



WATER AND SOLUTIONS

Section 6.3

SB1a,d,e

? What properties of Water make it
INVALUABLE to Living Things?

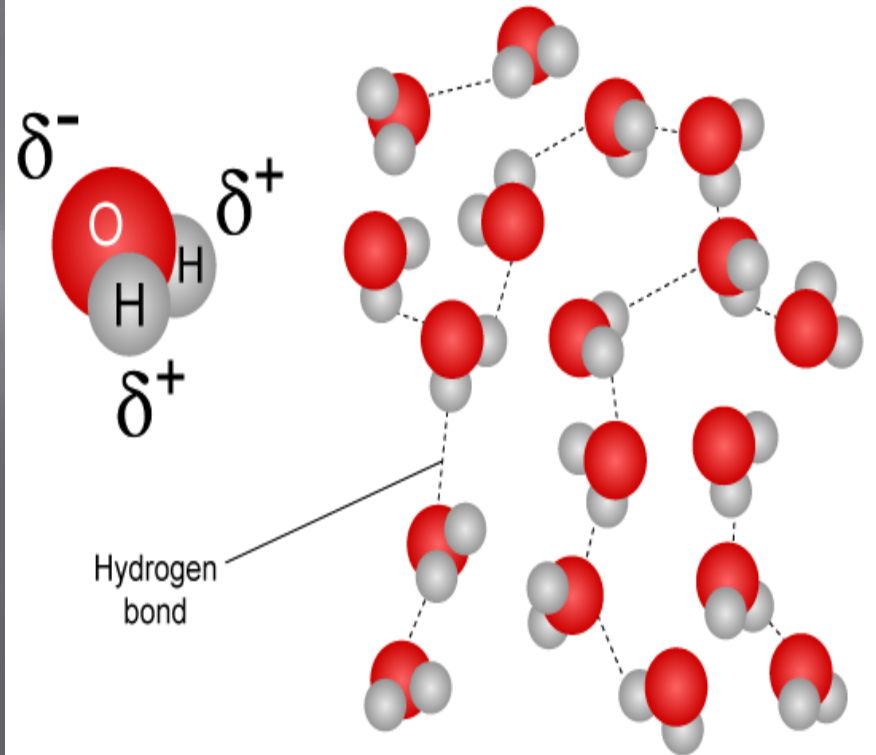
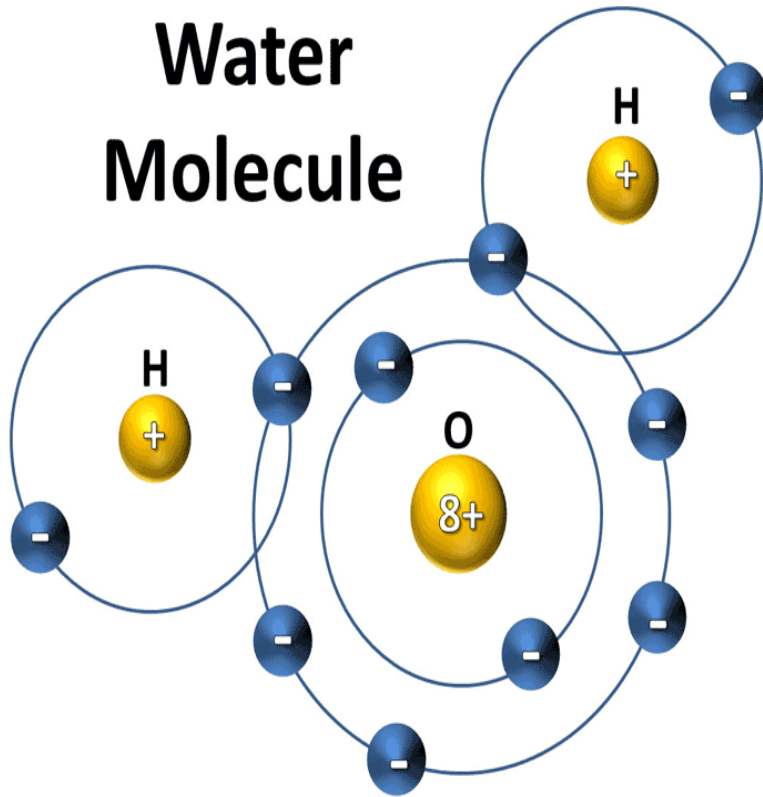
Water



- ▣ 70% of the body
 - Major component of cells
 - Helps maintain homeostasis
 - ▣ Maintains body temperature
 - ▣ Moves nutrients and waste
- ▣ 70% of the earth
 - Regulates earth's temperature
 - Solid water floats!

