California State University of Bakersfield, Department of Chemistry

Sugar Water Density Columns

Standard:

5-PS1-3. Make observations and measurements to identify materials based on their properties.

Introduction:

You can make colorful columns that demonstrate the concept of liquid density with just water, sugar and food coloring. Density is mass (how many atoms are in an object) divided by volume (how much space an object takes up.) Sugar molecules are made up of lots of atoms stuck together. The more sugar you add to a half cup of water, the more atoms it will contain and the denser it will be. Less dense liquids float to the top of more dense liquids

Materials*:*

2 cups hot water in large beaker, food coloring (red, blue, green, yellow) measuring spoons (tablespoon), measuring cups (1/2 cup), pipet, eyedropper, syringe (minus the needle) anything that allows you to slowly pour liquid into a glass, forceps for handling hot beakers, stirring stick, Sugar, tall thin glass or graduated cylinder, 4 small cups or beakers

Safety:

- Always have an adult with you to help you during your experiment.
- Always wear eye protection and gloves when doing chemistry experiments
- Conduct this experiment in a well-ventilated area.
- Use tongs to grip large beaker when pouring.

Procedure:

1. Measure ½ cup hot tap water into each of four cups.
2. To the first cup add 2 Tbs. sugar, to the second add 4 Tbs. sugar, to the third add 6 Tbs. sugar and to the fourth add 8 Tbs. sugar.
3. Stir until the sugar dissolves completely.
4. If the sugar won't dissolve, an adult may microwave the cup for thirty seconds and stir again.
5. Now add two drops of food coloring to each cup. Red to the 2 Tbs. cup, yellow to the 4 Tbs. cup, green to the 6 Tbs. cup, blue to the 8 Tbs. cup.
6. Put 40 ml. of the most dense sugar solution (blue) in the bottom of a graduated cylinder.
7. Use a dropper or pipet to gently and slowly put 40ml of the next densest liquid (green)

on top of the blue layer. It works best to tilt the tube and drop the solution against the side of the tube just above the surface of the liquid.

8. Add the yellow layer, and finally, the red layer which only contains 2 Tbs. per half cup and is the least dense.

Data and Observations:

Record your observations in this space

List the order in which the liquids were added into the glass tube

1.
2.
3.
4.

What did you see? Anything you were not expecting? Describe it here.

Questions:

What was the densest liquid?

What keeps the liquids separated? Can you describe what density is now?

Scientists often change variables in their experiments to see how they may affect the experimental outcome. What would happen if we added another liquid or if we change the order we add them?

References:

1. Spangler, S. Seven-Layer Density Column. In *Naked Eggs and Flying Potatoes*: U*nforgettable Experiments that Make Science Fun*, 1st ed.; Leibold, D., Ed.; Greenleaf Book Group Press: Austin TX, 2010; pp 71-75.