

Quick and Easy Density

Overview: Today you'll get to make a layered, colorful density jar and watch some fun effects of hot and cold water. Both will allow you to play while learning about density!

What to Learn: You should know that density means how tightly atoms are packed together in a substance.

Materials

- large glass jar
- water
- vegetable oil
- liquid dish soap (colored if possible)
- honey
- corn syrup
- molasses
- rubbing alcohol
- two identical glasses or jars
- hot water
- cold water
- red and blue food coloring
- index card or other thick, heavy paper

Experiment

Part I

1. Wear your gloves and put your goggles on. No exceptions!
2. Add a layer of honey to the bottom of a glass jar.
3. Gently add a layer of molasses.
4. Add a layer of soap.
5. Use food coloring to color the water, then add it to the jar.
6. Add a layer of oil.
7. Add a layer of alcohol.

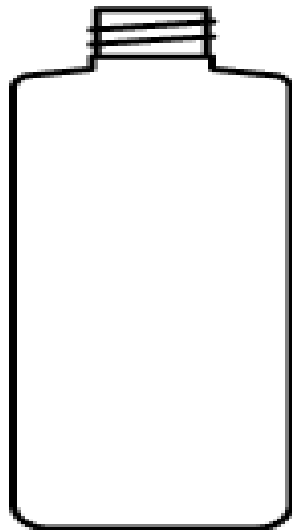
Part II

9. Get out two identical water bottles. Fill one to the brim with warm-hot water. Add 1-2 drops red food coloring.
10. Fill the second bottle with cold water. Add 1-2 drops blue food coloring. Notice how the food coloring flows in the two different temperatures.

11. Place a thick sheet of heavy paper (such as an index card) and use it to cap the blue bottle. Very quickly invert the bottle and stack it mouth-to-mouth with the red bottle. This is the tricky part: When the bottles are carefully lined up, remove the card. Is it different if you invert the red bottle over the blue?

Quick and Easy Density Illustration

Draw, color, and label the layers in your density jar. Label the material with the lowest density and the one with the highest density.



Reading

Density is basically how tightly packed atoms are. Mathematically, density is mass divided by volume. If an object has a mass of 20 grams and a volume of 10 milliliters, its density is $20 \div 10$, or 2g/mL. For example, take a golf ball and a ping pong ball. Both are about the same size or, in other words, take up the same volume. However, one is much heavier, meaning it has more mass than the other. The golf ball has its atoms much more closely packed together than the ping pong ball and as such the golf ball is denser. This property can be used in creating a “density jar.” A substance that is denser will float to the bottom of a container, while a less dense one will stay near the top.

Exercises

1. What material had the highest density? How do you know?
2. What liquid was the least dense? How do you know?
3. What did you observe in the experiment using cold water and hot water? In which one did the food coloring move faster? Why was this?
4. What did you observe when you flipped the two jars on top of each other?

Answers to Exercises

1. What material had the highest density? How do you know? (If you used the materials suggested, it was the honey. If not, whatever layer was on the bottom.)
2. What liquid was the least dense? How do you know? (Again, answers may vary according to what materials were used, but alcohol was the least dense of the materials suggested. It should have ended up at the top).
3. What did you observe in the experiment using cold water and hot water? In which one did the food coloring move faster? Why was this? (It moved faster in the hot water, because the water molecules were less dense).
4. What did you observe when you flipped the two jars on top of each other? (answers will vary)