Structure

Water Molecule

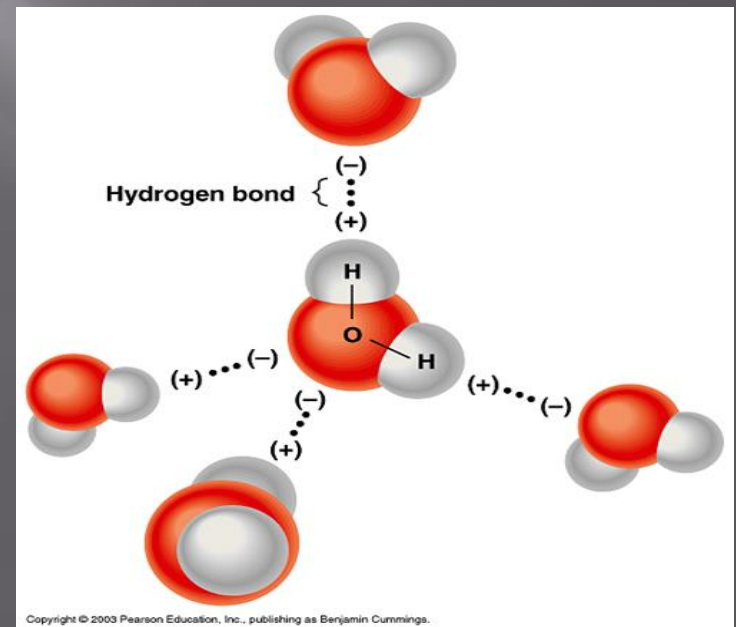
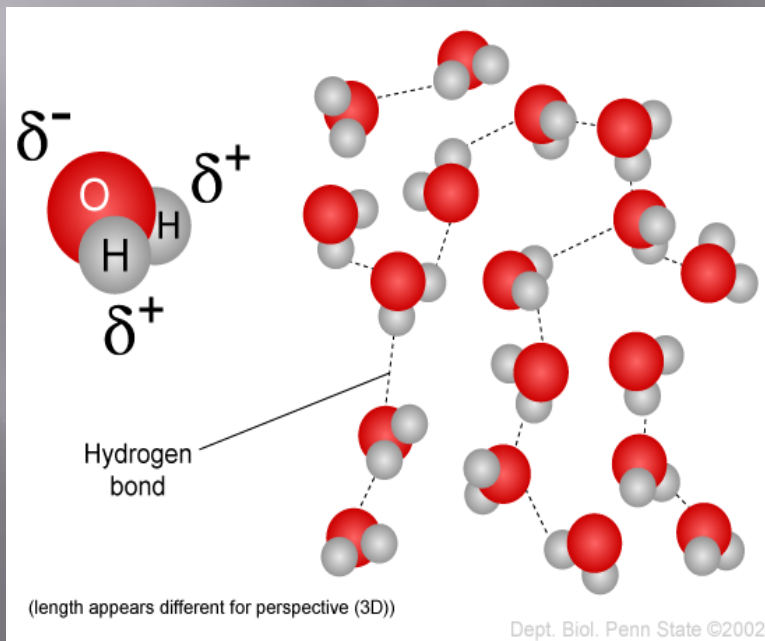


(length appears different for perspective (3D))

Bonding & Polarity

- ▣ A single water molecule is composed of 1 oxygen atom attached to 2 hydrogen atoms with covalent bonds – *this is a tiny molecule!*
- ▣ Water molecules are polar because the electrons (e-) that are shared in the covalent bond are not shared equally
 - The e- spend more time around the oxygen atom giving it a partially negative charge and less time around the hydrogen atoms giving them a partially positive charge

- Bonds form between water molecules as a result of their polarity. Water molecules form hydrogen bonds between the positive pole of one molecule (hydrogen atoms) and the negative pole of another molecule (oxygen atom).

