

Research question: how does presence of soap and salt affect the capillary action of water in a glass tube.

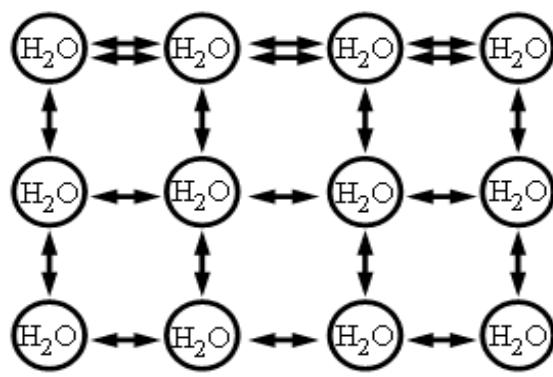
Introduction: Why I did.

The reason why I wanted to study water tension is because it has always fascinated me. My first encounter with water tension was when I saw water striders, I thought it was odd how an insect was able to walk on water and not sink. After this observation several question popped up in my head such as how can it float? Why can't I stand on the water? And lastly is there a way for the insect to sink in the water? This is why I chose to research on this in this paper to get a further understanding on how water tension actually works, in order to gain knowledge. But hopefully getting all the answers I wanted.

Background: how does water have water tension?

Water tension is the property of the surface of the liquid that allow it to resist an external force, due to the cohesive forces. When the cohesion between the water molecules is stronger , the increase of resistance increase. The reason why the water tension is so strong at the top is, because water molecules want to share cohesive forces with neighboring molecules however as the water molecules above has not many neighboring molecules its creates a stronger bond between the top molecules this can be illustrated in the figure under.

#### SURFACE



**Surface tension—molecules at the surface form stronger bonds**

Material:

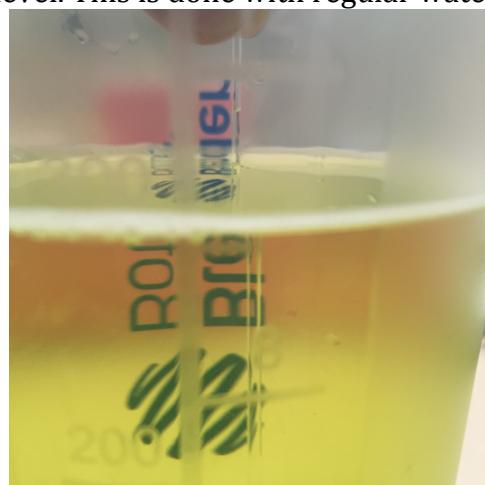
- Cup
- Water
- Salt
- Ruler
- Soap
- Tubes, capillary

### Method: what I did

In this experiment soap and salt will be added to water in order to observe the increase and decrease of water tension. First step of the experiment is to fill the cup to 300 ml of water then measure the distance of the water. When having obtained this information a capillary will be inserted in the water, at this moment the water will rise up in the tube and a mark will put on how far up the water rose up. Next step was to put several pumps of regular hand soap, stir it together and measure it the same way as previously explained, this was done with salt and water too. In order to get the most accurate results two tubes were inserted in each of the solution. After this the comparison between tubes were made in order to observe how strong the water tension of each solution is but also see what increase and decrease the water tension and by how much.



Picture above shows how the water raises higher inside the tube than the water level. This is done with regular water.

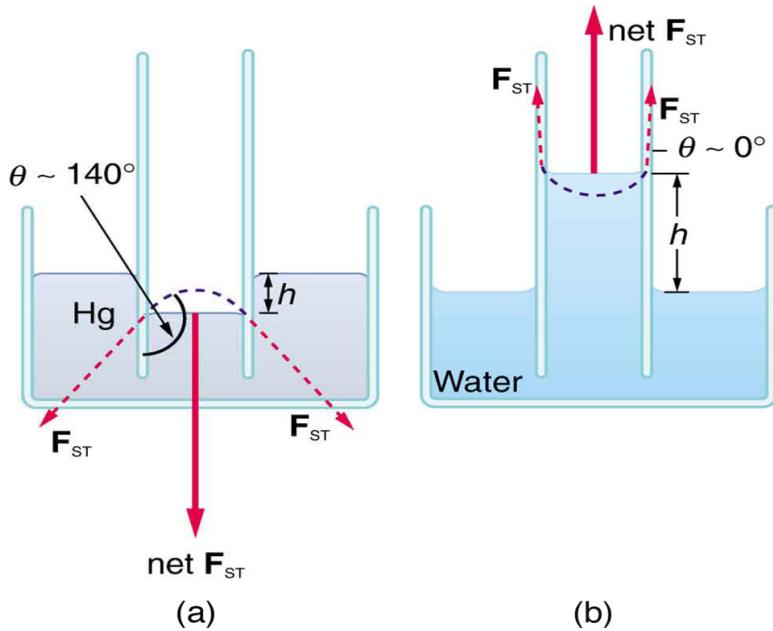


This is done with soap the water tension decreased.



Picture above shows the measurement made for each solution.

## Results: Data table and Images



The picture above shows how we can calculate the water tension and how the experiment looked like. The solution on the left side is mercury and the one on the right side is regular water. As illustrated above the water in the tube rose exponentially due to water tension and the solution on the left sank.

The height of the water was 7.3 cm  $\pm$ 0.01

Water	Salt + Water	Soap+ Water	Percentage Error
$8.7 - 7.3 = 1.4$	$8.3 - 7.3 = 1.0$	$7.8 - 7.3 = 0.5$	$0.02 \pm$
$8.6 - 7.3 = 1.3$	$8.4 - 7.3 = 1.1$	$7.8 - 7.3 = 0.5$	$0.02 \pm$

## Discuss data:

The capillary action is obtained by cohesive and adhesive forces. Cohesion is the property of like molecules (of the same substance) to stick to each other due to

mutual attraction. Adhesion is the property of different molecules or surfaces to cling to each other.<sup>1</sup>

As shown in the table above the water tension of just water is the strongest, followed by salt and water and the one with least water tension is soap. The reason why water has the strongest water tension is because of the strong dipole dipole bonds, however when one starts to add soap the bonds become weaker since the soap breaks up the strong water molecules. The reason why soap works this way is to easier clean clothes and water tension decrease. It was clearly observed that soap is very efficient.

Discuss error:

Some error that could have occurred was the measurement it was not 100 % since the ruler only measured cm and mm

Conclusion:

Bibliography/ reference

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<sup>1</sup> [http://www.diffen.com/difference/Adhesion\\_vs\\_Cohesion](http://www.diffen.com/difference/Adhesion_vs_Cohesion)