

# How many drops of water can you rest on one coin?



Explore surface tension with this simple activity.

**Setting:** Indoors

**Time:** < 10 minutes

**Concepts:** surface tension, properties of water

**Skills:** observing, math

## Subject(s):

- ✓ Physics
- ✓ Chemistry

## Ages:

- ✓ 6-8
- ✓ 9-11

## Materials:

- A coin
- Water
- Water droppers (eye droppers)

## What to do!

1. Using the dropper carefully drop as many drops of water as possible on the coin.
2. Record the number of drops you can place on the coin before the water flows over the edge.
3. When the water flows over the edge, start again!
4. Observe and describe the shape the water takes as you continue to add drops up to the point where it flows over the edge.
5. Repeat this at least three times and then calculate the average number of drops you recorded.

## What's happening?

The surface of the water curves because the top layer of the water acts like an invisible skin over the water, which keeps the water from flowing over the edge of the coin. This “skin” effect is caused by surface tension. Water molecules have a negative end and a positive end. As a result they are attracted to each other – they tend to “stick together”. This attractive force is known as cohesion. Forces, or attraction, between unlike molecules is called adhesion (i.e., the water sticks to the coin by adhesion)

Molecules within a liquid are attracted to all other neighbouring molecules equally so that the resultant force on any molecule is zero. Molecules at the surface of the liquid have the same molecules on one side (water) but different molecules (air) on the other side. The cohesive forces between water molecules are far greater than the adhesive forces between water and air molecules. This results in a net force on the surface towards the centre of the liquid. As a result of this force the liquid assumes a shape that has the smallest surface area – that of a sphere. This causes the surface of the water on the coin to be curved. Eventually gravity will overcome the cohesive forces and the water will flow over the edge of the coin.

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## Why does it matter?

Soaps and detergents interfere with the cohesive forces between water molecules, reducing overall surface tension when they are mixed with water. Pollution of water with detergents and household cleaners can significantly affect the survival of animals, insects and plants that rely on surface tension to live. For example, plants absorb water by exploiting the surface tension of water. Some insects, like water striders, rely on the surface tension of water for locomotion.



## Investigate further!

- Try to rest a needle or paper clip on water to see if the surface tension of water will hold it up. Can you make it stay on the surface?
- Investigate the effect of detergent on surface tension. In a pan of shallow water, sprinkle some pepper. Does it stay on the surface? Add a drop of dish detergent to the middle of the pan. What happens? Can you explain why this happens?
- Compare the cohesive forces of different liquids with water (e.g., vinegar, rubbing alcohol, milk, juice). The greater number of drops that can fit on the coin indicates higher cohesive forces between the molecules. Rank the liquids from highest to lowest cohesive force.