Properties of Water

Covalent bonding

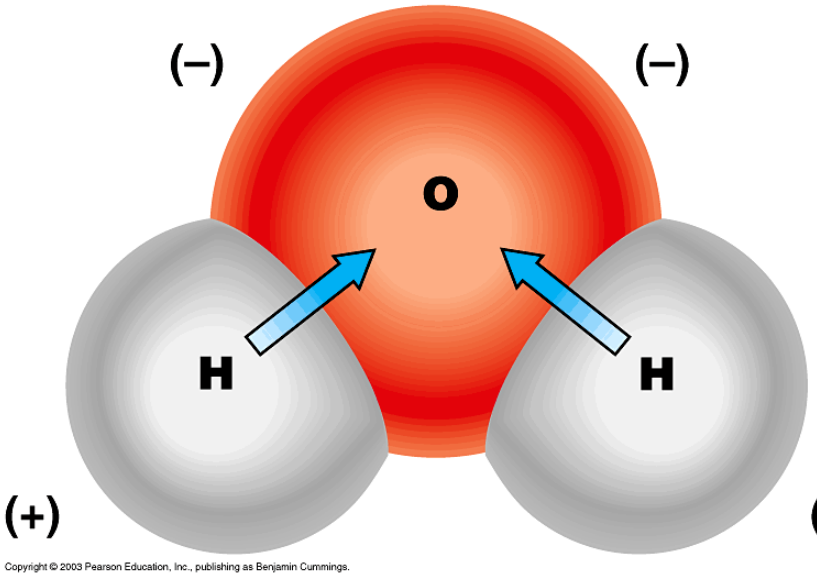
<u>Polar covalent bond</u> – unequal sharing of electrons

A great example of a molecule with polar covalent bonds is water. Why is water considered polar?

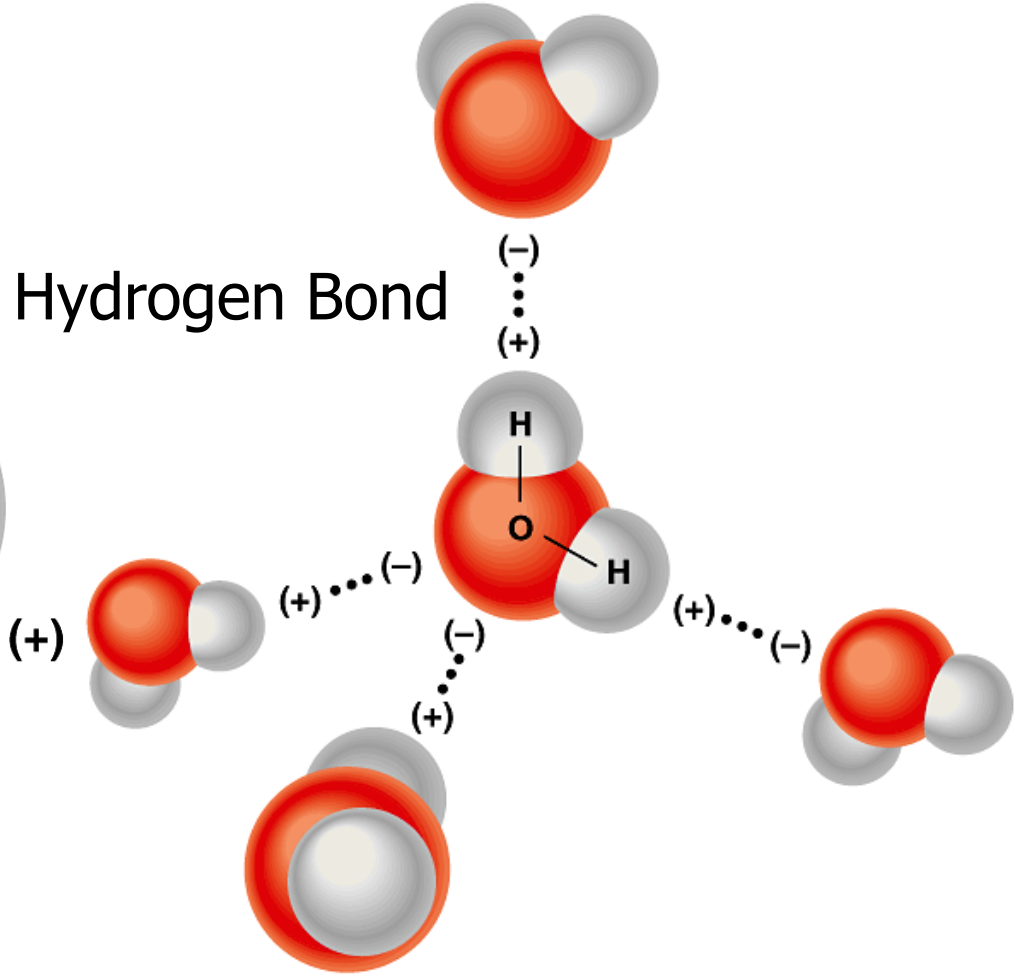
What is a partial positive and partial negative charge?

