

## Relative Strengths of Some Conjugate Acid-Base Pairs at 25°C in Aqueous Solution

Strongest Acid			Weakest Base		
Conjugate Acid	$K_a$	$pK_a$	Conjugate Base	$K_b$	$pK_b$
HClO <sub>4</sub>	$1 \times 10^{10}$	-10.0	ClO <sub>4</sub> <sup>-</sup>	$1 \times 10^{-24}$	24.0
HI	$3 \times 10^9$	-9.5	I <sup>-</sup>	$3 \times 10^{-24}$	23.5
HBr	$1 \times 10^8$	-8.0	Br <sup>-</sup>	$1 \times 10^{-22}$	22.0
HCl	$1 \times 10^7$	-7.0	Cl <sup>-</sup>	$1 \times 10^{-21}$	21.0
H <sub>2</sub> SO <sub>4</sub>	$1 \times 10^5$	-5.0	HSO <sub>4</sub> <sup>-</sup>	$1 \times 10^{-19}$	19.0
HNO <sub>3</sub>	$2 \times 10^2$	-2.3	NO <sub>2</sub> <sup>-</sup>	$5 \times 10^{-17}$	16.3
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<b>H<sub>3</sub>O<sup>+</sup></b>	<b><math>5.5 \times 10^1</math></b>	<b>-1.74</b>	<b>H<sub>2</sub>O</b>	<b><math>1.8 \times 10^{-16}</math></b>	<b>15.75</b>
HSO <sub>4</sub> <sup>-</sup>	$1.2 \times 10^{-2}$	1.92	SO <sub>4</sub> <sup>2-</sup>	$9.1 \times 10^{-13}$	12.04
H <sub>3</sub> PO <sub>4</sub>	$6.9 \times 10^{-3}$	2.16	H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	$1.4 \times 10^{-12}$	11.85
HF	$6.8 \times 10^{-4}$	3.17	F <sup>-</sup>	$1.5 \times 10^{-11}$	10.83
HNO <sub>2</sub>	$4.5 \times 10^{-4}$	3.35	NO <sub>2</sub> <sup>-</sup>	$2.2 \times 10^{-11}$	10.66
HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	$1.8 \times 10^{-5}$	4.74	C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup>	$5.6 \times 10^{-10}$	9.25
H <sub>2</sub> CO <sub>3</sub>	$4.3 \times 10^{-7}$	6.37	HCO <sub>3</sub> <sup>-</sup>	$2.3 \times 10^{-8}$	7.63
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	$6.2 \times 10^{-8}$	7.21	HPO <sub>4</sub> <sup>2-</sup>	$1.6 \times 10^{-7}$	6.79
H <sub>2</sub> S	$8.9 \times 10^{-8}$	7.05	HS <sup>-</sup>	$1.1 \times 10^{-7}$	6.95
NH <sub>4</sub> <sup>+</sup>	$5.6 \times 10^{-10}$	9.25	NH <sub>3</sub>	$1.8 \times 10^{-5}$	4.74
HCN	$4.0 \times 10^{-10}$	9.40	CN <sup>-</sup>	$2.5 \times 10^{-5}$	4.60
HCO <sub>3</sub> <sup>-</sup>	$4.8 \times 10^{-11}$	10.32	CO <sub>3</sub> <sup>2-</sup>	$2.1 \times 10^{-4}$	3.68
HPO <sub>4</sub> <sup>2-</sup>	$4.8 \times 10^{-13}$	12.32	PO <sub>4</sub> <sup>3-</sup>	$2.1 \times 10^{-2}$	1.68
HS <sup>-</sup>	$1.2 \times 10^{-13}$	12.92	S <sup>2-</sup>	$8.3 \times 10^{-2}$	1.08
<b>H<sub>2</sub>O</b>	<b><math>1.8 \times 10^{-16}</math></b>	<b>15.74</b>	<b>OH<sup>-</sup></b>	<b><math>5.6 \times 10^1</math></b>	<b>-1.74</b>
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H <sub>2</sub>	$1 \times 10^{-35}$	35.0	H <sup>-</sup>	$1 \times 10^{21}$	-21.0
NH <sub>3</sub>	$1 \times 10^{-38}$	38.0	NH <sub>2</sub> <sup>-</sup>	$1 \times 10^{24}$	-24.0
CH <sub>4</sub>	$1 \times 10^{-48}$	48.0	CH <sub>3</sub> <sup>-</sup>	$1 \times 10^{34}$	-34.0

**Weakest Acid**

**Strongest Base**

Acid strength **decreases** going down the conjugate acid list.

**H<sub>3</sub>O<sup>+</sup>** is the strongest acid that can exist in water.

Base strength **increases** going down the conjugate base list.

**OH<sup>-</sup>** is the strongest base that can exist in water.