

$$1. -\log(.0111) = pOH$$

$$pOH = 1.95$$

$$pH = 14 - 1.95$$

$$pH = 12.05$$

$$2. pH = -\log(1.35 \times 10^{-3})$$

$$pH = 2.87$$

$$pOH = 14 - 2.87$$

$$pOH = 11.13$$

$$3. pH = -\log(.0333)$$

$$pH = 1.48$$

$$4. pOH = -\log(.0347)$$

$$pOH = 1.46$$

$$5. pOH = 14 - 9.85$$

$$pOH = 4.15$$

$$-\log[H_3O^+] = 9.85$$

$$[H_3O^+] = 1.4 \times 10^{-10}$$

$$-\log[OH^-] = 4.15$$

$$[OH^-] = 7.08 \times 10^{-5}$$

$$6. pOH = 14 - 4.77$$

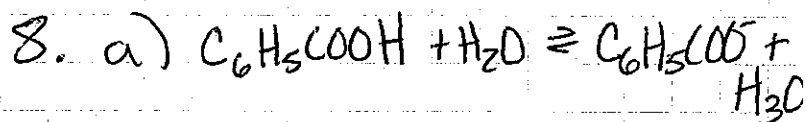
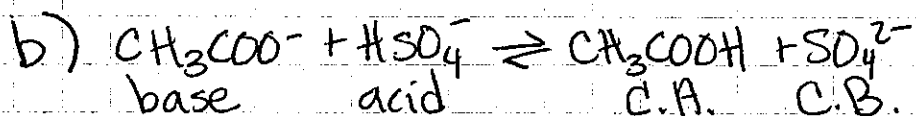
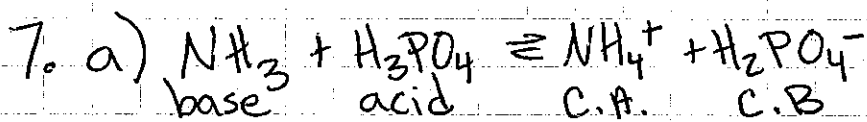
$$pOH = 9.23$$

$$-\log[OH^-] = 9.23$$

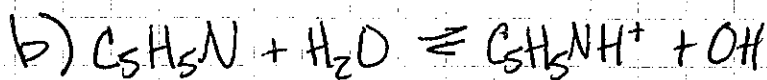
$$[OH^-] = 5.89 \times 10^{-10}$$

$$-\log[H_3O^+] = 4.77$$

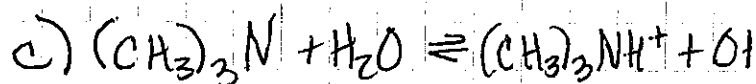
$$[H_3O^+] = 0.17 \times 10^{-4}$$



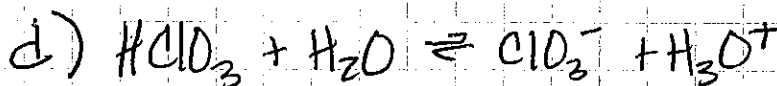
$$K_a = \frac{[C_6H_5COO^-][H_3O^+]}{[C_6H_5COOH]}$$



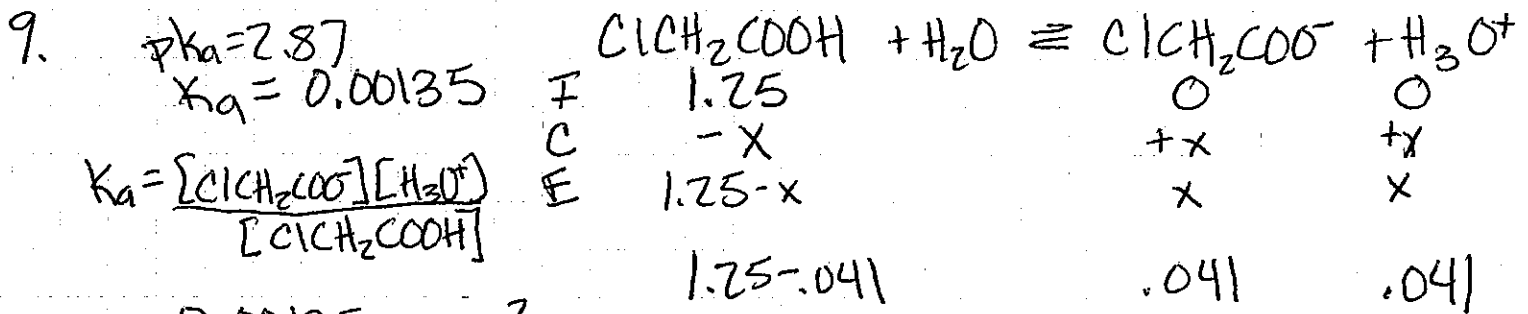
$$K_b = \frac{[C_5H_5NH^+][OH^-]}{[C_5H_5N]}$$



