

How Many Pennies?

Action

Students will see that more pennies fit into one for the glasses of water without any apparent reason.

Grade Level

Grade 9 - Fluids and Pressure

Biology 30 - Chemical Basis of Life

Materials

- 2 regular drinking glasses (they must be the same)
- Liquid detergent
- Approximately 50 pennies

Instructions

- Fill one of the glasses to the brim with water. To the other glass, add a drop of liquid detergent and then fill that glass to the brim with water. Do not let the students know that there is liquid detergent in one of the glasses before you do the experiment. Both glasses should look the same, like they contain only water.
- Have two student volunteers add pennies to the glasses at the same time. Continue adding pennies until the glasses overflow. See which glass can have the most pennies added without overflowing.

Safety

No safety concerns.

Hints

Have the glasses full, but not overfull of water when you start the experiment. Place the pennies in the glasses carefully by putting them in the water vertically at the edge of the glass.

Science Principle

In the glass without the liquid detergent, the surface tension is much greater because the surface water molecules have very strong cohesion. As a result, a convex meniscus is formed before the water runs over the side of the glass. In the other glass, the detergent breaks the surface tension so as soon as the water reaches the top of the glass, the water runs over. As a result, many more pennies can be placed in the glass with no liquid detergent than in the glass with liquid detergent without it overflowing.

A similar experiment can be performed using pennies and water. Students are each given a penny, an eyedropper and a glass of water and told to add as many drops of water as possible without the water running off the surface of the penny. The students will see the same convex meniscus formed on the penny and surface tension can be discussed.