

Acids, Bases, & Salts



What is an ACID?

- pH less than 7
- Neutralizes bases
- Forms H^+ ions in solution
- Corrosive-reacts with most metals to form hydrogen gas
- Good conductors of electricity

Acids Generate Ions



Weak vs. Strong Acids

- Weak Acids do not ionize completely:
Acetic, Boric, Nitrous, Phosphoric,
Sulfurous
- Strong Acids ionize completely:
Hydrochloric, Nitric; Sulfuric, Hydriodic

Common Acids

- HCl - hydrochloric- stomach acid
- H_2SO_4 - sulfuric acid - car batteries
- HNO_3 – nitric acid - explosives
- $\text{HC}_2\text{H}_3\text{O}_2$ - acetic acid - vinegar
- H_2CO_3 -carbonic acid – sodas
- H_3PO_4 - phosphoric acid -flavorings





**CAN YOU PASS
THE ACID TEST ?**

What is a BASE?

- pH greater than 7
- Feels slippery
- Dissolves fats and oils
- Usually forms OH^- ions in solution
- Neutralizes acids

Weak vs. Strong Bases

- Weak Bases: ammonia; potassium carbonate, sodium carbonate
- Strong Bases: sodium hydroxide; sodium phosphate; barium hydroxide; calcium hydroxide



Common Bases

- NaOH - sodium hydroxide (LYE) soaps, drain cleaner
- $\text{Mg}(\text{OH})_2$ - magnesium hydroxide-antacids
- $\text{Al}(\text{OH})_3$ -aluminum hydroxide-antacids, deodorants
- NH_4OH -ammonium hydroxide- “ammonia”



Types of Acids and Bases

- In the 1800's chemical concepts were based on the reactions of aqueous solutions.
- Svante Arrhenius developed a concept of acids and bases relevant to reactions in H₂O.
- Arrhenius acid – produces hydrogen ions in water.
- Arrhenius base – produce hydroxide ions in water.

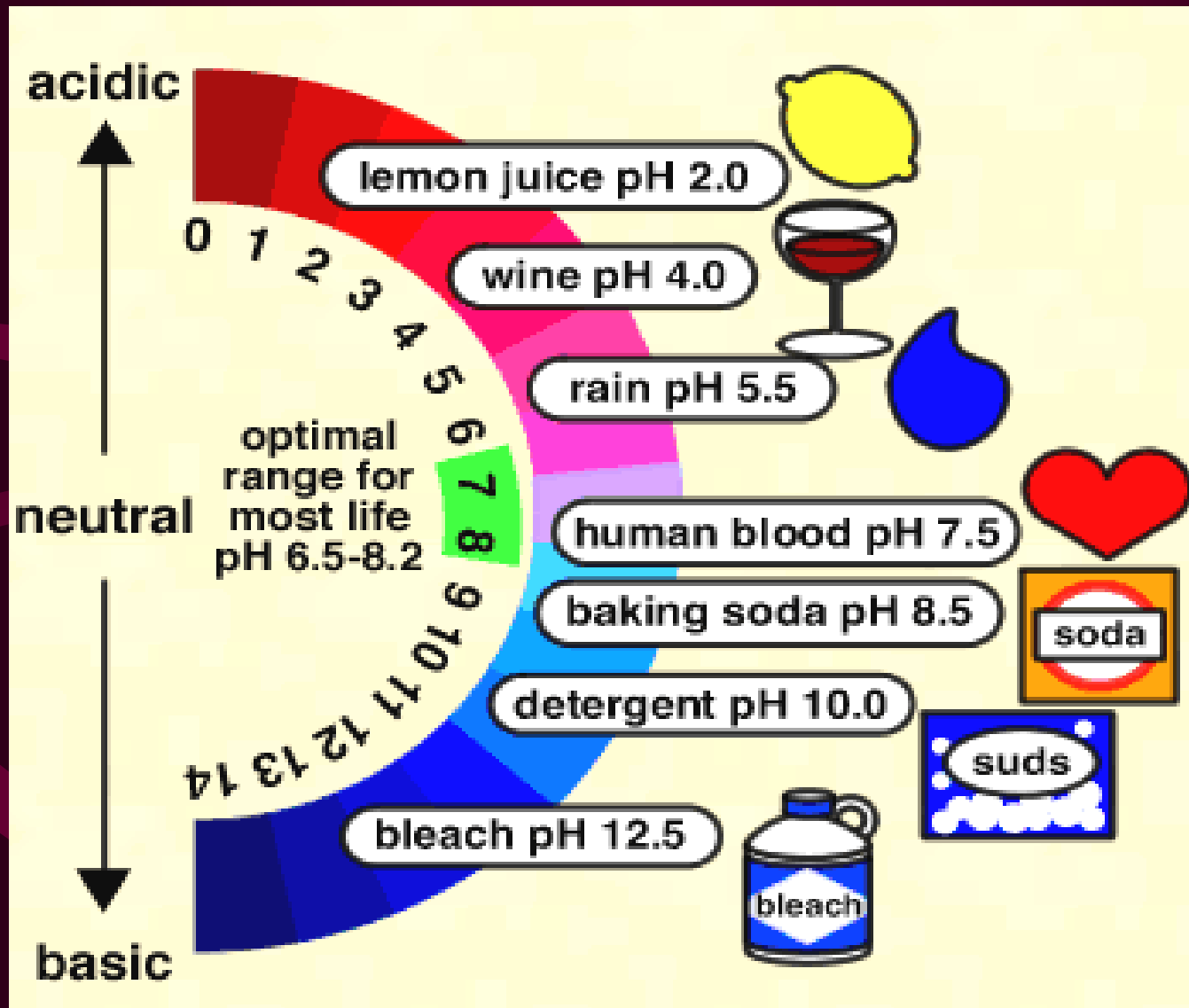
A broader ,more modern concept of acids and bases was developed later.

