




CHAPTER 2	Investigation 2.D: Investigating the Properties of Water	BLM 2.2.4
HANDOUT		

In this investigation, you will infer a property of water from an observation. You will then use that property to explain other observations.

Question

How can you explain the properties of water based on its shape and charge properties?

Materials

- water
- vegetable oil
- ethanol   
- pepper
- liquid dish detergent
- acetate strip
- cotton cloth
- vinyl strip
- wool cloth
- 500 mL beaker
- 2 shallow dishes
- sewing needles
- 2 small glasses
- 150 mL beaker

Safety Precautions

- Use care in handling sharp objects.

Procedure

1. Turn on a tap so that a very small steady stream of water is flowing.
2. Vigorously rub the end of the acetate strip with the cotton cloth.
3. Slowly move the acetate strip near the stream of water without touching the water. Record your observation.
4. Repeat Procedure Steps 2 and 3 using the vinyl strip and wool cloth.
5. Have one lab partner slowly pour vegetable oil into the 500 mL beaker, forming a small steady stream of vegetable oil similar to the water in Procedure Step 1.
6. Repeat Procedure Steps 2 through 4 using the vegetable oil. Record any differences between the behaviour of the oil and the water.
7. Place water in one shallow dish. Very carefully place a pin or needle onto the surface of the water in a horizontal position. (Your teacher may choose to do this step.) Record the appearance of the needle.

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8. Gently touch the needle. Record your observations.
9. Place ethanol in the second shallow dish. Try to repeat Procedure Steps 7 and 8 with the ethanol instead of the water. Record your observations.
10. Place one of the glasses in an empty shallow dish. Pour water into the glass from a beaker. When the glass is nearly full, pour very slowly and carefully. Observe and record the shape of the top of the water just before it starts to spill over into the dish.
11. Repeat Procedure Step 8 with ethanol. Record your observations.
12. Fill the 150 mL beaker about two thirds full of water.
13. Sprinkle pepper onto the water until a thin film of pepper forms on the surface.
14. Add a few drops of liquid dish detergent to the water. Observe the response of the film of pepper. Record your observations.

Analysis

1. The cotton-rubbed acetate strip was positively charged and the wool-rubbed vinyl strip was negatively charged. Was the stream of water attracted or repelled by the positive charge? Was the stream of water attracted or repelled by the negative charge? Was the stream of vegetable oil attracted or repelled by the positive charge? Was the stream of vegetable oil attracted or repelled by the negative charge? What do these observations tell you about the properties of water and of vegetable oil?

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5. How did filling the glass with ethanol differ from filling it with water? Explain the difference in the two liquids.
6. How did the dish detergent affect the film of pepper on the water? The molecules in the dish detergent have a long non-polar end and a charged head. Use this information to explain the effect on the pepper film that you described.

Conclusion

7. Describe the differences in the physical properties of ethanol and water. What is the significance of these properties of water to living systems, considering the fact that living cells contain a large percentage of water?