The Floating Bowling Ball

Introduction

Why do some things float while others sink? Capture your students' attention with this eye-catching demonstration of a bowling ball floating in water!

Concepts

- Density
- Volume

Materials

Aquarium or clear large plastic tub
Bowling ball, 8-lb
Additional bowling balls of various weights
Water

Safety Precautions

Gently place the bowling balls in the water. For heavier bowling balls, you will have to place them in the water gently and slowly lower them to the bottom of the aquarium. Not doing so could result in the aquarium glass breaking. Follow all laboratory safety guidelines.

Preparation

1. Fill the aquarium or tub 2/3 full with water.
2. Gently place the 8-pound bowling ball in the aquarium.

Disposal

The aquarium and bowling balls should be saved for future demonstrations.

Tips

- This demonstration is a great discrepant event for students to see as they walk into the classroom.
- Another option is to start with only water in the tank. Have students predict which bowling balls will float or sink from a variety of bowling balls with different weights (bowling balls 12 pounds and lighter will float).
- An extension of this activity could be to test more household items to see if the objects will sink or float. Extend the activity and have students calculate the densities of the objects before placing them in the tank.
- The following kits can be used to further explore density:

– Salting Out—Density Bottle Demonstration Kit (Flinn Catalog No. AP7931)
– Measurement Challenge—A Density Laboratory (Flinn Catalog No. AP5939)
– Density Cube Set (Flinn Catalog No. AP6058)

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Discussion

Density is a characteristic property of matter, and materials can be identified by their density. Density is defined as the mass of a substance per volume (Equation 1).

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} \qquad \textit{Equation 1}$$

Density is commonly expressed as g/cm^3 or g/mL. The density of pure water is 1.00 g/cm^3 at 20 °C. Objects with a density greater than 1.00 g/cm^3 will sink in pure water. Objects with a density less than 1.00 g/cm^3 will float in pure water.

Bowling balls are the same volume but can vary in weight. The circumference of a bowling ball is 27 inches. While the bowling balls are the same size, they have different masses and are made of different materials. The lower the mass, the smaller the density. When the density is less than 1.00 g/mL, the bowling ball will float.

To determine if a bowling ball will float or sink, the density can be calculated. First, the radius must be calculated from the circumference (Equation 2) and inches are changed to centimeters (1 inch = 2.54 cm):

$$\begin{aligned} &27 \text{ inches} = 68.58 \text{ cm} \\ &\text{Circumference} = 2\pi r \qquad \textit{Equation 2} \\ &68.58 = 2\pi r \\ &r = 10.9 \text{ cm} \end{aligned}$$

Then the volume of the bowling ball can be calculated using Equation 3.

$$\begin{aligned} &V = 4/3\pi r^3 \qquad \textit{Equation 3} \\ &V = 4/3\pi(10.9)^3 \\ &V = 5446.8 \text{ cm}^3 \end{aligned}$$

Lastly, the weight in pounds needs to be converted to grams before calculating the density (1 pound = 453.6 grams).

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

A sample calculation for an 8-lb bowling ball is given below.

$$\text{Density} = (8 \text{ lb} \times 453.6 \text{ g/lb})/(5446.8 \text{ cm}^3) = 0.67 \text{ g/cm}^3$$

Since the density of the 8-lb bowling ball is less than the density of water, the ball floats.

Materials for *The Floating Bowling Ball* are available from Flinn Scientific, Inc.

Catalog No.	Description
FB0212	Aquarium, All-Glass®, 20 gallon (24″ × 12″ × 16″)
AP6058	Density Cube Set
AP5939	Measurement Challenge—A Density Laboratory Kit
AP7931	Salting Out—Density Bottle Demonstration Kit

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.