

Acids & Bases

Book Reference

pp.594 - 600

Definitions:

Ionization:

Strength:

Strong

Weak



Acid & base strength

- Strong acids & bases

- 100% ionization (dissociation)
- Really not an equilibrium

- HCl - hydrochloric acid

LiOH - lithium hydroxide

- HNO₃ - nitric acid

NaOH - sodium hydroxide

- H₂SO₄ - sulfuric acid

KOH - potassium hydroxide

- Weak acids and bases

- Less than 100% ionization (dissociation)
- True equilibrium reactions

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Strong acid & base

- $\text{HNO}_3 \text{ -----} \rightarrow \text{H}^{+1} + \text{NO}_3^{-1}$
- Completely come apart
- $\text{NaOH} \text{ -----} \rightarrow \text{Na}^{+1} + \text{OH}^{-1}$
- Completely dissolve

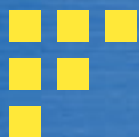


Weak Acids & Bases

- $\text{C}_2\text{H}_5\text{OH} \rightleftharpoons \text{H}^{+1} + \text{C}_2\text{H}_5\text{O}^{-1}$
- Only produces some product

Table 17 Dissociation constants of Acids and Bases

Acids	K _a	Type	Bases	K _b	Type
HCN	4×10^{-10}	} v.weak	H ₂ NCONH ₂	1.5×10^{-14}	} v.weak
H ₃ BO ₃	5.8×10^{-10}		C ₆ H ₅ NH ₂	4.6×10^{-10}	
C ₆ H ₅ OH	1.3×10^{-10}		NH ₄ OH	1.8×10^{-5}	} weak
H ₂ S	1.1×10^{-7}	(CH ₃) ₃ N	7.4×10^{-5}		
CH ₃ COOH	1.78×10^{-5}	} weak	CH ₃ NH ₂	4.4×10^{-4}	
HCOOH	1.8×10^{-4}		C ₂ H ₅ NH ₂	4.3×10^{-4}	} moderately strong
HF	6.7×10^{-4}	} strong	Ca(OH) ₂	3.7×10^{-3}	
HNO ₂	4.5×10^{-4}		NaOH	> 10	} Strong
HCl	> 10		KOH	> 10	
HNO ₃	> 10				
H ₂ SO ₄	> 10				
HClO ₄	> 10				



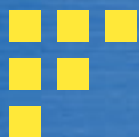
Scientists of Acid base chemistry





Arrhenius acids and bases

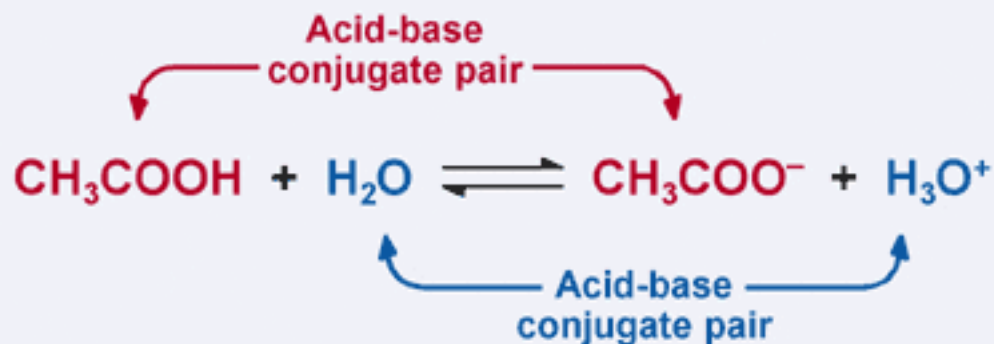
- Acid is any substance, which when dissolved in water, tends to increase the amount of H^+
- $HCl \rightarrow H^+ + Cl^-$
- Base is any substance, which when dissolved in water, tends to increase the amount of OH^-
- $NaOH \rightarrow Na^+ + OH^-$
- These definitions are correct but not general enough to include the wide range of acid and base substances which are known to exist. In addition, they rely on the use of water as a solvent, which is also too narrow.



Bronsted-Lowry acids & bases

- Acid is defined as any substance that can donate a hydrogen ion (proton)
- Base is any substance that can accept a hydrogen ion (proton)
- Bronsted-Lowry acids and bases must come in what is called conjugate pairs

Conjugate pairs





Label the conjugate pairs

