Properties of Water: Super Station Lab

Names: ____________________________

Question

- What can we learn about water by observing how it behaves in a variety of situations?

Knowledge Probe

List at least three things you know about water.

Materials

All materials needed for each activity will be at each workstation.

Investigation Plan

Station #1: Adhesion

1. Record your observations of your daisy from yesterday’s mini-lab in the Observations section.
2. Dip a glass capillary tube in the beaker of water then pull it back out. **CAUTION: Always hold a capillary tube between your thumb and forefinger.**
3. Hold a strip of paper towel so that the bottom is in the beaker. Observe what happens for a minute or so.
4. Record your observations in the Observations section.
5. Clean up your station before continuing.

Station #2: Cohesion

1. Use the eyedropper to carefully place drops of water on a penny. See if you can balance more drops of water than your partner!
2. Try the same thing with rubbing alcohol.
3. Record the number of drops of water and of rubbing alcohol that you successfully balanced on the penny in the Observations section.
4. Clean up your station before continuing.

Station #3: Temperature Moderation

1. The Thermohaline Current that moderates the climate in the northern hemisphere functions because water warmed at the equator travels north, releases its warmth, then sinks to the bottom of the ocean where it flows south. To observe the circulation based on water temperature, place one drop of food coloring in the beaker of water heating on the hot plate. **CAUTION: Do not touch the hot plate or beaker of water.**
2. Record your observations in the Observations section.
3. Clean up your station before continuing.
Station #4: Heat Absorption

1. Fill a beaker with tap water.
2. Use a thermometer to measure the temperature of the water.
3. Record the temperature in the Data/Observations section below.
4. Light the Bunsen burner. **CAUTION: Use care around open flames!**
5. Hold a pre-1982 penny with a pair of tongs in the flame of the Bunsen burner until it is red-hot. At this point the penny is about 680°C! **CAUTION: Do not touch the heated penny with your hands.**
6. Drop the penny in the beaker of water and wait a couple of minutes.
7. Measure the temperature of the water.
8. Record the temperature in the Observations section below.
9. Clean up your station before continuing.

Station #5: Evaporative Cooling

1. Spray the backs of one hand with water from the spray bottle.
2. Hold both hands in front of the fan. Pay attention to the feeling of temperature of your hands relative to each other.
3. Record your observations in the Observations section below.
4. Clean up your station before continuing.

Station #6: Ice Floats

1. A substance will float in water if it is less dense than water.
2. Find the mass of an ice cube on the balance.
3. Record the mass in the Observations section.
4. Place about 400 mL of water in a large graduated cylinder and record the volume. **CAUTION: Use care when handling glassware.**
5. Submerge the ice cube completely. You will have to poke it just below the surface of the water with a glass stir rod. Record how much the volume increased. This is the volume of the ice cube.
6. Using the formula for density where: density = mass (g) / volume (mL) calculate the density of ice.
7. Clean up your station before continuing.

Station #7: Universal Solvent

1. Water is capable of forming solutions with ionic and polar substances but not with non-polar substances. Which of the following do you predict will dissolve in water: sodium chloride, vegetable oil, starch? Which will not dissolve in water? Record your predictions in the Observations section.
2. Place a “pea sized” amount of each of these substances in a test tube and fill with water from the squeeze bottle. **CAUTION: Treat all laboratory chemicals a potentially hazardous.**
3. Stir each test tube with a glass stir rod.
4. Record the results in the Observations section.
5. Clean up your station before continuing.

Cautions

Always hold a capillary tube between your thumb and forefinger. Do not touch the hot plate or beaker of water. Use care around open flames! Do not touch the heated penny with your hands. Use care when handling glassware. Treat all laboratory chemicals a potentially hazardous.
Observations

1. What did you observe when you placed the capillary tubes and the paper towel in the beaker of water?

2. How many drops of water were you able to balance on a penny? How many of rubbing alcohol?

3. What did you observe when you put the food coloring in the water?

4. What was the initial temperature of the water at Station #4? What was the final temperature?

5. In the activity at Station #5, which hand felt cooler?

6. Record your data from Station #6 here.

7. Record your predictions from Station #7 here. Were your predictions right or wrong?
Evaluation

1. How are your observations from Station #1 similar to what happens in the water conducting cells in a tree?

2. Why do you think that the number of drops of alcohol and water you can balance on a penny are different from each other?

3. How is what you observed at Station #3 similar to the circulation of water in the ocean? How is it different?

4. How much did the temperature of the water change after adding the heated penny to the beaker? Does this surprise you? Why or why not?

5. One of the symptoms of heatstroke, a life threatening medical condition caused by excessive exposure to heat without adequate water and rest, is dry warm skin. This occurs because the body is unable to sweat enough to cool the body due to inadequate water intake. As a person offering first aid, how might you use the idea of evaporative cooling to treat a person suffering from heat stroke?

6. If the density of liquid water is 1 g/mL, how does the density of your ice cube compare? What do you think would happen to the density of ice if we made the ice cubes with a solution of sugar in water?

7. Sucrose (common table sugar) is used to sweeten drinks like tea and Kool Aid. It has the chemical formula C_{12}H_{22}O_{11}. Based on this information do you think sucrose is polar, non-polar or ionic? Defend your answer.