

Title: Making a Liquid Rainbow

Goal: To teach students the principles of density and density calculations by having them perform an experiment utilizing food coloring and varying amounts of water.

Statement of the Problem:

How can you make a liquid rainbow without the colors mixing?

Background/Purpose:

The purpose of this experiment is to explore the concept of density through both experimentation and quantitative calculation. Density is a measure of mass per volume and its average density is its total mass divided by its total volume. Students will gain additional perspective on this concept by experimenting with varying amounts of sugar and water and see how density directly affects the separation of colors. This experiment is also available in both English and Spanish.

Safety:

- Always have adult supervision to help you during the experiment
- Putting on gloves and eye protection is highly recommended when performing chemistry experiments

Parts List:

- Sugar
- Food coloring
- 3 cups
- Water
- 2 small cups
- Measuring spoon
- A fork (to help level off sugar from the tablespoon)

Directions:

1. Use measuring tablespoon and add 1 tablespoon of sugar to one cup, add 2 tablespoons of sugar to the 2nd cup, and add 3 tablespoons of sugar to the 3rd cup
2. Add 4 tablespoons of water to each of the 3 cups
3. Thoroughly mix the contents in all 3 cups to ensure that all sugar has been dissolved. **Note:** It will take more time for the cups with 2 and 3 tablespoons of sugar to completely, so just be patient!
4. Now comes the food coloring! With your preferred color, add 2 drops of food coloring to each of the 3 cups and mix thoroughly. It is recommended to use different colors for all 3 cups.
5. Then extract one tablespoon of water from the cup with the highest density (the cup that contains 3 tablespoons of sugar), and pour that into a small cup. Repeat

this process for the remaining 2 cups and pour the tablespoons into the same small cup. **Note:** When pouring the tablespoons into the small cup, it is important to pour the contents in slowly. Doing so will prevent mixing of the layers of colors.

6. You should now be able to see the separation of colors within the cup!

Extra:

As a supplement to this experiment, the video down below explores the quantitative calculations of density and how to understand the change in density of water as sugar was added in.