

**Acids and Bases
in
Biological Systems**

- Biological Systems**
- Stomach acid (hydrochloric acid)
 - Bee and wasp stings (formic acid)
 - Pancreatic fluid (includes sodium bicarbonate)
 - Citrus fruit (citric acid)

- Industrial Processes**
- Explosives (nitric acid)
 - Fertilizers (ammonia)
 - Glass etching (hydrofluoric acid)
 - Speeding up industrial chemical reactions (sulfuric acid)

Domestic Applications

- Window cleaner (ammonia)
- Drain cleaner (sodium hydroxide)
- Antacids (calcium hydroxide)
- Pickles (acetic acid)

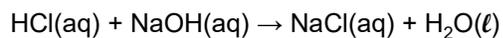
Neutralization

Neutralization Reactions

- The reaction between an acid and a base is a special kind of double displacement reaction called neutralization.
- An acid and base react together to form a salt and water.

Acid + Base → Salt + Water

Example



What is a salt?

- We normally think of salt as the stuff we put on food.
- The chemistry definition of a salt is
 - An ionic solid consisting of a positive ion (other than hydrogen) and a negative ion (other than hydroxide).

Daily Applications

- Why do green apples taste sour?
 - They contain acid
- Why does orange juice taste salty if you drink it after brushing your teeth?
 - A neutralization reaction occurs between the toothpaste (base) and the orange juice (acid) to form a salt.

- Why does acid rain cause damage to marble statues?
 - Marble is calcium carbonate. It reacts with acid to form substances that dissolve in water.
- How does pouring baking soda on an acid spill make the area safe?
 - Baking soda is a base and neutralizes the acid.

Antacids

- Stomach acid is hydrochloric acid.
- It has a pH of between 1 and 2.
- Excess acid in the stomach can cause what is known as “heartburn” or acid indigestion.
- Antacids contain a base.
- The base neutralizes the acid.

Sulfuric Acid

