



Acids and Bases

Science Study Guide Version 3.1

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Acids are substances with a pH lower than 7.

Bases are substances with a pH higher than 7.

Model	Details
Lewis:	frequently-mentioned Lewis acids include boron trifluoride and aluminum trichloride, which is used as a catalyst in the Friedel-Crafts reaction
acid	electron-pair acceptor
base	electron-pair donor
Brønsted-Lowry:	this model describes conjugate acids and bases; a base's conjugate acid is formed when the base has accepted a proton in a reaction, and an acid's conjugate base is formed when the acid has donated a proton in a reaction
acid	proton donor
base	proton acceptor
Arrhenius:	first modern model of acids and bases; superseded by the above models since it's not very effective at describing non-aqueous solutions; typically, Arrhenius acids and bases that interact with each other in a neutralization reaction form water and a salt
acid	dissociates in water to form H ⁺ hydrogen ions (protonation of water), resulting in the formation of hydronium (H ₃ O ⁺)
base	dissociates in water to form hydroxide ions (OH ⁻)

Strong Acids are acids that completely dissociate into H⁺ and an anion (negatively charged particle) in water.

Weak Acids are acids that do not completely dissociate in water.

Acid	Formula	Details
acetic acid	CH ₃ COOH	weak acid; a carboxylic acid (due to the -COOH functional group) found in vinegar
hydrochloric acid	HCl	strong acid; makes up a large portion of stomach acid; forms aqua regia (name means "royal water" because it can dissolve gold and other metals) with nitric acid; forms sodium chloride and water when combined with sodium hydroxide
nitric acid	HNO ₃	strong acid; forms aqua regia (name means "royal water" because it can dissolve gold and other metals) with hydrochloric acid
sulfuric acid	H ₂ SO ₄	strong acid; used in lead-acid batteries; created in the contact process with a vanadium (pent)oxide catalyst; it is the only diprotic strong acid, meaning it donates two protons per molecule instead of one in water