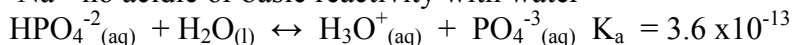
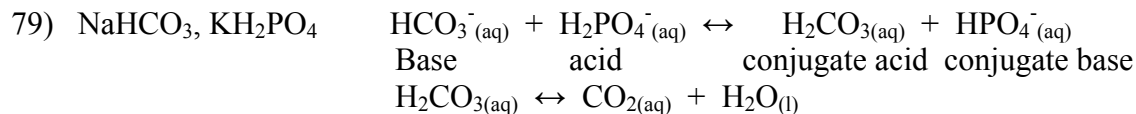


Chapter 16: 73, 79, 81, 93, 107, 111, 117, 125

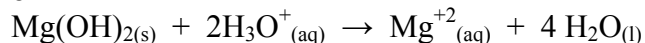
73)

a) Na_2HPO_4 Na^+ no acidic or basic reactivity with water

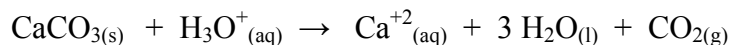
$\text{HPO}_4^{2-}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \leftrightarrow \text{OH}^-(\text{aq}) + \text{H}_2\text{PO}_4^-(\text{aq}) \quad K_b = 1.6 \times 10^{-7}$ more product favored reaction
so HPO_4^{2-} will act as a base and $\text{pH} > 7$

b) NH_4NO_3  NO_3^- very, very, very weak basec) SrCl_2 Sr^{+2} no acidic or basic reactivity with water Cl^- very, very, very weak base $\text{pH} \sim 7$ 

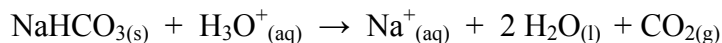
81



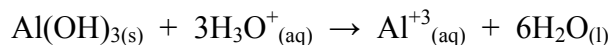
1 g $\text{Mg}(\text{OH})_2$	1 mol $\text{Mg}(\text{OH})_2$	2 mol H_3O^+	= 0.03 mol H_3O^+
	58 g $\text{Mg}(\text{OH})_2$	1 mol $\text{Mg}(\text{OH})_2$	



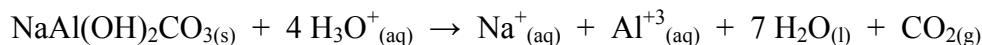
1 g CaCO_3	1 mol CaCO_3	2 mol H_3O^+	= 0.02 mol H_3O^+
	100g CaCO_3	1 mol CaCO_3	



1 g NaHCO_3	1 mol NaHCO_3	1 mol H_3O^+	= 0.01 mol H_3O^+
	84 g NaHCO_3	1 mol NaHCO_3	



1 g $\text{Al}(\text{OH})_3$	1 mol $\text{Al}(\text{OH})_3$	3 mol H_3O^+	= 0.04 mol H_3O^+
	78 g $\text{Al}(\text{OH})_3$	1 mol $\text{Al}(\text{OH})_3$	



1 g NaAl(OH) ₂ CO ₃	1 mol NaAl(OH) ₂ CO ₃	4 mol H ₃ O ⁺	= 0.03 mol H ₃ O ⁺
	144 g NaAl(OH) ₂ CO ₃	1 mol NaAl(OH) ₂ CO ₃	

The Al(OH)₃ neutralizes the greatest number of moles of acid per gram.

- 93) a) HCl strong acid
 b) NH₄⁺ weak acid
 c) H₂O amphiprotic
 d) CH₃COO⁻ weak base
 e) CH₄ neither acid nor base
 f) CO₃⁻² weak base

- 107 a) d HCl is a strong acid and thus dissociates completely
 b) b CH₃COOH is a weak acid which only partially dissociates

111) $K_a * K_b = K_w = 1 \times 10^{-14}$
 $3.9 \times 10^{-5} * K_b = 1 \times 10^{-14}$
 $K_b = 2.6 \times 10^{-10}$
 Benzoate with a K_b of 1.6×10^{-10} is close

117) a) No. Water autoionizes to a concentration of $\text{H}_3\text{O}^+ = 1 \times 10^{-7}$. HCl adds H_3O^+ to water, increasing the hydronium ion concentration. A solution of pH =9 has a $[\text{H}_3\text{O}^+] = 1 \times 10^{-9}$ which is 100 times less than 1×10^{-7} .

b) Yes. For example, you might dilute 1 mL of 1.00 M NaOH to 100 L and then the $[\text{OH}^-] = 1 \times 10^{-5}$ ($[\text{H}_3\text{O}^+] = 1 \times 10^{-9}$)

- 125 a) $\text{HNiacin}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \leftrightarrow \text{H}_3\text{O}^+_{(\text{aq})} + \text{Niacin}^-_{(\text{aq})}$
 b) $\text{Niacin}^-_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \leftrightarrow \text{OH}^-_{(\text{aq})} + \text{Hniain}_{(\text{aq})}$
 c) 0.02M niacin pH =3.26

	HNiacin	$\leftrightarrow \text{H}_3\text{O}^+$	Niacin ⁻
I	0.02M	0	0
C	-x	+x	+x
E	0.02-x	x	x

