Equilibrium Constants for Selected Acids and Bases

	Conjugate Acid	$K_a = K_w/K_b$	$K_b = K_w/K_a$	Conjugate Base	
Strong Acids	HCl	1×10^{6}	1×10^{-20}	Cl^-	Neutral Bases
	HNO_3	28	2.6×10^{-16}	NO_3^-	
	H_3O^+	1	1×10^{-14}	H_2O	
Weak Acids	H_3PO_4	7.1×10^{-3}	1.4×10^{-12}	$H_2PO_4^-$	Weak Bases
	HCOOH	1.8×10^{-4}	5.6×10^{-11}	$HCOO^-$	
	C_6H_5COOH	6.3×10^{-5}	1.3×10^{-10}	$C_6H_5COO^-$	
	CH_3COOH	1.75×10^{-5}	5.7×10^{-10}	CH_3COO^-	
	H_2CO_3	4.5×10^{-7}	2.2×10^{-8}	HCO_3^-	
	$H_2PO_4^-$	6.3×10^{-8}	1.6×10^{-7}	HPO_4^{2-}	
	HOCl	2.9×10^{-8}	3.4×10^{-7}	OCl^-	
	NH_4^+	5.6×10^{-10}	1.8×10^{-5}	NH_3	
	HCO_3^-	4.7×10^{-11}	2.1×10^{-4}	CO_3^{2-}	
	HPO_4^{2-}	4.2×10^{-13}	2.4×10^{-2}	PO_4^{3-}	
	H_2O	1×10^{-14}	1	OH^-	
Neutral Acids	NH_3	-	-	NH_2^-	Strong Bases

$HCl + OCl^- \rightarrow$

$HOCl + CH_3COO^- \rightarrow$

$H_3PO_4 + HCO_3^- \rightarrow$

H_2CO_3 (in excess) + $OH^- \rightarrow$

$H_2CO_3 + OH^-$ (in excess) $\rightarrow$

H_3PO_4 (in excess) + $CO_3^{2-} \rightarrow$

$H_3PO_4 + CO_3^{2-}$ (in excess) $\rightarrow$

Standard State Reduction Potentials for Selected Oxidizing Agents and Reducing Agents

	Conjugate Oxidizing Agent	E^o_{red}	Conjugate Reducing Agent	
Strong Oxidizing Agents	MnO_4^-	1.679	MnO_2	Neutral Reducing Agents
	MnO_4^-	1.491	Mn^{2+}	
	Cl_2	1.3581	Cl^-	
	$Cr_2O_7^{2-}$	1.33	Cr^{3+}	
	O_2	1.229	H_2O	
Weak Oxidizing Agents	Br_2	1.087	Br^-	Weak Reducing Agents
	HNO_3	0.96	NO	
	Ag^+	0.7996	Ag	
	O_2	0.682	H_2O_2	
	MnO_4^-	0.588	MnO_2	
	O_2	0.401	OH^-	
	H^+	0.000…	H_2	
Neutral Oxidizing Agents	Co^{2+}	-0.28	Co	Strong Oxidizing Agents
	Zn^{2+}	-0.7628	Zn	
	K^+	-2.924	K	

$Cl_2 + H_2O_2 \rightarrow$

$O_2 + NO \rightarrow$

$Ag^+ + NO \rightarrow$

A few years ago a spill of potassium permanganate, $KMnO_4$, occurred in Greencastle. Dave Roberts, volunteer fire fighter and DePauw Storeroom Manager, treated the spill using sodium bisulfate, $NaHSO_3$. Knowing that K_a for $HMnO_4$ is 0.50 and that K_a for HSO_3^- is 6.4×10^{-8}, and that E^o for MnO_4^-/Mn^{2+} is 1.49 V and that E^o for SO_4^{2-}/HSO_3^- is 0.049 V, is the unbalanced reaction involved

$$MnO_4^- + HSO_3^- \rightarrow HMnO_4 + SO_3^{2-} \quad \text{or} \quad MnO_4^- + HSO_3^- \rightarrow Mn^{2+} + SO_4^{2-}$$