Properties of Water

Covalent bonding vs. Hydrogen bonding



Covalent Bond



Properties of Water

Universal Solvent

Water is the solvent of Life!

<u>Solute</u> – substance dissolved in a solvent to form a solution

<u>Solvent</u> – fluid that dissolves solutes

Example: Ice Tea – water is the solvent and tea and sugar the solutes

Properties of Water

Cohesion, Adhesion and Surface Tension

cohesion **= water attracted to other water molecules because of polar properties**

adhesion **= water attracted to other materials**

surface tension **= water is pulled together creating the smallest surface area possible**

Properties of Water

Capillary Action

Because water has both adhesive and cohesive properties, *capillary action* is present.

Capillary Action = water's adhesive property is the cause of capillary action. Water is attracted to some other material and then through cohesion, other water molecules move too as a result of the original adhesion.

Ex: Think water in a straw

Ex: Water moves through trees this way

Properties of Water

High Heat Capacity

In order to raise the temperature of water, the average molecular speed has to increase.

It takes much more energy to raise the temperature of water compared to other solvents because hydrogen bonds hold the water molecules together!

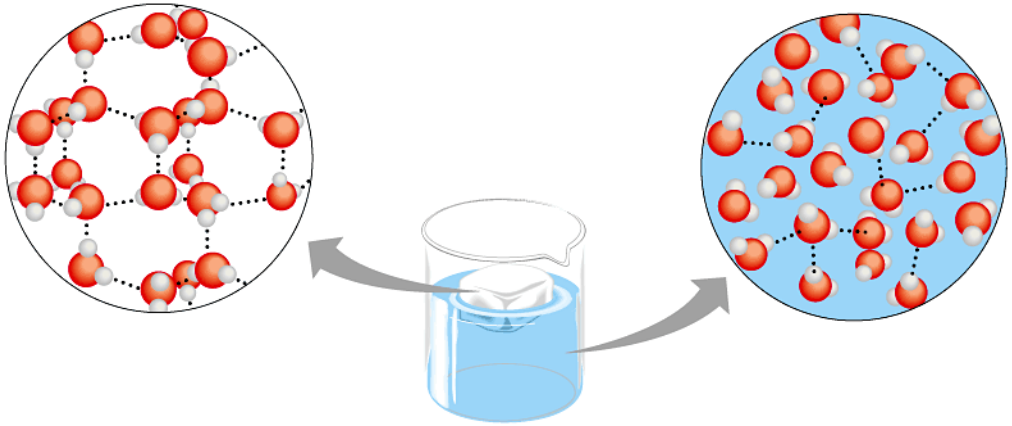
Water has a *high heat capacity.*

"The specific heat is the amount of heat per unit mass required to raise the temperature by one degree Celsius."

Properties of Water

Density

Water is less dense as a solid! This is because the hydrogen bonds are stable in ice – each molecule of water is bound to four of its neighbors.



Solid – water molecules are bonded together – space between fixed

Liquid – water molecules are constantly bonding and rebonding – space is always changing

Properties of Water

So, can you name all of the properties of water?

Adhesion

Cohesion

Capillary action

High surface tension

Holds heat to regulate temperature (High heat capacity)

Less dense as a solid than a liquid

Acids and Bases

Strength compared using pH scale

Ranges from 0 – 14

Logarithmic Scale (gets 10x bigger/smaller)