Bronsted-Lowry acid- donates a hydrogen ion in a reaction.

Bronsted – Lowry base – accepts a hydrogen in a reaction.

- Conjugate acid- compound formed when an base gains a hydrogen ion.
- Conjugate base – compound formed when an acid loses a hydrogen ion.

pH Scale



Reactions with indicators

Indicator	Acid color	Neutral color	Base color
Phenolphthalein	Colorless	Faint pink	Dark pink
Bromthymol blue	Yellow	Green	Blue
Litmus	Red	-----	Blue

pH paper



- pH paper changes color to indicate a specific pH value.

Buffers

- A buffer is a solution that resists changes in pH when small amounts of acids and bases are added.

Situations in which pH is controlled

- “Heartburn”
- Planting vegetables and flowers
- Fish Tanks and Ponds
- Blood
- Swimming pools

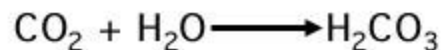
Acids and Bases in Solution

- $\text{HCl} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^-$
(more hydronium ions, more acidic)
- $\text{NaOH in water} \rightarrow \text{Na}^+ + \text{OH}^-$
(more hydroxide ions, more basic)
- $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{HOH}$
Acid + Base yields type of salt and water
- $\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-$
ammonia gas + water yields ammonium and hydroxide ions

Acid Rain



Pollution in the air (sulfur dioxide, carbon dioxide, nitrogen dioxide) combines with water to form various acids.



Rapid changes in pH can kill fish and other organisms in lakes and streams.

Soil pH is affected and can kill plants and create sinkholes



Acid rain can harm fish.





Sinkholes in Oakview Cemetery, Albany, Ga. - 7/94 by D.W. Hicks



What is a SALT?

- A salt is a neutral substance produced from the reaction of an acid and a base.
- Composed of the negative ion of an acid and the positive ion of a base.
- One of the products of a Neutralization Reaction
- Examples: KCl , MgSO_4 , Na_3PO_4



Neutralization Reaction

- A neutralization reaction is the reaction of an acid with a base to produce salt and water.
- Example





