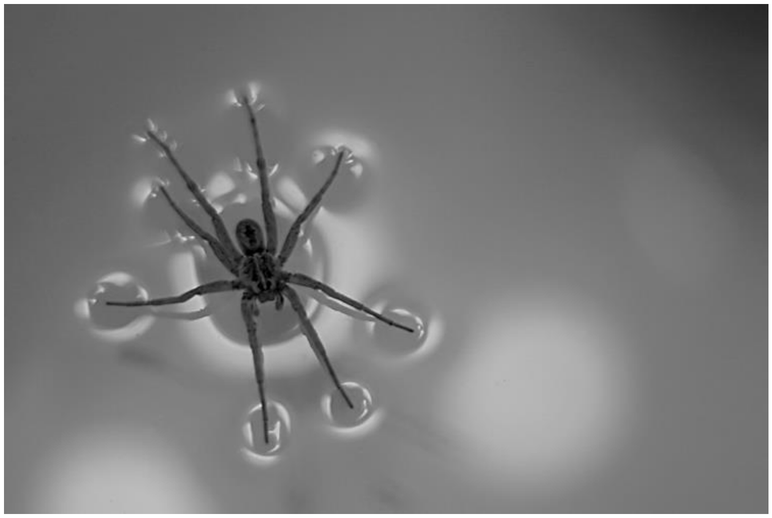
Surface Tension and Adhesion



1. Obtain a medicine dropper and a small graduated cylinder. Make sure the dropper is clean.

2. Drop water into the graduated cylinder with the dropper, counting each drop.

3. How many drops, of the size produced by the medicine dropper, are in each cubic centimeter (cc) of water? (1 cc = 1 mL)?

4. Conversely, how much water is in each drop? (divide 1 cc by the number of drops)?

5. Now, let's see how many drops of water can you place on the surface of a penny before it overflows?

6. How many drops do you predict?

7. Drop water from the dropper onto a penny, keeping careful count of each drop. Draw a diagram showing the shape of the water on the penny after one drop, when the penny is about half full, and just before it overflows.

8. How many drops were you able to place on the surface of the penny before it overflowed?

9. Explain your results in terms of cohesion.

Part B
Effects of Detergent

1. With your finger, spread one small 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? More, less or the same as before?

3. Specifically, how many drops do you think it will hold?

4. Using the same dropper as before, add drops of water to the penny surface. Keep careful count of the number of drops, and draw the water on the penny after one drop, about half full, and just before overflowing.

5. How many drops were you able to place on the penny before it overflowed?

6. Did the detergent make a difference? Describe the effect of the detergent.

1 c Drop Shape on Glass and Wax Paper.

1. What will be the shape of a drop of water on (a) a piece of wax paper and (b) a glass slide? Draw the shape you expect on each surface.

2. Why did you predict as you did? What assumptions are guiding your thinking?

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

Explain your results in terms of adhesion

The Climbing Properties of Water

Water moves to the tops of tall trees due to capillary action combined with root pressure and transpiration from the stomata in the leaves. Water will also climb up paper, and often the migrating water will carry other molecules along with it. The distance traveled by these other molecules will vary with their mass and charge.

1. How fast do you think water would climb a strip of absorbent paper about one half inch wide? (about one inch per ________________seconds)

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 and reach the bottom. (inside the cylinder)

   Place a single small drop of ink from a black dry erase marker on the paper, about one inch from the bottom, and let it dry completely.

   Put 10 mL of water into the graduated cylinder so that the bottom of the paper is immersed in the water and the drop of ink is just above the surface of the water. (Add water the cylinder before the paper!)
   Note the starting time and complete the following chart:

Time (minutes)	Distance (inches)
0	
5	
10	
15	
20	
25	
30	

3. How did the ink change?

4. Glue your strip of paper to your sheet and label each color on the strip.

5. Explain your results in terms of capillary action, polar molecules and hydrogen bonding.

Cohesion of Water

1. Put 8 mL of water into a 10 mL graduated cylinder.

2. What will happen if you add cooking oil?

    a. The oil will float on top of the water.
    b. The oil will sink to the bottom of the water
    c. The oil will dissolve in water
    d. The oil will become mixed up with the water
    e. Other ____________________________

Oil is hydrophobic, or "water-hating". It is called this because its chemical structure does not allow the formation of hydrogen bonds. Therefore, oil does not dissolve in water. When mixed, the two substances form separate layers, and because oil is less dense, it sits on top of the water.

