**Water chemistry** (chapters 2 and 3)

Water (H2O)

 H

 O

 H

 • The most abundant molecule in living things

 √ Our bodies are about half water by weight

Fig 2.6

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: C56H­110O6 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

Fig 3.11

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

Fig 3.12

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

Figs 3.14 and 3.15

 Acid

Any molecule that adds H+ ions to a solution

 • Examples:

 HCl -> H+ + Cl–

 Hydrochloric acid

 H2CO3 -> H+ + HCO3–

 Carbonic acid

Text figures on page 47

Base

Any molecule that removes H+ ions from a solution

 • Examples:

 OH– + H+ -> H2O

 Hydroxide ion

 HCO3– + H+ ->H2CO3

 Bicarbonate ion

Text figures on page 47

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 2.11

Buffer

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

 • Buffers make a solution resistant to pH change by acids and bases

• Blood is buffered by the carbonic acid and bicarbonate ions in the

 blood

 • The carbonic acid replaces any lost H+

H2CO3 -> HCO3– + H+

• The bicarbonate ion absorbs any excess H+

 HCO3– + H+ -> H2CO3

Text figure on page 510; table 18.1