Properties of Water

Objective: Water is everywhere. It makes up about 3/4ths of the surface of the earth. It makes up 50-95% of the weight of living organisms. It is in the air we breathe, the sinks we use and in every cell of the body. 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 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 for a week or so?
5. How would life in a lake be affected if ice sank and lakes froze from the bottom up?

Water has the ability to be a liquid, solid or gas depending on the temperature at which it is found. Each molecule of water is made up of 2 hydrogen and 1 oxygen bonded together. Water is attracted to other water molecules like magnets. This is called cohesion.

Part 1

Materials:

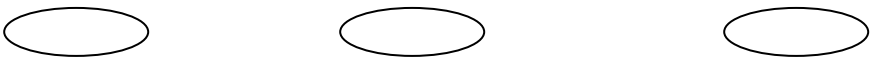
Penny	Water
Medicine Dropper	Graduated Cylinder

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 1 mL in the graduated cylinder.
3. How many drops, of the size produced by your medicine dropper, are in each cubic centimeter (cc) of water? (1 cubic centimeter = 1 milliliter) _____ drops
4. Conversely, how much water is in each drop? (divide 1cc by the number of drops) _____ cc. Per drop, on average.
5. Predict how many drops you will be able to put on the penny before it overflows by having each person at your table guess.

Person 1	
Person 2	
Person 3	
Person 4	
Total of 1-4	
Average	

6. Now, lets see how many drops of water you can place on the surface of the penny before it overflows. Drop water from the dropper onto the penny, keeping a careful count of each drop.
7. Draw a diagram below showing the shape of the water on the penny after one drop, when the penny is half full and just before it looks like it is going to overflow.



Single Drop Half Full _____drops Near Overflowing _____drops

8. How many total drops did you get on the penny? _____
9. If the number of drops is different from your prediction, explain your results in terms of cohesion.

Part 2
Materials:

Penny	Water
Medicine Dropper	Detergent

Methods:

1. With your finger, spread one drop of detergent on the surface of a dry penny.
2. How many drops do you thing this penny will hold after being smeared with detergent?

Person 1	
Person 2	
Person 3	
Person 4	
Total of 1-4	
Average	

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.


Single Drop


Half Full _____drops


Near Overflowing _____drops

4. Did the detergent have an effect on the outcome?

5. How does the detergent affect the water?

6. Explain how detergents act as cleaning agents.

Part 3
Materials:

Penny	Water	Glass Slide
Medicine 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.


Wax Paper


Glass Slide

2. Perform the experiment. Place several drops of water on each surface and draw the results below.


Wax Paper


Glass Slide

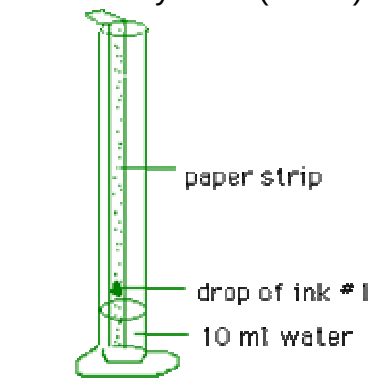
3. Explain what happened.

Part 4
Materials:

Water	Chromatography Paper Strip	Stop Watch
Graduated Cylinder	Vis-A-View Marker	

Methods:

1. How fast do you think that water will climb up a piece of absorbent paper about ½ in. wide? One inch per _____(time)
2. Obtain a 50 ml 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.



50 ml graduated cylinder

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. Water and note the time at 5-minute intervals. When water climbs to the tip of the paper, remove it and let it dry.

Time	Distance
0	
5	
10	
15	
20	
25	
30	

7. How did the ink change?

8. Why did this occur, think about plants and capillary action?

Part 4a – Water & Oil
Materials:

Water Graduated Cylinder
Oil

Methods:

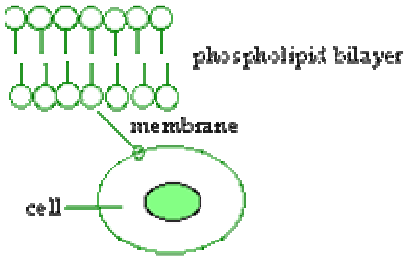
1. Put 8 ml of water into a 10 ml graduated cylinder.
2. What will happen if you add cooking oil?
3. Gently add 2 ml of cooking oil by tilting the cylinder of water slightly and letting the oil run slowly down the inside of the cylinder.
4. What happened?
5. Save the graduated cylinder with its contents and get a clean 10 ml cylinder for the next experiment.
6. Draw the contents of the graduated cylinder.

Part 4b – Oil & Water
Materials:

Water Graduated Cylinder
Oil

Methods:

1. Place 8 ml of oil into a 10 ml graduated cylinder.
2. What will happen when you add water?
3. Gently add 2 ml of water by tilting the cylinder of oil slightly and letting the water run slowly down the inside of the cylinder.
4. Which is less dense (meaning which has less weight per ml), oil or water?
5. This characteristic of water and oil is very important for living things, determining many properties of the cell. Can you explain how? Consider the following picture.



Part 4c – Water, Oil and Dye

Materials:

Food Coloring Dye
Graduated Cylinders from 4a & 4c

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. 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. How does the dye behave in each cylinder? Does it diffuse into the oil? Into the water?
3. Will the contents remain mixed?

Part 5 – Pulling it all Together

1. List three things that you discovered about water?

2. How do the characteristics of water help the body?