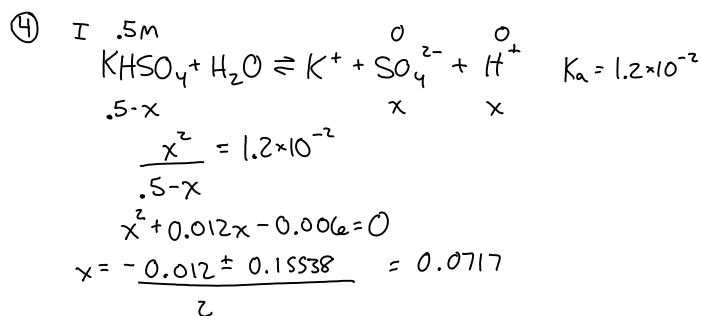
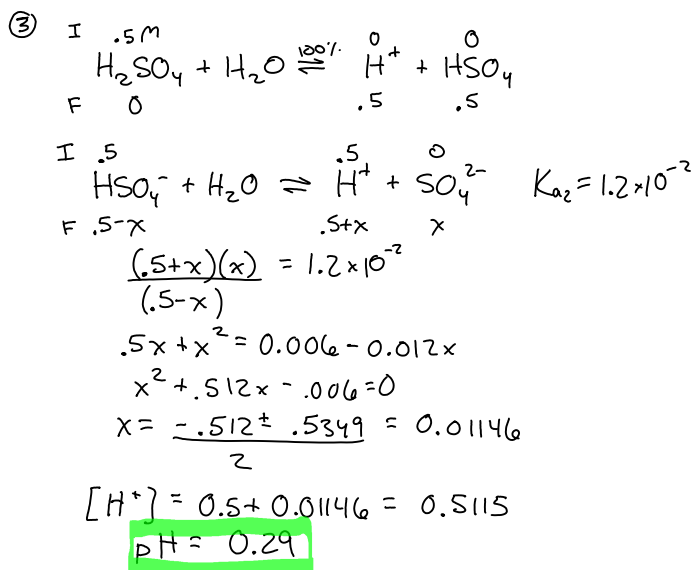
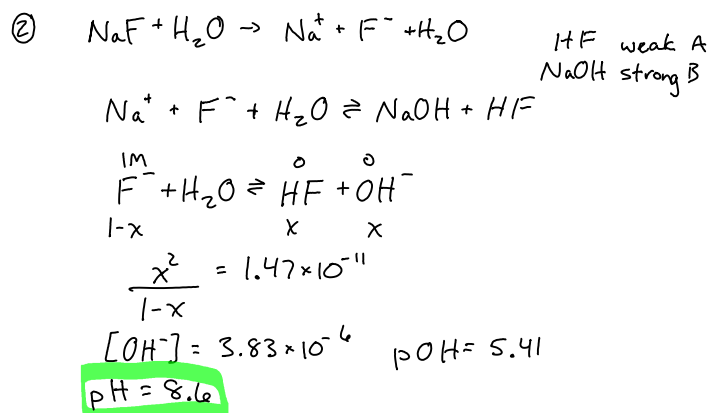
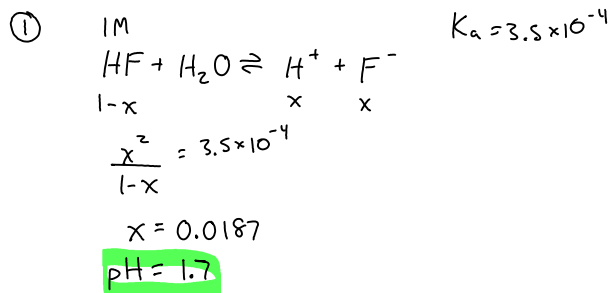


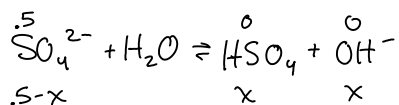
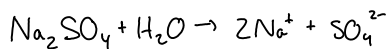
Test 1 Penance

