

ACID BASE THEORIES

- Early acid-base theories were based on empirical knowledge of the characteristic properties of acids and bases

Example: acid turns litmus red
base turns litmus blue

- Later theories were based on theoretical knowledge of the reactions of acids and bases

ARRHENIUS THEORY OF ACIDS AND BASES

- Arrhenius' theory is based on his work to explain electrical conductivity of solutions
- Aqueous solutions of neutral ionic compounds, acids, and bases (ionic hydroxides only) were all found to conduct electricity and are known as *electrolytes*
- Neutral ionic compounds and ionic hydroxides consist of ions in their pure form. These substances *dissociate* in water to form free ions (They can also conduct electrical current in their liquid state)
- An Arrhenius base was therefore considered to be an ionic hydroxide that dissociates in water to increase the hydroxide ion concentration
- Because all ionic hydroxides dissociate 100% in water according to Arrhenius all bases are strong

- **Acids in their pure form are molecular substances and will only conduct electricity as an aqueous solution (this is why the state of an acid is always aqueous)**
- **An Arrhenius acid was therefore considered to be a substance that *ionizes* in water to form free ions. Arrhenius acids were said to be hydrogen containing substances that ionize in water to increase the hydrogen ion concentration**
- **Acids can be classified as strong or weak based on the degree to which they ionize in water**
- **Strong acids like hydrochloric or sulfuric almost completely (> 99%) ionize in water**
- **Weak acids such acetic or carbonic acid will only partially (<50%) ionize in water.**
- **The strength of an acid is communicated by writing the percent ionization over the arrow of the equation of the ionization of the acid in water**
- **Strong acids are more dangerous than weak acids because the corrosive behavior of acids is due to the hydrogen ions**