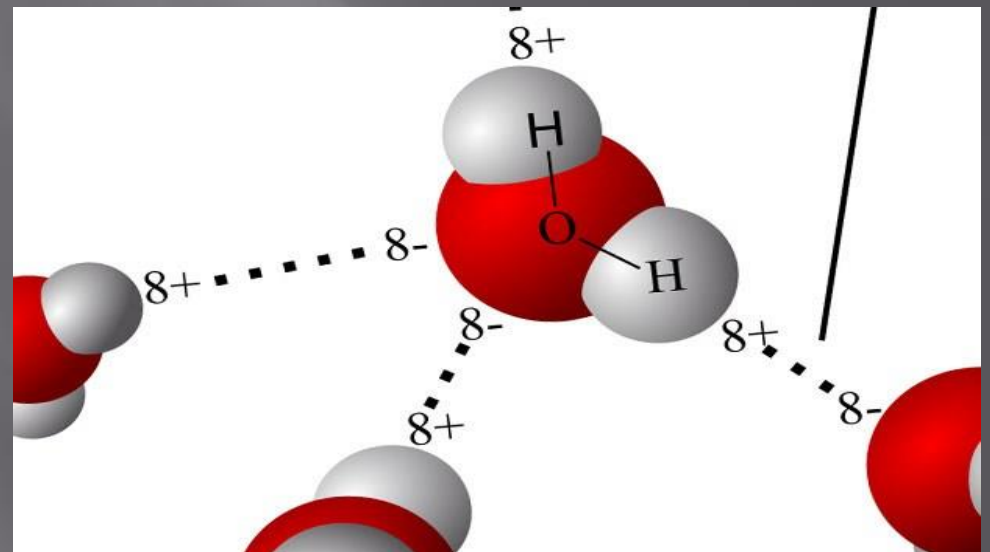
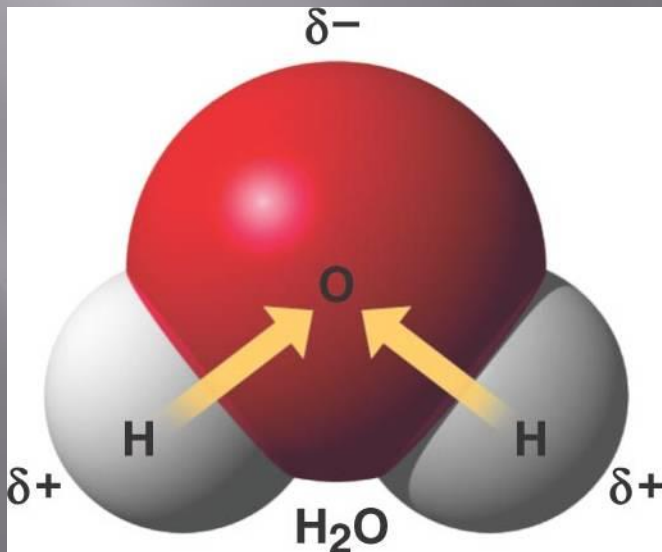


▣ Polarity

- ▣ Molecules that have an unequal distribution of charges are called polar molecules
- ▣ Polarity is the property of having two opposite poles

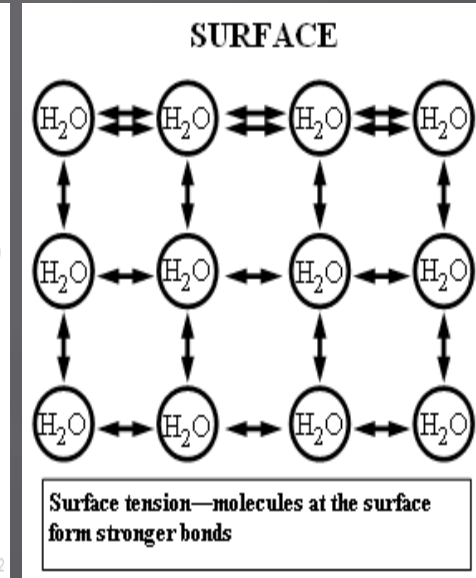
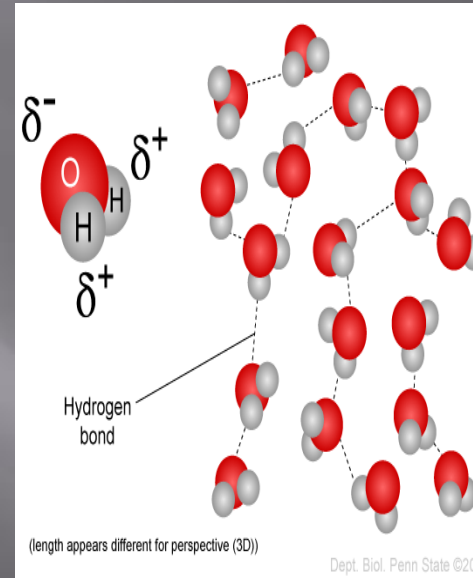
▣ Hydrogen Bond

