



H2Olympics

Summary

In this lesson you will compete in a Water Olympics to investigate two properties of water—adhesion and cohesion.

Digital Option

This activity is available as a digital lesson on your computer, tablet or smartphone. You may choose to do the activity digitally if you prefer but check with your teacher first. Scan the QR code below with your smartphone camera to access the digital version or go to



Pre-Activity Questions:

1. Do you know the definitions of cohesion and adhesion? Write your best guess below. If you're not sure, that's ok! You will learn about it in this lesson.

Cohesion:

Adhesion:

Get WET!

Home Water Lessons

Name: _____

2. Have you ever seen an insect walk on water? How are they able to do this? Take your best guess below.



Materials

Please gather these materials before starting.

Activity

- Coins
- Eye dropper (or pen/pencil)
- Clear glass or cup
- Several paper clips
- Fork
- A soup bowl with water in it
- Pepper
- Liquid soap such as dish soap
- A strip of paper towel
- A tall glass
- Water
- A pen or pencil
- Towels to clean up water
- Flat cookie sheet to catch spills

Procedure

Activity

We are going to compete in some water Olympics, or H2Olympics as this activity is called, to learn the properties of water. These properties allow bugs to walk on water and make water droplets stick to leaves.



Pole Vault

1. For the Pole Vaulting event you will need:
 - A penny
 - Water
 - Eye dropper (or pen/pencil)
 - Cookie sheet to put all the materials on
2. Fill a cup with water until it is even with the rim. Place the cup on the cookie sheet.

3. Add pennies (or other available coins), one at a time. Keep track of the number of pennies added. Continue to add pennies until the water spills over the side.
4. How many pennies were you able to add before the water spilled over? Enter your results below.

Number of Pennies: _____



What happened in this event? The **surface tension** created by **cohesion** of water molecules allows the water to brim over the glass before the tension is too great and the water molecules break apart and spill.

Balance Beam

5. For the Balance Beam event you will need:
 - *A penny*
 - *Water*
 - *Eye dropper (or pen/pencil)*
 - *Cookie sheet to put all the materials on*
6. Place a penny on the cookie sheet. Using an eyedropper, add as many drops of water on the penny as possible without spilling over the edge. Keep track of the number of drops. Continue until water spills over the edge of the penny or the water drop collapses.
7. How many drops of water were you able to put on the penny? Enter your result in the box before moving on.

Number of drops: _____

Water piles up on a penny forming a large dome due to the **cohesive** nature of water molecules that attract to each other. The **adhesive** nature of water to other materials makes it stick to the penny and create the edges of the dome.

The Pepper Sprint

8. The materials you will need for the Pepper Sprint are:
 - *soup bowl with water in it*
 - *pepper*
 - *soapy water created from soap and water*

9. Sprinkle pepper over the water in your bowl of water. What does the pepper do when sprinkled on the water? Describe your observations below.

10. The pepper appears to float on the water. Put your finger in it and see what happens? Does anything change?

11. Add a drop of soapy water to the middle of the bowl with pepper and watch what happens! Describe below.



12. What happened? The soap breaks the surface tension of the water by breaking the **cohesive** bonds of water. This event happened so quickly we can't even time it!

13. Let's look take a closer look at soap breaking the **surface tension** of water. Here we have a bowl of water sprinkled with pepper.

As we learned in the previous events the **cohesive** property of water creates what appears to be a membrane of water. This is called **surface tension** and is what holds the pepper on top of the water.



When we add a drop of soap. The pepper appears to scatter to the sides of the bowl. This is because the soap broke the surface tension of the water and propelled the water to the edges of the bowl along with the pepper.

Distance Running

14. For the Distance Running event you will need:

- *A strip of paper towel*
- *Pen or pencil*
- *Tape*
- *Tall glass*
- *Water*

15. Add an inch of water to the glass.

16. Attach a strip of paper to a pen or pencil using tape or tying it around the pen.

17. Cut it to the length of the glass.

18. Draw a line in the center of your paper towel.

19. Get your timer ready.

20. Place the paper towel in the glass and rest the pen on top.

21. Immediately start timer!

22. How long does it take for the water to reach the line on your paper towel? Record the number of seconds below.

Number of seconds: _____



What happened? Water seemingly “climbs” up to the paper towel. This is called **absorption**. This event is the result of the **cohesive** and **adhesive** properties of water that cause the water to bond to itself and the paper towel, allowing it to move up the paper towel. This is the same process that allows water to move up plants and trees in **capillary action**. Capillary action occurs when the adhesive bonds to the vessel walls (or paper towel) are greater than the cohesive bonds of the liquid.

Backstroke

23. For the Backstroke event you will need

- *A cup of water*
- *Paper clips*
- *A fork*

24. Try placing a paper clip on the surface of water. The easiest way to do this is to lay the paper clip on the prongs of a fork and lower it into a cup of water. See how many paper clips you can suspend on the water’s surface.

Enter your result below.

Number of paper clips on top of water: _____



What Happened? The **cohesive** nature of water—the property that causes water to “stick” to itself—creates **surface tension** allowing paperclips to stay suspended on the surface of water. This is exactly how water bugs stand on water!

Let's Review!

What was your result in each event?

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Pole Vaulting: _____

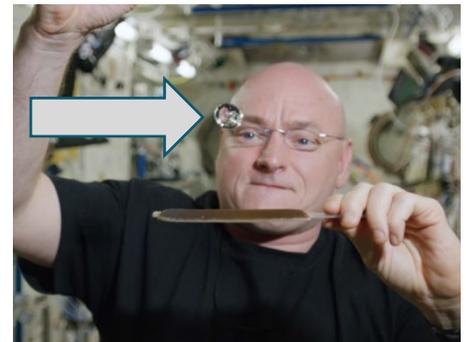
The Balance Beam: _____

Distance Running: _____

Backstroke: _____

Congratulations! You have medaled in the Water Olympics!

In space, without gravity, water behaves differently. Without gravity it attracts to itself or to objects near it more easily. It forms balls of water that “stick” together.



Quiz

1. What property causes water to form balls and bond to itself in space? Circle the correct answer.

Adhesion

Surface Tension

Cohesion

2. Which picture shows the properties of adhesion? Circle the correct picture.



Glossary

Adhesion: The attraction of water molecules to other materials as a result of hydrogen bonding.

Capillary action: The means by which water is drawn through tiny spaces in a material, such as soil, through the processes of adhesion and cohesion.

Cohesion: The attraction of water molecules to each other as a result of hydrogen bonding.

Gravity: The natural force of attraction exerted by Earth on objects or materials on its surface that tends to draw them down toward its center.

Surface tension: The attraction among water molecules at the surface of a liquid; creates a skin-like barrier between air and underlying water molecules.

Universal Solvent: A term applied to water because it can dissolve many substances.