Digestion and pH

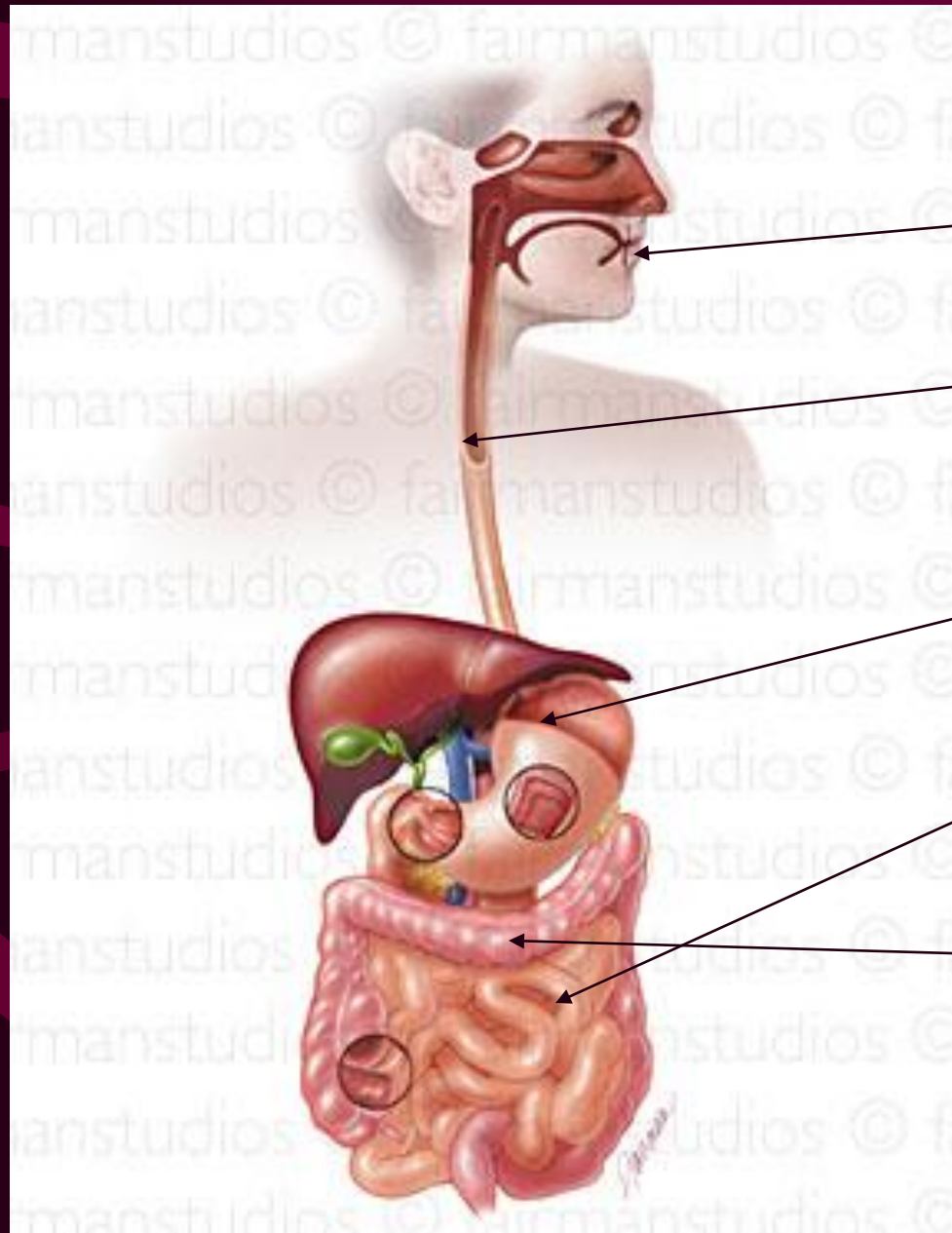
- Digestion-process by which foods are broken down into simpler substances.
- Mechanical digestion-physical process in which food is torn apart (mouth)
- Chemical digestion- chemical reactions in which large molecules are broken down into smaller molecules. (stomach and small intestines)



pH in the Digestive System

-  Mouth-pH around 7. Saliva contains amylase, an enzyme which begins to break carbohydrates into sugars.
-  Stomach- pH around 2. Proteins are broken down into amino acids by the enzyme pepsin.
- Small intestine-pH around 8. Most digestion ends. Small molecules move to bloodstream toward cells that use them

Digestive system



mouth

esophagus

stomach

small intestine

large intestine

Acids, Bases, and Salts

The End

