

Basic Chemistry for Biology

Biology 12
Mrs. Frost
Duchess Park

Matter ... anything that occupies space

"Atom"

Smallest unit of matter

Biological

C (carbon)

H (hydrogen)

N (nitrogen)

O (oxygen)

P (phosphorus)

S (sulfur)

Periodic Table of the Elements

Why Do Atoms React?

CHNOPS

To become more "stable" by having a full outer

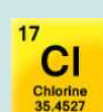
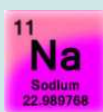
shell (Octet Rule)

← IONIC

→ COVALENT

Ionic Compounds

Reaction between **metal** and **nonmetal**



Electrons are either "given away" or "picked up"

Importance to Living Systems

- Dissolve easily in polar solutions

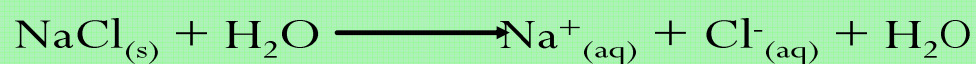


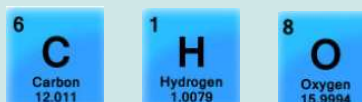
Figure 2.7
page 24

- control blood pressure
- control blood volume
- muscle contractions
- nerve impulses

- stomach acid (HCl)
- helps balance blood pH
- nerve impulses (indirect)

Covalent Compounds

Reaction between two **nonmetals**



Electrons are more or less equally shared between atoms

non-polar

polar

Importance to Living Systems

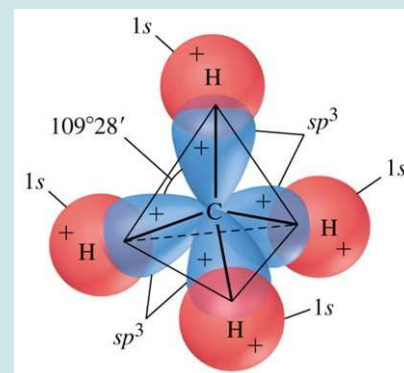
- All organic compounds

Figure 2.8
page 25



- Shape determines function

- hormones, antibodies, enzymes

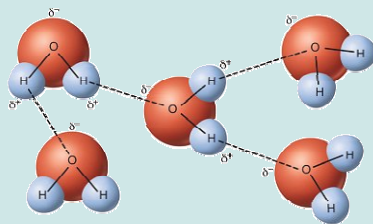
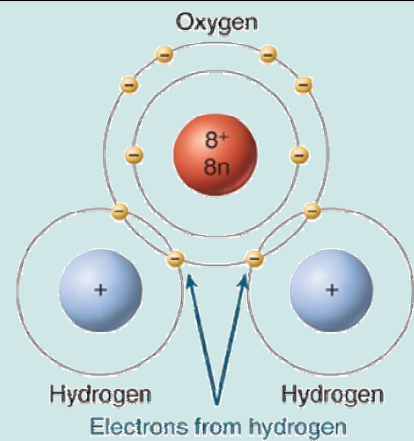


Importance of Water

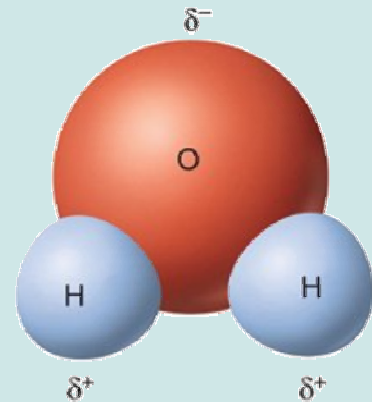
- Most abundant liquid on earth
- Makes up 50-90% of living tissue

Water is...

- ionic OR covalent?
- organic OR inorganic?
- polar or non-polar?



Hydrogen Bonding
 - weak individually
 - strong collectively



Properties of Water

High Heat Capacity

A lot of energy is required to break all the hydrogen bonds

Temperature of water rises and falls **SLOWLY**

I love the specific heat capacity of water!



Allows warm blooded organisms to regulate their body temperature

Properties of Water

High Heat of Vaporization

Takes a lot of energy to
convert liquid water to gas



Evaporation of sweat
removes heat from
the surface of the
skin, cooling the body

Properties of Water

Solvent

Substances are dissolved and transported around body



Hydrophobic

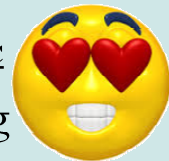
water fearing

(covalent compounds)

Hydrophilic

water loving

(ionic compounds)



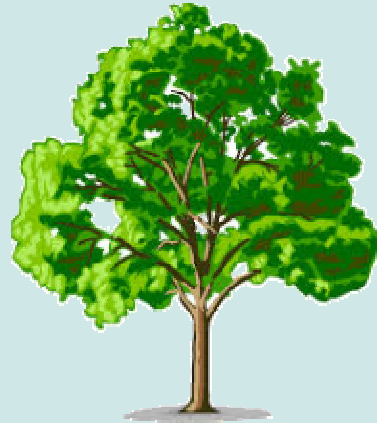
... don't forget about waste removal as well!

Properties of Water

Cohesive & Adhesive

Cohesion holds hydrogen bonds of water molecules together forming **surface tension**

Water is attracted to other molecules by **adhesive** forces.



Water and dissolved minerals are transported through plants by cohesive and adhesive forces

Properties of Water

Surface Tension

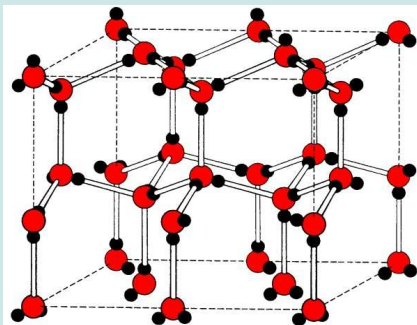
Hydrogen bonding gives water high surface tension



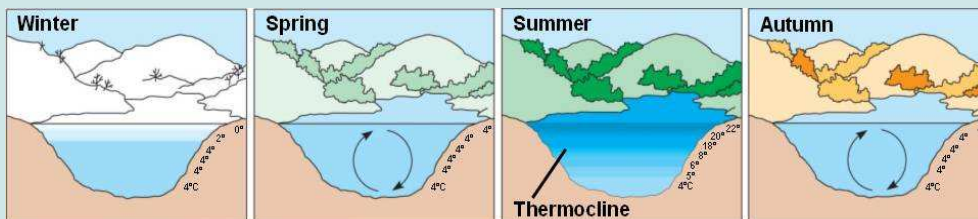
Properties of Water

Solid is less dense than liquid

Spaces in solid form of water
allow it to float on liquid water



Insulates fresh water and
prevents sudden changes in
temperature that would
kill aquatic life



Properties of Water

Lubricant

Organisms require moisture to function

protects



moistening of food



allows diffusion of gases



breakdown of
nutrients