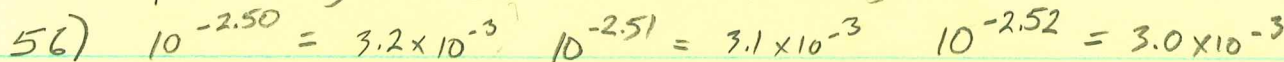
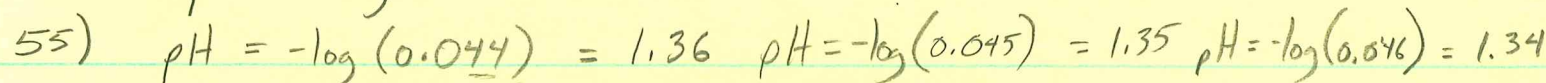
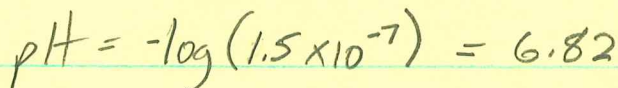
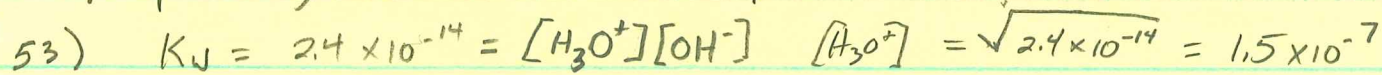
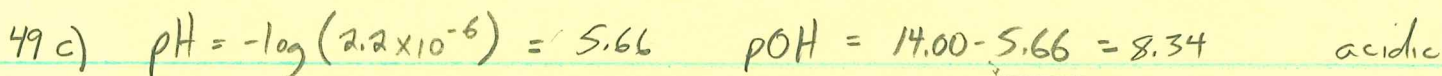
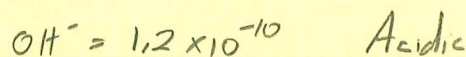
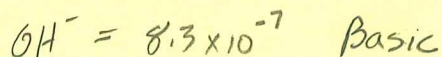
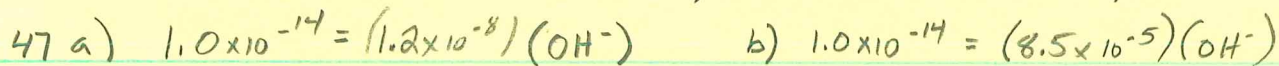
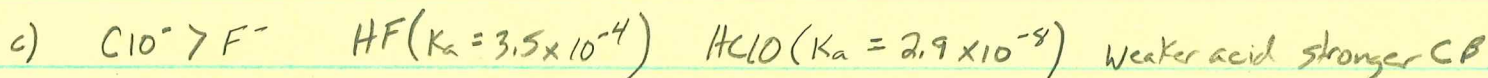
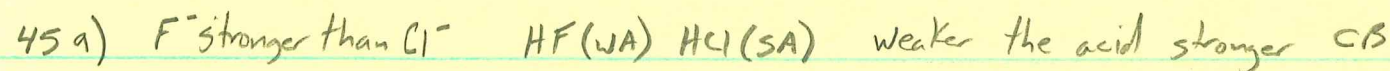
