

Surface Tension and High Diving

Surface tension makes water act as though it has an invisible skin. Anyone who's done a belly flop into a pool has had painful experience with this "skin." Olympic high divers need to enter the water with a knife-like precision, exposing the smallest cross-sectional area of their bodies to the water surface to lessen the blow caused by the water's surface tension. In this activity, you'll observe water's surface tension up close.

Important...

If you have trouble getting the horizontal needle to float, try one of these ideas:

- Rub it on your forehead, being careful not to stick yourself, then try to float it.
- Float a piece of tissue paper on the surface of the water. Gently place the needle on the paper. Using the point of a sharpened pencil, push the paper under the water. The needle should remain on the surface.

Stuff You'll Use: ▶clear plastic cups ▶needle ▶magnifying lens
▶waxed paper ▶water ▶dishwashing liquid ▶eyedropper ▶(optional) tissue paper ▶(optional) sharp pencil

What to Do:

- 1 Fill a cup (free from any soap residue) with water.
- 2 Drop a needle, point-first, into the water and observe.
- 3 Carefully lower a needle horizontally into the water and observe.
- 4 Using a magnifying lens, examine the surface of the water that is in contact with the needle. *Do you see a depression in the water?*
- 5 While the needle is floating, use an eyedropper to add several drops of dishwashing liquid. *What happens? Why?*

How It Works:

The high surface tension of water allows it to support objects that are more dense than water, such as a needle. The surface tension results from the very strong attraction water molecules have for each other. The tendency for particles of a liquid to be attracted to each other is called cohesion. The figure at left provides a graphical illustration of the cohesive forces in a water sample. Water molecules in the middle of the drop of water are attracted equally in all directions. Those water molecules on the surface, however, are only attracted to water molecules within the drop. This creates a force across the surface that causes a drop of water to form a bead.

Surface tension can be reduced by introducing a surfactant (a surface-acting agent) such as detergent, which interferes with the attractive forces between the water molecules. When the dishwashing liquid is added to the water, the horizontal needle sinks because the detergent has lowered the surface tension of the water.

More Fun?

Learn more about the topics addressed in this activity. Terrific Science Press (www.terrificscience.org/sciencestore) offers the following books that include activities involving the science of water and surfactants:

- ▶▶ [*Teaching Chemistry with TOYS*](#)
- ▶▶ [*Dirt Alert: The Chemistry of Cleaning*](#)

