Zippy Zappy Boats

from **Celebrating Chemistry**

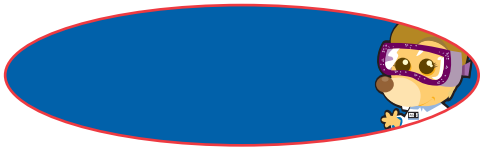
Did you ever wonder how a water bug stays afloat on water? The bug can stay afloat because of the surface tension of the water. Surface tension is the result of the water molecules sticking to one another. This packs the molecules together and forms a smooth surface, giving the bug a "floor" upon which to walk. In this experiment you will see what happens when you change the surface tension of water.

Materials

- Pencil or ballpoint pen
- Thin Styrofoam tray or plate
- Blunt-ended scissors
- Liquid detergent (any liquid soap or dish detergent)
- Cookie sheet or flat tray
- Water

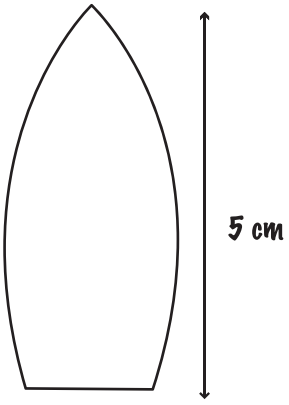
ADAPTATION *To help young participants keep the two boats separated, use two different colors of Styrofoam. The experiment may be done by placing two cut pieces of Styrofoam in opposite corners of the tray and touching a cotton swab dipped in liquid detergent to the surface of the water behind the boat. A notch may be cut into the flat edge of the boat to give participants a place to put their cotton swabs.*

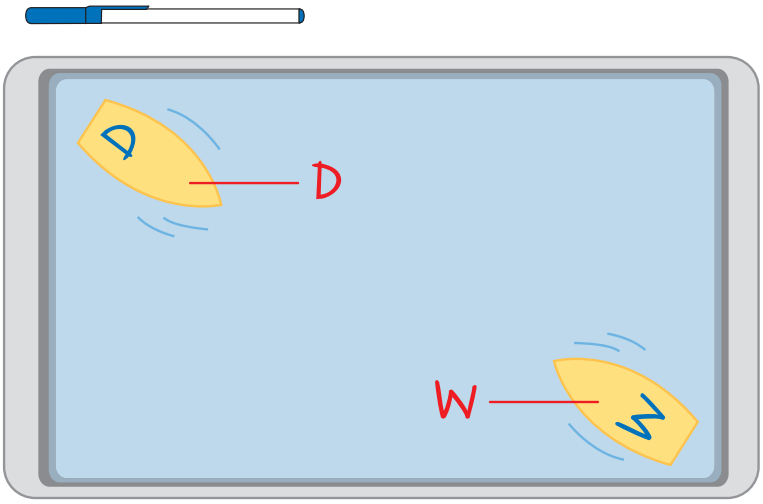
SAFETY! *Be sure to follow Milli's Safety Tips and do this activity with an adult! Do not eat or drink any of the materials in this activity!*



Procedure

1. Use the pen or pencil to draw a boat about 5 cm (2 inches) long on the Styrofoam tray.
2. Cut out the boat with the scissors.
3. Trace around the boat at another location on the Styrofoam tray and cut out the second boat to create two identical boats.
4. Write a "W" on one boat and a "D" on the other one.
5. Place the boat labeled "D" letter-side down and put a drop of liquid detergent near the straight edge opposite of the point.
6. Allow the detergent to dry a few minutes. While the detergent dries out, pour water into the cookie sheet or tray until the water is about halfway up the sides.
7. Hold one boat in each hand with the letters facing up or have your adult partner help you. Place them flat on the surface of the water at the same time in opposite corners with their pointy ends heading toward the center of the tray. Observe what happens.
8. Record your observations in the "What Did You Observe?" section.
9. Recycle your boats and remaining tray or plate scraps. Carefully pour the water down the sink and wash out the cookie sheet or tray. Thoroughly clean the work area and wash your hands.





Where's the Chemistry?

Your "D" boat should have zipped across the water. Water sticks to itself very well, especially near the surface. A water molecule on the top of a puddle of water is pulled downward by the molecules beneath it. This special property of water is called cohesion. The cohesion of water creates a strong, flexible "skin" on the water's surface. Adding soap disrupts the arrangement of the water, and the water molecules near the boat have a harder time sticking to one another, making it possible for the boat to go forward.

Try this...

Put fresh water in the tray and try repeating this experiment using vegetable oil instead of detergent. Make more boats and see if the size of the drop of detergent makes a big difference. Is the difference more notable when the drop has dried overnight? See if you can make a boat with a shape that moves more quickly through the water.

What Did You Observe?

"W" boat	"D" boat

The American Chemical Society develops materials for elementary school age children to spark their interest in science and teach developmentally appropriate chemistry concepts. The *Activities for Children* collection includes hands-on activities, articles, puzzles, and games on topics related to children's everyday experiences.

The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at www.acs.org/kids.

Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

Never eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

Never experiment on your own!

For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".