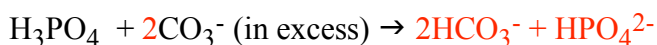
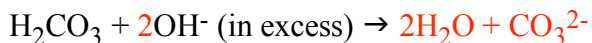
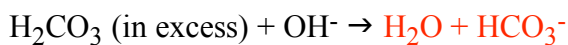
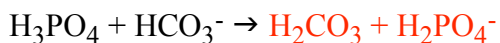
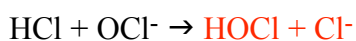


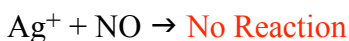
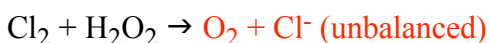
Equilibrium Constants for Selected Acids and Bases

	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^-	
	$\text{C}_6\text{H}_5\text{COOH}$	6.3×10^{-5}	1.3×10^{-10}	$\text{C}_6\text{H}_5\text{COO}^-$	
	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

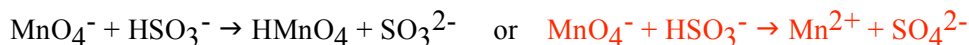


Standard State Reduction Potentials for Selected Oxidizing Agents and Reducing Agents

	Conjugate Oxidizing Agent	E°_{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^-	
	$\text{Cr}_2\text{O}_7^{2-}$	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	



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° for $\text{MnO}_4^-/\text{Mn}^{2+}$ is 1.49 V and that E° for $\text{SO}_4^{2-}/\text{HSO}_3^-$ is 0.049 V, is the unbalanced reaction involved



The reaction that happens must be the one that goes from stronger reactants to weaker products. For the acid/base reaction, the stronger of the two acids is HMnO_4 , which is the product; thus, this is not a favorable reaction. For the redox reaction, the stronger of the two oxidizing agents is HSO_3^- ; thus, this is the favorable reaction.