

Chapter 8 – Acids, Bases, and Salts



What are acids?

- Acids tend to taste sour
- Corrode metals
- Produce H^+ ions in water
- H_3O^+ = Hydronium Ion ($\text{H}^+ + \text{H}_2\text{O}$)



Examples of Acids

- Hydrochloric acid – HCl
- Nitric Acid – HNO₃
- Sulfuric Acid – H₂SO₄
- Acetic Acid – CH₃COOH



Acids in Solutions



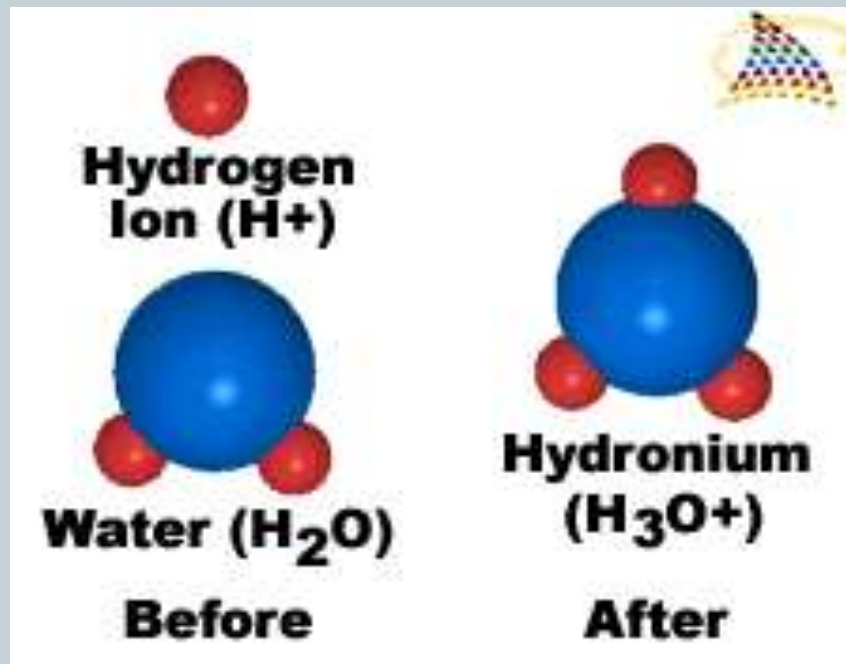
- Acids in water separate (**ionize**) into H⁺ ions and negative ions



So an acid is...?



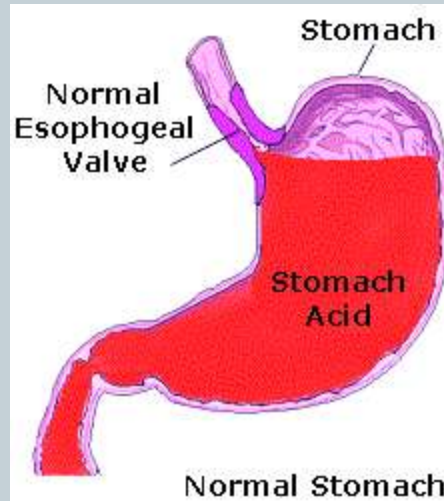
- An **acid** is any substance that produces H^+ ion (H_3O) when placed in water



