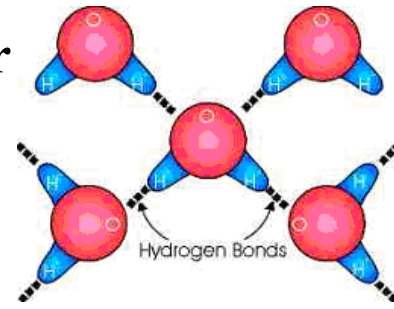


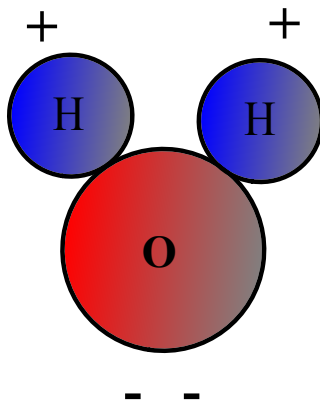
## Section 2.2 Properties of Water

### I. Water and its Importance

#### A. Water is polar

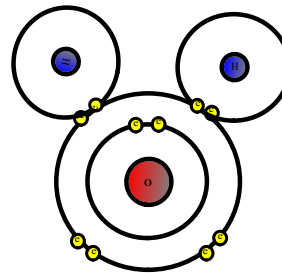


1. Polar molecule = *a molecule with an unequal distribution of charge.*
2. These molecules have *a positive end and a negative end.*



Water and Its Importance

Water is polar



3. Polar molecules attract *other polar molecules*, as well as, *charged ions*, this property is referred to as *adhesion*.

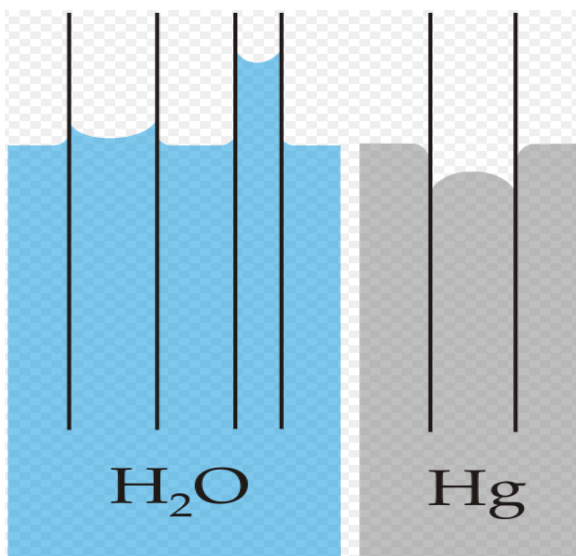
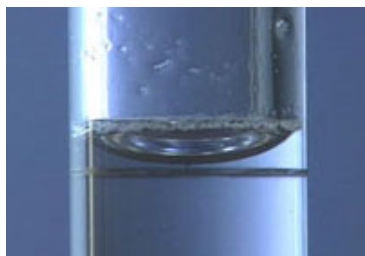
4. When two water molecules come in close contact, *the negative oxygen end* is attracted to the *other* water molecule's *positive hydrogen end*.

This attraction of opposite charges forms a weak bond called a *hydrogen bond* and the property is referred to as *cohesion*.

The combination of adhesion and cohesion results in the movement of water through plants by *capillary action*.



