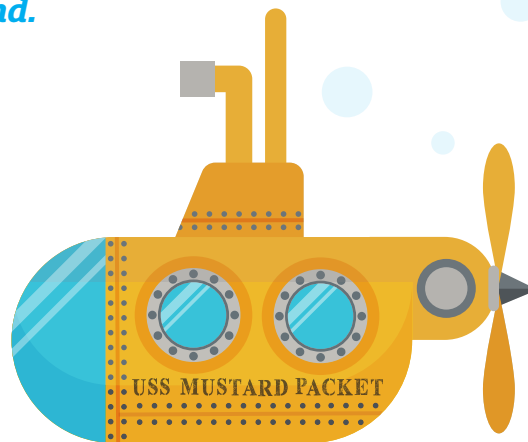


Oh Buoy! Buoyancy!

Make a mini-submarine that moves at your command.

Collect

- Water
- Condiment packet (ketchup, soy sauce, or similar)
- 1-liter clear plastic bottle
- Permanent markers (optional)
- Paperclips
- Kosher salt
- Tablespoon



Make an ocean

1. Clean the bottle and remove the label and cap.
2. Decorate your bottle with permanent markers to create an underwater environment for your submarine.
3. Fill the bottle with water until it is about two inches from the top.

Dive, Dive, Dive!

4. Place the condiment packet submarine into the bottle.
5. If the packet floats, add a paperclip to the bottom of the packet.
6. If the packet sinks to the bottom, add about 3 tablespoons of salt to the water, cap the bottle, and shake it up until it dissolves. This will increase the density of the water. Keep adding salt until the packet is floating near the top of the bottle.
7. Fill the remainder of the bottle with water until it is all the way to the brim. Screw the cap on tightly.
8. Gently squeeze the bottle and watch as the submarine goes up and down at your command!

How does it work?

To be neutrally buoyant and float near the top of the bottle, the density of the condiment packet must be equal to the density of the water. If you added a paperclip, you increased the packet's density. If you added salt, you increased the density of the water.

Just like your condiment packet, neutral buoyancy for the submarine occurs when the density of the submarine is equal to the density of the water around it. Submarines dive and resurface by filling an area called the ballast with air or water to increase or decrease its buoyancy. Filling the ballast with water causes the submarine to sink, and filling it with air causes it to rise up again.

When you squeeze the sides of the bottle, you are increasing the pressure on the water inside. That increase in pressure is applied to everything inside the bottle, including the condiment packet. The packet has a small air pocket inside, which is compressed when pressure is increased. When squeezed, the overall density of the packet becomes greater than the density of the water, causing the submarine to sink. Once the pressure on the bottle is released, the air inside of the packet expands, causing it to rise to the top again.

Take it further!

What else could act as a submarine? Find another object that has trapped air inside of it, or you can add an air pocket by using an eyedropper, pen cap, or straw as part of your submarine.