- ▣ A hydrogen bond is a weak interaction involving a hydrogen atom and a fluorine, oxygen, or nitrogen atom



Properties of Water

- Cohesion
 - The attraction of water molecules to one another
- Surface Tension
 - The enhanced attraction of water molecules to one another at the surface

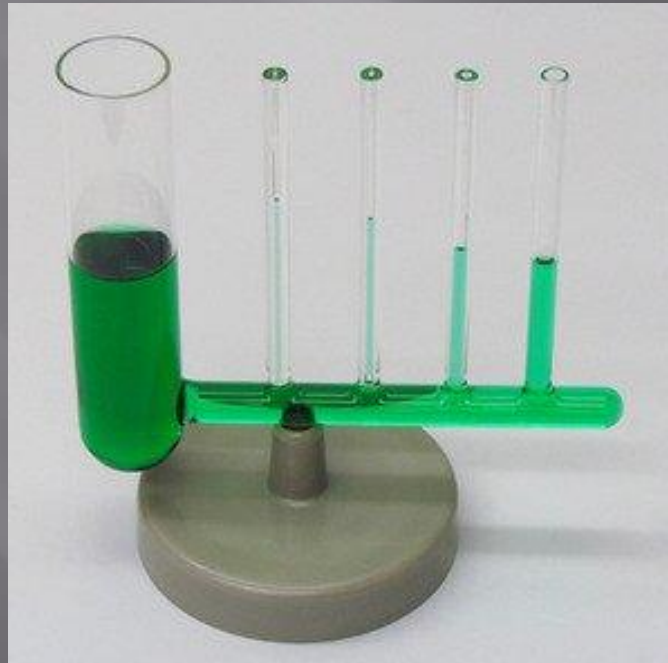


▣ Adhesion

- ▣ The attraction of water molecules to a solid like glass or a cell wall.

▣ Capillary Action

- ▣ Water moving up a tube or stem

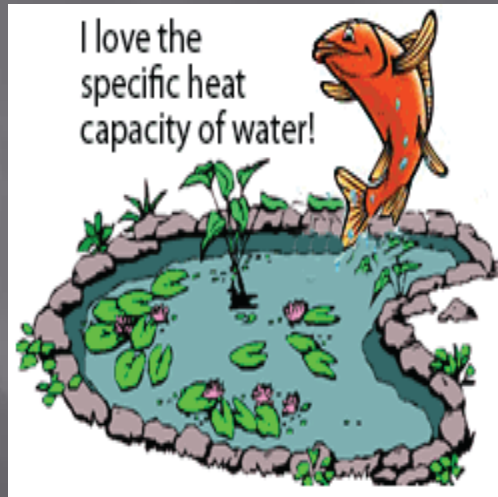


▣ High Heat Capacity

- ▣ It requires a lot of energy to change water's temperature. It "resists" temperature change.
 - ▣ Regulates the earth's temperature
 - ▣ Regulates the body's temperature

▣ High Heat of Vaporization

- ▣ It requires a lot of energy to move water from the liquid phase to the gas phase
 - ▣ Again, this helps to regulate temperature
 - ▣ For example, sweating helps to cool the body



Water Expands When It Freezes!

- ▣ Solid water is less dense than liquid water
- ▣ This is why ice floats!