Monday, March 19, 2007
6:50 PM



$$\text{pH} = 1.1$$

⑤



$$K_b = \frac{1.0 \times 10^{-14}}{1.2 \times 10^{-2}} = 8.3 \times 10^{-13}$$

$$\frac{x^2}{.5-x} = 8.3 \times 10^{-13}$$

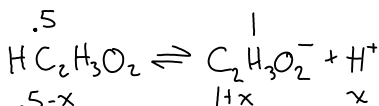
$$x = 6.45 \times 10^{-7}$$

$$\text{pOH} = 6.19$$

$$\text{pH} = 7.8$$

⑥ 0.250 mol $\text{C}_2\text{H}_3\text{O}_2$ 1M

$$\frac{.5 \text{ mol}}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 250 \text{ mL} = 0.125 \text{ mol HC}_2\text{H}_3\text{O}_2 = .5 \text{ M}$$



$$\frac{(1+x)(x)}{.5-x} = 1.8 \times 10^{-5}$$

$$x = 9 \times 10^{-6}$$

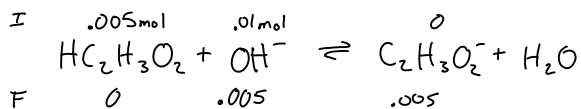
$$\text{pH} = 5.1$$

⑦ $\text{HC}_2\text{H}_3\text{O}_2$ weak acid NaOH strong base

$$\text{total V} = .03 \text{ L}$$

$$\frac{.5 \text{ mol HC}_2\text{H}_3\text{O}_2}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 10.0 \text{ mL} = 0.005 \text{ mol}$$

$$\frac{.5 \text{ mol NaOH}}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 20.0 \text{ mL} = 0.01 \text{ mol}$$



$$[\text{OH}^-] = \frac{.005 \text{ mol}}{.03 \text{ L}} = 0.166$$

$$\text{pOH} = -\log(.166) = .779$$

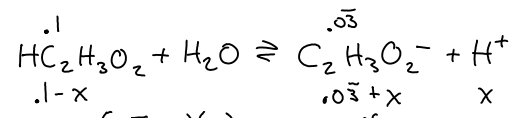
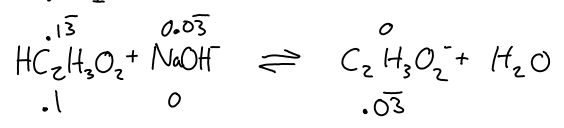
pH = 13.2

⑧ $\frac{.200 \text{ mol HC}_2\text{H}_3\text{O}_2}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 200 \text{ mL} = .004 \text{ mol}$

$\frac{.100 \text{ mol NaOH}}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 10.0 \text{ mL} = .001 \text{ mol}$

Total V = 0.03 L

$[\text{HC}_2\text{H}_3\text{O}_2]_I = .1\bar{3}$ $[\text{NaOH}]_I = 0.0\bar{3}$



$\frac{(.0\bar{3}+x)(x)}{.1-x} = 1.8 \times 10^{-5}$ $x = 5.4 \times 10^{-5}$

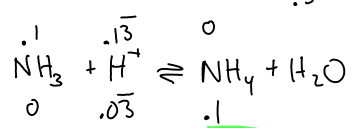
pH = 4.3

⑨ $\frac{0.3 \text{ mol NH}_3}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 10 \text{ mL} = 0.003 \text{ mol NH}_3$

$\frac{0.2 \text{ mol HCl}}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 20 \text{ mL} = 0.004 \text{ mol HCl}$

total V = 30 mL = 0.03 L

0.1 M NH₃ 0.1 $\bar{3}$ M HCl



NH₄ diss is negligible

$\text{pH} = -\log(.0\bar{3}) = 1.48$

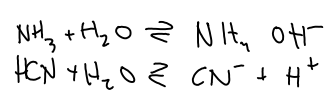
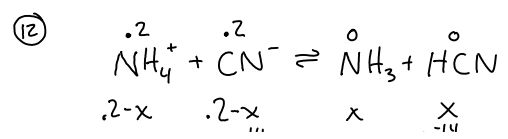
⑪ $\begin{array}{ccc} .500 & 0 & 0 \\ \text{NH}_3 + \text{H}_2\text{O} & \rightleftharpoons & \text{OH}^- + \text{NH}_4^+ \\ .500-x & x & x \end{array}$ $K_b = 1.76 \times 10^{-3}$