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. What has happened?

4. Save this graduated cylinder with its contents and get a clean 10 mL cylinder for the next experiment.

5. Place 8 mL of cooking oil in a 10 mL graduated cylinder.

6. What will happen when you add water?

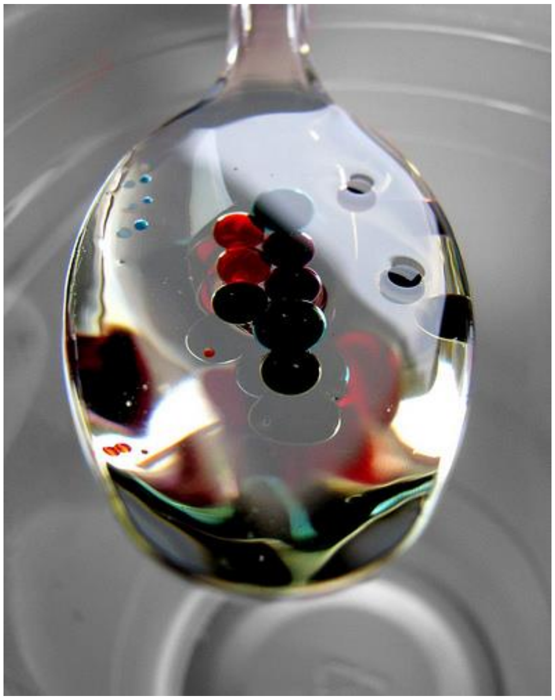
    a. The water will float on top of the oil
    b. The water will sink to the bottom of the oil
    c. The water will dissolve in the oil
    d. The water will become mixed up with the oil
    e. Other ___________________________

7. 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. What happened?

8. Which is less dense? Oil or water?

9. This characteristic behavior of water and oil of critical importance for living things, determining many properties of the cell.

Water, Oil and Dye



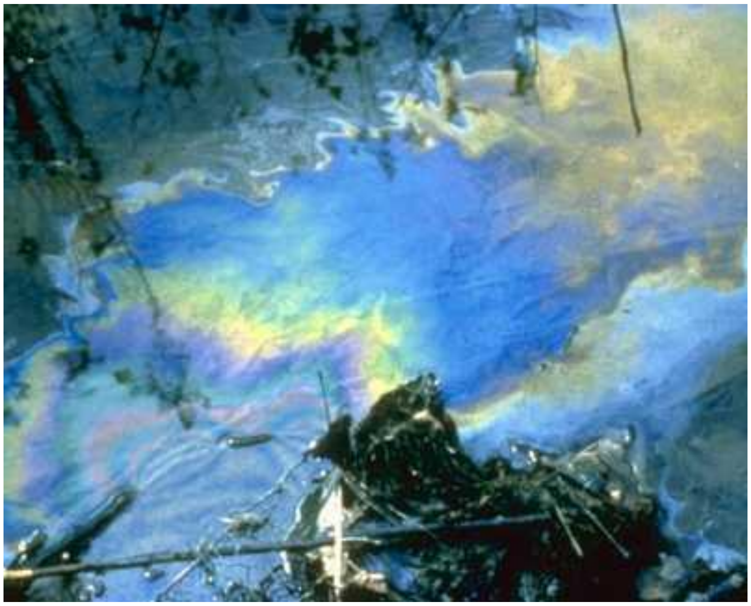
1. Predict what will happen if you add a few drops of a water soluble dye solution to each of the above graduated cylinders containing water and oil. Will the dye mix with the water, the oil, or both?

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 the water and the oil. How does the dye behave in each cylinder?

3. Stir the contents of each cylinder with a stirring rod and then let it sit. Will the contents remain mixed?

4. Explain the actions of the dye using terms such as solution, hydrogen bonding and polarity.

Sheen



1. Take a clean beaker of water. Predict what will happen if you add one small drop of oil to the water using a medicine dropper.

2. Do this experiment. Can you see the oil? Add more drops if necessary to see it clearly. Describe.

3. Predict what will happen if you add a drop of detergent to the beaker.

4. Now add a drop of detergent to the beaker of water with oil on top. Record your results.

5. Explain your results in terms of amphipathic molecules and cohesion.