Lab: Can it Float?

FOR THE TEACHER

Summary
In this lab, students will investigate the relationships between mass, volume, density and buoyancy in common objects. Students will be tasked with determining the volume of a variety of objects as well interpreting the meaning of their buoyancy in water.

Grade Level
High School

Objectives
By the end of this lab, students should be able to
- Compare the relative densities of common household materials
- Explain how differences in content can cause changes in density
- Construct and interpret a graph based on data collected from the lab

Chemistry Topics
This lab supports students’ understanding of
- Density
- Measurement

Time
Teacher Preparation: 10 minutes
Lesson: 60 minutes

Materials
- Measuring cup
- Water
- 2 canned soft drinks (one diet, one not diet, same brand)
- 2 candy bars or fruits (supplied by teacher: Snickers, 3 Musketeers, orange)
- Large container of some variety

Safety
- Always wear safety goggles when handling chemicals in the lab.
- Students should wash their hands thoroughly after completing the lab.
- Follow the teacher’s instructions for cleanup of materials.
- Food in the lab should be considered a chemical not for consumption.

Teacher Notes
- I use this lab experiment as a take home lab assignment. Find out more about my take home labs in the March issue of Chemistry Solutions or in the AACT Webinar archive.
- The materials are commonly found at home, so have students to check for availability. Soda, and food items could be supplied by the teacher in this instance.
- Allowing students to complete the lab in the classroom before or after school is a good option/alternative.
- In our district, density is taught in junior high, but is still considered to be an intensive property for identifying materials that can be tested in chemistry. We find that students are coming in with a better understanding of density than they once did, but their grasp of the concept can still
use refinement, so this take-home lab is a way to reinforce the concept as a supplement to an in-class refresher.

FOR THE STUDENT
Lesson

Can it Float?

Objectives
- To review the fundamental meaning of density
- To compare the relative densities of common household materials
- To explain how differences in content can cause changes in density

Safety
- Always wear safety goggles when handling chemicals in the lab.
- Wash your hands thoroughly before leaving the lab.
- Follow the teacher’s instructions for cleanup of materials and disposal of chemicals.
- Food in the lab should be considered a chemical not for consumption.

Materials
- Measuring cup
- Water
- 2 canned soft drinks (one diet, one not diet, same brand)
- 2 candy bars or fruits (supplied by teacher: Snickers, 3 Musketeers, orange)
- Large container of some variety

Procedure
1. In the space below, construct a data table to include the following:
   a. Predict the order of mass of these objects from lowest mass to greatest mass.
   b. Predict the order of volume of these objects from lowest volume to greatest volume.
   c. Predict the order of density of these objects from lowest density to greatest density.
   d. Predict whether each object will float or sink in water.

2. Once you have completed your predictions take your materials home and complete the lab. Be sure to set up a data table to record your measurements and observations. Record your measurements in the table as you complete the lab.

3. At home devise a way to determine the volume of each object as accurately as you can. Remove the candy bars from their wrappers before making your measurements. You may not open the soft drinks. (You’re finding the volume of the can) For the fruit, find the volume without peeling it first. Then, after doing the float test on the unpeeled fruit, peel it and retest it. Describe how you determined the volume in the space provided for “Method” below.

4. After determining the volume of the objects, place each in a container of water so they are free to float or sink. Record your observations.
Data

Method

Analysis
1. Describe any differences between your predictions and your actual measurements:

2. 
   a. Using graph paper, construct a graph of mass vs. volume with the range of measurements being equal on both axes. (Example: if the volume range is from 0 – 200mL, the mass range should also be 0 – 200g). Be sure you allow for the maximum volume you measured, plus a few mL or grams just in case.

   b. Draw a line with a slope of 1 through your graph. This line represents the density of water.

3. Based on your observations plot your volumes and your revised predictions about the mass of each of the objects (in bar form) on the graph. Discuss why you placed the tops of the bars where you did on the graph.

4. Cut each candy bar (or fruit) in ½ and draw a sketch of what you see. Try to explain your density results and observations based on what you see.

5. Explain in your own words what you think is responsible for the difference in the densities of the soft drinks.

6. Explain in simple terms what you think is responsible for an object having buoyancy.

7. Be sure to attach your graph paper to this lab paper.

Parent Signature ___________________________ Date _____________