

Surface Tension

Raccoon Creek Explorers #32

Supplies:

- Very thin wire (such a magnet wire or copper wiring from the inside of an old cable)
- scissors
- ruler
- a bowl or pan of water



Vocabulary:

adhesion- the tendency for different molecules to stick together

buoyancy- the ability to float on a particular liquid or gas

cohesion- the tendency for similar molecules to stick together

density- mass per unit of volume

surface tension- the property of the surface of a liquid that allows it to resist outside forces, a sort of film that forms on the surface of a liquid, caused by the strong bonds between the molecules of the surface layer.

Background:

Have you ever seen a water strider skating across the surface of a pond or stream? It might surprise you to learn that they aren't floating but are in fact walking on water! So how do water striders do this? Its all thanks to way they're bodies are built and a property of water called surface tension. Water striders are very light and have very long legs. They use this legs to spread their mass out over the surface of the water so they don't break through the surface tension.

For this experiment we'll get metal to 'float' on the surface of water by making a water strider out of wire!

Let's Get Started:

- 1.) Fill a bowl or pan with water.
- 2.) Cut the wire into 3 equal pieces, each about 10 cm in length.
- 3.) Tightly twist the three wires together in the middle to create a 'bug' with six 'legs'. Gently curve each leg into a shallow U shape.
- 4.) Try to get it so that your bug rest on all legs equally on a flat surface. Once you're satisfied, gently set the bug on the surface of the water.
- 5) If your strider sinks, try adjusting the legs to ensure all six are touching the water and its weight is evenly distributed. The heavier and thicker the wire you use, the more difficult it will be and the more likely your strider is to break the surface tension!




Reflect:

Do you think there's a size limit for how big a water strider could be? Why or why not?

Is the water strider floating the same way a boat would or is this something different?

Why is it so important that all of the water strider legs touch water at the same time and distribute weight equally? What happens if they don't?



Apply:

Surface tension is pull of the molecules at the surface of a liquid because the molecules are slightly attracted to each other (called cohesion). This cohesion is what makes the formation of bubbles possible, and is responsible for the way water makes droplets on a surface. It may seem like the water strider is floating in water the same way a boat does, but there are some important differences. A boat floats using the buoyant force and displacing water. The buoyant force (the force of the water pushing against the boat) is equal to the amount of water it displaces. The water strider does not displace any water so it can't be said to be floating. It simply uses its long legs to create a large surface area, distributing its weight well enough that it does not break the force of the surface tension.

Wrap Up:

Experiment with the relationship between mass, surface area and surface tension by making different kinds of water strider. Make some with longer or shorter legs, or use heavier wire like paperclips and notice how well each water strider does.

