

Density Rainbow

Red, yellow, green, blue – what order of colors will you make your rainbow? Discover how different liquid densities can help you create your own sugar water rainbow. How many teaspoons of sugar will be the densest?

TEKS:

MATH 3.7 E: The student is expected to determine liquid volume (capacity) or weight using appropriate units and tools.

SCI 5.5 A: The student is expected to classify matter based on measurable, testable, and observable physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating using water as a reference point), solubility in water, and the ability to conduct or insulate thermal energy or electric energy.

SCI 5.5 C: The student is expected to identify changes that can occur in the physical properties of the ingredients of solutions, such as dissolving salt in water or adding lemon juice to water.

Materials:

- Baster
- 6 cups or glasses
- Food coloring (red, orange, yellow, green, blue, and purple)
- 1-cup measuring cup
- Plastic test tube
- Spoon
- Sugar
- Teaspoon
- Water

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How To:

Part 1: Preparing densities

1. Measure and pour 8 ounces of water into each of the six cups or glasses. It is important that all the cups or glasses have the same volume of water.
2. Add 3-4 drops of red food coloring to one cup, then 3-4 drops of orange food coloring to another cup, and repeat this process for the remaining colors (yellow, green, blue, and purple). Use a spoon to thoroughly mix each color in the water.
3. Now it is time to change the densities of each solution. Follow the table below and use the teaspoon to add the corresponding amount of sugar to each colorful solution.

Water Color	Amount of Sugar Added (tsp)
Red	0
Orange	2
Yellow	4
Green	6
Blue	8
Purple	10

4. Stir each cup until the specified amount of added sugar is dissolved in the water.

Part 2: Combine the colors! Two methods are listed below.

Method 1:

1. Take the baster and squeeze all the air out of the bulb.
2. Put the tip of the baster into the red water, and release a small amount of pressure to suck up a bit of the red water.
3. While still squeezing the bulb, transfer the tip into the orange water to suck up a bit of the orange water.
4. Continue to do this for the rest of the colors. Make sure you have enough pressure to suck up all the colors.
5. Slowly squeeze the contents out of the baster and into the test tube, making sure to move the baster up as each color is released from its tip.
6. Observe what happens to the colors in your test tube! Do they change after a few days?

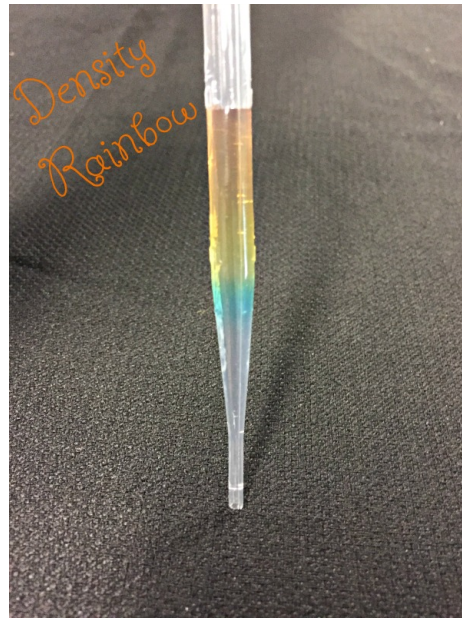
Method 2:

1. Using the baster, suck up some of the purple water and add it to the empty test tube.
2. Suck up some of the blue water, and very slowly add it to the tube, just above the surface of the purple solution. Make sure to add it to the middle of the surface.
3. Continue working backwards through the rainbow, making sure that you add each layer slowly and gently. It may take some practice to get a nice and layered rainbow.
4. Observe what happens to the colors in your test tube! Do they change after a few days?

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STEM Explanation:

Density is a property that measures how much space an object or material takes up in relation to that object's mass. Adding sugar to water increases the water's density. This happens because the addition of sugar causes the mass of the water solution to increase, but the volume of water for each color remains constant. The addition of food coloring to the water allowed us to visually see the different densities we created. When we added increasing amounts of sugar to each color of water in the rainbow, we made red the least dense color and purple the most dense! This caused the purple water to sink to the bottom of the test tube and each color of the rainbow to layer on top of it.

Career Connection:

Chemists study the properties of matter. There are many specializations within chemistry, but all chemists seek to understand the structure, properties, and compositions of various substances. They also study the dynamics of systems and processes at a molecular level.

Resource:

<https://littlebinsforlittlehands.com/sugar-water-density-rainbow-science-experiment/>

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