

Density Layers

Grade Level: 4, 5, 6, 7

Duration: 30-40 minutes

Classification: Classroom and/or STEM Spark

Subject(s): Chemistry, Physics

Categories (STEM): Science

Keywords: density, chemistry, physics, buoyancy, immiscibility

Introduction

- Summary: Students will try to determine densities of random objects by comparing if they float or sink in 3 different solvents: water, oil, and corn syrup.
- Description: Density can be determined by identifying if substances sink (greater) or float (smaller). Students will try to determine densities of random objects by comparing if they float or sink in 3 different solvents: water, oil, and corn syrup. In case of school limitations, please let the WiSE program know if sinks will not be able for use and cleanup.

Online Resources: <https://www.scientificamerican.com/article/stacking-liquids/>

Vocabulary

- **Immiscibility:** incapable of being mixed; when substances layer off
- **Buoyancy:** The ability or tendency to float in water or air or some other fluid.
- **Density:** The degree of compactness of a substance.

Materials

Materials	Quantity	Reusable?
Canola Oil	1/3 cup per 4 students	No
Corn Syrup	1/3 cup per 4 students	No
Water	1/3 cup per 4 students	No
Jars	1 per 4 students	Yes
Water Pitcher	2 per classroom	Yes
Cut Pipe Cleaners	3 per 4 students	No
Paper Clips	3 per 4 students	Yes
Cut Aluminum Foil	3 per 4 students	No
Q tips	3 per 4 students	No
Toothpicks	3 per 4 students	No
Rubber Bands	3 per 4 students	Yes
Feather	3 per 4 students	No

Gallon Size Ziploc	1 per 4 students	No
Pens/Pencils	1 per student	Yes
Density Chart Handout	1 per student	No
Food Coloring	1 variety package per classroom	Yes

Directions

- Have students form groups of 4.
- Distribute the Density Chart Handout to students and have them make predictions.
- Meanwhile, prepare a jar for each group. Fill 1/3 of each full with each solvent (oil, water, and corn syrup) being careful to pour gently down the side and not directly mix.
- Handout 1 jar to each group of 4 students. **Optional: add a few drops of food coloring.**
- Hand out 1 of each random object to each group: cut pipe cleaners, paper clips, cut aluminum foil, Q tips, toothpicks, rubber bands, and feathers.
- Have students place one of each object into each jar.
- Compare and contrast what subjects float and sink in each jar.
- Have students write down their observations in their Density Chart Handout.
- Have students seal their jars and invert slowly one time. Leave the jar upside down for several minutes and observe again.
- **When cleaning up, collect and clean all jars to reuse as well as paper clips and rubber bands. Gallon Size Ziploc can contain the mess if you can't clean the materials before bringing the kit back. Seal jars before bringing back.**

Discussion Questions

- What substances float in oil? water? corn syrup?
- What substances sink in oil? water? corn syrup?
- Rank all substances by predicted densities based on where they are in the jar.
- Predict if some other substances would float or sink that were not included in the kit.
- What things did students predict correctly? What did they not?
- Rank the 3 solvents (oil, water, and corn syrup) in order of density.

What is happening?

- Students prepare jars with 3 different solvents within to identify and rank densities of unknown substances they are provided. After experimenting, students will discuss which conclusions matched their original predictions and explain why others did not.

Applications:

- Majors
 - Chemistry
 - Physics
 - Engineering
- Jobs
 - Chemist
 - Physicist
 - Mechanical Engineer
 - Propulsion Engineer

- Pipeline Engineer
- Hobbies
 - Using Sinkers when fishing
 - Swimming (pool noodles and survival float using clothes)
- Real world applications
 - Creating clean water with packets in Africa (dirt aggregates and settles on bottom)
 - Bartenders make layered drinks
 - Layering in pasta salads
 - Fish Swim Bladder (air-filled; suspends fish in water so they don't float to surface)
 - Soaking dishes
 - Lifejackets, buoys, & boat rings



PROGRAM FOR WOMEN
IN SCIENCE AND ENGINEERING

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