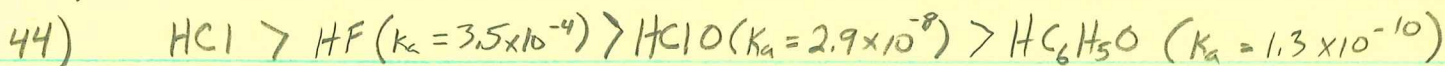
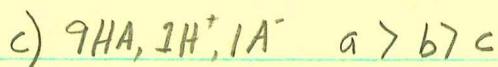
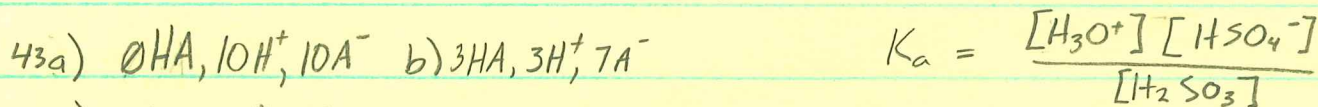
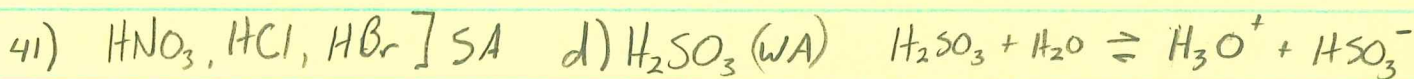
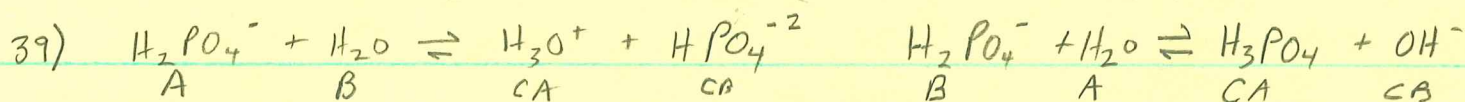
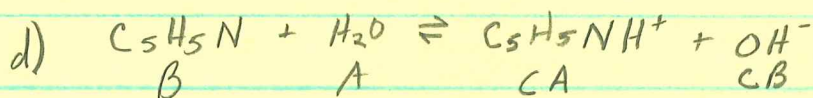
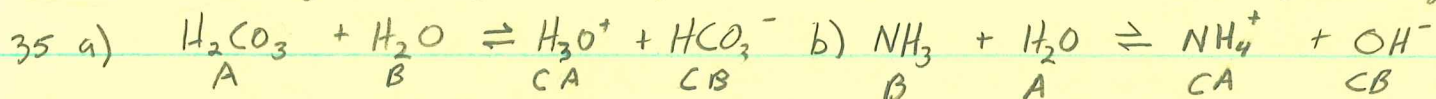
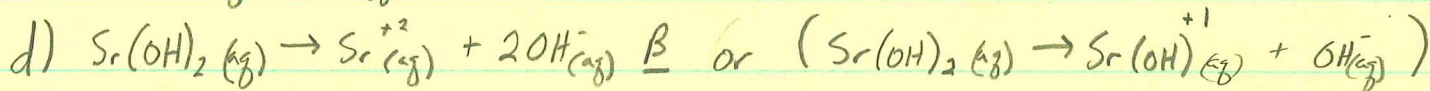
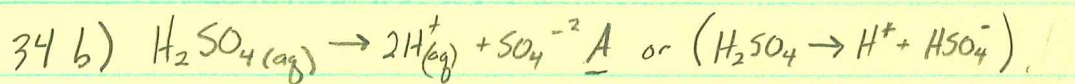
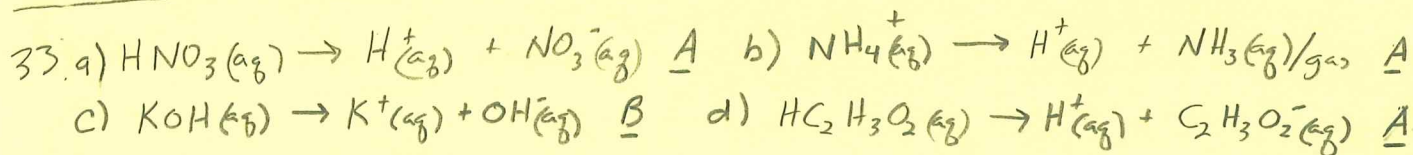


