

Topic: Hydrogen Bond Lab

Summary: Students examine properties of water by dropping water onto a penny.

Goals & Objectives: Students will be able to determine how hydrogen bonding causes the cohesion of water. Students will be able to create a bar graph of their results.

Time Length: 90 minutes

Materials:

- Pipettes – one for every two students
- Pennies – one for every two students
- Paper towels – one for every two students
- Small (50 mL) beakers with water – one for every two students
- Graph paper and handout – for each student

Procedures:

1. Students get the supplies. Students place the paper towel on top of their desk and place the penny on top of the towel. Students use their pipettes to collect water from the beaker and then slowly place the same size of water drops onto their penny. It is important that the students do this slowly so that the water can easily bead up onto the penny. Students will continue adding water in the same location of the penny until the water spills over the side. Students record their results in the data table provided in the handout. The same student then dries off the penny and repeats two more times.

2. Once three trials have been complete by one student, their partner then tries three times, recording their data each time in the data table. Students then calculate the averages from their trials and their partner's trials. Students are to share their averages. You display the averages on the white board or overhead projector so that all the students can write down the averages. Students are to bar graph their data before finishing the analysis and conclusion questions.

Accommodations:

Students who are not able to participate can record the data and not participate in the dropping of the water. Students with an IEP can take the handout home if they need extra time. They can also graph only their data and not their partners or the class average.

Evaluation:

The data table and hypothesis is worth 5 points. The graph is worth a total of 10 points, with each part worth 5 points: title and labels, correct IV and DV values, completed graph. The analysis questions are worth 6 points, one for each line. The conclusion questions are worth 2 points each. This assignment is worth a total of 25 points.

Graphing:

Create a bar graph with your average, your partner's average and the class average on the x-axis and the number of drops on the y-axis.

Analysis:

1) Independent variable: cohesive forces of water

Dependent variable: _____

Standardizing variables: _____

2) _____ is the type of bond when the hydrogen atom of one water molecule is attracted to the oxygen of another water molecule.

3) Why does water stick together? _____

Use the paragraph below to answer questions 4 through 6.

If you held a paper towel vertically from the top and you wet the bottom of the towel, the water will climb up the towel against the force of gravity. This is caused by adhesion. Adhesion is an attraction between molecules of different substances. Cohesion is the attraction between molecules of the same substance.

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 next to the slightly positive region of each bond and a - symbol next to the slightly negative region of each bond.

