

Project Exploration creates transformative learning opportunities for youth underrepresented in the sciences –particularly students of color and girls – by equipping them with the skills, practices, and mindset needed for a lifelong pursuit of learning. STEM@Home makes activities around science, technology, engineering, and math accessible and fun to do at home. This STEMbook activity, resources, and more are available at www.projectexploration.org/stemathome.

In this activity, you will:

Follow the steps of the scientific method to determine the density of substances.

Supplies Required:

Graphic organizer
1 Test tube
Honey *
Oil *
Rubbing alcohol *
Water *
Dish soap *
2 colors of food coloring
*Amounts will depend on the size of the test tube! Each amount should be the same!

Video

What is density? <https://tinyurl.com/yy88xj5s>

Overview

Why do boats float on lakes and seas? Why do ice cubes float? Why do pennies sink when you throw them into a fountain? It's because of density!

Density is a measure of how much mass is contained in a given unit volume (density = mass divided by volume). If mass is a measure of how much "stuff" there is in an object or liquid, density is a measure of how tightly that "stuff" is packed together.

Based on this density equation (Density = Mass ÷ Volume), 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 or have less "stuff" packed into them than heavier liquids (like honey or corn syrup).

Every liquid has a density number associated with it. Water, for example, has a density of 1.0 g/cm³ (grams per cubic centimeter—another way to say this is g/mL, which is grams per milliliter).



Instructions

1. Use the graphic organizer to complete the experiment.
2. STEP 1: Problem: What do we want to solve? Are all liquids the same density?
3. STEP 2: Hypothesis: Make a prediction! Do you think all liquids are the same density? Draw a picture of your prediction. Label the liquids on your organizer.
4. STEP 3: Experiment: Test it out and make observations!
5. Start by adding food coloring to the rubbing alcohol and to the water – using a different shade for each. This will allow you to identify each liquid.
6. Measure out equal quantities of each liquid.
7. Add them to the tube, one by one. Pour each liquid in very slowly and write down the order in which you pour. Wait a minute or two between each additional liquid. What is happening?
8. STEP 4: Analysis: Based on your observations what do we now know? What happened to each liquid? Where did they end up? What can you infer about the densities of liquids in relation to their viscosity (thickness of a liquid)? Why do you think this happened?
9. Different liquids have different densities and therefore, different weights. The heaviest liquids will sink, the lighter liquids will rise to the top. Density is a comparison between an object's mass and volume. Based on this, if the weight – or mass – of something increases but the volume stays the same, the density has to go up. Lighter liquids, like water, are less dense than heavy liquids, like honey, and so float on top of the more dense layers.
10. STEP 5: Conclusion: Was your hypothesis correct or incorrect?

Additional Resources

1. Watch a video about the seven layer density column: <https://tinyurl.com/wpdabr8>
2. 5 facts about density: <https://tinyurl.com/lwwyt3w> Try these out at home!

Share It Out

Share on social media: Share the results of your experiment with your friends and family on social media! Explain the steps of the scientific method in a video! Use the hashtags:

#ScientificMethod
#ProjectExploration
#StemAtHome

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