# Ch 17 Acids + Bases Exercises



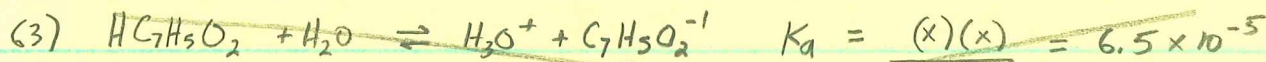
57a)  $0.25M HCl$   $H_3O^+ = 0.25M$   $pH = -\log(0.25) = 0.60$   $[OH^-] = \frac{1.0 \times 10^{-14}}{0.25} = 4.0 \times 10^{-14}$   
 SA or  $pOH = 13.40$

b)  $0.015M HNO_3$   $H_3O^+ = 0.015M$   $pH = -\log(0.015) = 1.82$   $[OH^-] = \frac{1.0 \times 10^{-14}}{0.015} = 6.7 \times 10^{-13}$

c) total  $H_3O^+ = 0.072M$   $pH = -\log(0.072) = 1.14$   $[OH^-] = 1.4 \times 10^{-13}$

59a)  $pH = 1.25$   $H_3O^+ = 10^{-1.25} = 0.056M$   $0.250L \times \frac{0.056 mol HI}{L} \times \frac{127.9 g HI}{1 mol} = 1.8g HI$

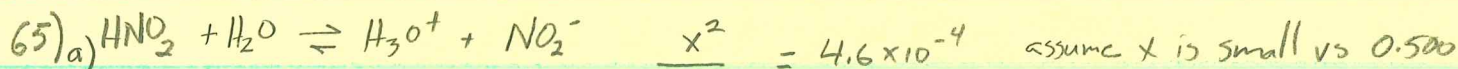
61)  $n = \frac{PV}{RT} = \frac{(1.02 atm)(0.224 L)}{(0.0821 \frac{atm \cdot L}{mol \cdot K})(300.35 K)} = 0.00927 mol = 0.0062 M$   
 $pH = 2.21$



I	0.100	0	0
C	-x	+x	+x
E	0.100 - x	x	x

assume x is small compared to 0.100  
 $x = 2.5 \times 10^{-3}$   $\frac{2.5 \times 10^{-3}}{0.100} \times 100 = 2.5\%$

$pH = -\log(2.5 \times 10^{-3}) = 2.60$



0.500	0	0
-x	+x	+x
0.500 - x	x	x

$x = 0.015$   $pH = 1.82$   
 $\frac{0.015}{0.500} \times 100 = 3\%$

b)  $\frac{x^2}{0.100} = 4.6 \times 10^{-4}$  if x is small  $x = 0.0068M$   $\frac{0.0068}{0.100} \times 100 = 6.8\%$

quadratic  $x = 0.00656M$   $pH = 2.18$  Not valid (still close)  $pH = 2.17$

c)  $\frac{x^2}{0.6100} = 4.6 \times 10^{-4}$  if x is small  $x = 0.0021M$   $pH = 2.68$   $\frac{0.0021}{0.6100} \times 100 = 21\%$

quadratic  $x = 0.0019$   $pH = 2.72$  Not valid

67)  $75.0 ml \times \frac{1.05 g}{ml} \times \frac{1 mol}{60.05 g} = \frac{0.262 mol}{1.50 L} = 0.1749 M$

$\frac{x^2}{0.1749 - x} = 1.8 \times 10^{-5}$  if x is small vs 0.1749  $pH = 2.75$   
 $x = 0.00177M$   $\frac{0.00177}{0.1749} \times 100 = 1.0\%$



0.185	0	0
-x	+x	+x
0.185 - 0.00112	0.00112	0.00112

$K_a = \frac{(0.00112)^2}{(0.18388)} = 6.82 \times 10^{-6}$



125) a) <sup>LA</sup>  $\text{Fe}^{+3}$  accepts from <sup>LB</sup>  $\text{H}_2\text{O}$  b) <sup>LA</sup>  $\text{Zn}^{+2}$  accepts from <sup>LB</sup>  $\text{NH}_3$  c) <sup>LA</sup>  $\text{BF}_3$  accepts from <sup>LB</sup>  $(\text{CH}_3)_3\text{N}$

