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Chemistry and physics in everyday life

Experiment guide

Lava lamp

Have you ever wondered how a hurricane forms? Warm water evaporates and causes warm, humid air masses to rise fast and high. Cold air is heavier and sinks. The cold and warm air masses begin to rotate in a spiral due to the Earth's rotation (Coriolis force). As they turn, they attract even more warm, humid sea air. Air masses of different weights, which either rise or fall, are therefore important for the formation of hurricanes. In our experiment, we don't investigate air masses but liquids that rise or sink depending on their weight.

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Make the colors dance

How does it work?

Imagine you have a large, light balloon and a tiny, heavy lead ball. Although the lead ball is much smaller, it is heavier. It's a bit like the liquids in our experiment. Some liquids are quite heavy for their size, others are lighter. Researchers say they have different densities. In our experiment, we will mix different liquids. The lighter liquids, those with a lower density, will float on top, just like the balloon. The heavier liquids with the higher density will sink to the bottom, like the lead ball. Did you know that the density of a liquid also changes when it is heated or cooled? Try it out and see what happens if you use warmer or colder water.

Fun Fact

Why does fat float on soups in the form of small, round droplets? Because fat and water repel each other, the oil forms spherical shapes so that the two liquids touch each other as little as possible.

Let's dance!

You will need:

- Protective sheet and clothes that may get stained, as you are working with food coloring
- Two transparent glasses in different sizes
- Baking soda (1-2 teaspoons) or fizzy tablet (1/4 of a tablet)
- Food coloring (liquid 2-3 teaspoons)
- White vinegar
- Vegetable oil
- Teaspoon
- Water

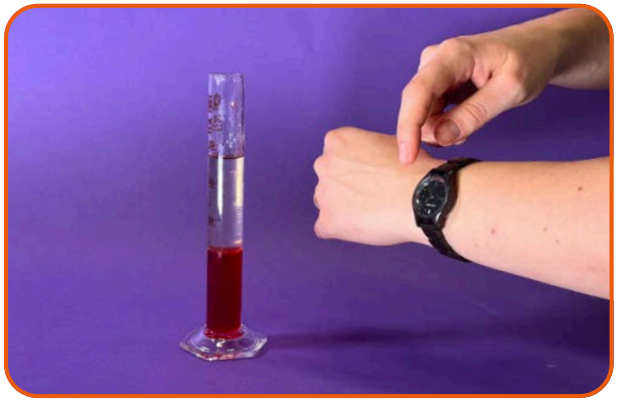
Let's go!

Step by step:

1 Fill the glass with equal parts water and vinegar.

2 Mix red food coloring with the water and vinegar.

3 Now use double the amount of oil and pour it into the glass.



4 Wait about one minute and watch how the mixture behaves.

5 Then add baking soda or a piece of the fizzy tablet and observe.

6 Take the second glass and pour your ingredients into the container in a different order. Does the order change anything about the experiment?

...and what happens when I...

- What happens if you leave out the vinegar or use double the amount of oil?
- What happens if you heat the water for your experiment?
- Does the shape of your glass matter?
- Do different spheres form depending on whether you use baking soda or fizzy tablets?

Background knowledge

As you have noticed, the density of liquids plays an important role. In order for the colored water to move, it needs some chemical help. The fizzy tablets and baking soda release carbon dioxide. These gas bubbles attach themselves to the colored water. Because the gas bubbles are lighter than the oil, they rise together with the water droplets. At the surface, the gas bubbles burst and the carbon dioxide escapes into the air. As the water is now heavier than the oil, it sinks back down again.

At ISTA, Caroline Muller researches weather phenomena such as hurricanes. With the help of hurricane hunters, satellites and mathematics, the research group wants to find out how global warming affects the weather. As in the experiment, density influences whether air masses rise or sink.