

How Many Drops Can You Pile on a Penny?

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Materials; (per class)

- 15 micropipettes
- 15 pennies
- 15 paper towels
- 150ml liquid detergent
- 150ml saturated solution NaCl
- 150ml saturated solution Na₂CO₃ (washing soda)
- Tap water

Because of water's highly polar bonding it displays a characteristic called surface tension. By adding chemicals that affect the polarity of the water bonds you can change the surface tension of the water. The number of drops of water that will "stick" to a penny is a good indicator of surface tension, and therefore the strength of the water bonding.

Pre-lab discussion:

- 1) Explain how the intermolecular forces between water molecules act to create the "skin" or surface tension.
- 2) What causes water molecules to be polar?
- 3) Which part of a detergent molecule allows it to dissolve in water, what part allows it to dissolve in oily substances?
- 4) What is viscosity and what does it have to do with surface tension?

Procedures:

- 1) Fill the micropipette with tap water.
- 2) Place drops on top of a penny. Be sure to hold the micropipette vertically. Do not touch the penny or the water that accumulates there.
- 3) Count the number of drops you can add before the water flows off the penny. Record the total.
- 4) Dry the penny off and repeat steps 2 and 3 twice more to insure reliable data.
- 5) Repeat steps 1 through 4 but fill the micropipette with the salt (NaCl) solution instead.
- 6) Repeat steps 1 through 4 but fill the micropipette with the Washing soda solution (Na₂CO₃) instead.
- 7) Repeat steps 1 through 4 and use the detergent solution in the micropipette.

Data Table:

Substance	Drops (range)	Drops (average)
Water		
Salt		
Washing Soda		
Detergent		

- 1) Compare the average number of drops placed on the penny with the results of your classmates. What might account for any differences?
- 2) What happened when the water finally flowed off the penny? Describe the forces involved.
- 3) What was the control for this procedure?
 - 4) What effect did the detergent have on surface tension? Why?