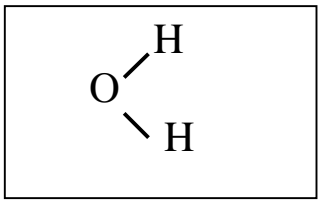
Water (H_2O)



- The most abundant molecule in living things

  √ Our bodies are about half water by weight

Fig 26.6

Water has many properties that are essential to sustaining life

- Water dissolves most substances

  √ This allows substances to be easily transported in body fluids

- Water cools when it evaporates

  √ We can lower body temperature through sweating

Hydrophobic substances

Substances that do not dissolve well in water

- Usually molecules containing many more carbon atoms than oxygen atoms

- Example: $C_{56}H_{110}O_6$ is a hydrophobic molecule

Dissolve

When solute particles (molecules, atoms, or ions) are evenly spread out from each other in a liquid

- Solute = The substance that is dissolved in a liquid
- Solution = The liquid with the dissolved solute in it
- Concentration = The amount of solute in a volume of solution

√ Concentrations are usually stated as grams solute per liter or as % concentrations

√ A solute in brackets means the concentration of that solute

Example: [Sugar] = The concentration of sugar in a liquid

Diffusion

The movement of a solute from an area of its high concentration to an area of its low concentration.

- Cell membranes are barriers that prevent most solutes from diffusing through them

Osmosis

The movement of water across a cell membrane towards whichever side has the highest solute concentration

- "Water moves towards solutes"

- Hypertonic = A solution with a higher solute concentration than a cell

  √ Cells shrink in hypertonic solutions because they lose water through osmosis

- Hypotonic = A solution with a lower solute concentration than a cell

  √ Cells enlarge in hypotonic solutions because they gain water through osmosis

- Isotonic = A solution with an equal solute concentration to a cell

  √ Cells stay the same size in isotonic solutions because they don't gain or lose water through osmosis

Fig 3.7 and 3.8

Acid

Any molecule that adds H^+ ions to a solution

- Examples:

$HCl \rightarrow H^+ + Cl^-$

Hydrochloric acid

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

Carbonic acid

Fig 2.16

Base

Any molecule that removes H^+ ions from a solution

- Examples:

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

Hydroxide ion

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

Bicarbonate ion

Fig 2.16

pH scale

A number (from 0 to 14) that indicates the H^+ concentration of a solution

- The pH is how acidic or how basic the solution is
- Pure water has a pH of 7 and is called "neutral" (not acidic or basic)
- Solutions that are acidic have a higher $[H^+]$ than pure water
  - √ Acidic solutions have pHs **lower** than 7
  - √ The higher the $[H^+]$, the lower the pH
- Solutions that are basic have a lower $[H^+]$ than pure water
  - √ Basic solutions have pHs **higher** than 7
  - √ The lower the $[H^+]$, the higher the pH

Fig 2.17

Buffer

Substances that (when added to a solution) minimize changes in the solution's pH

- Buffers make a solution resistant to acids and bases
- Blood is buffered by the carbonic acid and bicarbonate ions in the blood
- The carbonic acid replaces any lost H^+

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

- The bicarbonate ion absorbs any excess H^+

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