Acid – donates H+ when added to aqueous solutions

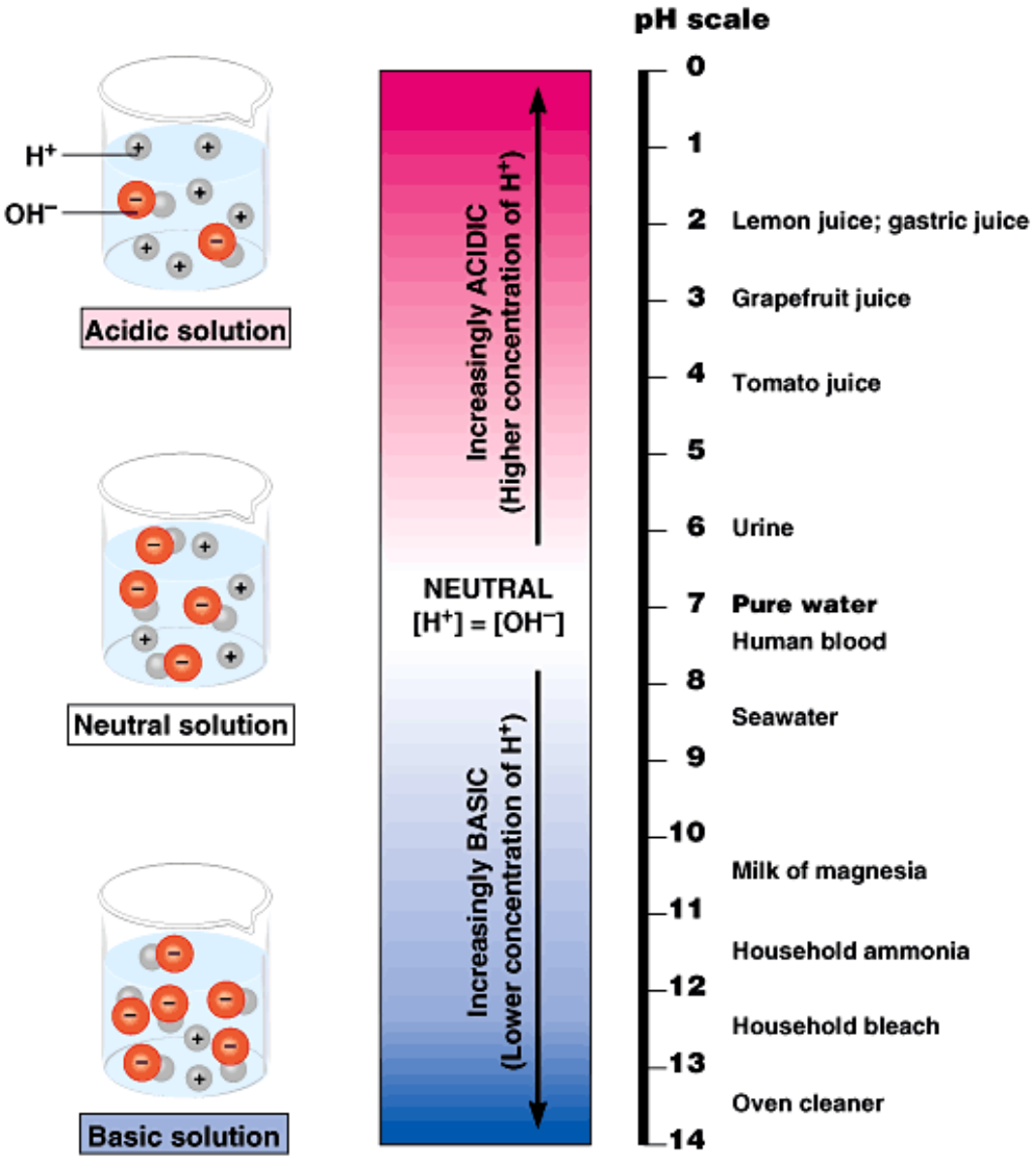
Ranges from pH 0-6.9

Base – breaks up into hydroxide (OH-) ions and another compound when placed in an aqueous solution

Ranges from pH 7.1 – 14

Distilled water is pH 7.0 or neutral. Why?

$$H_2O \longrightarrow H^+ + OH^-$$



Acids and Bases

Buffers – compounds used to maintain a contant pH within a system

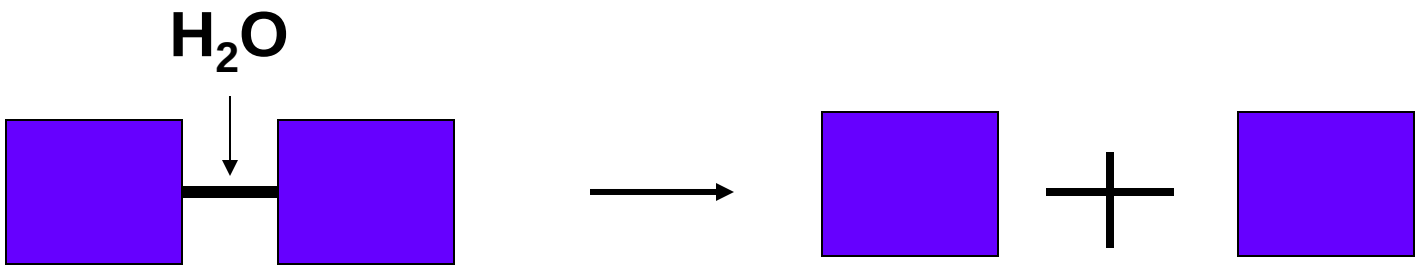
$$H_2CO_3 \longrightarrow H^+ + HCO_3^-$$

Carbonic acid **bicarbonate ion**

Acids and Bases

Making Biological Molecules

Condensation Reaction



Hydrolysis Reaction