**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