

Acids and Bases

Acids and bases are two groups of chemical compounds with opposite properties that are encountered frequently in the laboratory and in everyday life. Acids, bases, and the products of their reactions are vital to many life processes and are invaluable to industry and agriculture.

Acids generally taste sour or tart. Bases generally taste bitter and may feel slippery to the touch. However, strong acids and strong bases are dangerous chemicals that are poisonous and can cause chemical burns; they should never be tasted or touched.

When combined with other substances such as water, acids and bases dissociate, or break up, to produce ions, particles that carry an electrical charge.

An acid is a substance that can lose, or “donate,” a hydrogen ion when combined with another substance, such as water. When the compound hydrogen chloride (HCl) is dissolved in water, the compound dissociates, or separates, releasing hydrogen ions (H) and chloride ions (Cl):



Acids may be strong or weak, depending upon how many hydrogen ions they release in solution.

The strongest acids are the mineral, or inorganic, acids. These include sulfuric acid, nitric acid, and hydrochloric acid. Strong acids are important in industry and manufacturing, where they are used to make products such as fertilizers, dyes, drugs, and some types of batteries. Weak organic acids are in many of the foods we eat and drink, such as citrus fruits (citric acid), milk and yogurt (lactic acid), apples (malic acid), vinegar (acetic acid), meats and other protein-rich foods (amino acids), and even soda pop (carboxylic acid).

Bases may be strong or weak, depending upon how many hydroxide ions they release in solution. The more hydroxide ions that are released, the stronger the base.

When the compound sodium hydroxide (NaOH) is dissolved in water, the compound dissociates, forming sodium ions (Na) and hydroxide ions (OH):



The strongest bases are the hydroxides and oxides of certain metals and earth metals, and include calcium hydroxide, potassium hydroxide, strontium oxide, and sodium hydroxide. The latter is a main component of soaps and cleaning products, including highly caustic products such as lye, drain openers, and oven cleaners. Weaker bases include ammonia, milk of magnesia, and carbonates such as baking soda (sodium bicarbonate) and limestone (calcium carbonate). Seawater, toothpaste, egg whites, and blood are also slightly basic.