Real World Acids

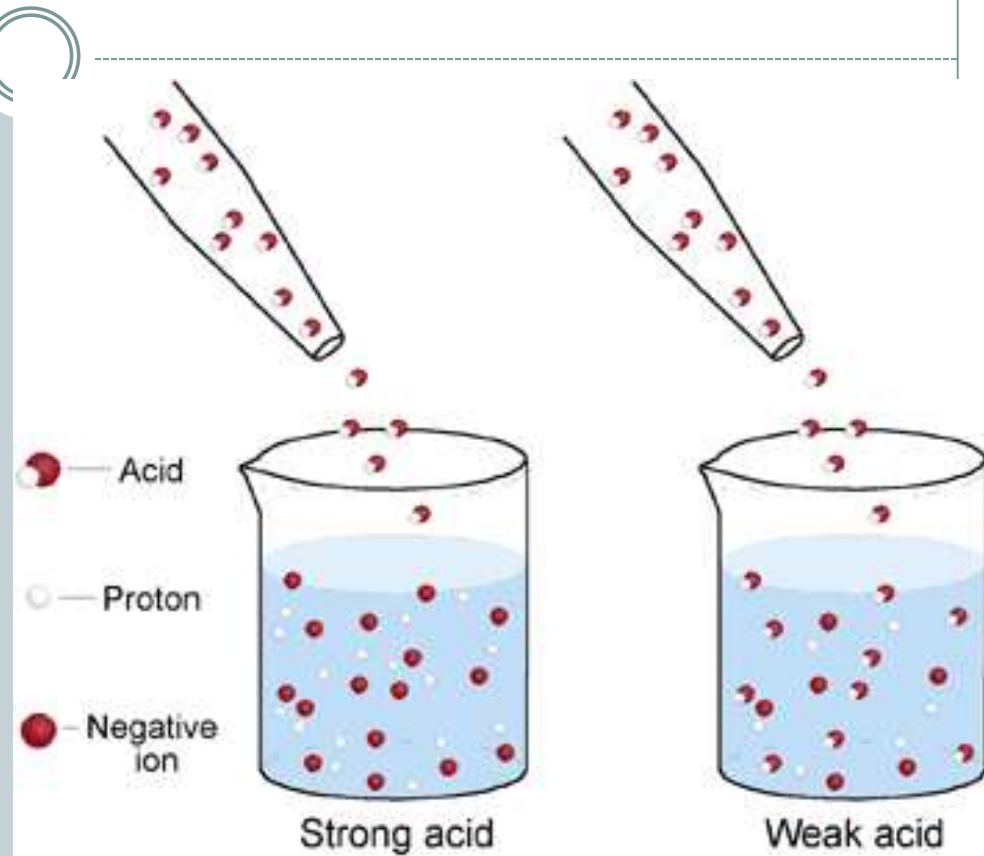


- Stomach Acid
- Battery Acid
- Pop/Coffee
- Tomatoes
- Rain



Strength of Acids

- Some acids are stronger than others
- A **strong acid** is one that ionizes (breaks apart) fully in water (HNO_3 – Nitric Acid)

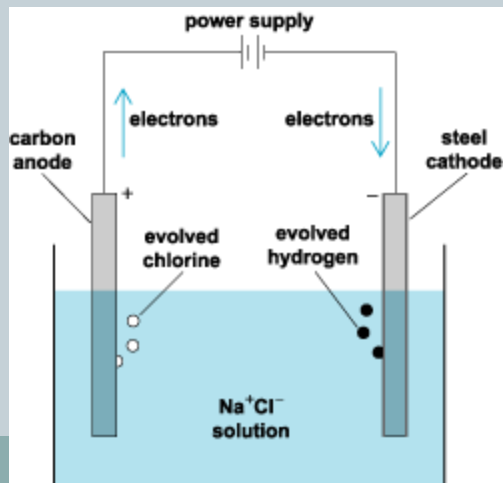


- A **weak acid** is one in which only some molecules ionize (break apart) in water (CH_3COOH – Acetic Acid)

Electrolytes



- When acids ionize in water, the charged ions are able to move around in the solution and conduct electricity
- A substance that conducts electricity when dissolved in water is an **electrolyte**



What is a base?



- Bases tend to be bitter
- Slippery (soap)
- Also referred to as alkaline
- Produce OH^- ions in water (**Hydroxide Ion**)



Examples of Bases



- Sodium Hydroxide - NaOH
- Ammonia – NH_3
- Not every base contains hydroxide ions, but they ALL react with water to form OH^-

Bases in Solutions



- Bases in water separate into OH^- ions and positive ions



So an base is...?



- A **base** is any substance that produces OH^- ion when placed in water



Real World Bases



- Milk
- Bleach
- Ammonia
- Baking Soda
- Soap (NaOH – Lye)



