pH = - log[H+] **pOH = -log[OH-]** **pH + pOH = 14** **$pK_a = -\log K_a$**

$[H^+] = 10^{-pH}$ **$[OH^-] = 10^{-pOH}$** **$K_w = 10^{-14} = K_a \cdot K_b$** **$K_a = 10^{-pKa}$**

K_a Table (Chang)

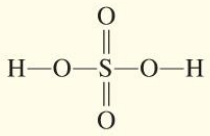
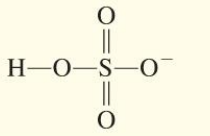
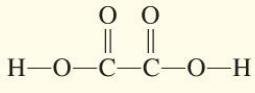
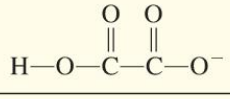
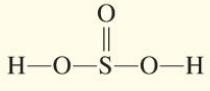
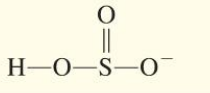
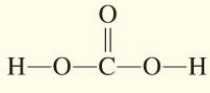
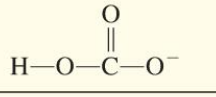
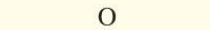
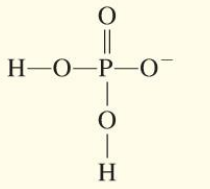
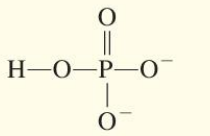
(Acid)		(Base)	K_a
$HClO_4$	⇆	$H^+ + ClO_4^-$	very large
HI	⇆	$H^+ + I^-$	large
HBr	⇆	$H^+ + Br^-$	large
HCl	⇆	$H^+ + Cl^-$	large
HNO_3	⇆	$H^+ + NO_3^-$	large
H_2SO_4	⇆	$H^+ + HSO_4^{2-}$	large
H_3O^+	⇆	$H^+ + H_2O$	1.0
HOOCCOOH	⇆	$H^+ + HOOCCOO^-$	6.5×10^{-2}
H_2SO_3	⇆	$H^+ + HSO_3^-$	1.3×10^{-2}
HSO_4^-	⇆	$H^+ + SO_4^{2-}$	1.3×10^{-2}
H_3PO_4	⇆	$H^+ + H_2PO_4^-$	7.5×10^{-3}
$Fe(H_2O)_6^{3+}$	⇆	$H^+ + Fe(H_2O)_5(OH)^{2+}$	6.0×10^{-3}
HF	⇆	$H^+ + F^-$	7.1×10^{-4}
HNO_2	⇆	$H^+ + NO_2^-$	4.5×10^{-4}
HCOOH	⇆	$H^+ + HCOO^-$	1.7×10^{-4}
$Cr(H_2O)_6^{3+}$	⇆	$H^+ + Cr(H_2O)_5(OH)^{2+}$	1×10^{-4}
$C_6H_8O_6$	⇆	$H^+ + C_6H_7O_6^-$	8.0×10^{-5}
C_6H_5COOH	⇆	$H^+ + C_6H_5COO^-$	6.5×10^{-5}
$HCOOCOO^-$	⇆	$H^+ + (OOCCOO)^{2-}$	6.1×10^{-5}
CH_3COOH	⇆	$H^+ + CH_3COO^-$	1.8×10^{-5}
$Al(H_2O)_6^{3+}$	⇆	$H^+ + Al(H_2O)_5(OH)^{2+}$	1×10^{-5}
H_2CO_3	⇆	$H^+ + HCO_3^-$	4.2×10^{-7}
H_2S	⇆	$H^+ + HS^-$	9.5×10^{-8}
HSO_3^-	⇆	$H^+ + SO_3^{2-}$	6.3×10^{-8}
$H_2PO_4^-$	⇆	$H^+ + HPO_4^{2-}$	6.2×10^{-8}
$C_9H_8O_4$ (aspirin)	⇆	$H^+ + C_9H_7O_4^-$	3.0×10^{-10}
H_3BO_3	⇆	$H^+ + H_2BO_3^-$	7.3×10^{-10}
NH_4^+	⇆	$H^+ + NH_3$	5.7×10^{-10}
HCN	⇆	$H^+ + CN^-$	4.9×10^{-10}
C_6H_5OH	⇆	$H^+ + CN^-$	1.3×10^{-10}
HCO_3^-	⇆	$H^+ + CO_3^{2-}$	4.8×10^{-11}
H_2O_2	⇆	$H^+ + HO_2^-$	2.4×10^{-12}
HPO_4^{2-}	⇆	$H^+ + PO_4^{3-}$	4.8×10^{-13}
H_2O	⇆	$H^+ + OH^-$	1.0×10^{-14}
HS^-	⇆	$H^+ + S_2^-$	1.1×10^{-19}

Strong acids;
Conjugates that
do not behave as bases

Moderate acids

Weak acids;
Conjugates are bases;
The weaker the acid,
the stronger the
conjugate base

TABLE 15.5 Ionization Constants of Some Diprotic Acids and a Polyprotic Acid and Their Conjugate Bases at 25°C

Name of Acid	Formula	Structure	K_a	Conjugate Base	K_b
Sulfuric acid	H_2SO_4		very large	HSO_4^-	very small
Hydrogen sulfate ion	HSO_4^-		1.3×10^{-2}	SO_4^{2-}	7.7×10^{-13}
Oxalic acid	$H_2C_2O_4$		6.5×10^{-2}	$HC_2O_4^-$	1.5×10^{-13}
Hydrogen oxalate ion	$HC_2O_4^-$		6.1×10^{-5}	$C_2O_4^{2-}$	1.6×10^{-10}
Sulfurous acid*	H_2SO_3		1.3×10^{-2}	HSO_3^-	7.7×10^{-13}
Hydrogen sulfite ion	HSO_3^-		6.3×10^{-8}	SO_3^{2-}	1.6×10^{-7}
Carbonic acid	H_2CO_3		4.2×10^{-7}	HCO_3^-	2.4×10^{-8}
Hydrogen carbonate ion	HCO_3^-		4.8×10^{-11}	CO_3^{2-}	2.1×10^{-4}
Hydrosulfuric acid	H_2S		9.5×10^{-8}	HS^-	1.1×10^{-7}
Hydrogen sulfide ion†	HS^-		1×10^{-19}	S^{2-}	1×10^{5}
Phosphoric acid	H_3PO_4		7.5×10^{-3}	$H_2PO_4^-$	1.3×10^{-12}
Dihydrogen phosphate ion	$H_2PO_4^-$		6.2×10^{-8}	HPO_4^{2-}	1.6×10^{-7}
Hydrogen phosphate ion	HPO_4^{2-}		4.8×10^{-13}	PO_4^{3-}	2.1×10^{-2}

*H_2SO_3 has never been isolated and exists in only minute concentration in aqueous solution of SO_2. The K_a value here refers to the process $SO_2(g) + H_2O(l) \longrightarrow H^+(aq) + HSO_3^-(aq)$.

†The ionization constant of HS^- is very low and difficult to measure. The value listed here is only an estimate.