Answers to 1.76 Practice Problems 1

1) 5.0
2) 4.0
3) 3.0
4) 9.0
5) 10.0
6) 11.0
7) 7.0
8) 6.8
9) 6.5
10) 5.0
11) 4.2
12) 3.5
13) 9.0
14) 9.8
15) 10.4

16)

Name	**Chem Formula**	**Species formed in aqueous sol'n**	**Acid/ Base/ Ampi/ Salt**
potassium chloride	KCl	potassium ion, K^+ chloride, Cl^- (very soluble, >10g/100mL, KCl (aq) formation unlikely)	salt
nitric acid	HNO_3	hydrogen ion, H^+ nitrate, NO_3^-	acid
calcium sulfate	$CaSO_4$	calcium ion, Ca^{2+} sulfate, $*SO_4^{2-}$ $CaSO_4$ (aq); (slightly soluble, log K_{sp} = -4.2) (*can act as a base, however, no HSO_4^- formation,HSO_4^- << SO_4^{2-} in neutral waters, pK_a= 2.0)	salt
calcium hydroxide	$CaOH_2$	hydroxide, OH- calcium ion, Ca^{2+}	basic
calcium carbonate	$CaCO_3$	calcium ion, Ca^{2+} carbonate, CO_3^{2-} carbonate + H^+ ↔ bicarbonate: CO_3^{2-}+ H^+ ↔ HCO_3^- (pK_a=10.33)	basic
ammonium acetate	CH_3COONH_4	acetate + H^+ ↔ acetic acid: CH_3COO^- + H^+ ↔ CH_3COOH ammonium ↔ ammonia + H^+: NH_4^+ ↔ NH_3 + H^+	amphiprotic, a buffer, stabilizes the pH over a given capacity
ammonium nitrate	NH_4NO_3	nitrate, NO_3^- ammonium, $*NH_4^+$ (*can act as an acid, however, pK_a= 9.2, so will NOT dissociate significantly in neutral waters)	salt
hydrogen sulfide	H_2S	hydrogen sulfide↔ bisulfide + H^+, H_2S↔ HS^- + H^+ (sulfide, S^{2-} not formed significantly, HS^- ↔ S^{2-} + H^+, pK_a=12.9)	acid
sodium nitrite	$NaNO_2$	sodium ion, Na^+ nitrite, NO_2^- (no HNO_2 formation; HNO_2 << NO_2^- in neutral waters, pK_a= 3.3)	salt

Refs: Umland & Bellama, *General Chemistry, 3rd Edition*, Brooks/Cole Publishing, 1999
Morel & Hering, *Principles and Applications of Aquatic Chemistry*, Wiley & Sons, 1993