

Kids at the Co-op

SCIENCE

Understanding Density

Everything in the Whole World is made up of tiny molecules. How hard and heavy objects are, is dependent on their molecules. Although objects appear to be solid, like this piece of paper, the molecules that make them up are actually constantly moving. Molecules are so small that you can't even feel it! Density is dependent on how much space the molecule has to move around in. Objects with a smaller density float and objects with a larger density sink.

The Math definition: Density is a comparison between an object's mass and its volume. Remember the all-important equation: $\text{density} = \text{mass} \div \text{volume}$.

Liquids have various densities and it is easy to see, with this experiment, which ones are denser than others.

Liquid Materials: 3 oz of each(use any or all of these)

Honey
Corn Syrup
100% Maple Syrup
Whole Milk
Dish Soap
Water
Vegetable Oil
Rubbing Alcohol
Lamp Oil

Other Materials:

1 Quart (1L) container – tall, narrow, clear
9, 4 oz (118 ml) plastic cups, for sorting you liquids
Turkey baster
Food coloring
Metal bolt
Popcorn kernel
Board game die
Cherry tomato
Plastic beads
Plastic soda cap
Ping-Pong ball

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There is an order to add the liquids to ensure that they do not mix. Although all these liquids had different densities, some can mix easily and it will change the density!

Pour equal amounts of each liquid in the cups. All the amounts must be the same. You may want to set the cups in the order you'll add them into the container: honey, corn syrup, maple syrup, whole milk, dish soap, water, vegetable oil, rubbing alcohol, and lamp oil. Add food coloring to the water and the rubbing alcohol for contrast so they stand out in the finished column.

Start your column by pouring the honey into the cylinder. It's very important to slowly layer the honey, corn syrup, and maple syrup into the center of the cylinder. Take your time. Also, make sure they don't touch the sides of the cylinder as you pour. It's okay if the liquids mix a little as you are pouring. The layers will slowly even themselves out because of their varying densities.

Use the turkey baster to carefully layer the milk and the dish soap. Again, don't let the liquids touch the sides of the container and add them s-l-o-w-l-y and carefully, a dribble at a time. Squirting them into the container is not an option if you want to end up seeing all nine layers.

Starting with the water, hold the tip of the baster against the side of the container close to the layer of dish soap. Squeeze gently so the water flows down the side of the container and onto the dish soap. Move the baster upward as needed. Layer the vegetable oil, the rubbing alcohol, and the lamp oil in the same way. Allow the layers to settle and separate even more before moving on to the next step.

Try and guess where the objects will land in the layers before you drop each one!

Release the objects one at a time into the tower so they "slide" as gently as possible through the liquids and fall along the side of the container. Release them at different spots around the container to avoid causing too much turbulence in the same location in the liquids. This helps put the objects toward the outside of the container so you can see them on "their" layer. Start with the bolt and then release the popcorn kernel, the game dice, the cherry tomato, the plastic beads, and the soda bottle cap. Let the upper layers settle completely between each release. The cherry tomato may stir things up a bit so let it all settle down again. You may have to nudge the bottle cap a little with a straw or spoon handle so it fills with liquid and sinks. The Ping-Pong ball will float very nicely on top of the lamp oil.

Well done!