The pH Scale



- The pH Scale is used to measure the degree of acidity or alkalinity



Ranges from 1 – 14

< 7 = Acid

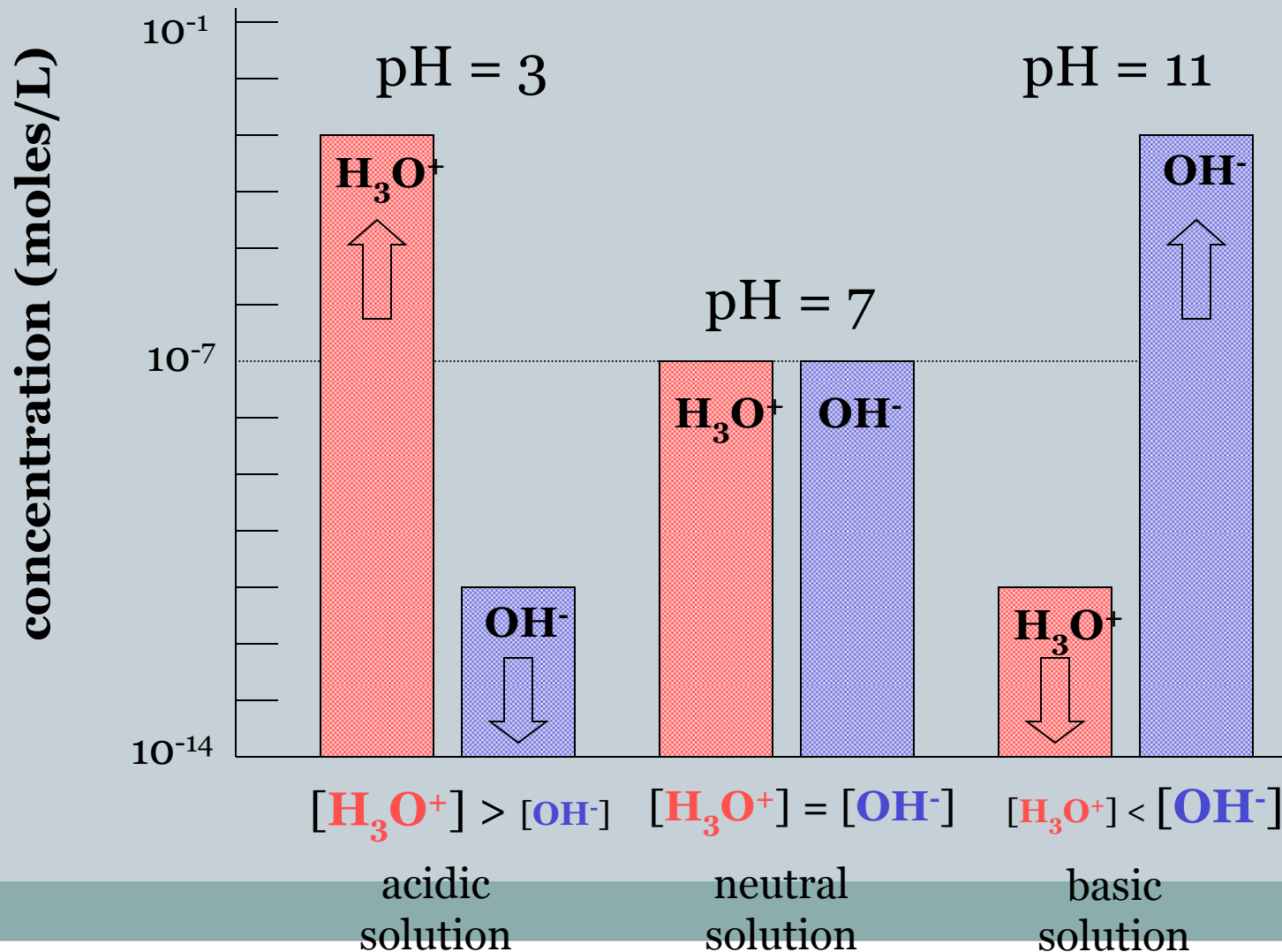
> 7 = Base

7 = Neutral



- The different pH values tell you how many H⁺ there is compared to OH⁻
- Small amounts of water naturally self-ionizes
 - $\text{H}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O} + \text{OH}^-$
- Because there are **equal** number of hydronium ions and hydroxide ions, water is neutral

Acid – Base Concentrations



The pH Scale

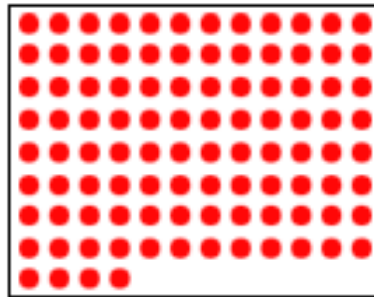


- The pH scale is a logarithmic scale
- This means that each step of 1 on the scale is a 10x concentration difference

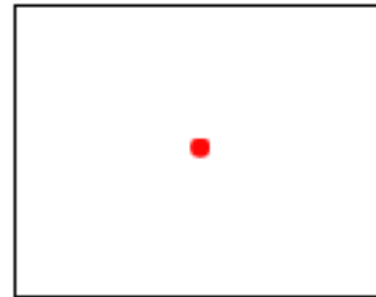
The pH Scale



- A difference of 2 on the pH scale is the equivalent of $10 \times 10 = 100$ times more (or less) concentrated



pH4



pH6

- **Mol:** A unit of concentration that indicates the amount of dissolved substance (in gram molecular weight) contained in a liter of solution. For example, the molecular weight of salt (NaCl) is $22.990 + 35.453 = 58.443$; therefore, 1 mol/l means that 58.443 grams of salt is dissolved in water to comprise one liter of saltwater.

Testing pH

- Acid/Base Litmus Paper
 - Acids turn blue litmus paper red
 - Bases turn red litmus paper blue
- Higher quality litmus paper will give you a specific value on the pH scale
- Digital pH meter



Neutralizations



- When you mix an acid with a base the result is a neutral solution (water + salt)
 - $\text{HCL} + \text{NaOH} \rightarrow \text{H}^2\text{O} + \text{Na}^+ + \text{Cl}^-$
NaCl
- A **salt** is any ionic compound made form the neutralization of an acid with a base

Titrations



- **Titrations** are lab procedures used to calculate the concentration of an acid or basic solution
- A known sample is mixed with the unknown until it is neutralized
- An indicator (bromthymol blue) is used to visually see when a certain pH is reached

