**Properties of Water Notes Guide:**

**Concept: Water and its properties due to hydrogen bonding helps make life possible on Earth.**

The structure of water is the key to its special properties. Water is made up of one atom of oxygen and two atoms of hydrogen, bonded to form a molecule (H2O)

Water molecules are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ meaning one region of the molecule has a more positively charged side and a more negatively charged side.

Draw two water molecules and show the charged areas. Draw a hydrogen bond between them.

Each water molecule can form a maximum of four \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonds at a time.

**Cohesion**: The linking of like molecules. Example: Water molecules use hydrogen bonds to connect with other water molecules. This creates the surface tension. Think drinking straw.

**Adhesion**: The clinging of one substance to another \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Example: Water attached to a car windshield. Water climbs up paper tower or cloth.

**Transpiration**: The movement of water molecules up the very tiny xylem tubes and their evaporation from the stomata in plants. The water molecules cling to each other by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and to the walls of the xylem tubes by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Special properties of water:

1. cohesion & adhesion

2. good solvent (the substance something is dissolved in)

3. lower density as a solid

4. high specific heat

5. high heat of vaporization

2. Water is the solvent of life

**Solvent**: The substance something is dissolved in

**Solute**: The substance being dissolved

**Solution**: The solvent mixed with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Hydrophilic**: water-soluble. Examples: solutions which dissolve in water. Example: many salts, sugars, polar molecules, some proteins.

**Hydrophobic**: water repelling. Example: lipids, oils which are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. Lower density as a solid

Most substances are more dense when they are solid but NOT water. Ice Floats! Hydrogen bonds form a crystal (think snowflake). Ice is less dense than liquid water.

4. High specific heat

**Specific Heat** is the amount of heat required to raise or lower the temperature of a substance by 1oC. Water can take a lot of energy to heat up or to cool down. Water resists changes in temperatures.

5. Heat of vaporization

Water has a boiling temp of 100oC, Freezing temp of 0oC. Liquid state for a wide range of temperatures. This allows an organism to use water to remove excessive body heat.

**Acidic and Basic conditions affect living organisms**

**pH scale** runs from 0 to 14 and measures the relative acidity and alkalinity of aqueous (watery) solutions.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** have an excess of H+ ions and a pH below 7.

**Bases** have an excess of OH- Ions and a pH above 7.

Pure water is neutral which means it has a pH of 7.

**Buffers** are substances that minimize changes of pH. They accept H+ from solutions when they are in excess and donate H+ when they are depleted. Buffering compounds are essentials in living tissues to minimize pH changes.