$\frac{x^2}{.500-x} = 1.76 \times 10^{-3}$

$x = .00297$

$\text{pOH} = 2.53$

pH = 12



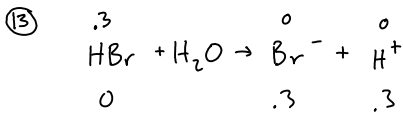
$$K_{eq} = \frac{1 \times 10^{-14}}{(K_b \text{NH}_3)(K_a \text{HCN})} = \frac{1 \times 10^{-14}}{(1.76 \times 10^{-5})(6.2 \times 10^{-10})} = 0.916422$$

$$\frac{x^2}{(2-x)(2-x)} = 0.916422 \quad x = .0978$$

$$\frac{[H^+][CN^-]}{[HCN]} = 6.2 \times 10^{-10}$$

$$[H^+] = \frac{6.2 \times 10^{-10}(x)}{2-x} = 5.93 \times 10^{-10}$$

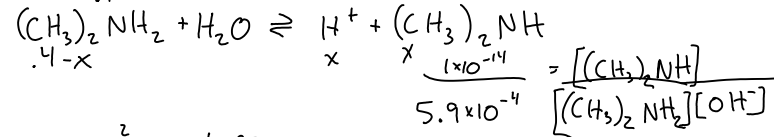
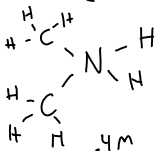
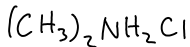
$$\text{pH} = 9.2$$



$$[H^+] = .3$$

$$\text{pH} = .523$$

14



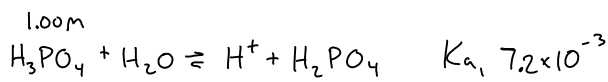
$$\frac{x^2}{.4-x} = 1.695$$

$$.4-x$$

$$x = 2.6 \times 10^{-6}$$

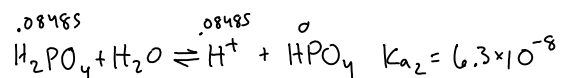
$$\text{pH} = 5.6$$

15

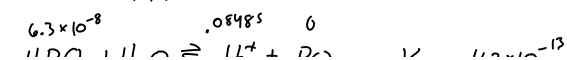


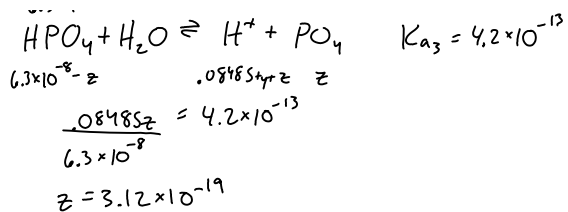
$$\begin{array}{cccc} 1-x & & x & x \\ \frac{x^2}{1-x} = 7.2 \times 10^{-3} & & x = .08485 & \end{array}$$

$$1-x$$



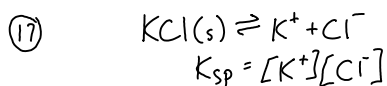
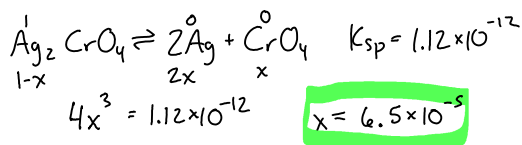
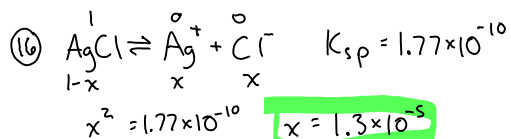
$$\begin{array}{cccc} .08485-y & & .08485+y & y \\ (.08485-y)(y) = 6.3 \times 10^{-8} & & y = 6.3 \times 10^{-8} & \end{array}$$





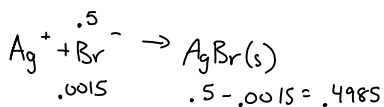
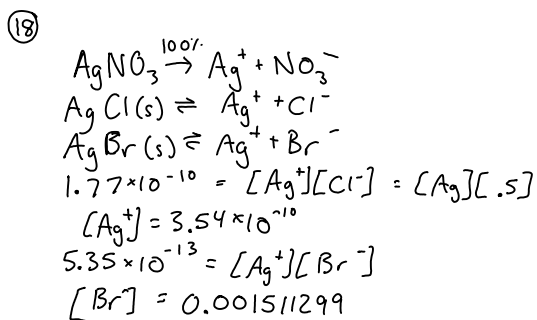
$$[\text{H}^+] = 0.085 \quad [\text{H}_2\text{PO}_4^-] = 0.085$$

$$[\text{HPO}_4^{2-}] = 6.3 \times 10^{-8} \quad [\text{PO}_4^{3-}] = 3.1 \times 10^{-19}$$

