PRESENTED BY: girlstart

deSTEMber

SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH

# Hook, Line, and Sinker

Get hooked on this challenge that will test both your coordination and understanding of science! Help your diver search for sunken treasure as you learn how density and buoyancy work together.

## TEKS:

SCI 4.5 A: The student is expected to measure, compare, and contrast physical properties of matter, including mass, volume, states (solid, liquid, and gas), temperature, magnetism, and the ability to sink or float.
SCI 5.5 A: The student is expected to classify matter based on measurable, testable, and observable physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating using water as a reference point), solubility in water, and the ability to conduct or insulate thermal energy or electric energy.

## Materials:

- 2 disposable plastic pipettes
- 2 hex nuts
- 6-inch piece of wire
- 10-inch piece of wire
- 1-liter plastic bottle with cap
- 16-ounce plastic cup
- Scissors
- Water

## How To:

*Part 1: Creating and testing the diver*

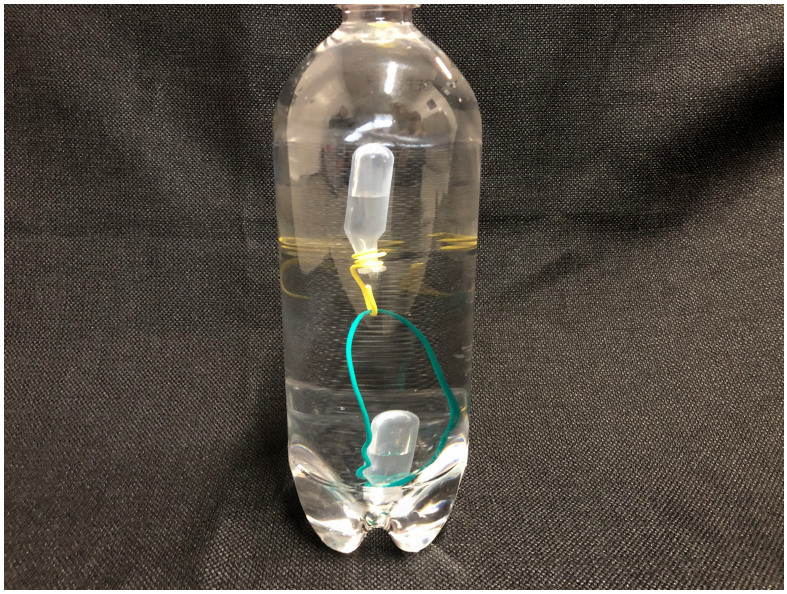
1. Slip a hex nut onto the stem of a pipette and secure it by twisting it onto the bottom of the bulb of the pipette. Be sure to twist the hex nut a few times so that it will hold in place, but not so much that it might break the pipette.

2. Once the hex nut is in place, take a pair of scissors and cut off the stem of the pipette a quarter of an inch from the base.
3. Fill the 16-ounce plastic cup with at least 4 inches of water and test the "diver" you just created by placing it into the water cup. Observe what happens. You should see the diver bobbing up and down, with the plastic bulb sticking completely out of the water.
4. Draw some water into the diver by squeezing the bulb and then releasing while the open tip is submerged in the water. Observe what happens. You should see that it floats so that most of the diver is submerged with just the tip of the bulb above the water's surface. If the diver sinks to the bottom, remove a few drops of water by squeezing the bulb until it floats just below the water's surface. You might have to be patient and do this a few times until it is right!
5. Fill the 1-liter plastic bottle to the brim with water.
6. Carefully place the diver into the bottle, but be sure not to lose any of the water inside the diver and that the bottle is still filled to the brim. If you do, go ahead and test the diver in your plastic cup again to make sure it still floats.
7. After you have placed the diver inside and double-checked to make sure no water was lost in the diver or the bottle, screw the bottle cap on the extremely full bottle.
8. Squeeze the bottle and observe what happens to the diver. Does the diver sink? If you don't see much happening, try to squeeze the bottle harder with both hands. Then observe what happens to the diver when you stop squeezing.
9. Using steps 1-8, make another diver. In order to play hook, line, and sinker, you need to have two divers.

*Part 2: Putting it all together*

1. After creating and testing the two divers, take them out of the 1-liter bottle, and refill the bottle with water. The divers will now be used to make a hook and a sinker.
2. Take the 6-inch wire and wrap one end of the wire between the bulb and hex of one of the divers several times in order to secure it. The other end of the wire should be in a shape of a hook or a "J." This hook should be large.
3. Use the 10-inch wire to make a "U" shape. Wrap both ends of the "U" around the second diver, making sure to keep the wire wrapped between the hex and bulb. Once you do this, this diver will be considered the "sinker".
4. Place the sinker into the test cup filled with water that was used to create the divers. This time, make sure to fill the bulb until it sinks and barely floats above the bottom of the bottle.
5. Make sure the 1-liter bottle is filled with water and drop the sinker into the bottle. Remember that the bottle needs to be filled to the brim to ensure that it works properly. Then add the second diver with the hook into the bottle and screw the cap on tightly.
6. Squeeze the bottle on the sides and you should notice that the hook dives to the bottom of the bottle. Now the game is on! Try your best to retrieve the sinker using the hook from the diver to bring it to the surface. If it doesn't work, experiment with water levels in both the hook and sinker until you're able to play. Designing the game is all part of the fun!



## STEM Explanation:

Notice the water levels in the diver as you squeeze the soda bottle. You should be able to see that the water rises in your diver as you squeeze the bottle. When this happens, the air that is trapped in the top half of the bulb gets compressed into a smaller space. The compression of air as the water level increases causes the diver's weight to increase as well. This decreases the buoyancy, causing the diver to sink. Reversely, when you stop squeezing the bottle, the compressed air expands again, causing water to leave the diver, allowing it to float back to the top of the bottle.

## Career Connection:

*Ocean engineers* take on a broad understanding of civil, mechanical, and electrical engineering and applying it to life under the sea. These professionals often work in areas such as offshore oil recovery, marine transportation and design, and coastal construction. This field brings together engineering and oceanography.

## Resources:

https://www.stevespanglerscience.com/lab/experiments/density-divers/
http://coe.fit.edu/dmes/ocean.php