

10C – SURFACE TENSION

Part 1 Analysis – Demonstrating surface tension

Table 1 – Demonstrating surface tension

# of drops	Observations of water

Part 1 Questions – Demonstrating surface tension

1. Why does the penny have to be clean, and free of oils and detergents?
2. What type of intermolecular forces are holding the drop together? How does this force work on the molecular level?
3. Provide evidence from this activity that supports the claim that water has a high surface tension.

Part 2 Analysis – Surface tension supports weight

Table 2 – Surface tension supports weight

Item	Small paperclip	Large paperclip	Dime	Staple
Observations				

Part 2 Questions – Surface tension supports weight

1. Which objects did you successfully float on the surface of the water? What is happening at the molecular level that allows these objects to float?

2. What do you observe about the surface of the water near the paperclip?

3. Based on your observations of how various items behaved on the surface of the water, how does mass affect the strength of the intermolecular forces at the surface of the water?

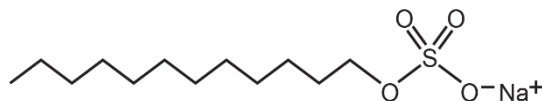
4. In terms of density and intermolecular forces, why was it so difficult to get the dime to float?

Part 3 Analysis – Surfactants**Table 3 – Surfactants**

Observations	
Number of drops required to see a change	

Part 3 Questions – Surfactants

1. What happened to the paperclip when you added the drops of soap solution? Why do you think this happened?
2. A typical soap compound has a structure shown below. Assume carbon atoms exist at each bend in the chain, and there are enough hydrogen atoms bonded to fill 4 bonds per carbon. Circle the part of the soap compound that would be attracted to water. Explain your reasoning.



3. Soap acts as a *surfactant*, lowering the surface tension of water. Where can you find surfactants at home? What do they do? How does surface tension determine what those surfactants do?

Part 4 Analysis – Temperature and surface tension

Table 4 – Temperature and surface tension

Item	Small paperclip	Large paperclip
Observations		

Part 4 Questions – Temperature and surface tension

1. Compare your results to those observed in cooler water (Table 2). Were you able to float the paper clip on hot water as easily as cooler water?

2. What happens to the surface tension of water as it is heated? From an intermolecular perspective, why does this happen?

Part 5 Analysis – Surface tension and small particles

Table 5 – Surface tension and small particles

	Pepper	Pepper + soap
Observations		

Part 5 Questions – Surface tension and small particles

1. Would salt particles behave the same as pepper particles if you sprinkled salt on the top of the water's surface? Explain your answer based on what you think happens with salt-water particle attractions at the molecular level compared to pepper-water attractions.
2. What other substances in nature act like pepper when contacting water? Describe at least two examples.
3. How does the strength of intermolecular forces of nonpolar compounds like oil compare to the strength of the intermolecular forces of polar compounds like water? Based on your answer, predict whether it would be easier or more difficult to float a paperclip in vegetable oil compared to water. Explain your answers.
4. How does the polarity of a molecule relate to its surface tension?