

# Student Investigation Sheet

## Cohesion and Surface Tension of Water

In this investigation you will perform two investigations that will demonstrate the properties of cohesion and surface tension in water. Cohesion refers to the binding of two like molecules. In the case of water, cohesion refers to the binding of water molecules via hydrogen bonds. In other words, water molecules cohere to one another. Similar to the cohesive property of water is its high surface tension. Due to hydrogen bonding, it is relatively difficult to “break” the surface of liquid water compared to other liquids.

**Safety Precautions:** Wear closed-toe shoes and do not eat or drink anything in the lab (including the experimental materials). Report any broken glass, and do not to try and clean it up by yourself.

**Objective(s):** You will investigate the properties of water, including surface tension and cohesion.

### Materials:

Per group:

- coin (penny, dime, or nickel)
- 25 mL graduated cylinders, 2
- 200 mL beaker
- eyedroppers, 4
- liquid soap or dish detergent in a small container
- distilled water
- cooking oil
- food coloring
- glass stirring rod
- stopwatch or timer

### Key Question

<b>What is the question you want to answer?</b>	
	<i>Directions:</i> Write the question for the investigation. The question should be specific and investigable.
	<u><i>Key Components</i></u> <ul style="list-style-type: none"><li>• Specific (one general thought, does not combine two or more questions)</li><li>• Is able to be investigated</li></ul>

### Hypothesis

<b>What do you predict will be the result of the investigation?</b>	
	<i>Directions:</i> Develop a claim about what you think is going to happen.

Key Components

- Expresses a cause-and-effect relationship
- Is testable
- Incorporates prior knowledge

## Plan

How will you investigate the question?	
	<p><i>Directions:</i> Describe the plan that you will use to study your question and analyze your hypothesis.</p>
	<p><u><i>Key Components</i></u></p> <ul style="list-style-type: none"><li>• Plan is easily repeatable by others</li><li>• Plan describes the use of materials</li><li>• Plan is in a logical order</li></ul>

## Data

**What evidence was gathered during the investigation?**

*Directions:* Record all of the evidence that has been collected. Use graphic organizers, tables, and graphs when appropriate.

*Key Components*

- Data (from an investigation and/or other sources, such as observations, reading material, archived data, etc.)
- Appropriate (data applies directly to the question)
- Sufficient (uses enough data to completely answer the question and determine a finding on the hypothesis)

## Conclusion

What did you learn from this investigation?

*Directions:* Develop a conclusion for your investigation. The conclusion should contain clear thoughts and proper vocabulary. This section focuses on the answer to your question. It should support or refute the hypothesis by using logical reasoning to link the hypothesis to the data.

*Key Components*

- Use precise and accurate language
- Use scientific vocabulary
- Provide clear logical thoughts
- Use evidence and reasoning to support or refute the hypothesis

## Analysis and Conclusions

1. How did your predictions compare with your results? What might explain discrepancies, if any?
2. What type of chemical attraction is responsible for both the high surface tension and cohesion of water? With respect to this chemical attraction, why is oil unable to dissolve in water?
3. How and why did the liquid soap change the number of drops that could fit on the coin's surface? How and why did it change the association between oil and water?
4. Using the Internet or other resources to learn about the relevant chemical properties of ethanol, answer the following question: Compared to water, how much ethanol would you expect to fit on the surface of a coin: more, less, or the same amount? Why?