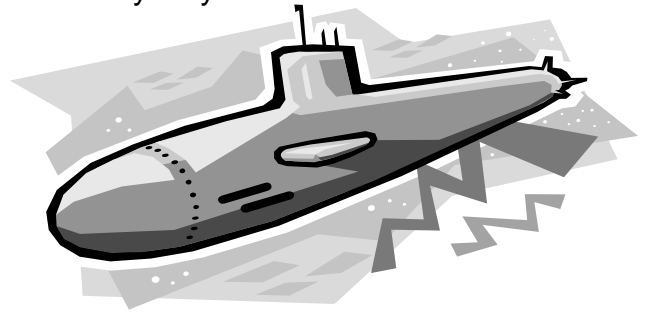


Build Your Own Submarine

Build your own submarine and see if you can control its buoyancy!

Materials

- 1 heavy weight (tape 12 washers together)
- 1 medium weight (tape 9 washers together)
- 1 light weight (tape 6 washers together)
- 1 20oz. bottle
- 3 rubber bands
- 1 bendy straw
- Ice pick or sharp nail



Process

1. Gather your sub, weights and straw
2. Unscrew the cap of your bottle. Have an adult help you use the nail or ice pick to put a hole in the bottle cap.
3. Have an adult help you use the nail or ice pick to put 3 evenly spaced holes in the body of the bottle.
4. Bend your straw at its joint, put the short end of the straw into the bottle's cap hole.
5. Rubber band your weights to your sub, put the lightest weight closest to your straw, the medium weight behind it, and the heavy weight near the bottom of the bottle. Be careful not to cover any of the holes in the bottle sub.
6. Put your bottle sub in the water. What happens?
7. Blow into your straw, now what happens to your sub? Can you find neutral buoyancy?

So What's Happening?

A *ballast* tank is a compartment within a boat, ship or other floating structure that holds water. In a *submarine*, the ballast tanks can be filled with water to *submerge* the ship. When the water is pushed out and replaced with air, the submarine rises to the surface. This is called controlling the *buoyancy* of the ship.

Buoyancy is how much something sinks or floats in the water. A submarine floating on the ocean's surface has *positive buoyancy*. However, when a submarine sinks to the ocean's floor it has *negative buoyancy*. Submarines spend most of their time somewhere in between, floating under the water's surface; this is called *neutral buoyancy*. The trick to neutral buoyancy is to find the proper mix of air and water so the sub seems to remain suspended in the water, neither floating nor sinking.



Vocabulary

- **Ballast Tank** – a compartment within a boat, ship or other floating structure that holds water
- **Submarine** – a ship that can operate below the surface of the water
- **Submerge** – to go or place underwater
- **Buoyancy** – how much something sinks or floats in the water
- **Positive Buoyancy** – when something floats in the water
- **Negative Buoyancy** – when something sinks in the water
- **Neutral Buoyancy** – when something is suspended between floating and sinking. It is able to move below the surface of the water, like a submarine.

For More Information

Explorit Science Center. “Science Bytes: Float, Sink, or Swim.” Last Modified 2011.

<http://www.explorit.org/science/bytes/float.html>

Georgia State University: HyperPhysics. “Buoyancy.” Last Modified 2011.

<http://hyperphysics.phy-astr.gsu.edu/Hbase/hframe.html>