127) a)  $\text{HFWA}$  molecules in soln (Not ionized) b)  $\text{HI}$  strong completely ionized

c)  $\text{HCHO}_2$  WA d)  $\text{HNO}_3$  SA completely ionized

128) a)  $\text{NH}_3$  WA (molecules) b)  $\text{NaOH}$  SB complete dissociation

c)  $\text{NaHCO}_3$   $\text{HCO}_3^- + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 + \text{OH}^-$  d)  $\text{Sr(OH)}_2$  SB complete dissociation

129) an  $\uparrow$  in  $\text{H}^+$  would shift the eq  $\leftarrow$  causing less  $\text{HbO}_2$  in blood  $\downarrow$   $\text{O}_2$  carrying capacity

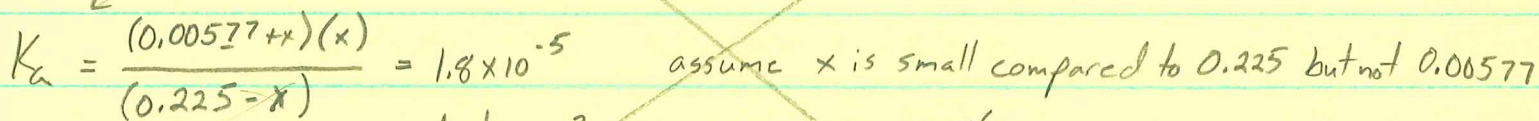
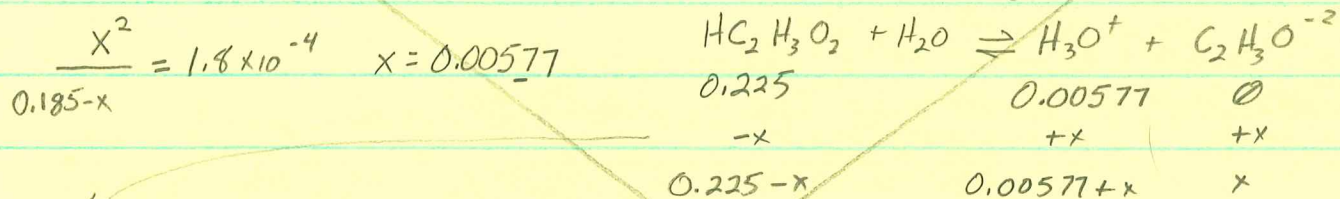
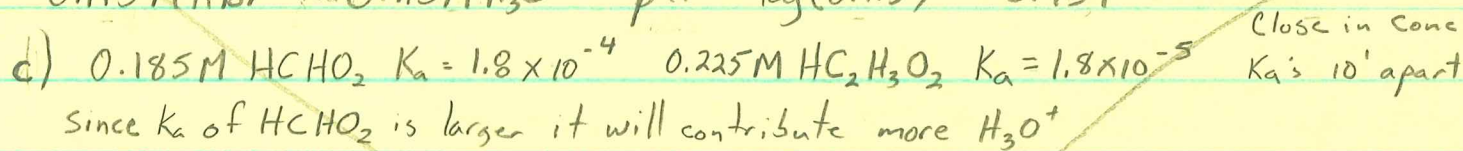
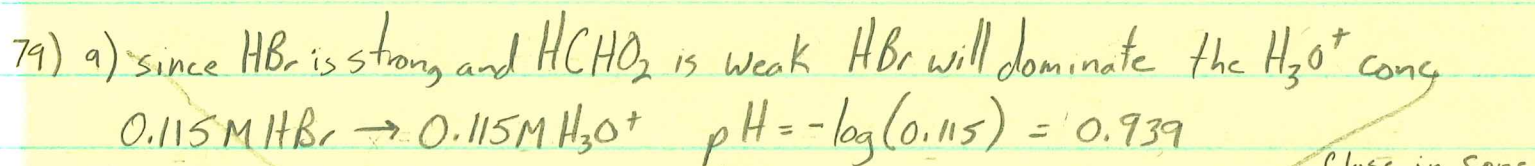
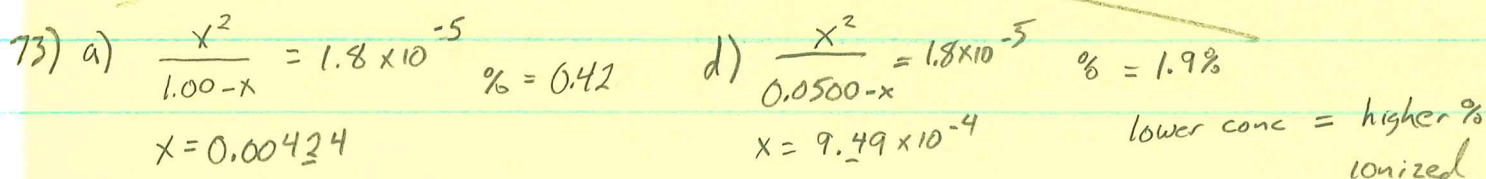
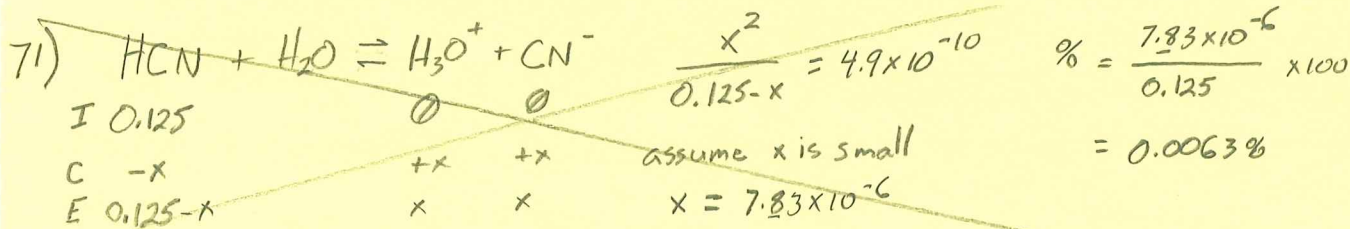
131)  $[\text{H}^+] = 10^{-1.3} = 0.05 \text{ M}$   $\text{Mg(OH)}_2 + 2\text{HCl} \rightarrow \text{MgCl}_2 + 2\text{H}_2\text{O}$

