**Special Properties of Water Lab**

**Background:**

Water is a polar covalent  molecular compound with ionic characteristics that make it perfect  to support life processes. In fact, organisms are made up of 40 to 95 % water. The following lab will introduce you to some of the characteristics of this precious liquid.

This lab will investigate some of the special properties of water that make it unique. You should also appreciate that all properties of water are consequences of the chemical arrangement of the water molecule. In other words,

**WATER HAS SPECIAL PROPERTIES BECAUSE IT IS POLAR AND CAN FORM H-BONDS.**

**Materials**: A: pennies, water beaker, pipette; B: wax paper; C: soap, toothpick; D: paper clip, soap, beaker; E: baking soda, cream of tartar; F: salt, oil, stirrer

 **Investigating the Properties of Water**

 P**art A. Pennies**

1. How many drops of water do you think will fit on the head of a penny?

2. Using a dropper slowly drop water onto a penny counting each drop. How many drops of water did fit on the head of a penny?

3. What does this activity tell you about one of water’s properties?

4.  Draw what the penny looks like, as viewed from the side, before it overflowed.

**Part B. Wax Paper**

5. Place several drops of water on a piece of wax paper.  You may use food coloring to color the water if you wish. What happens to the water droplets as you roll them around on the wax paper?

6. What does this activity tell you about one of water’s properties?

7. Give the scientific term used to describe the property of water you discovered in parts A and B. Explain this property in molecular terms.

**Part C. Soap**

8. Place one drop of water on your piece of wax paper. Draw a diagram of the water droplet from the side perspective.

9. Place a toothpick in soap and dip it into the water droplet. Draw a diagram of the result.

10. What effect does soap have on water?  Use scientific language you learned in parts A and B in your answer.  Explain this effect in molecular terms.

**Part D. Surface Tension**

11. Fill a beaker or cup till it is just about to overflow. Balance a paper clip on the surface of water. (hint: don’t let your fingers touch the water). Touch the paper clip once it is balanced. What happens?

12. Balance the paper clip again. Add one drop of detergent to the water and record what happens.

      What does this tell you about the properties of water?

13.  Clean the beaker so there is no detergent remaining.

 **Part E. Water as a Catalyst for Chemical Reactions**

14. In a clean, dry beaker, add a small amount of baking soda.  Then add a small amount of cream of tartar.

15.  Record what happens:

16.  Now, slowly add water to the mixture. What happens?

17.  Rinse the contents of the beaker in the sink, and clean the beaker.

**Part F. Polarity**

18. Add a few grains of salt to a beaker containing water. Stir. Describe what happens:

19. Now, add a small amount of cooking oil to the beaker containing water. Stir. Describe what happens:

**Analysis**

Part F.  Polarity of water

Water is a **polar** molecule, meaning it has one end with a slight positive charge and another end with a slight negative charge.  Molecules without positive and negative ends are called **nonpolar**.  As a general rule, water is good at dissolving polar and ionic compounds, but does not dissolve nonpolar compounds.

1.    Based on your observations for part F, which substance was nonpolar, the cooking oil or the salt?

2.    Based on your observations for part F, which substance was polar or ionic?

Part E.  Water as a catalyst for chemical reactions

Water is needed for most chemical reactions that take place within living organisms.

3.    What evidence do you have, based on your observations in part E, that water is needed for a chemical reaction to take place?

Parts C and D: Surface Tension and Cohesion

  Water molecules are attracted to each other because of their polarity.  The positive and negative ends attract one another like magnets.  This attraction is called **cohesion**.  They stick together.  At the surface, this produces a “film” that covers the surface and holds it.  This film is called **surface tension**.

            4.When you placed the paper clip on top of the water, was it floating?  If not, then what was holding it up?

            5.Why do you think the paper clip sank to the bottom of the beaker when you added a drop of mild detergent to the beaker?

Parts A and B:  Cohesion and Adhesion

 When water sticks to something, we call this **adhesion**.  When you step out of the shower and see tiny droplets of water on your skin, that is an example of adhesion.  In a plant, cohesion and adhesion help the plant by allowing water to travel upwards away from the roots to deliver water to all parts of the plant.

6. Explain why the penny was able to hold so many drops of water before it overflowed.

            7. What caused the water to spill over?

8. How did the droplet of water on the surface of the penny demonstrate both adhesive

                 and cohesive properties of water?