



STEM @ HOME GUIDE: Cartesian Diver

- **Aim:** To observe how buoyancy works

- **Materials required:**

- ✓ Plastic Straw
- ✓ 2-liter soda bottle
- ✓ Water
- ✓ Scissors
- ✓ 5 small paperclips

- **Questions to think about before you start:**

- ✓ Why do some materials float and others sink?
- ✓ Can you get the dropper to move up and down in the water?

HELPFUL TIPS

- Make sure your bottle is clean and all labels removed so you can see what is happening
- Have a cup with water handy to test that your straw/paperclip divers barely float (THIS IS IMPORTANT)

- **Instructions:**

Make sure to perform the experiment as a team (parent and student).

- **Parent:** Cut the straw into section 2-3 inches long
- **Student:** fold the straw section in half and stick one side of the paper clip into each half
- **Student:** Add a second paper clip to one of the diver's and add two paper clips to the other. You should have a chain or tail hanging from each diver
- **Parent:** Fill the plastic bottle to the top
- **Student:** Place your divers in the bottle (the water should reach the very top a little overflow it okay).
- **Parent:** Screw on the cap
- **Student:** Gently squeeze the bottle and watch your divers sink, when you let go, they will float back to the top

- **The science behind the fun:**

Squeezing the bottle causes the diver (paperclip/straw) to sink because the increased pressure pushes water up into the diver. More water inside the straw increases its mass and causes it to sink. When you stop squeezing the bottle the pressure goes back down and the water is forced back out, lowering its density and allowing it to float back to the top of the bottle.

- **Extensions Activities:**

- ✓ Try adding a more divers with different length paper clip tails and see how they moves when you squeeze the bottle.
- ✓ What other ways can you add more weight to the straws?
- ✓ What happens if you change the water temperature?
- ✓ What happens if you change the straw length?

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- **Real world application:**

Knowing the principles of this activity allow boats to float, submarines and divers to move up and down in the water. Submarines move up and down by changing the amount of air and water inside specialized compartments. Divers wear a lot of gear to help them breathe underwater and they also have to add weights to their dive suit to keep them from floating back to the surface.

- **Vocabulary:**

- **Buoyancy:** Force on an object making the object rise or move upward.
- **Density:** Measurement that compares the amount of matter (stuff) an object has to its volume (space).
- **Pressure:** Force on or against an object by a solid, liquid or gas in contact with it.

Did you know?

- The Cartesian Diver is named after Rene Descartes, the French scientist who created this activity to demonstrate buoyancy in the 1600's.
- Fish can move up and down in the ocean by changing the amount of pressure around a small air sac in their body.

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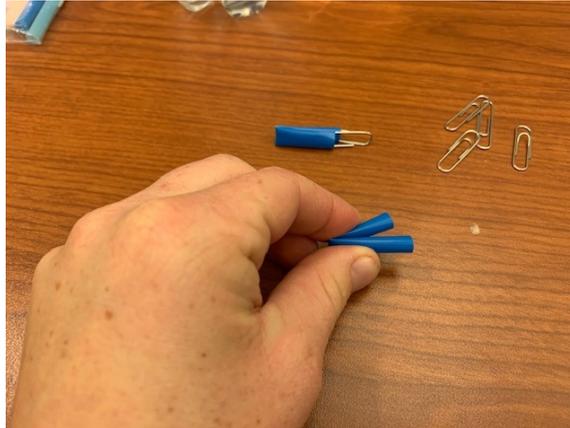


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Cartesian Diver Photo Guide



Supplies



Cut and fold straw



Insert paperclip chains



Place divers into bottle



Squeeze the bottle



See how the divers fall to the bottom



Release the bottle