

POTENTIALLY USEFUL INFORMATION

$$\text{pH} = -\log[\text{H}^+]$$

$$\text{pOH} = -\log[\text{OH}^-]$$

$$\text{pH} + \text{pOH} = 14$$

$$\text{pK}_a = -\log K_a$$

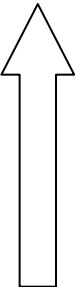
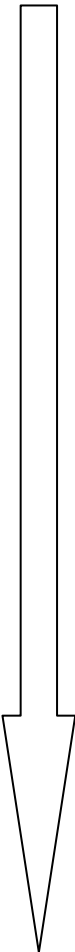
$$[\text{H}^+] = 10^{-\text{pH}}$$

$$[\text{OH}^-] = 10^{-\text{pOH}}$$

$$K_w = 10^{-14} = K_a \cdot K_b$$

$$K_a = 10^{-\text{pK}_a}$$

K_a Table

(Acid)	(Base)	K_a	
HClO ₄	⇌ H ⁺ + ClO ₄ ⁻	very large	 <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Strong acids; Conjugates that do not behave as bases </div>
HI	⇌ H ⁺ + I ⁻	large	
HBr	⇌ H ⁺ + Br ⁻	large	
HCl	⇌ H ⁺ + Cl ⁻	large	
HNO ₃	⇌ H ⁺ + NO ₃ ⁻	large	
H ₂ SO ₄	⇌ H ⁺ + HSO ₄ ²⁻	large	
H ₃ O ⁺	⇌ H ⁺ + H ₂ O	1.0	
HOOC ⁻ COOH	⇌ H ⁺ + HOOC ⁻ COO ⁻	5.9 x 10 ⁻²	<div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Moderate acids </div>
H ₂ SO ₃	⇌ H ⁺ + HSO ₃ ⁻	1.5 x 10 ⁻²	
HSO ₄ ⁻	⇌ H ⁺ + SO ₄ ²⁻	1.2 x 10 ⁻²	
H ₃ PO ₄	⇌ H ⁺ + H ₂ PO ₄ ⁻	7.5 x 10 ⁻³	 <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Weak acids; Conjugates are bases; The weaker the acid, the stronger the conjugate base </div>
Fe(H ₂ O) ₆ ³⁺	⇌ H ⁺ + Fe(H ₂ O) ₅ (OH) ₂ ²⁺	6.0 x 10 ⁻³	
HF	⇌ H ⁺ + F ⁻	3.5 x 10 ⁻⁴	
HNO ₂	⇌ H ⁺ + NO ₂ ⁻	5.1 x 10 ⁻⁴	
HCOOH	⇌ H ⁺ + HCOO ⁻	1.7 x 10 ⁻⁴	
Cr(H ₂ O) ₆ ³⁺	⇌ H ⁺ + Cr(H ₂ O) ₅ (OH) ₂ ²⁺	1 x 10 ⁻⁴	
C ₆ H ₅ COOH	⇌ H ⁺ + C ₆ H ₅ COO ⁻	6.5 x 10 ⁻⁵	
HCOO ⁻ COO ⁻	⇌ H ⁺ + (OOC ⁻ COO) ²⁻	6.4 x 10 ⁻⁵	
CH ₃ COOH	⇌ H ⁺ + CH ₃ COO ⁻	1.76 x 10 ⁻⁵	
Al(H ₂ O) ₆ ³⁺	⇌ H ⁺ + Al(H ₂ O) ₅ (OH) ₂ ²⁺	1 x 10 ⁻⁵	
H ₂ CO ₃	⇌ H ⁺ + HCO ₃ ⁻	4.3 x 10 ⁻⁷	
HSO ₃ ⁻	⇌ H ⁺ + SO ₃ ²⁻	1.02 x 10 ⁻⁷	
H ₂ S	⇌ H ⁺ + HS ⁻	9.1 x 10 ⁻⁸	
H ₂ PO ₄ ⁻	⇌ H ⁺ + HPO ₄ ²⁻	6.23 x 10 ⁻⁸	
H ₃ BO ₃	⇌ H ⁺ + H ₂ BO ₃ ⁻	7.3 x 10 ⁻¹⁰	
NH ₄ ⁺	⇌ H ⁺ + NH ₃	5.7 x 10 ⁻¹⁰	
HCN	⇌ H ⁺ + CN ⁻	4.9 x 10 ⁻¹⁰	
C ₆ H ₅ OH	⇌ H ⁺ + CN ⁻	1.3 x 10 ⁻¹⁰	
HCO ₃ ⁻	⇌ H ⁺ + CO ₃ ²⁻	5.6 x 10 ⁻¹¹	
H ₂ O ₂	⇌ H ⁺ + HO ₂ ⁻	2.4 x 10 ⁻¹²	
HPO ₄ ²⁻	⇌ H ⁺ + PO ₄ ³⁻	2.2 x 10 ⁻¹²	
HS ⁻	⇌ H ⁺ + S ₂ ⁻	1.1 x 10 ⁻¹²	
H ₂ O	⇌ H ⁺ + OH ⁻	1.0 x 10 ⁻¹⁴	