$3.26 = \text{pH} = -\log[\text{H}_3\text{O}^+]$
 $5.5 \times 10^{-4} = [\text{H}_3\text{O}^+] = x$

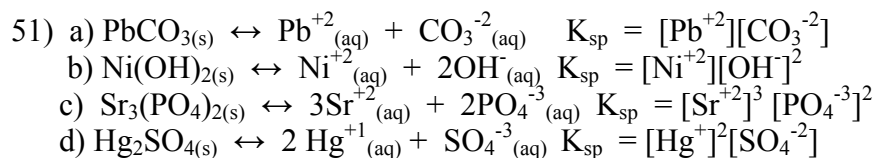
$$K_a = \frac{[\text{Niacin}^-][\text{H}_3\text{O}^+]}{[\text{HNiacin}]} = \frac{(5.5 \times 10^{-4})(5.5 \times 10^{-4})}{(0.02 - 5.5 \times 10^{-4})} = 1.6 \times 10^{-5} = 2 \times 10^{-5}$$

$$d) K_a * K_b = K_w = 1 \times 10^{-14}$$

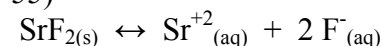
$$1.6 \times 10^{-5} * K_b = 1 \times 10^{-14}$$

$$K_b = 6.4 \times 10^{-10} = \frac{[\text{HNiacin}][\text{OH}^-]}{[\text{Niacin}]}$$

Chapter 17: 51, 55, 57, 61, 89, 101



55)

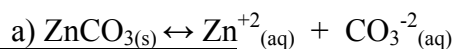
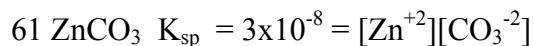
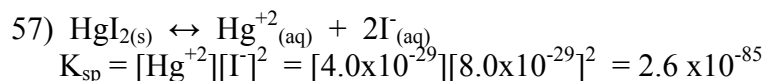


0.011 g SrF ₂	1 mol SrF ₂	= 8.76x10 ⁻⁴ mol SrF ₂
0.1 L	125.62 g SrF ₂	1 L

8.76x10 ⁻⁴ mol SrF ₂	1 mol Sr ⁺²	= 8.76 x10 ⁻⁴ mol Sr ⁺²
1 L	1 mol SrF ₂	1 L

8.76x10 ⁻⁴ mol SrF ₂	2 mol F ⁻	= 1.75 x10 ⁻³ mol F ⁻
1 L	1 mol SrF ₂	1 L

$$K_{\text{sp}} = [\text{Sr}^{+2}][\text{F}^{-}]^2 = [8.76 \times 10^{-4}][1.75 \times 10^{-3}]^2 = 2.7 \times 10^{-9}$$



	Zn ⁺²	CO ₃ ⁻²
I	0	0
C	+x	+x
E	x	x

$$K_{\text{sp}} = 3 \times 10^{-8} = [\text{Zn}^{+2}][\text{CO}_3^{-2}] = x^2$$

$$2 \times 10^{-4} \text{ M} = x$$

b)

	Zn ⁺²	CO ₃ ⁻²
I	0.05	0
C	+x	+x
E	0.05+x	x

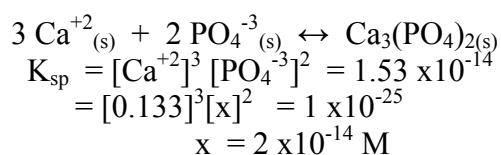
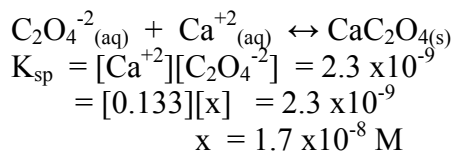
Assume that x is negligible when added to 0.05

$$K_{\text{sp}} = 3 \times 10^{-8} = [\text{Zn}^{+2}][\text{CO}_3^{-2}] = [0.05]x$$

$$6 \times 10^{-7} \text{ M} = x$$

c) same as b except CO_3^{-2} initial concentration = 0.05 M $x = 6 \times 10^{-7} \text{M}$

$$89) \text{Ca}^{+2} \frac{5.33 \text{ g}}{\text{L}} \frac{(1 \text{ mol Ca}^{+2})}{(40.08 \text{ g Ca}^{+2})} = 0.133 \text{ M Ca}^{+2}$$



$$101) K_{\text{sp}} \text{ AgBr} = 3.3 \times 10^{-13} = [\text{Ag}^+][\text{Br}^-] \quad x = 3.3 \times 10^{-10} \text{ lowest } [\text{Ag}^+] \text{ needed; will precipitate first}$$

$$\begin{aligned} \text{AgCl} &= 1.8 \times 10^{-10} = [\text{Ag}^+][\text{Cl}^-] & x &= 1.8 \times 10^{-7} \\ \text{Ag}_2\text{CrO}_4 &= 9.0 \times 10^{-12} = [\text{Ag}^+]^2[\text{CrO}_4^{-2}] & x &= 9.48 \times 10^{-5} \end{aligned}$$

Sub in x for $[\text{Ag}^+]$; $[\text{Br}^-] = [\text{Cl}^-] = [\text{CrO}_4^{-2}] = 0.001$