$$4.00 \times 10^2 \text{ mg Mg(OH)}_2 \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{1 \text{ mol Mg(OH)}_2}{58.33 \text{ g}} \times \frac{2 \text{ mol HCl}}{1 \text{ mol Mg(OH)}_2} \times \frac{1000 \text{ mL HCl}}{0.05 \text{ mol}} = 270 \text{ mL yes}$$

135)  $\frac{(50 \text{ mg})}{802} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times \frac{1 \text{ mol}}{180 \text{ g}} \times \frac{3202}{\cancel{\text{g}^+}} \times \frac{1.06 \cancel{\text{g}^+}}{1 \text{ L}} = 0.015 \text{ M}$   $K_a = 10^{-3.5} = 3.16 \times 10^{-4}$   $\uparrow$  Not small

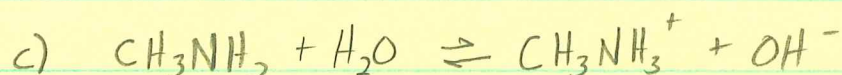
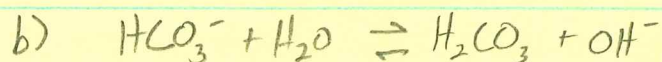
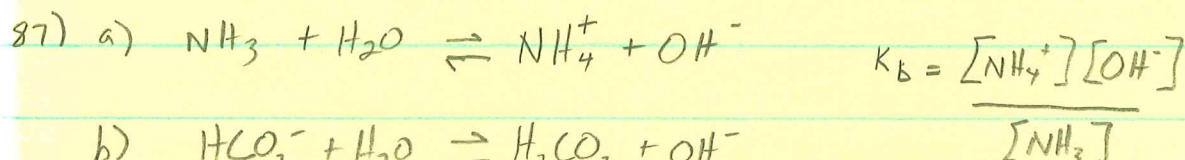
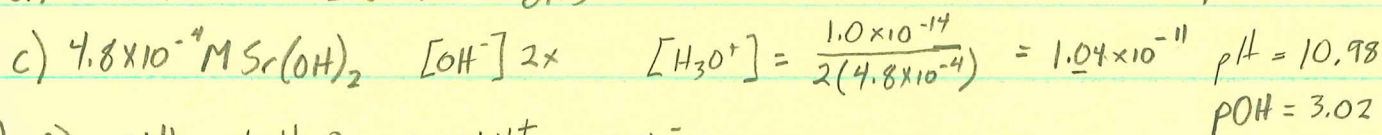
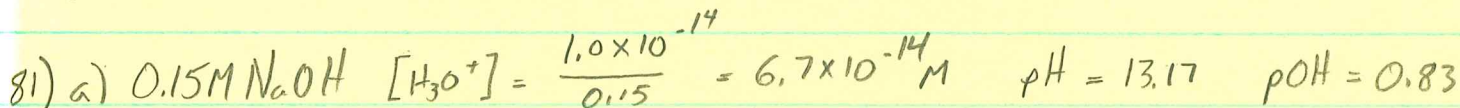
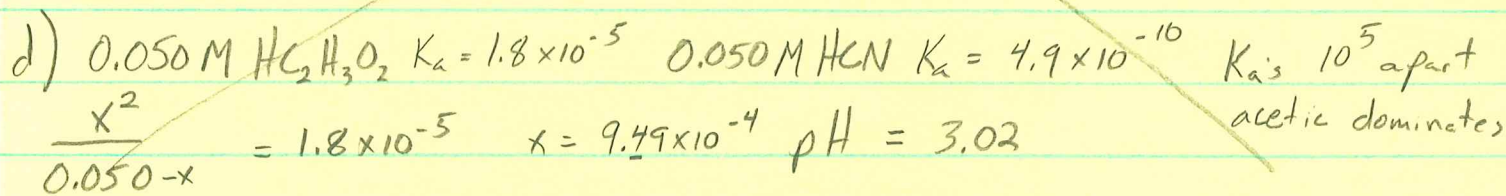
$\frac{x^2}{0.015 - x} = 3.16 \times 10^{-4}$  if  $x$  were small compared to  $x = 0.002065$  (13%)  $\text{pH} = 2.68$

$x \rightarrow \text{quadratic} = 2.04 \times 10^{-3}$   $\text{pH} = 2.69 \approx 2.7$



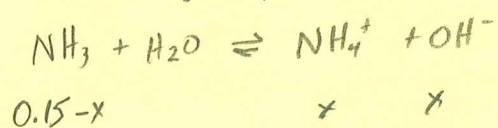
quadratic  $x^2 + 0.00577x - 4.05 \times 10^{-6} = 0$   $x = 0.0006325$

$[\text{H}_3\text{O}^+] = 0.00577 + 0.0006325 = 0.0064$   $\text{pH} = 2.19$





89)  $0.15 \text{ M NH}_3$   $K_b = 1.76 \times 10^{-5}$   $[\text{OH}^-]$ ,  $\text{pH}$ ,  $\text{pOH}$ ?



$$K_b = \frac{x^2}{0.15 - x} = 1.76 \times 10^{-5}$$

$$x = 0.00162 \text{ M}$$

$$\text{pOH} = 2.79 \quad \text{pH} = 11.21$$

91)  $\frac{455 \text{ mg Caff}}{1} \times \frac{1 \text{ g}}{1600 \text{ mg}} \times \frac{1 \text{ mol}}{194.20 \text{ g}} = 0.002343 \text{ M}$

