

Lab: Drops on a Penny

Exploring Scientific Method

Background Information

Cohesion

- Water molecules are attracted to other water molecules.



Background Information

Surface Tension

- Surface tension is the cohesion of water molecules at the surface of a body of water.
- The cohesion forms a surface 'film' or 'skin'.
- Some substances may change the cohesive force – or strength – of the surface 'skin' of the water.

Identify the Problem

- Does soap increase, decrease, or not effect the cohesion (surface tension) of water molecules?



Hypothesis

Educated Guess

- I believe that the effect of the soap on the cohesion (surface tension) of water molecules will be to increase / decrease circle one

Because ...

- Soap is slippery and will make the water fall off.

Alternatively (increase)

- Soap is heavy and will help to hold it in place.

Proper Lab Conduct

- Be careful not to get soap (chemical) in your eyes.
- Never taste anything used for a lab experiment.
- Clean up your area after an experiment, and return the materials to their proper location.
- Do not use the pipettes to squirt water; they are only for use as described in the procedure.



Materials

Each group will need:

- Four 5-fils coins (wiped clean with a tissue, but no soap)
- One ¼ cup of water (bottled or distilled)
- One ¼ cup of soapy water (10 drops of dish soap)
- One pipette
- Sheets of tissue or paper (to see when the water overflows)



Procedure

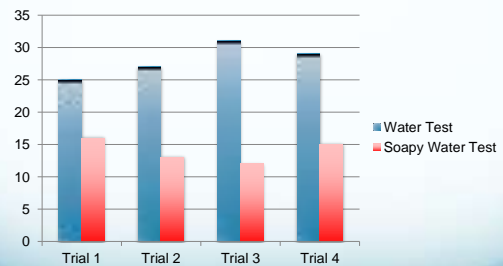
- **Step 1** – Wipe the coins to clean them off, but don't use any soap.
- **Step 2** – Place one coin on a sheet of paper.
- **Step 3** – Use the pipette to place one drop of WATER on the coin at a time until ANY amount of water runs over the edge of the coin.
- **Step 4** – Record the number of drops for that trial in the Data Table.
- Repeat steps 1-4 for each water trial, and then do the same thing only using SOAP WATER.

Data Tables

Water Test – Data Table				
Trial 1	Trial 2	Trial 3	Trial 4	Average
25	31	27	29	28

Soapy Water Test – Data Table				
Trial 1	Trial 2	Trial 3	Trial 4	Average
16	13	12	15	14

Drops of Water Graph



Data Analysis

1. Calculate the Average number of drops for each of the tests.

$$(\text{Trial 1} + \text{Trial 2} + \text{Trial 3} + \text{Trial 4}) \div 4 = \text{Average}$$

$$(25 + 31 + 27 + 29) \div 4 = 28$$

$$(\text{Trial 1} + \text{Trial 2} + \text{Trial 3} + \text{Trial 4}) \div 4 = \text{Average}$$

$$(16 + 13 + 12 + 15) \div 4 = 14$$

Data Analysis

2. Were your trials close in the numbers of drops to one another for each of the tests or was there a big difference?

- My numbers were all within 4-6 digits of one another.
- If they were not, I would repeat the experiment carefully. This is because maybe my clean water had some soap in it by accident.

Data Analysis

3. If each drop is about half a millimeter (0.5 mm), how many millimeters on average would fit on the penny with water, and how many would fit on the one with soapy water?

$$28 \text{ drops of water} \times \frac{0.5 \text{ mm of water}}{\text{drop of water}} = 14 \text{ mm of water}$$

$$14 \text{ drops of soapy water} \times \frac{0.5 \text{ mm of water}}{\text{drop of soapy water}} = 7 \text{ mm of water}$$

Data Analysis

4. Which test had more drops stay on the coin? By how many drops, and how many milliliters?
- The Water test had on average 14 more drops (7 milliliters) stay on the coin than the Soapy Water test.

Conclusion

5. The data from my experiment proved that my hypothesis was CORRECT INCORRECT (circle one), and that the effect of the soap on the cohesion (surface tension) of the water molecules increased / decreased (circle one).

Because...

- Soap acts as an impurity and doesn't grab on to water molecules like other water molecules do.
- Soap helps to break down molecules that are trying to bind together.

Conclusion

6. If I was to repeat this experiment, I would consider the following changes (list at least two different things or ways you would test such as using a different type of liquid):
- Using different size coins.
 - Using different types of soap.
 - Using pop instead of just water.
 - Using hot water and cold water.

Lab: Drops on a Penny

- Make sure your name is on as Marker.
- Total the Lab out of 10 and write it at the top.
- Hand it back.
- Write your own score down on your Grade Tracking Sheet.