

Polarity also prevents liquids from mixing. A liquid that is polar has positively and negatively charged areas in its molecules, making polar molecules attract each other like magnets. A liquid that is nonpolar has evenly distributed charge in its molecules, so it will not attach to polar molecules. Water is polar and oil is nonpolar, so they do not mix.

What if the liquids are poured into the cup in a different order? Will they still form layers by their density or will they mix? Repeat this investigation backwards (oil → water → soap → syrup) or in any other order and record your observations.

Order of Liquids Poured	Layers formed (if any)

What liquids will you stack? Submit a photo of your Density Column to AtHome@discoveryworld.org for a chance to have your investigation featured by Discovery World.