

Student Activity Cards

Activity: *CALL ME BOND, HYDROGEN BOND*

Information: The surface of water acts like a skin that keeps some things out. The skin is actually a layer of water molecules held tightly together by hydrogen bonds. This is why water forms drops, and why some insects can skate on water's surface.

Challenge: Can you make water demonstrate the properties described in the paragraph above? Describe or draw a picture of how you did it. If you need help, send one group member to ask the teacher for suggestions.

Materials you will need: cup of water, paper clip, fork

Activity: *HOW CAN YOU TELL A POLAR MOLECULE FROM A POLAR BEAR?*

Information: More things dissolve in water than in any other substance. Some materials are magnetically charged (polar) and dissolve easily in water. Water molecules dissolve these materials by forming hydrogen bonds with each molecule in the material. Other substances are nonpolar. These do not dissolve or mix in water because hydrogen bonds are not formed.

Challenge: Which of these two materials is polar, oil or sugar? How can you tell? Send one group member to check with the teacher to see if your response is correct.

Materials you will need: cup of water, oil, sugar

Activity: *IT'S NO SWEAT. . . OR IS IT?*

Information: It is a very hot day. You and some friends decide to race around the block to the playing field. Suddenly, one of your friends stops and complains about feeling overheated. You happen to be carrying a bottle of suntanning oil and a bottle of water. One friend says oil will help cool down the overheated friend; the other claims water will work better.

Challenge: Which of your friends is right? Try spreading a thin layer of each liquid on your hand. Which one feels cooler? Suggest reasons for the outcome. Send one group member to check with the teacher to see if your response is correct.

Materials you will need: oil, water, paintbrush for each person

Activity: *FREEZING WATER IS A SWELL IDEA*

Information: You plan to go on a hike tomorrow. You want to bring along some water. You have water in both glass and plastic bottles. A friend suggests freezing the filled bottles overnight, so the water will still be cool when you need a drink.

Challenge: Which container of water should you put in the freezer? Draw a picture of and provide an explanation for what you think each might look like when you check the freezer in the morning. (Don't try this one at home!) Send one group member to check with the teacher to see if your response is correct.

No materials needed; this is a mental lab!



Hydrocharade Cards

Hydrocharade Card

HOW THE SURFACE OF WATER SUPPORTS A PAPER CLIP

All members of your group except one represent water molecules at the surface of a cup of water. Tie strings around your waists, leaving a tail hanging in back. Your backs represent the negative pole or end of the molecule. Indicate the positive end by holding your arms outstretched in front of you like a "V." Now hold tightly onto each other's strings; this symbolizes hydrogen bonding among water molecules.

To show a paper clip or a pin being supported by water's surface, one group member gently lays a broom handle or meter stick across several of the bonds (strings). You can also illustrate your failed attempts at floating the paper clip by placing the broom handle at an angle between the bonds.

Materials you will need: strings, broom or meter stick

Hydrocharade Card

HOW WATER DISSOLVES SUGAR

Get several sheets of scrap paper and write a large "+" at one end and a "-" at the other end of each piece. The "+" represents the positive pole of a sugar molecule, and the "-" represents the negative end. Put the papers in a pile. (This represents a cube of sugar that has just been placed into a cup of water.)

All members of your group except one represent water molecules swirling around the sugar cube. Each water molecule holds a string in each hand and has another string tied around his or her waist, leaving a tail hanging in back. Your backs represent the negative pole or end of the molecule. Indicate the positive end by holding your arms outstretched in front of you like a "V."

One group member, representing a spoon, "stirs up" the sugar and the water. This student tapes the positive end of the sugar molecules (pieces of paper) to the negative charge (the tail) of the water molecules. This student may also tape the negative end of the sugar molecule to the strings held in the water molecules' hands. The strings represent hydrogen bonds. The sugar molecules are kept in solution because they have formed hydrogen bonds with (are taped to) water molecules.

Materials you will need: strings, scraps of paper, tape, marking pen



Hydrocharade Cards

Hydrocharade Card

HOW EVAPORATING WATER MOLECULES REMOVE ENERGY

All members of your group except one represent water molecules in a liquid state. Tie strings around your waists, leaving a tail hanging in back. Your backs represent the negative pole or end of the molecule. Indicate the positive end by holding your arms outstretched in front of you like a "V."

In liquid form, the water molecules remain close together, weaving in and about each other. Because molecules are in motion during the liquid state, hydrogen bonds are constantly formed, broken, and reformed as molecules pass by each other. Represent this by weaving around each other, grasping onto and releasing the strings of other molecules as they pass by. The strings represent hydrogen bonds.

To show some molecules being heated up, have one group member, representing a heat source, tag a few water molecules. Tagged molecules become energized. They move about more rapidly, making it more difficult for other molecules to hold onto them (to form bonds). Eventually, they break away, becoming gas molecules (evaporating). The molecules that are left behind have less heat energy, making the water feel cooler.

Materials you will need: string, a sign labeled "heat source"

Hydrocharade Card

HOW WATER EXPANDS WHEN IT FREEZES

All members of your group except one represent water molecules in a liquid state. Tie strings around your waists, leaving a tail hanging in back. Your backs represent the negative pole or end of the molecule. Indicate the positive end by holding your arms outstretched in front of you like a "V."

Mark a boundary with chalk on the floor around all group members to represent the sides of a container. As a liquid, the molecules must stay within the boundary, standing close to each other. Another group member (a cool student), representing a heat sink (something that "absorbs" heat energy, such as the cool air in a freezer), tags molecules (taps them on the shoulder). When you are tagged, begin to move more slowly. (Your heat energy has been transferred to the heat sink.)

When water molecules move more slowly, hydrogen bonds form more easily. To represent this, group members who are slowed down should grasp each other's strings. Move apart from each other until the string is straight. Eventually, there will not be room within the boundary, and some group members will need to step outside the chalk marks.

Materials you will need: string, a sign labeled "heat sink," chalk

