Properties of Water Lab

**Introduction:**

A water molecule (H2O) is composed of two hydrogen atoms and one oxygen atom bonded together. Water is considered to be a **polar** molecule because the electrons are unevenly distributed between the hydrogen atoms and the oxygen atom. Because oxygen has more protons than hydrogen, the electrons from each of the two hydrogen atoms are pulled towards the oxygen atom. This causes the oxygen end of the molecule to have a **partial negative charge** and the hydrogen end of the molecule to have a **partial positive charge.** This allows for hydrogen bonding between water molecules. Since water is a polar molecule, it is attracted to other polar molecules, and it repels non-polar molecules.

Water molecules have several special properties. For example, water molecules are strongly attracted to other water molecules. This is called **cohesion**. Cohesion causes the molecules at the surface of the water to be tightly drawn together so that the surface of the water is difficult to penetrate. This is called **surface tension. Adhesion** is when water sticks to surfaces other than itself. When adhesion forces are greater than cohesion forces, water can flow upward through a narrow tube against gravity. This is called **capillary action**. Water molecules can also break apart large macromolecules such as carbohydrates, proteins, and lipids through a process called **hydrolysis**.

In this lab, we will use a series of short experiments to investigate the special properties of water.

**Purpose:** *(Explain why we are doing this lab.)*

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Experiment #1 – Celery/Colored Water

**Procedure:**

* Your teacher has placed a celery stalk in colored water.

**Hypothesis:** *(Predict what the celery stalk will look like after 24 hours.)*

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**Materials:** *(Make a list of the materials that were used in this part of the lab.)*

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**Results:**

1. Explain what happened to the celery after it stayed in the colored water overnight.

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Experiment #2 – Clean Penny: Water Drops

**Hypothesis:** *(Predict how many drops of water will be able to fit on the surface of a clean penny.)*

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**Materials:** *(Make a list of the materials that were used in this part of the lab.)*

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**Procedure:**

* Drop water from a dropper onto a clean, dry penny.
* Carefully count each “drop”.
* Be sure to hold the dropper as vertical as possible, and don’t over-squeeze the dropper.
* From the side view at eye level, draw a diagram in the space below that shows the shape of the water on the penny.

**Results:**

* 1. Draw the profile of the penny with the water, after 10 drops, 20 drops, and just before it

overflows.

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**After 10 Drops After 20 drops Before Overflowing**

* 1. How many drops were placed on the clean penny before it overflowed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Experiment #3 – Soapy Penny – Water Drops

**Hypothesis:** *(Predict how many drops of water will be able to fit on the surface of a soapy penny. Is this more or less than your prediction for the clean penny?)*

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**Materials:** *(Make a list of the materials that were used in this part of the lab.)*

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**Procedure:**

* With your finger, spread a drop of soap on the surface of a dry penny.
* Using the same dropper as before, add drops of water to the penny’s surface.
* Carefully count the number of drops until it overflows.

**Results:**

* 1. How many drops were placed on the soapy penny before it overflowed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Experiment #4 - Drop Shape

**Hypothesis #1:** *(Predict what will happen when a water drop is placed on a glass slide. Will it fall off when shaken?)*

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**Hypothesis #2:** *(Predict what will happen when a water drop is placed on wax paper. Will it fall off when shaken?)*

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**Materials:** *(Make a list of the materials that were used in this part of the lab.)*

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**Procedure #1:** Place one drop of water on the glass slide.

**Results:**

* 1. Draw a diagram of the results when viewed at eye level.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. Shake the slide a little. Explain what happens to the water when you shake the slide.

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**Procedure #2:**Place one drop of water on wax paper.

**Results:**

1. Draw a diagram of the results when viewed at eye level.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Shake the paper a little. Explain what happens to the water when you shake the slide.

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Experiment #5 – Surface Tension

**Hypothesis:** *(Predict how many paperclips will be able to float on the surface of the water before one breaks through and sinks to the bottom.)*

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**Materials:** *(Make a list of the materials that were used in this part of the lab.)*

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**Procedure:**

* Fill a Styrofoam cup with water.
* Gently place the paperclips on the surface of the water.

**Results:**

1. How many paperclips were you able to float on the surface of the water? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Analysis Questions:

1. The results of the celery/colored water experiment occurred due to which property of water?\_\_\_\_\_\_\_\_\_\_\_\_.

2. The water molecules on the clean penny were **cohesive/adhesive?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

3. Soap breaks up the cohesiveness of the water molecules on a penny. **True/False?**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Was there more adhesion between a) the glass slide and water **OR** b) between the waxed paper and water?

5. Based on your results, would you say glass is a polar or non-polar substance? How do you know? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Based on your results, would you say wax is a polar or non-polar substance? How do you know? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Paper clips are heavier than water. Explain why the paperclips were able float on the surface of water. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_