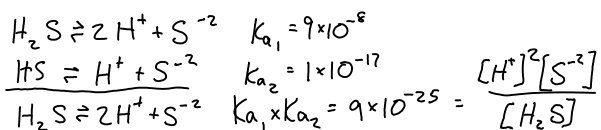
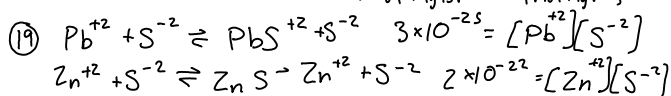


$$\frac{35.58 \text{ g KCl}}{135.58 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol KCl}}{74.54 \text{ g KCl}} \times \frac{1 \text{ mol Cl}^-}{1 \text{ mol K}^+} \times \frac{1.27 \text{ g}}{1 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 4.557 \text{ mol/L}$$

$$K_{sp} = [\text{K}^+][\text{Cl}^-] = (4.5 \text{ mol/L})^2 = 20.8$$



$$0.4985 \text{ mol AgBr}(s) \times \frac{1 \text{ mol AgNO}_3}{1 \text{ mol AgBr}} \times \frac{169.91 \text{ g}}{1 \text{ mol AgNO}_3} = 84.7 \text{ g AgNO}_3$$

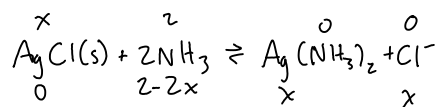


$$9 \times 10^{-25} = \frac{[H^+]^2 [2 \times 10^{-20}]}{[.1]}$$

$$[H^+] = 0.0021213$$

$$pH = 2.7$$

(21)



$$\frac{x^2}{(2-2x)^2} = K_{sp} K_f = 0.00306$$

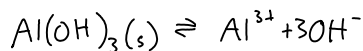
$$\frac{x}{2-2x} = .05532 = x = .1106 - .1106x$$

$$.8894x = .1106$$

$$x = .1244$$

0.12 mol AgCl(s) dissolves

(20)



$$K_{sp} = [Al^{3+}][OH^-]^3 = 3 \times 10^{-34}$$

$$4 = -\log[H^+]$$

$$[H^+] = 10^{-4}$$

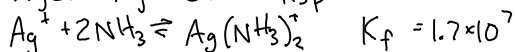
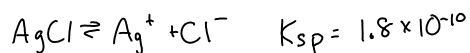
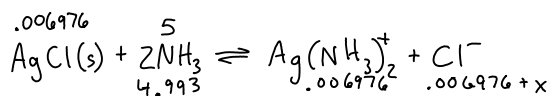
$$[OH^-] = 10^{-10}$$

$$3 \times 10^{-34} = [10^{-10}]^3 [Al^{3+}]$$

$$[Al^{3+}] = 3 \times 10^{-4} \text{ mol/L}$$

solubility of Al(OH)₃ is 3 × 10⁻⁴ mol/L

(22)



$$K_{eq} = .00306$$

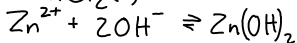
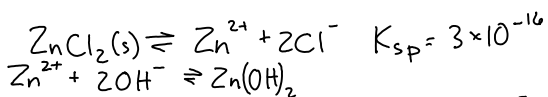
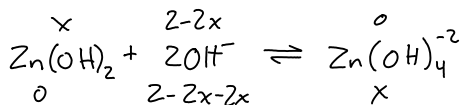
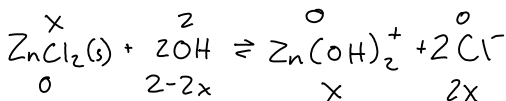
$$lg \text{ AgCl} \times \frac{1 \text{ mol AgCl}}{143.35} = .006976$$

