Exam Ch 14 - 17 Key (Version E)

1. a. $K_p = 109$
$= (P_{NOBr})^2 / [(P_{NO})^2(P_{Br2})]$
$= (90.0768)^2 / [(P_{NO})^2(0.0159)]$
$P_{NO} = 0.0583$ atm

b. As temperature increases, pressure increases, which signifies a backwards shift. If increased temperature induces a backwards shift, heat bust be a product, therefore the reaction is exothermic. ($\Delta H = —$)

c. Shift right since 2 moles of gas takes up less space than 3 moles of gas.

2. a. $C_4H_9Br_{(aq)} + 2\ H_2O_{(l)} \rightarrow C_4H_9OH_{(aq)} + H_3O^+_{(aq)} + Br^-_{(aq)}$
b. Rate = $k[C_4H_9Br]^1$

3. a. (2.00 mL NaOH)(0.125 M) = $2.50x10^{-4}$ mol OH^-
$pH = pK_a + \log ([A-]/[HA])$
$6.912 = pK_a + \log (2.5x10^{-4})/(1.75x10^{-3})$

	HA +	OH^- →	A^- +	H_2O
I	$2.00x10^{-3}$	$2.50x10^{-4}$	0	
C	$-2.50x10^{-4}$	$-2.50x10^{-4}$	$2.5x10^{-4}$	
F	$1.75x10^{-3}$	0	$2.5x10^{-4}$	

At equilibrium point:
(16.00 mL NaOH)(0.125 M) = $2.00x10^{-3}$ mol OH-, so $2.00x10^{-3}$ mol HA

$pK_a = 7.757$
$K_a = 1.75x10^{-8}$

4. a. $AgOH > Cd(OH)_2 > Al(OH)_3$
b. $Al(OH)_3$: $K_{sp} = 2.x10^{-32} = [Al3+][OH-]^3$
$[Al(OH)_3] = [Al^{3+}] = x$
$3[Al(OH)_3] = [OH^-] = 3x$
$K_{sp} = x(3x)^3$
$= 27x^4$
$x = 5.(2)x10^{-9}$
$3x = 2x10^{-8}$ M OH^-
$Cd(OH)_2$: $K_{sp} = 5.9x10^{-15} = [Cd^{2+}][OH^-]^2 = x(2x)^2 = 4x^3$
$x = 1.1x10^{-5}$
$2x = 2.3x\ 10^{-5}$
$AgOH$: $K_{sp} = 2.0x10^{-8} = [Ag^+][OH^-] = x^2$
$x = 1.4x10^{-4}$ M OH-

Exam Ch 14 - 17 Key (Version F)

1. a) $K_p = 109$
$= (P_{NOBr})^2 / [(P_{NO})^2(P_{Br2})]$
$=(0.0568)^2 / [(P_{Br})^2(0.0259)]$
$P_{Br} = 0.0441$ atm
b) When T decreases, P increases; therefore, rxn shifts backward. If T decreases shifts backward, heat must be reactant. So, ΔH is + (endothermic).

c) Backwards (left)-more moles

2. a) $C_4H_9Br_{(aq)} + 2\ H_2O_{(l)} \rightarrow C_4H_9OH_{(aq)} + H_3O^+_{(aq)} + Br^-_{(aq)}$
b) Rate = $k[C_4H_9Br]^1$

3. (15.00 mL HCl)(0.125M)=1.87(5) mol H^+=1.87(5) mol B initially

	B	+	**$H^+ \rightarrow$**	**BH^+**
I	$1.87(5)*10^{-3}$		$3.75*10^{-4}$	0
Δ	-		-	+
F	$1.5*10^{-3}$		0	$3.75*10^{-4}$mol

$pH = pK_a + \log([B] / [BH^+])$
$7.008 = pK_a + \log (0.0015 / 3.75*10^{-8})$
$K_a = 2.5*10^{-8}$

4. a) $CaSO_4 > Ag_2SO_4 > Cu_2(SO_4)_3$
b) Ag_2SO_4
$K_{sp} = [SO_4^{2-}][Ag^+]^2 = 1.2*10^{-5}$
$x\ (2x)^2 = 4x^3 = 1.2*10^{-5}$
$x = 0.0144$
$[SO_4^{2-}] = 0.0144$

$CuSO_4$
$K_{sp} = [SO_4^{2-}][Ca^{2+}]$
$6.1*10^{-5} = x^2$
$x = 7.8*10^{-3}$
$[SO_4^{2-}] = 0.0078$

$Cu_2(SO_4)_3$
$5.7*10^{-3} = (2x^2)(3x)^3$
$= 36x^5$
$x = 0.0139$
$3x = 0.0418$

Exam Ch 14 - 17 Key (Version G)

1. a) $H_3O^+_{(aq)} + C_3H_7OH_{(aq)} + Cl^-_{(aq)} \rightarrow C_3H_7Cl_{(aq)} + 2H_2O_{(l)}$
   b) Rate = $k[C_3H_7OH]^1[H_3O^+]^1$

2.

B	+	$H^+ \rightarrow$	BH^+
4.95		1.35mml	0
-1.35		-1.35	+1.35
3.60mml			1.35

   $(6.00mL)(0.225M\ HNO_3) = 1.35*10^{-3}$mol H^+
   $(22.00mL)(0.225M\ HNO_3) = 4.95*10^{-3}$mol $H^+ \rightarrow 4.95*10^{-3}$ mol B

   $pOH = pK_b + \log(H^+/B)$
   $6.892 = pK_b + \log([1.35]/[3.60])$
   $= pK_b + (-0.426)$
   $pK_b = 7.318$
   $K_b = 4.81*10^{-8}$

3. a) T decrease, P increase—P increase means shift right, so heat if product, so exothermic
   b) $\rightarrow$
   c) $K_p = (P_{NO})^2P_{Br2} / (P_{NOBr2}) = (0.0459)^2\ P_{Br2} / 0.468^2$
   $9.17*10^{-3} = 0.962\ P_{Br2}$
   $P_{Br2} = 9.53*10^{-3}$ atm

4. a) $BeSO_4 < Fe_2(SO_4)_3 < (NH_4)_2SO_4$
   b) $BeSO_4$
   $1.2*10^{-7} = [Be^{2+}][SO_4^{2-}]$
   $= x^2$
   $x = 3.46*10^{-4}$M

   $(NH_4)_2SO_4$
   $6.1*10^{-3} = [NH_4]^2[SO_4^{2-}]$
   $= (2x)^2x$
   $= 4x^3$
   x = 0.115 M or x = 0.0781 M(wrong formula)

   $Fe_2(SO_4)_3$
   $3.7*10^{-6} = (2x)^2(3x)^3$
   $= 0.0400$
   $[SO_4^{2-}] = 0.120$ M

Thanks to Tina Zhou, Class of 2006 for typing this. Please let Mr. Hambleton know if you find any typos or other mistakes.