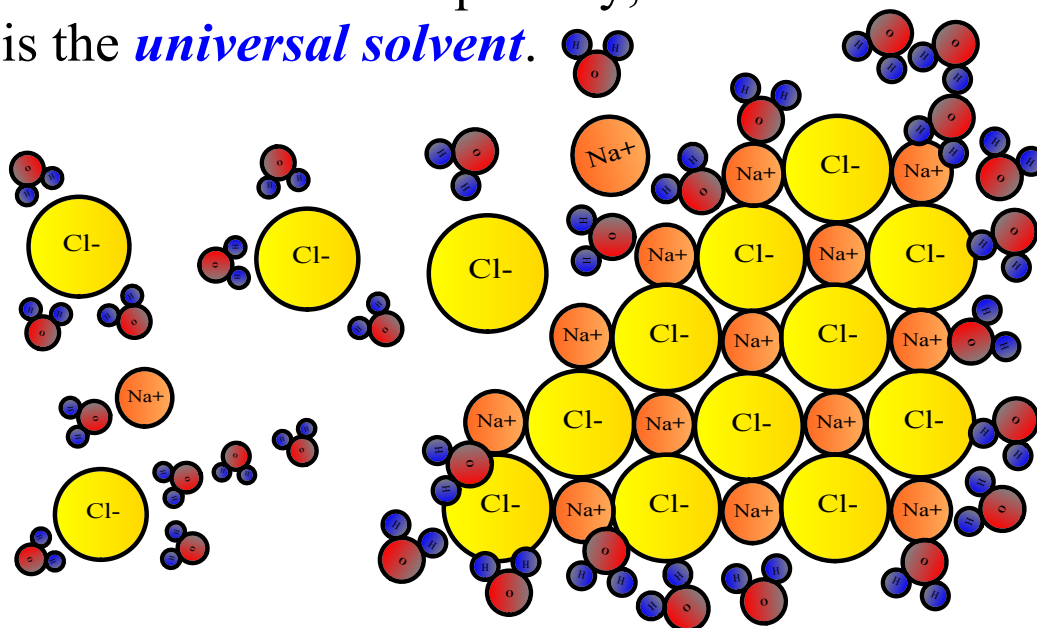
### Capillary action



*Surface Tension* - type of cohesion



5. Because of water's polarity, it ...  
-is the *universal solvent*.



## B. Water resists temperature changes

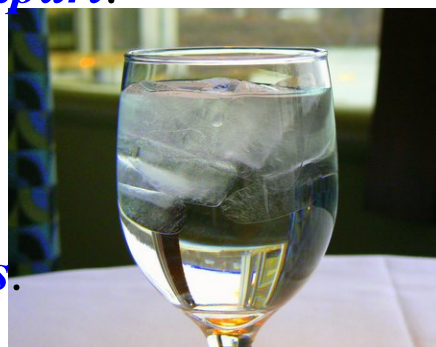
1. Water requires *more* heat to increase its temperature than other liquids. **WHY?**  
B/c hydrogen bonds *between each water molecule*, as you add *heat*, must be broken to move around.
2. And it takes a more heat to break the bonds of a water molecule, than most substances. This characteristic of water is referred to as *high specific heat*.

3. When water cools, it *gives off a lot of heat*. The characteristic of water is *high heat of fusion*.
4. Because water takes longer to heat up and cool down, it is like an *insulator* that helps maintain a steady environment when conditions *fluctuate* outside and within our own *bodies/cells*.

### C. Water expands when it freezes

\*As water begins to freeze more and more *hydrogen bonds* are formed and the water molecules become more *spread apart*.

When this happens as a piece of ice forms, it becomes *less dense* than the surrounding *liquid water*, therefore, ice *floats*.



## II. Mixtures and Solutions

A. Mixture = a combination of substances in which the **individual components** *retain their own properties*.



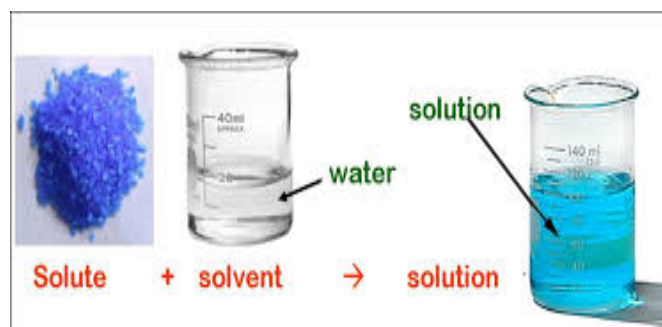
Ex: sand and salt; salt and pepper

B. Solution = a mixture in which one or more substances (*solutes*) are distributed *evenly* in another substance (*solvent*).