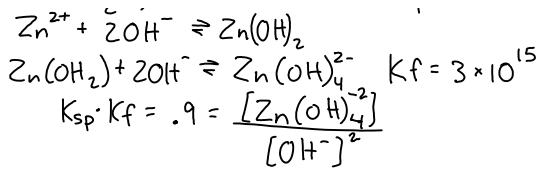
$$.00306 = \frac{(.006976)(.006976 + x)}{(4.993)^2}$$

$$.07629 = 4.866 \times 10^{-5} + .006976x$$

$$x = 10.9 \text{ mol}$$

(23)





$$.9 = \frac{x}{(2-4x)^2} = \frac{x}{(4-16x+16x^2)}$$

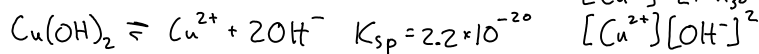
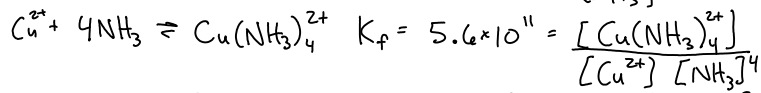
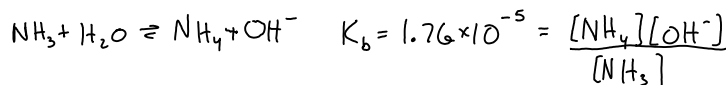
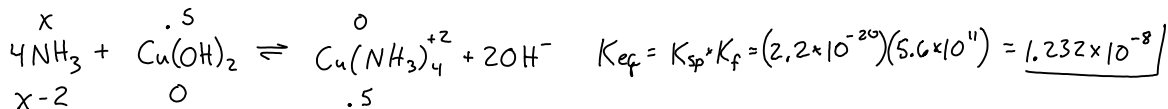
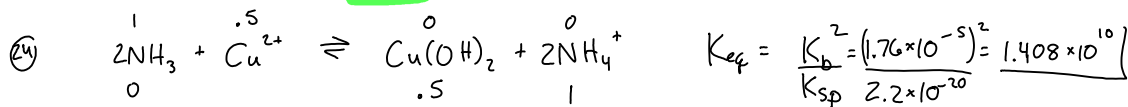
$$3.6 - 14.4x + 14.4x^2 - x = 0$$

$$14.4x^2 - 15.4x + 3.6 = 0$$

$$x = \frac{15.4 \pm \sqrt{29.8}}{2(14.4)} = .345176 \text{ or } \del{.724869}$$

$$.345176 \text{ mol ZnCl}_2 \times \frac{136.806 \text{ g}}{\text{mol}} = 47.2 \text{ g or } \del{.724264 \text{ mol} \times \frac{136.806 \text{ g}}{\text{mol}} = 99.1 \text{ g}}$$

5×10^1



$$1.232 \times 10^{-8} = \frac{[\text{Cu}(\text{NH}_3)_4^{2+}][\text{OH}^-]^2}{[\text{NH}_3]^4}$$

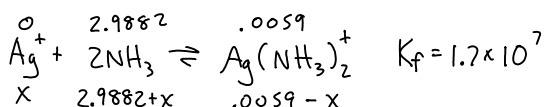
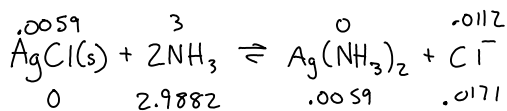
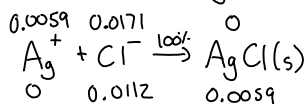
$$= \frac{(.5)(1.76 \times 10^{-5})^2}{(x-2)^2}$$

$$x = 2.1$$

$$\text{total} = 2.1 + 1 = 3.1 \text{ mol NH}_3 \text{ added}$$

$$\textcircled{25} \quad 1 \text{ g NaCl} \times \frac{1 \text{ mol}}{58.44 \text{ g}} = 0.0171$$

$$1 \text{ g AgNO}_3 \times \frac{1 \text{ mol}}{169.91 \text{ g}} = 0.00589$$



$$1.7 \times 10^7 = \frac{.0059 - x}{(x)(2.9882 + x)}$$

$$1.7 \times 10^7 x^2 + 5.0799 \times 10^7 x = .0059 - x$$

$$1.7 \times 10^7 x^2 + 5.0799 \times 10^7 x - .0059 = 0$$

$$\frac{-5.0799 \times 10^7 \pm 5.0799 \times 10^7}{(2)(1.7 \times 10^7)}$$

$$[\text{NH}_3] = 3.0$$

$$[\text{Cl}^-] = 1.7$$

$$[\text{Ag}^+] = 1.2 \times 10^{-10}$$