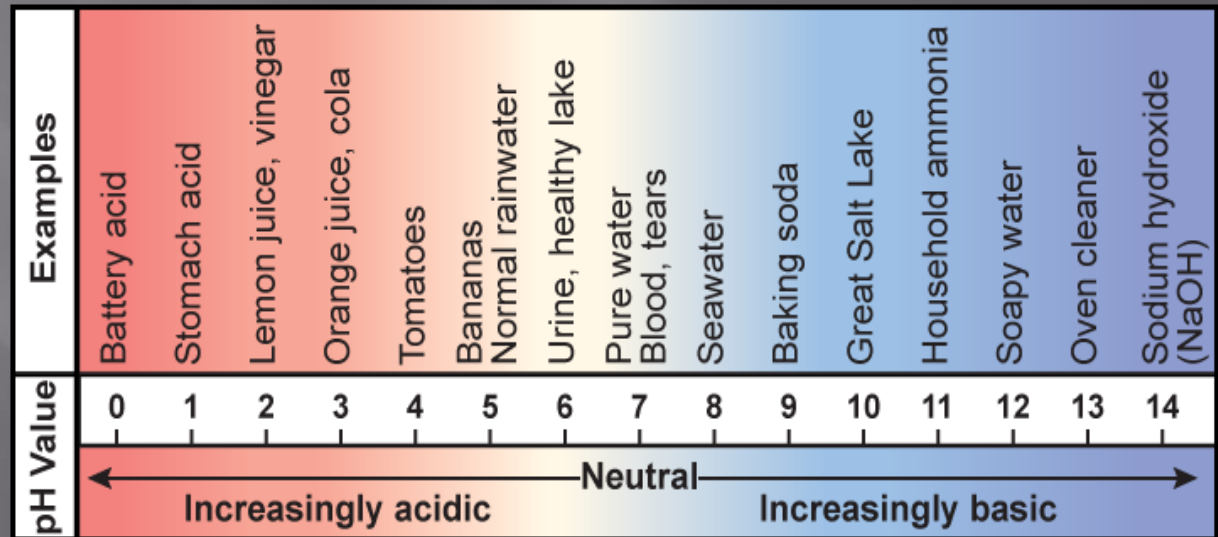


- ▣ Water is the “Universal Solvent!”
 - Because of its small size and polarity it is capable of dissolving many substances
- ▣ Solutions
 - Solvent + solute = solution
 - In a solution the solute is dissolved in – and evenly distributed throughout – the solvent.

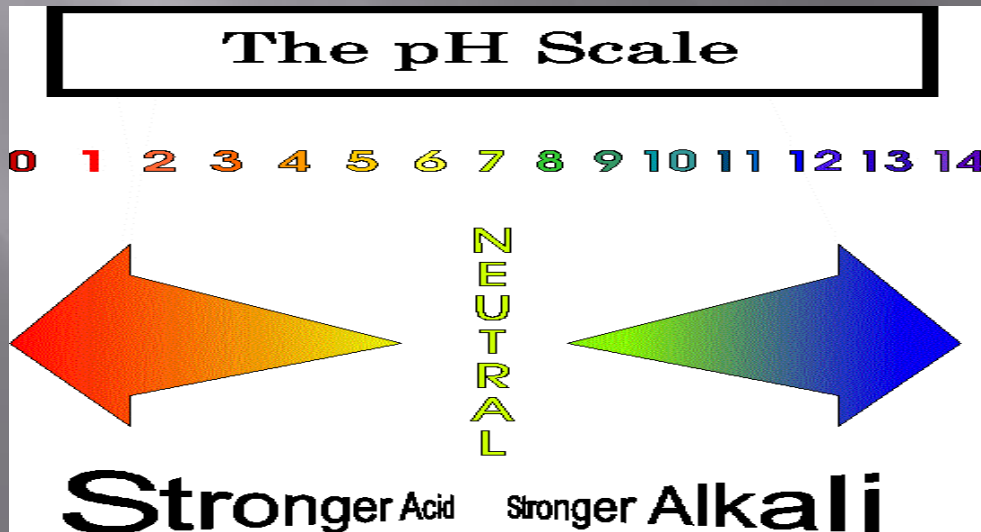


Acids & Bases

- An acid is a substance that gives away H^+ ions in a solution
- A base is a substance that gives away OH^- ions in a solution
- The acidity of a solution can be measured on a pH scale



- The pH scale measures the concentration of H^+ in a solution
- Acidic solutions have a pH less than 7
- Basic solutions have a pH greater than 7
- A pH of 7 is neutral



| pH Value | Examples |
|----------|-----------------------------|
| 0 | Battery acid |
| 1 | Stomach acid |
| 2 | Lemon juice, vinegar |
| 3 | Orange juice, cola |
| 4 | Tomatoes |
| 5 | Bananas Normal rainwater |
| 6 | Urine, healthy lake |
| 7 | Pure water Blood, tears |
| 8 | Seawater |
| 9 | Baking soda |
| 10 | Great Salt Lake |
| 11 | Household ammonia |
| 12 | Soapy water |
| 13 | Oven cleaner |
| 14 | Sodium hydroxide (NaOH) |

▣ Buffers

- ▣ Substances that can react with acids or bases to resist changes in pH
- ▣ Our bodies contain buffers that help maintain our pH within an acceptable range
 - ▣ For example, the carbonic-acid-bicarbonate helps to maintain our blood pH at 7.4
 - ▣ If our blood pH rises above 7.8 or below 6.8 we could die!

