Activity 7.6
Changing the density of an object—Adding material

How can you make an object float when it ordinarily sinks?

In this activity, students see that a can of regular cola sinks while a can of diet cola floats. As a demonstration, bubble wrap is taped to the can of regular cola to make it float. This high-volume but light-weight material increases the volume of the object more than it increases the weight. This decreases the density enough for the can-and-bubble wrap object to float. Students will use this idea to make an object that is more dense than water float.

Materials needed for the demonstration

Water
Large clear plastic container
Can of regular cola
Can of diet cola
Bubble wrap
Scissors
Tape
Paper towel

Materials needed for each group

Small water-resistant item that sinks
Small water-resistant items that float like zip-closing plastic bags, styrofoam pieces, cork, empty film canisters with lids, etc.
Tape, rubber bands, string, etc.

Notes about the materials

- **Be sure you and the students wear properly fitting goggles.**
- Have students bring in small water-resistant items that sink such as plastic toy figures.
- The items students use to make their sinking objects float will vary. Either provide an assortment of materials or have students bring them from home.

Preparing materials

- Test your cans of regular and diet cola ahead of time by following the procedure on p. 428. The regular cola should sink, while the diet cola floats.

Activity sheet

Copy *Activity sheet 7.6—Changing the density of an object—Adding material*, pp. 430–431, and distribute one per student when specified in the activity.

Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 437–439. For this formative assessment, check a box beside each aspect of the activity to indicate the level of student progress. Evaluate overall progress for the activity by circling either "Good", "Satisfactory", or "Needs Improvement".

Activity 7.6
Changing the density of an object—Adding material

Question to investigate

How can you make an object float when it ordinarily sinks?

Demonstration

1. Do a demonstration to show students that a can of regular cola sinks and a can of diet cola floats.

Procedure

1. Fill a large clear container about ¾ full of room-temperature water.

2. Holding the cans sideways, place a can of regular cola and a can of diet cola in the water.

***Expected results*: The can of regular cola should sink and the can of diet cola should float.**

2. Discuss student observations.

Tell students that the cans are made of the same material and have the same volume and are filled with the same amount of soda.

Ask students questions such as the following:

- Why do you think one can sinks and the other floats?
- Since the volumes are the same, what must be different about the sodas?

Tell students that the mass of the regular soda is greater than the mass of the diet soda. The regular soda has 30–40 grams of sugar dissolved in it. The diet soda is sweetened with an artificial sweetener that takes many fewer grams to achieve a similar level of sweetness.

3. Discuss ways to get the can of regular cola to float.

Ask students how they might make the can of regular cola float without opening the can. Students may suggest shaking the can. This may cause some gas to come out of the solution, which would decrease the overall density if the gas could somehow make the can get bigger. Since the can won't expand, shaking the soda won't increase the volume of the can or decrease it's mass, so it won't affect the density. You may choose to shake the can and put it back in the water to show students that shaking will not affect density.

Students may suggest putting something on the can to increase its volume. Ask students if they can think of something that would add volume to the can but not add much weight. One procedure for making the can of regular soda float is suggested on the following page.

4. As a demonstration, add a high-volume but lightweight material to an object that ordinarily sinks in water to make it float.

Procedure

1. Use a paper towel to dry off the outside of the can of regular cola.

2. Cut a piece of bubble wrap so that it is as wide as the height of the can. The length of the bubble wrap should be just enough to go around the can once.

3. Wrap the bubble material around the can, and use tape to attach the wrap securely in place.

4. Place the can-and-bubble wrap object back in the water.

***Expected results*: The object should float.**

5. Discuss why the can-and-bubble wrap object floats.

Ask students to use the terms *mass*, *volume*, and *density* to explain why adding the bubble wrap helped the can float. Be sure students understand that it is the *combined* mass and volume of the can and the bubble wrap that makes the can-and-bubble wrap object less dense than water so that it floats.

Tell students that life jackets work in a similar way. Ask students why a life jacket helps a person to float. Explain that a person wearing a life jacket floats because of the combination of the body and the life jacket is less dense than water.

Distribute *Activity sheet 7.6—Changing the density of an object—Adding material.*

6. Have students make an object float which ordinarily sinks.

Challenge students to make a small object, which ordinarily sinks, float. They can bring in small objects like plastic figures, marbles, or keys that sink. Either provide materials that float such as cork, zip-closing plastic bags, or styrofoam or have students bring them from home. Give students time to assemble their objects and test them in a container of water.

7. Discuss with students how adding volume without adding much weight makes the items float.

Have students explain how they made their objects float. Ask students what all of these floating objects have in common. Students should realize that mass is increased slightly, while volume is increased much more. When the density of this larger combined object is less than the density of water, it floats.