Organic Chemistry 212
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Notes: *Chapter Seven – Acids and Bases*

Acid/Base definitions

Arrhenius:

An acid provides H_3O^+ [hydronium] ions and a base provides OH^{1-} [hydroxide] ions in an aqueous solution. (Actually Arrhenius said H^+ ions but we now know that these attach to water molecules.)

Strong acids react completely with water to form hydronium ions. Weak acids produce smaller concentrations of hydronium ions.

What are some common examples of:

Strong acids:

Weak acids:

Strong bases:

Weak bases:

Brønsted-Lowry:

An acid is a proton donor and a base is a proton acceptor. An acid-base reaction is a proton transfer reaction. Any pair of molecules that can be interconverted by transfer of a proton is called a conjugate acid-base pair.

Give some examples of acid-base conjugate pairs:

A substance that can act as either an acid or a base is called **amphiprotic.**
Examples:

Properties / Reactions

Acids and bases react with each other in a reaction called neutralization.
A stronger acid and base react to produce a weaker acid and base.

Example:

Strong acids react with certain metals.

Example:

Acids react with metal hydroxides. How is this different from neutralization?

Example:

Strong acids react with metal oxides.

Example:

Reactions (cont.)

Acids react with carbonates to produce carbon dioxide gas.

Discussion:

Glucose catalyzed by yeast:

Acids react with ammonia in water and this means they react with amines.

Discussion:

Pure water and K_w

Sidebar on Logarithms

Defining pH and pOH

A pH indicator is a substance that changes color at a certain pH.

Titrations

Discussion:

Buffers

A buffer is a solution whose pH changes very little when small amounts of hydronium ion or hydroxide ion are added to it. It is able to respond in such a way that the ph remains fairly constant. Buffers ***resist*** changes in pH.

Buffered solutions contain an acid and its conjugate base. If equimolar concentrations exist then the pH will equal the pKa of the acid. This allows us to choose the best conjugate acid/base pair to achieve the pH needed.

The closer the pH of a buffer to the pKa of the acid the greater the capacity of the buffer to absorb added acid or base and maintain a stable pH. The capacity of a buffer also increases as the concentration of the solution increases.

Blood

What is the pH of blood?

What three buffer systems does the body use?

carbonate

phosphate

proteins (discussed in a later chapter)

Henderson-Hasselbalch Equation

Sample problem:

What is acidosis?

What are the two types of acidosis?

What causes this condition?

What is alkalosis?

Biochemical Buffers

TRIS, HEPES