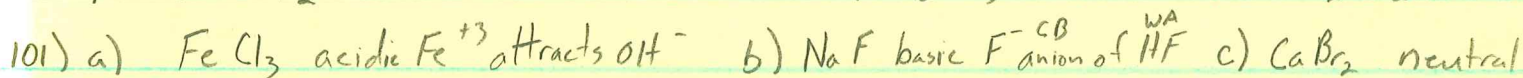
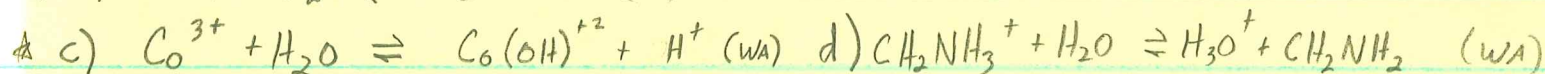
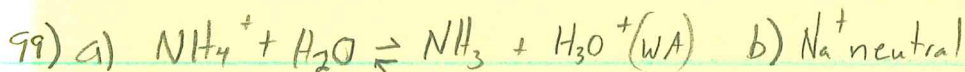
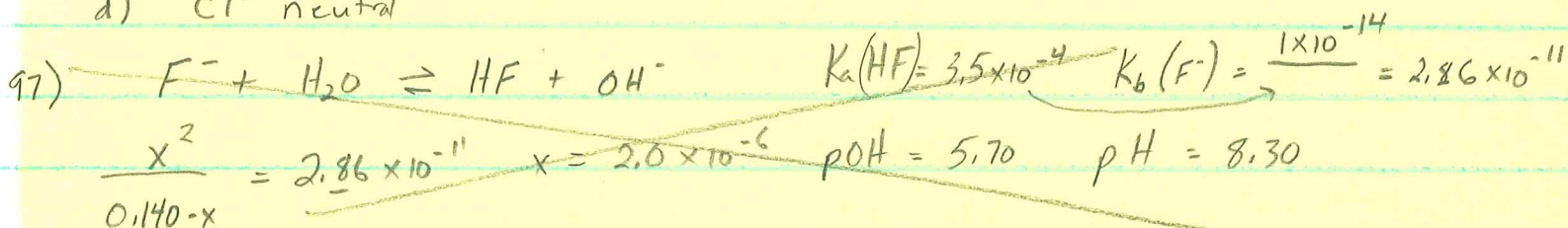
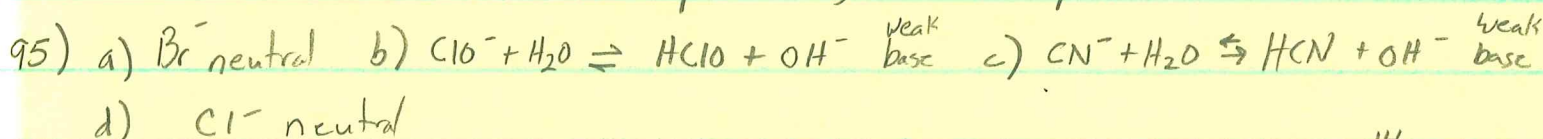
$$K_b = 10^{-10.4} = 3.98 \times 10^{-11}$$

$$\frac{x^2}{0.002343 - x} = 3.98 \times 10^{-11}$$

$$x = 3.05 \times 10^{-7} \text{ M}$$

$$\frac{3.05 \times 10^{-7}}{0.002343} \times 100 = 0.013\%$$

$$\text{pOH} = -\log \uparrow = 6.5 \quad \text{pH} = 7.5$$



$$K_b \text{ C}_6\text{H}_5\text{NH}_2 = 3.9 \times 10^{-10}$$

$$K_a(\text{C}_6\text{H}_5\text{NH}_3^+) = 2.6 \times 10^{-5} > K_b(\text{NO}_2^-) = 2.2 \times 10^{-11}$$

$$K_a \text{ HNO}_2 = 4.6 \times 10^{-4}$$

$$\text{NH}_4^+ K_a = 5.6 \times 10^{-10} >$$

