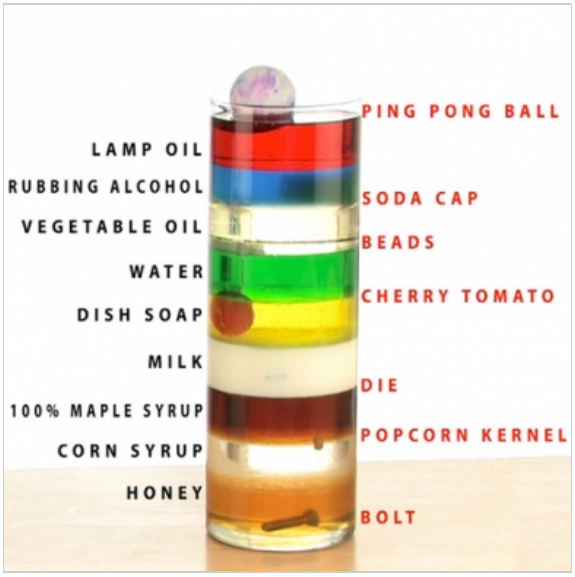
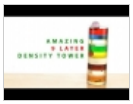
DENSITY TOWER - MAGIC WITH SCIENCE

Make objects float in the middle of a liquid with this amazing trick



VIDEOS



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With this trick, you'll put a new spin on our famous Density Column demonstration. First, we'll teach you how to make layers of liquid sit on top of each other. This density demonstration looks cool, but what if you could make different objects float in the middle of those cool looking liquids? You'll impress yourself and your friends with what you can do with your Density Tower.

Materials

- Tall, narrow, clear container (500 mL or 1000 mL graduated cylinders are perfect)
- 50-100 mL (1.5-3.5 oz) lamp oil
- 50-100 mL rubbing alcohol
- 50-100 mL vegetable oil
- 50-100 mL tap water
- 50-100 mL dish soap
- 50-100 mL milk
- 50-100 mL maple syrup
- 50-100 mL corn syrup
- 50-100 mL honey
- Ping pong ball
- Soda bottle cap
- Plastic bead
- Grape tomato
- Board game die
- Popcorn kernel
- Metal nut or bolt

EXPERIMENT REVIEWS PRINT EXPERIMENT

EXPERIMENT

1. 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
   - Corn syrup
   - Maple syrup
   - Milk
   - Dish soap
   - Water
   - Vegetable oil
   - Rubbing alcohol
   - Lamp oil

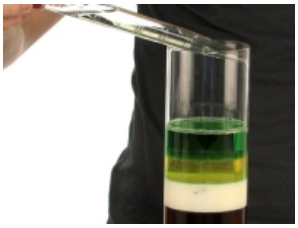
2. After letting the liquid layers settle, you'll notice that they remain in the order you poured them into the cylinder and that they are clearly distinguishable from each other. What scientific principle do you think contributes to the

column's layers?

3. Make a chart that shows the order of each layer.
4. Take the various small objects and drop them into the column. Drop them in the following order:

    Metal nut or bolt
    Popcorn kernel
    Board game die
    Grape tomato
    Plastic bead
    Soda cap
    Ping pong ball

5. Each of the objects will sink through or float on a different layer of the density column. What makes some objects sink deeper into the column while some hardly sink at all?



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.

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.

The same goes for the small objects that you dropped into your density column. The metal bolt is more dense than any of the liquids in the column and therefore sinks directly to the bottom. Less dense objects will float on individual layers of the column, however. For instance, the plastic bead is more dense than the vegetable oil and everything above it but less dense than the water and everything below it. This makes the bead settle on the top of the water.

ADDITIONAL INFO

In the materials, we had you grab a bunch of miscellaneous tiny objects. This is the perfect opportunity to get in some scientific exploration! Use what you learned from dropping the bead, soda bottle cap, tomato, and die into the container to figure out which items are more and less dense than water. Which items have more density than vegetable oil? What items are less dense than honey?

OBSERVATIONS

When all the liquids and small objects have been added to your density tower, you will have what appears to be a magic column. All of the liquids will be clearly distinguishable from each other and each of the objects will have settled at different levels within the liquids. Construct a chart to show the order that the liquids are in and the position of each object.

Why do you think these two phenomena happen? What scientific principle is this illustrating?