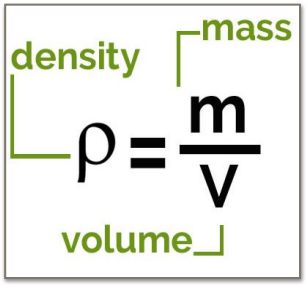
The DIY Lava Lamp Experience

Learn

Scientific Principles

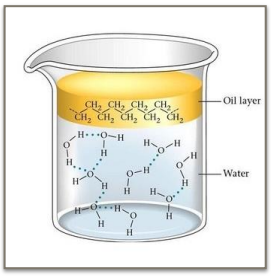
Density

- Definition - the measurement of how compact a substance is – aka, how much of it fits in a certain amount of space. (The scientific equation is **density = mass/volume**.) Density can be affected by temperature—the hotter a liquid is, the less dense it will be.

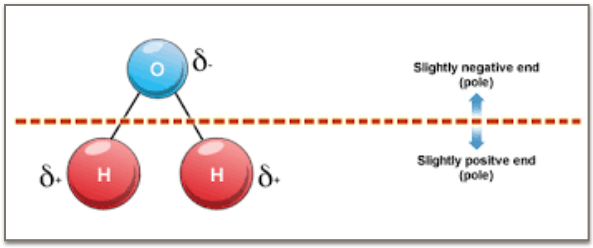


- Example - If you measure an equal volume of oil and water, you'll find that the water is heavier than the same amount of oil. This is because **water molecules are packed more tightly** and a cup of water actually has more mass than a cup of oil. Because water is more dense than oil, it will sink to the bottom when the two are put in the same container.

Polarity



- Definition – Polarity is an attribute occurs when a molecule has a lopsided electrical charge that attracts other atoms.
- Example - Even though they have different densities, oil and water would eventually mix together if it weren't for **polarity**. Water molecules are **polar** because they have a lopsided electrical charge that attracts other atoms. The end of the molecule with the two hydrogen atoms is **positively charged**. The other end, with the oxygen, is **negatively charged**. Just like in a magnet, where north poles are attracted to south poles ("**opposites attract**"), the positive end of the water molecule will connect with the negative end of other molecules. Oil molecules, however, are **non-polar**— they **don't have a positive or negative charge**, so they are not attracted to the water molecules at all. This is why oil and water don't mix!



Experiment

What you need:

- **1** tall cup/container
- **¼ cups** of oil (vegetable oil or baby oil will work)
- **2 cups** of water
- **1 to 2 drops** of food coloring
- **1-2** antacid tablets, cut in two

Experiment steps:

If you're using the AR partner app (Science for Seniors), match the color of the stars in the experience with the steps on this sheet.

1. Fill the container most of the way up with your choice of oil.
2. Fill the rest of the container with water. The water will sink to the bottom of the container and rest under the oil.
3. Add a few drops of food coloring (all the same color). The food coloring is water-based, so it will also sink to the bottom as well and color the water.
4. Break an Antacid tablet into a few small pieces and drop them in the flask one at a time, leaving some time in between each piece.
5. Watch your lava lamp erupt into activity! When the reaction slows down, you can simply add more Antacid to get it going again.

Discover

What about real-life lava lamps?

Real lava lamps use a polar and non-polar liquid just like our homemade one from the experiment did. In a real one, however, the densities of the liquids are much closer together than vegetable oil and water and the lamp uses heat to manipulate the densities. The denser liquid sinks to the bottom, but the lava lamp light heats it up until it expands and becomes less dense, causing it to rise upward. As it gets farther from the light, it cools down, becoming denser again until it sinks; then the cycle starts all over.

Instead of using a light, in our homemade lava lamp we used antacid tablets to power the lamp. The **antacid reacts with the water to produce carbon dioxide gas bubbles**. These stick to the water droplets. The **water/gas combo is less dense than the oil**, so they rise to the top of the flask. At the top, the gas bubbles pop and escape into the air, allowing the dense water to sink back to the bottom again.

Informational Videos

Check out these videos to learn about how real lava lamps are made and what makes them work.

If you're using the AR partner app (Science for Seniors), scan the images and we'll pull the videos up for you.

The Whole Process
https://www.youtube.com/watch?v=3AtBTP0Hf4g

What's Inside
https://www.youtube.com/watch?v=JIfeR_nqVUA