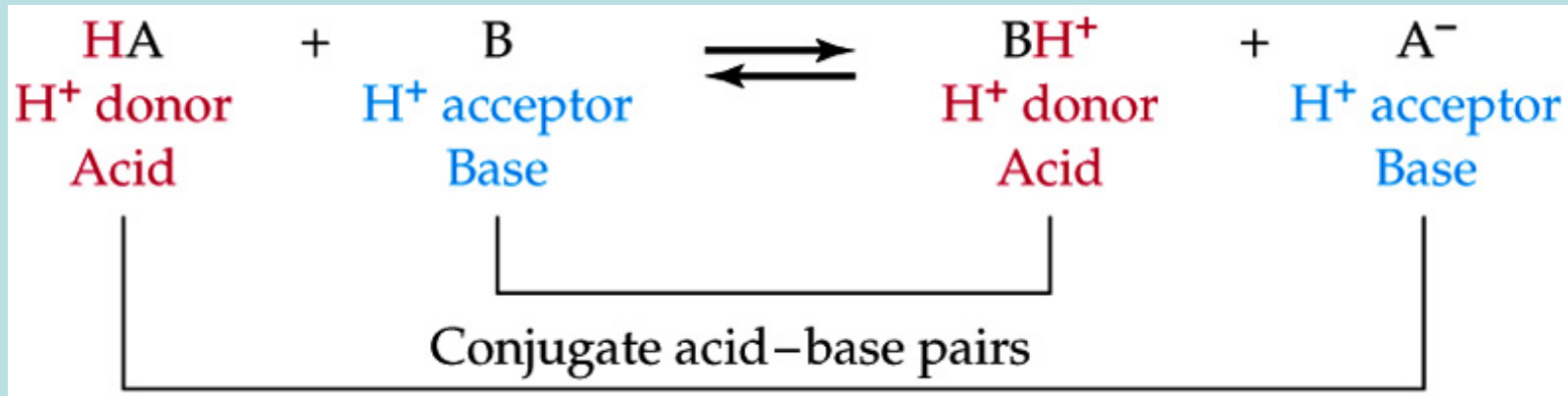


# Chapter 14 – Acids & Bases



# Brønsted-Lowry Acids & Bases



# Strengths of Acids & Bases

**TABLE 15.1** Relative Strengths of Conjugate Acid–Base Pairs



	Acid, HA		Base, A <sup>-</sup>			
 <p>Stronger acid</p> <p>Weaker acid</p>	HClO <sub>4</sub>	} Strong acids. 100% dissociated in aqueous solution.	ClO <sub>4</sub> <sup>-</sup>	} Very weak bases. Negligible tendency to be protonated in aqueous solution.		
	HCl				Cl <sup>-</sup>	
	H <sub>2</sub> SO <sub>4</sub>				HSO <sub>4</sub> <sup>-</sup>	
		HNO <sub>3</sub>		NO <sub>3</sub> <sup>-</sup>		
		H <sub>3</sub> O <sup>+</sup>		H <sub>2</sub> O		
		HSO <sub>4</sub> <sup>-</sup>	} Weak acids. Exist in solution as a mixture of HA, A <sup>-</sup> , and H <sub>3</sub> O <sup>+</sup> .	SO <sub>4</sub> <sup>2-</sup>	} Weak bases. Moderate tendency to be protonated in aqueous solution.	
		H <sub>3</sub> PO <sub>4</sub>				H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>
		HNO <sub>2</sub>				NO <sub>2</sub> <sup>-</sup>
		HF				F <sup>-</sup>
		CH <sub>3</sub> CO <sub>2</sub> H				CH <sub>3</sub> CO <sub>2</sub> <sup>-</sup>
		H <sub>2</sub> CO <sub>3</sub>				HCO <sub>3</sub> <sup>-</sup>
		H <sub>2</sub> S				HS <sup>-</sup>
		NH <sub>4</sub> <sup>+</sup>		NH <sub>3</sub>		
		HCN		CN <sup>-</sup>		
		HCO <sub>3</sub> <sup>-</sup>		CO <sub>3</sub> <sup>2-</sup>		
		H <sub>2</sub> O		OH <sup>-</sup>		
		NH <sub>3</sub>	} Very weak acids. Negligible tendency to dissociate.	NH <sub>2</sub> <sup>-</sup>	} Strong bases. 100% protonated in aqueous solution.	
		OH <sup>-</sup>				O <sup>2-</sup>
		H <sub>2</sub>				H <sup>-</sup>
				 <p>Weaker base</p>		

Table 15.1 from *Chemistry by McMurray & Fay*

# Indicators

Indicator	pH	0	1	2	3	4	5	6	7	8	9	10	11	12		
Methyl violet	Yellow														Violet	
Thymol blue	Red						Yellow (acid range)						Blue (base range)			
Methyl orange	Red						Yellow-orange									
Bromocresol green	Yellow											Blue				
Methyl red	Red						Yellow									
Chlorphenol red	Yellow						Red									
Bromthymol blue	Yellow											Blue				
Phenol red	Yellow						Red									
Phenolphthalein	Colorless						Red									
Thymolphthalein	Colorless						Blue									
Alizarin yellow	Yellow														Violet	

**Table 15.4** from *Chemistry by McMurray & Fay*