

Polarity/Hydrogen Bonding Lab

Purpose: Water molecules are polar because there is an uneven sharing of the electrons between the oxygen and hydrogen atoms. This unequal sharing of electrons causes a positive charge at the hydrogen atoms and a negative charge at the oxygen atom. The hydrogen atom of one water molecule attracts the oxygen of another water molecule.

****Remember:** The bonds between the Oxygen atom and each of the Hydrogen atoms in 1 molecule of water are polar covalent bonds because the Hydrogen and Oxygen are unevenly SHARING electrons. Polar covalent bonds are strong and not easily broken.

A *Hydrogen Bond* occurs when a slightly negative Oxygen atom and a slightly positive Hydrogen atom from **DIFFERENT MOLECULES** are attracted to each other. These bonds are very easy to form, but are very weak and easily broken.

Problem: Because of water's polarity, it is very adhesive and cohesive. Cohesion allows the molecules to stick together via hydrogen bonds between molecules, thus creating surface tension. In this lab we will investigate the number of water droplets that can stick together on the surface of a penny.

Please read all materials and procedures before creating your hypothesis and running your experiment.

Materials per group:

-1 penny -1 pipette -1 beaker -water -paper towel

Procedures:

1. Place the penny on top of the paper towel. Make sure it is as flat as possible.
2. Use your pipette to draw water from the beaker. **Tip:** squeeze the pipette and hold PRIOR to putting it in the water. Place the pipette in the water and slowly release the top. Pull the pipette out of the beaker.
3. Hold the pipette above the surface of the penny. Try to stay close to the surface so you are not dropping water from a high distance.
4. SLOWLY squeeze the pipette and allow 1 drop of water to drop onto the surface of the penny.
5. You will continue to place drops of water on the penny as your partner keeps track and records in the data table, until the water tension breaks and water falls off of the penny.
6. The number of drops will be the total number BEFORE the cohesion breaks. (ex: if you place 20 drops on the penny and then your 21st drop causes the tension to break, you will record 20 drops)
7. Each partner will run 3 trials.
8. After 3 trials, take the average of both partners' trials. Place in the data table.
9. Place your and your partner's averages in the class data table on the shared Google Drive Spreadsheet and be sure to record the other class averages.
10. Find the average of the class averages.

Graphing:

On Google Drive, create a spreadsheet and name it

Period-bio-LastnameOfeachPartner-WaterLab and share with the teacher.

Using the data, create a graph that will show the COMPARISON between your average, your partner's average, and the class average.

**Be sure to properly label your y-axis, x-axis, and title!

Analysis Questions:

1. What concept was being demonstrated/applied in this lab exercise?
2. What is the difference between the polar covalent bonds in a water molecule and the hydrogen bonds between water molecules?
-Polar covalent bond:

-Hydrogen bond:
3. Why does water stick together?
4. What is the difference between cohesion and adhesion?

Circle the correct answer:

5. Cohesion / adhesion causes plants to draw water from its roots to its leaves.
6. Cohesion / adhesion lets water to stay connected as it rises up the tree.

Conclusion:

- 7) How did your hypothesis compare with your average?
- 8) Circle the location of *two* hydrogen bonds using the three H₂O molecules below. Write a + symbol and a - symbol in each H₂O molecule to indicate polarity.

