



How is the Surface Tension of Water Affected By Soap?

Introduction: Surface tension of water is a force exerted by the surface of water on the particles below. It results from the attraction of water molecules to other water molecules. The force of surface tension tends to pull drops of water into spherical shapes. When drops of falling water are photographed with a high-speed camera, their shape is visible. Surface tension refers to water's ability to "stick to itself". Surface tension can be measured and observed by dropping water (drop by drop) onto a penny. The number of water drops that can fit on a penny will surprise you.

1. **Initial Observation:** Observe surface tension by seeing how many drops of water can fit on a penny.

Number of Drops 11

Question: How does soap affect the water's surface tension?

2. Develop a **hypothesis** that answers the experimental question. Write your hypothesis below. *I think soap "loosens" the surface tension, which means less water will stay on the penny.*

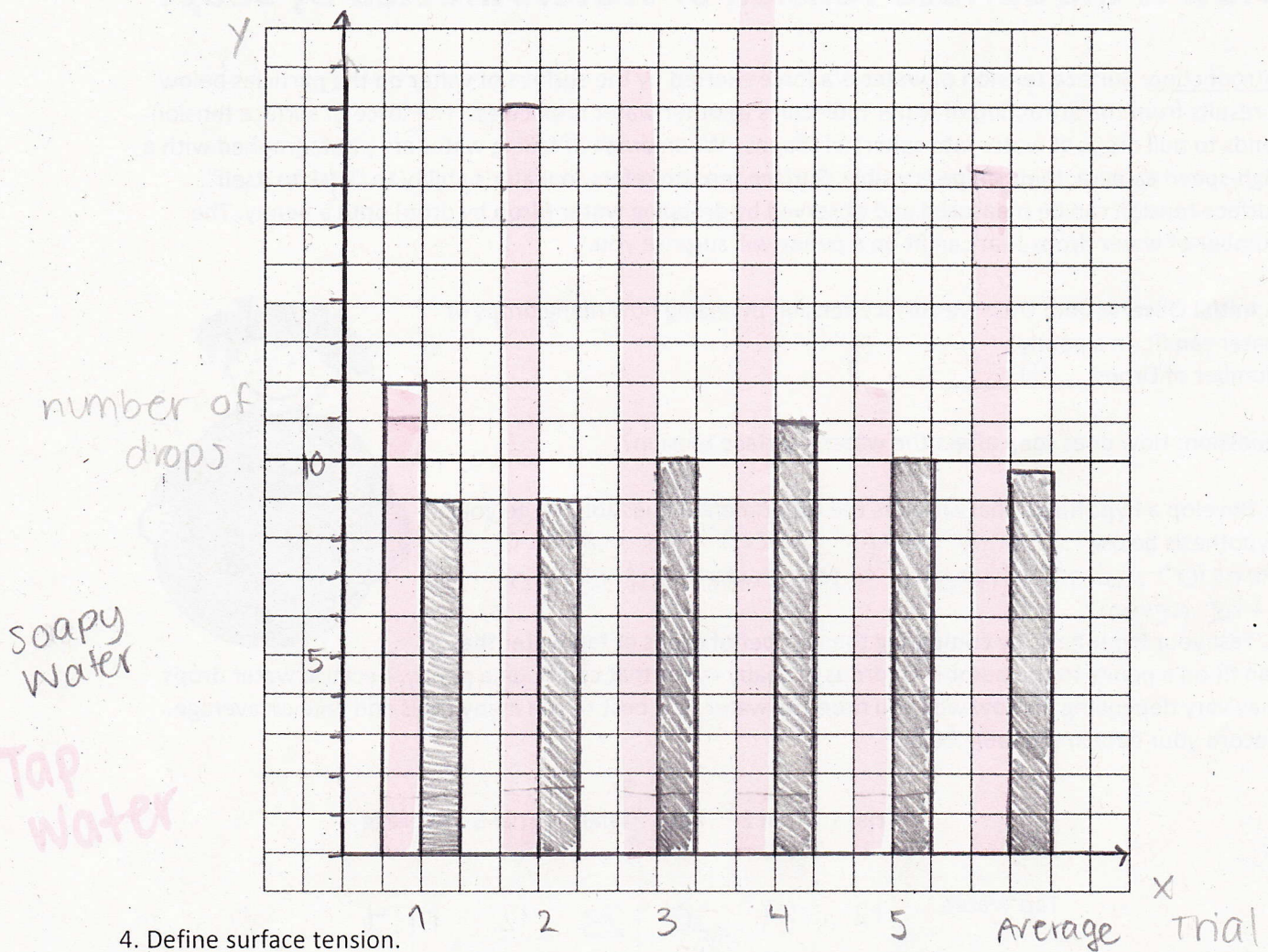
3. Test your hypothesis by comparing the number of drops of tap water that can fit on a penny to the number of drops of soapy water that can fit on a penny. Because water drops may vary depending on how well you drop the water, it is best to run many trials and take an average. Record your data in the table below



	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
Tap Water	12	19	20	23	12	17.4
Soapy Water	9	9	10	11	10	9.8



3. Create a graph that best represents all of your data.



4. Define surface tension.

Surface tension is a measure of how difficult it is to break the surface of a liquid.

5. Was your hypothesis supported or rejected? Support with specific data.

My hypothesis was supported by the fact that the penny held less soapy water than tap water in every trial.

6 Suggest a reason for your observations and data (Why did it happen?).

The soap inhibited the water's ability to stay on the penny. The soap probably broke some hydrogen bonds between the water's molecules that would have held the water on the penny as the amount increased.

7. Why were many trials taken and averaged?

Many trials were taken and averaged, so we can prove the reliability of the information. The same result does not always occur for every trial, so we needed to perform multiple tries and average them.

8. What is an experimental constant? Why is important to keep aspects of an experiment constant?

What are the constants in this lab (list at least three)?

An experimental constant is a part of the experiment that does not change throughout. It is important to keep aspects of an experiment constant so a change in the part that is being examined may be observed. Constants in this lab include use of a penny to measure, number of trials performed, and a pipette to measure drops of liquid.

9. What is a control? In this experiment, what is your control group?

The control group serves as a standard for comparing with the experimental group. In this case, the control would be using normal water.

10. What is an independent variable? Identify the independent variable in the experiment.

An independent variable is a variable that does not depend on other variables and will not be changed by them. The independent variable in this experiment would be the type of liquids we drop onto the penny. (amount of soap)

11. What is a dependent variable? Identify the dependent variable in the experiment.

A dependent variable depends on other factors. In this experiment the dependent variable is how many drops fit on the

12. Name the 5 unique properties of water. penny.

1. Cohesion
2. High surface tension
3. High specific heat
4. Valuable solvent
5. Adhesion

13. People usually think of water as being wet. If water alone is used to wash clothing, however, it doesn't penetrate the fabric very well. Based on what you observed in the lab, how does the addition of detergent make water "wetter", that is, more capable of penetrating the pores of the fabric?

The detergent allows oil and water to mix more readily by lowering the surface tension of water. The soap binds to oily dirt and pulls it away when mixed around with water.