In other words, **one substance is dissolved in another and will not settle out** of the solution.

Ex: salt water, carbonated drinks

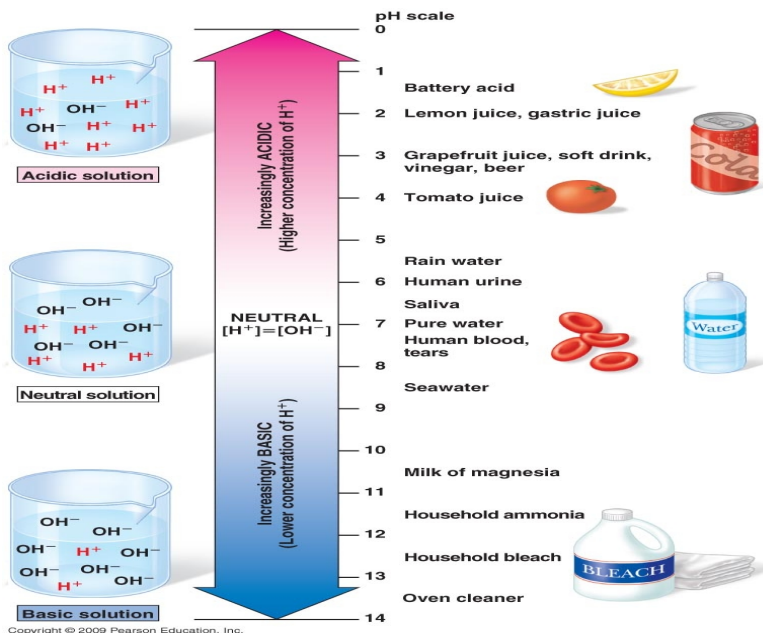
Organisms can't live unless the **concentration of dissolved substances** stays within a *specific, narrow range*.



## C. Acids and Bases

1. Chemical reactions can only occur when *conditions are right*. One of the conditions that is very important is the *pH* of a solution.
2. The pH measures the “*percent of hydrogen*” in a substance, indicating how *acidic* or *basic* a solution is.
3. pH scale rates *0 to 6.9* acidic; *7.1 to 14* basic; *7* as neutral.
  
4. An acid is any substance that forms *hydrogen ions (H<sup>+</sup>)* in water.  
Ex:  $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$
5. A base is any substance that forms *hydroxide (OH<sup>-</sup>)* in water.  
Ex:  $\text{NaOH} \rightarrow \text{Na}^+ + \text{OH}^-$
6. If the number of **H<sup>+</sup>** and **OH<sup>-</sup>** ions *equal* than solution is *neutral* with a **pH of 7**.

# pH SCALE

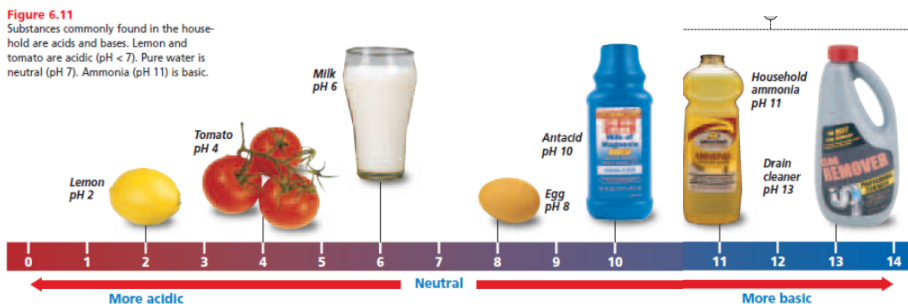


## Acids and Bases pH

If  $H^+ > HO^-$  then solution is acidic

If  $H^+ = OH^-$  then solution is neutral

If  $H^+ < HO^-$  then solution is basic



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