



Water Connections

OBJECTIVE:

These exercises will demonstrate the adhesive, cohesive, and surface tension properties of water. They will show you how water in the form of rain can adhere to pollution molecules as well as demonstrate how plants will not absorb water from their leaves or roots if water flow occurs without adhesion and cohesion. The resulting erosion and damage to management of water would be significant. Therefore, proper protection and conservation of water can ensure a plentiful supply for all.

MATERIALS:

Activity 1

Clear plastic cups
100 pennies
Water



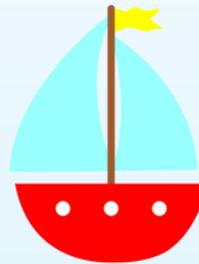
Activity 2

Eyedropper
1-2 pennies
Water



Activity 3

Boat pattern (see activity page)
Stiff cardboard or manila folder
Water
Liquid soap
Large pan
Scissors



Activity 4

Fork
Paper clips
Magnifying glass
Clear plastic cup of water



BACKGROUND:

The nature of water molecules causes them to be attracted to other water molecules as well as to molecules of other substances. This adhesion is required in order for water to move through plants, as it is for blood to move through the body. The cohesive force between water molecules causes the water surface to behave as though it's covered by a thin membrane that is always trying to contract. This surface tension is like water's skin. Paper clips and water striders do not actually float. They are held up by bonds between water molecules. Wood and some other objects, however, do float on water. They break the surface tension and stay afloat because water molecules deeper in the water can support their weight.

The same forces that cause water molecules to be attracted to each other cause them to adhere to other substances. If these adhesive properties were not present, water would slide off all substances, such as leaves and animals.

PROCEDURE:

1. Set the classroom up in 4 different activity stations. The students can work individually or in groups. Explain to students that the activity will demonstrate some of the amazing qualities of water.
2. Students will rotate through each activity, recording their results on the sheets provided at each station.
3. After the students have rotated through all the stations, discuss the definitions of adhesion, cohesion, and surface tension with the whole class.
4. Have students guess which definitions match each experiment and review the correct answers.
5. Have students write a reflection on the experiments and their results.

KEY VOCABULARY:

Adhesion is the attraction of water molecules to other materials (such as grass, soil, or leaves).

Cohesion is the attraction of water molecules to each other as a result of hydrogen bonding.

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

Name _____

Date _____

ACTIVITY 1: A Penny for Your Thoughts



Directions:

Fill the clear plastic cup with water until the water level reaches the rim of the cup. Add pennies one at a time. Keep count of the number of pennies you add. Continue adding pennies until the water spills over the side of the cup.

Before Activity: How many pennies do you think you can add to the cup before the water spills over?

Your guess: _____

After Activity: How many pennies did you add to the cup before the water spilled over?

Number of pennies: _____

Definitions:

Adhesion is the attraction of water molecules to other materials (such as grass, soil, or leaves).

Cohesion is the attraction of water molecules to each other as a result of hydrogen bonding.

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

Which of the above water properties (**adhesion, cohesion, surface tension**) occurred with the cup of water and pennies? Use evidence from the activity to support your answer.

Name _____

Date _____

ACTIVITY 2: Dripping Away



Directions:

Using an eyedropper, place as many drops of water on the penny as possible without spilling over the edge. Keep track of the number of drops. Continue until the water spills over or until the water drops collapse.

Before Activity: How many drops of water do you think you will be able to place on the penny?

Your guess: _____

After Activity: How many drops of water were you able to place on the penny?

Number of drops: _____

Definitions:

Adhesion is the attraction of water molecules to other materials (such as grass, soil, or leaves).

Cohesion is the attraction of water molecules to each other as a result of hydrogen bonding.

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

Which of the above properties (**adhesion, cohesion, surface tension**) occurred with the penny and drops of water? Use evidence from the activity to support your answer.

Name _____

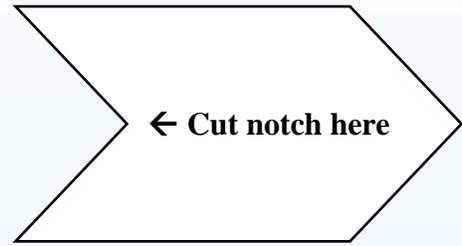
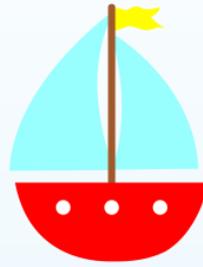
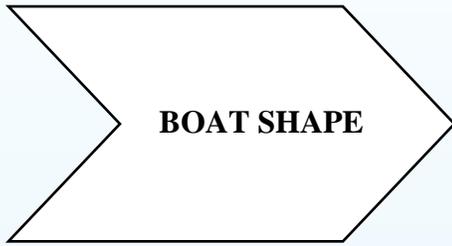
Date _____

ACTIVITY 3: Ready, Set, Go!

Part 1

Cut out two boat shapes (see below) from a piece of cardboard.

Place one boat in the large pan of water and observe what happens.



Part 2

Using scissors, cut a small notch in the back of the second boat (see below).

Put a small drop of soap on the notch.

What happened to the second boat? Compare the outcomes of Part 1 and Part 2.

Which water property or water properties (**adhesion, cohesion, surface tension**) occurred in Part 2? Use evidence from the activity to support your answer.

Name _____

Date _____

ACTIVITY 4: Float My Boat



Directions:

Try placing a paper clip on the surface of the water (Hint: Lay the paper clip on the prongs of a fork and carefully lower it into the water). Use a magnifying glass to observe the paper clip coming into contact with the surface of the water.

Before Activity: How many paper clips do you think you can suspend on the surface of the water?

Your guess: _____

After Activity: How many paper clips were you able to suspend on the surface of the water?

Number of paper clips: _____

Definitions:

Adhesion is the attraction of water molecules to other materials (such as grass, soil, or leaves).

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Which water property or water properties (**adhesion, cohesion, surface tension**) occurred in this activity? Use evidence from the activity to support your answer.
