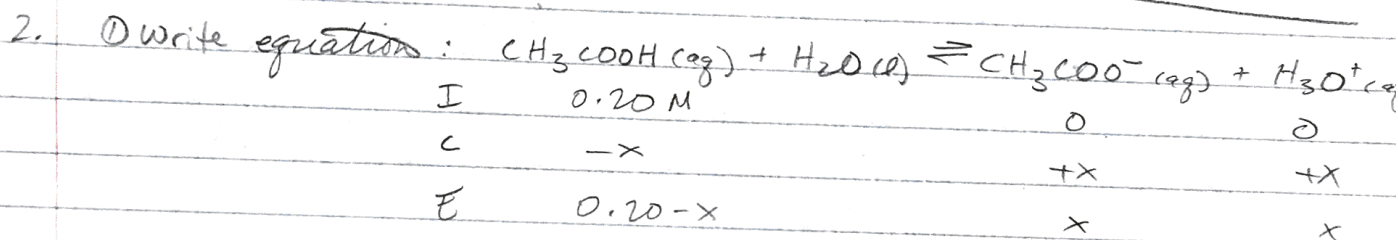
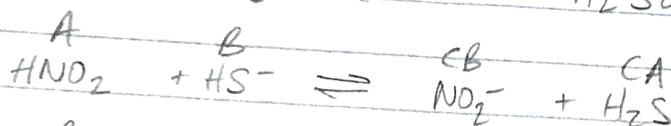


PLI 53
Monday, July 18, 2016

Solution



$$K_a = \frac{[CH_3COO^-][H_3O^+]}{[CH_3COOH]} = \frac{x^2}{0.20 - x} = 1.8 \times 10^{-5}$$

* $K_a \cdot 100 < 0.1$ So we can remove x from denominator

$$1.8 \times 10^{-5} = \frac{x^2}{0.20} \rightarrow x = \sqrt{1.8 \times 10^{-5} (0.20)} = 1.9 \times 10^{-3}$$

$$= [H_3O^+] \quad pH = -\log 1.9 \times 10^{-3} = \boxed{2.72}$$



I	0.45 M	0	0
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C	-x	+x	+x
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E	0.45 - x	x	x
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$$pH = -\log [H_3O^+]$$

$$[H_3O^+] = 10^{-pH} = 10^{-3.68} = 2.09 \times 10^{-4} M$$

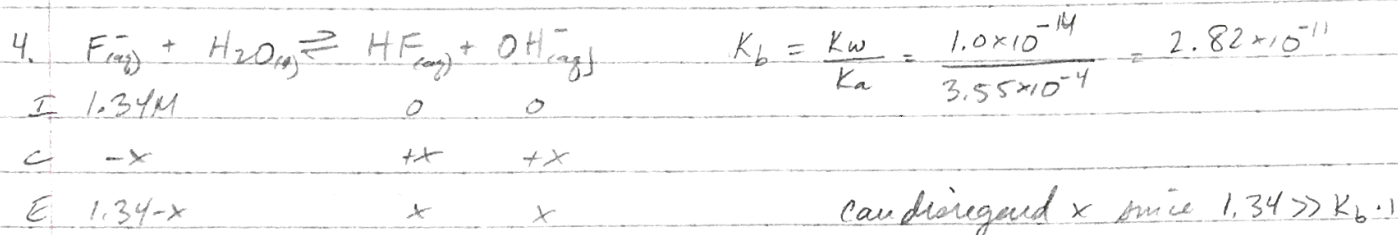
$$= [H_3O^+] = [A^-]$$

$$K_a = \frac{[H^+][A^-]}{[HA]} = \frac{(2.09 \times 10^{-4} M)^2}{0.45 M} = \boxed{9.71 \times 10^{-8} = K_a}$$

↑

we can disregard the x in the denominator

again, will get same answer because x is so small.



$$K_b = \frac{[HF][OH^-]}{[F^-]} = 2.82 \times 10^{-11} = \frac{x^2}{1.34-x}$$

$$\rightarrow 2.82 \times 10^{-11} = \frac{x^2}{1.34} \rightarrow x = \sqrt{2.82 \times 10^{-11} (1.34)} = 6.15 \times 10^{-6} = [OH^-]$$

$$pOH = -\log [OH^-] = -\log (6.15 \times 10^{-6}) = 5.21 \rightarrow pH = 14 - pOH = 14 - 5.21 = 8.79$$

5. a. $KClO_4$: neutral $\rightarrow$ conjugates of strong acid/bases
 b. $NaCN$: basic $\rightarrow$ CN^- is conjugate base of weak acid HCN
 c. $NH_4CH_3CO_2$: neutral $\rightarrow$ both conjugates of weak acids/bases, but $K_a = K_b$
 d. $AlCl_3$: acidic $\rightarrow$ Al^{3+} is conjugate acid of weak base $Al(OH)_3$
 e. NH_4ClO : basic $\rightarrow$ $K_b > K_a$ for conjugate acid/base
 f. K_2CO_3 : basic $\rightarrow$ CO_3^{2-} is conjugate base of weak acid H_2CO_3
 g. $PbBr_2$: neutral $\rightarrow$ conjugates of strong acids/bases
 h. NaF : basic $\rightarrow$ F^- is conjugate base of weak acid HF
 i. $LiClO_4$: neutral $\rightarrow$ conjugates of strong acids/bases
 j. NH_4Br : acidic $\rightarrow$ NH_4^+ is conjugate acid of weak base NH_3

6.	HNO_2 $K_a = 4.5 \times 10^{-4}$	H_2SO_4 $K_a = \text{huge}$	H_2O $K_a = 1 \times 10^{-14}$	H_2CO_3 $K_a = 4.2 \times 10^{-7}$	NH_3 $K_a = \text{small}$	HF $K_a = 7.2 \times 10^{-4}$
a)	4	6	2	3	1	5
b)	NO_2^- $K_b = 2.2 \times 10^{-11}$	HSO_4^- $K_b = \text{v. small}$	OH^- $K_b = 1$	HCO_3^- $K_b = 2.4 \times 10^{-8}$	NH_2^- $K_b = \text{huge}$	F^- $K_b = 1.4 \times 10^{-11}$
c)	3	1	5	4	6	2