Properties of Water
Biochemistry
Honors Biology
Lindemulder

Objective**:** Water is everywhere. It makes up about 75% of the surface of the earth. It makes up 50-95% of the weight of living organisms. It is in the air we breathe and in every cell of the body. Water has the ability to be a liquid, solid, or gas depending on the temperature at which it is found. Water has special properties that make it unusual and complex. For instance, think about what water can do by answering these questions:

1. How does water rise from the roots of a tree to the very top?
2. How do some insects walk on the water?
3. Why does ice float rather than sink?
4. Why do people become seriously ill, or die, if they go without liquid?
5. How would life in a lake be affected if ice sank?

Part I
Materials: penny, water, pipette (or dropper), graduated cylinder

Methods:

1. Obtain a medicine dropper and a small graduated cylinder. Make sure the dropper is clean.
2. Using the dropper, count how many drops it takes to get 1mL in the graduated cylinder. Repeat this five times and take the average. Record these numbers and perform the calculation in your notebook.
3. How many drops, of the size produced by your medicine dropper, are in each cubic centimeter (cc) of water? Record this number in your notebook. (Hint: 1 cubic centimeter = 1 milliliter)
4. Conversely, how much water is in each drop? (Hint: Divide 1cc by the number of drops.) Record this in your notebook.
5. Predict how many drops you will be able to put on the penny before it over flows by having each person in your group guess. Record this in your notebook.
6. Drop water from the dropper onto the penny, keeping a careful count of each drop.
7. Draw a diagram in your notebook showing the shape of the water on the penny after one drop, when the penny is half full, and just before it appears it will overflow.
8. How many total drops did you get on the penny prior to overflowing? Record this in your notebook. In your conclusion, you should discuss these results and how they show the properties of water.

Part 2
Materials: penny, pipette (or dropper), detergent

Methods:
Water Detergent

1. With your finger, spread one drop of detergent on the surface of a dry penny.
2. How many drops do you think this penny will hold after being smeared with detergent? Record your predictions in your lab notebook.
3. Using the same dropper as before, add drops of water to the penny surface. Keep a careful count of the number of drops, and draw pictures as before. Record pictures and data in your lab notebook.

Part 3
Materials: penny, water, glass slide pipette (dropper), wax paper

Methods:
1. What will the shape of water be on a piece of wax paper and a glass slide? Draw your prediction in your lab notebook.
2. Perform the experiment. Place several drops of water on each surface and draw the results.

Part 4
Materials: water, graduated cylinder, chromatography paper, Vis-a-View marker, stop watch

Methods:
1. How fast do you think that water will climb up a piece of absorbent paper about 1⁄2in. wide? Record your prediction in your lab notebook.
2. Obtain a 50ml graduated cylinder and tear off a strip of chromatography paper that is just long enough to hang over the side of the cylinder (inside) and reach the bottom.
3. Place a single drop of ink from a Vis-a-View pen on the paper about one inch from the bottom and let it dry.
4. Place 10ml of water into the graduated cylinder and place the strip of paper in the cylinder so the bottom end is immersed in water and the drop of ink is just above the surface of the water. Fold the paper over the top of the graduated cylinder.
5. Note the starting time.
6. Record the distance the water has traveled at 5-minute intervals. When water climbs to the tip of the paper, remove it and let it dry.

Part 5a
Materials: water, graduated cylinder, oil

Methods:
1. Put 8ml of water into a 10ml graduated cylinder.
2. Predict what will happen when cooking oil is added. Record your prediction in your lab notebook.
3. Gently add 2ml of cooking oil by tilting the cylinder of water slightly and letting the oil run slowly down the inside of the cylinder.
4. Save the graduated cylinder with its contents and get a clean 10ml cylinder for the next experiment.
5. Record your observations and draw the contents of the graduated cylinder in your lab notebook.

Part 5b
Materials: water, graduated cylinder, oil

Methods:
1. Place 8ml of oil into a 10ml graduated cylinder.
2. Predict what will happen when water is added. Record your prediction in your lab notebook.
3. Gently add 2ml of water by tilting the cylinder of oil slightly and letting the water run slowly down the inside of the cylinder.
4. Record your observations and draw the contents of the graduated cylinder in your lab notebook.

Part 5c

Materials: food coloring, graduated cylinders from 5a and 5c

Methods:

1. Predict what will happen if you add a few drops of water-soluble dye solution to each of the above graduated cylinders containing water and oil. Record your prediction in your lab notebook. (Will the dye mix with the water, the oil or both?)
2. Perform the experiment. Add a few drops of dye to each cylinder. Use a glass-stirring rod to penetrate the interface between each layer, giving the dye access to both water and oil. Record your observations.

Questions: Answer in complete sentences.

1. In part one of the lab, what property of water allowed for it to hold as much water as it did? On a molecular level, what causes this property of water?
2. In part two of the lab, how did the detergent effect the outcome?
3. On a molecular level, how did the detergent interact with the water?
4. What properties of a detergent (on the molecular level) make it good for cleaning?
5. In part three of the lab, what accounts for the different behavior of water on the glass and wax paper?
6. In part four of the lab, what changes were observed in the ink as time progressed? Why did this occur? How does this relate to plants?
7. From part five of the lab, which is more dense: water or oil? How is density defined?
8. Discuss three properties of water examined in this lab.
9. How do the unique characteristics of water help the function of the human body?