

Catch a Rainbow

Grade Level: P, K, 1, 2

Duration: 5- 20 min

Classification: Classroom, Science Fair, STEM Spark

Subject(s): Chemistry, Biochemistry

Categories (STEM): Science

Keywords: Surface Tension, Hydrophilic, Hydrophobic, Convection, Diffusion

Introduction

- Summary: Explore surface tension by experimenting with milk, food coloring, and dish soap
- Description: Students will be able to observe the amazing effect that soap has on surface tension through the classic food coloring and milk experiment.

Online Resource: <https://www.steamsational.com/milk-surface-tension-experiment/>

Materials

Material	Quantity	Reusable?
Shallow Bowl (plastic/paper)	1 per Group of 2	Yes/no
Food Coloring	1 variety pack	Yes
Deep Bowl	1	Yes
Liquid Dish Soap	1	Yes
Whole Milk (or Buttermilk)*	1 half-gallon per 100 groups of 2 kids (200 kids total)	No
Toothpicks	1 box	No
Bucket**	1	Yes

*For activity extension, consider adding other dairy products such as skim milk or cream

**To pour milk in after experiment if a sink is not readily available

Directions

- Pour water close to the top of the deep bowl
- Drop a color in water and observe
- Pour (1cm) enough milk to cover the bottom of a shallow bowl.
- Drop 2-3 different colors in milk and observe
- Add a drop of dish soap into the center of the milk bowl
- Observe and compare reactions

Activity Extension

- If supplies allows, try the experiment with other dairy products (i.e. cream, skim milk, etc.)

Discussion Questions

- What does the dye do in water? **Diffuse**
- What does the dye do in whole milk? **Not diffuse**
- Why doesn't the dye diffuse in milk? **it has fats**
- Where happens when the dish soap is added? **colors drop to the bottom of the bowl and then resurfaces**
- Why does the dye drop to the bottom of the bowl and resurface after adding dish soap? **convection**
- Where does the color move when it resurfaces? **to the sides away from the bowl**
- Why do the colors move away from the soap? **they are repellant due to hydrophobic and hydrophilic interactions**

What is happening?

- When dye is added in water it is able to **diffuse** freely because of favorable interactions between water and dye molecules.
- When dye is added to milk it does not **diffuse** because fats entrap the dye.
- When dish soap is added to the milk and dye, **surface tension** is overcome and the dye drops to the bottom of the bowl.
- The dye then raises back to the surface as **convection** occurs.
- The dye moves outward from the drop of dish soap because of repellant interactions between **hydrophobic** (dye) and **hydrophilic** (dish soap) interactions.

Applications

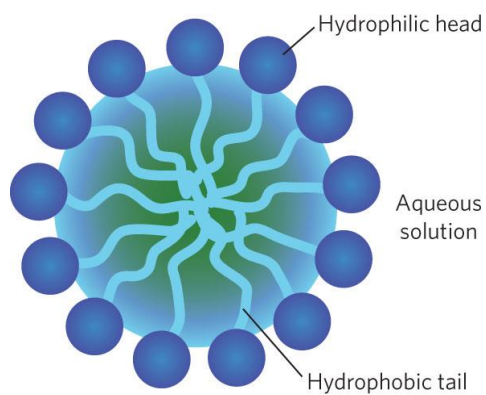
- Majors
 - Chemistry (Thermodynamics)
 - Biochemistry (Hydrophobic, Hydrophilic, Amphipathic Interactions)
- Jobs
 - Cooks (Convection)
 - Chemists, Biochemists
- Hobbies - skipping rocks on water
- Real world applications

- Water striders
- Boiling water (overcome surface tension)
- Washing hands and dishes

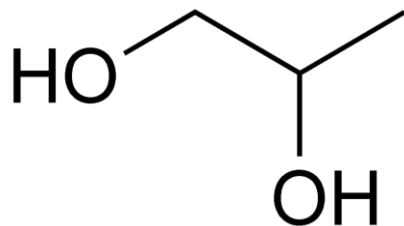
Water Strider



Dish Soap Molecule



Dye Main Ingredient Propylene Glycol Structure



PROGRAM FOR WOMEN
IN SCIENCE AND ENGINEERING

This activity was last updated in fall 2020 by Student Role Models.