Fruit Floats

Introduction

What determines whether something sinks or floats? Can objects be altered to make them sink or float?

Concepts

- Density

Materials

Aquarium or other large, clear container
Balance
Grapes, 1 per team
Materials for student-designed experiments
Oranges, 2
Ruler, metric
String, 30 cm

Safety Precautions

Any food that is brought into the lab should be considered a chemical and should not be consumed. The materials used in this laboratory activity are considered nonhazardous. Please follow all laboratory safety guidelines. Wash hands thoroughly with soap and water before leaving the laboratory.

Preparation

Locate an aquarium or a large, clear container to be used in the orange demonstration.

Procedure

I. Initial Demonstration: Orange Float

1. Place a peeled and an unpeeled orange in a large, clear container that is filled with water. (The peeled orange should sink and the unpeeled should float.)
2. Entertain student ideas to explain the differences in the "floatability" of the oranges. (Expect such ideas as, "The peel holds it up" or "The peel is like a life-jacket and causes it to float.")
3. Use a string and a ruler to measure the circumference of each orange. Then, weigh each orange.
4. Use the following formulas to calculate the density of each orange.

$$\text{Circumference} = 2\pi r \text{ (solve for r)}$$

$$\text{Volume} = \frac{4}{3}\pi r^3 \text{ (calculate volume using r)}$$

$$\text{Density} = \text{mass/volume}$$

(The peeled orange should have a density greater than 1.0 and the unpeeled orange should have a density less than 1.0.)

5. Have students explain the "orange results" in terms of density.

II. Prediction: Grape Float?

1. Have students predict whether a grape will sink or float.
2. Determine the grape's density by measuring its circumference, weighing it, etc.
3. Predict whether the grape will sink or float based upon its density.
4. Test the grape in the water. (It should sink in water.)

Publication No. 10319
061616

III. Design a Grape Float

In this part of the activity let students form a research team and design an experiment where they can make a grape float. Follow the general guidelines below as students design and conduct their own experiments.

A. Form a research group and formulate a hypothesis about how to make a grape float.

B. Design an experiment and write your plan in detail. Be sure to include controls.

C. Discuss the hypothesis and materials required with your instructor.

D. Secure all the necessary materials.

E. Conduct the experiment and record all results.

F. Write a complete laboratory report and include: 1) A statement of hypothesis; 2) A description of procedures and experimental design; 3) Data and observations; 4) Interpretation of results; 5) Further possible experiments.

Allow students to experiment and note the interesting variety of ways students can get a grape to float!

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. Fruit and water may be thrown in the trash or flushed down the drain according to Flinn Suggested Disposal Methods #26a and #26b.

Tips

- This challenge is highly motivating and is perfect for involving students in higher level cognitive skills as outlined in the National Science Standards.
- Some experimental designs might include:

a. Creating life jackets for the grapes—perhaps out of orange skin.
b. Coating the grape with various substances.
c. Injecting the grape with various substances.
d. Changing the density of the solution.
e. Changing the temperature of the water/grape.
f. Peeling the grape

Extension

As a further challenge, see if students can determine how to get a grape to be "suspended" in a solution, i.e., float halfway up in a liquid. (This will require very careful measurement to establish the concentration of solutes inside and outside the grape membrane.)

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Process: Grades K–12
Systems, order, and organization
Evidence, models, and exploration
Content Standards: Grades 5–8
Content Standard A: Science as Inquiry
Content Standard B: Physical Science, properties and changes of properties in matter
Content Standards: Grades 9–12
Content Standard A: Science as Inquiry
Content Standard B: Physical Science, structure and properties of matter

Materials for *Fruit Floats* are available from Flinn Scientific, Inc.

Catalog No.	Description
FB0211	Aquarium, All-Glass®, 10-gallon
FB0511	Plastic Animal Cage, Terrarium, Medium
AP4823	String, Thin

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