$$K_b = \frac{[OH^-][(CH_3)_3NH^+]}{[(CH_3)_3N]}$$



$$K_a = \frac{[ClO_3^-][H_3O^+]}{[HClO_3]}$$



$$K_a = \frac{[ClCH_2COO^-][H_3O^+]}{[ClCH_2COOH]}$$

$$0.00135 = \frac{x^2}{1.25 - x}$$

* assume x is small

$$0.00135(1.25) = x^2$$

$$x = 0.041$$

* check if x is small

$$\frac{0.041}{1.25} = 3.3\%$$

* x is small

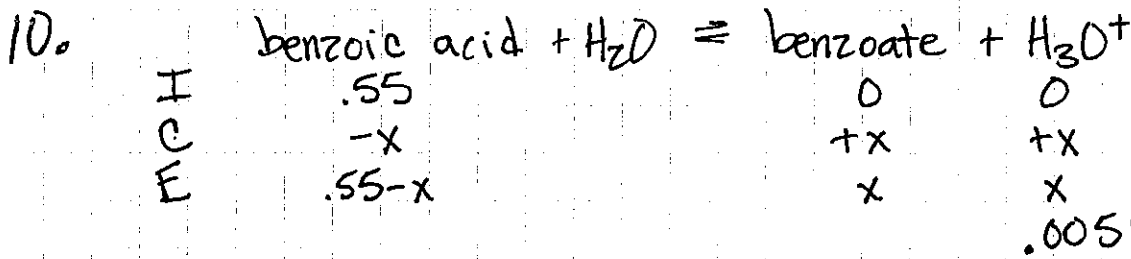
$$[H_3O^+] = 0.041 M$$

$$[ClCH_2COO^-] = 0.041 M$$

$$[ClCH_2COOH] = 1.21 M$$

$$pH = -\log(0.041)$$

$$pH = 1.39$$



$$K_a = \frac{[H_3O^+][benzoate]}{[B.A.]}$$

$$6.3E-5 = \frac{x^2}{.55 - x}$$

* assume x is small

$$x^2 = 3.465E-5$$

$$x = 0.0059$$

* check if x is small

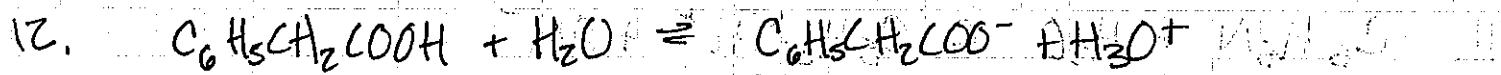
$$\frac{0.0059}{.55} = 1\%$$

* x is small

$$pH = -\log[H_3O^+]$$

$$pH = -\log(0.0059)$$

$$pH = 2.23$$



I	0.12	0	0
C	-0.0024	+0.0024	+0.0024
E	.12 - 0.0024	0.0024	0.0024

$$\text{pH} = 2.62$$

$$[\text{H}_3\text{O}^+] = 0.00240$$

$$K_a = \frac{(0.0024)^2}{(0.12 - 0.0024)}$$

$$K_a = 4.90 \times 10^{-5}$$



I	.1	0	0
C	-x	+x	+x
E	.1 - x	x	x

$$K_a = \frac{[\text{H}_3\text{O}^+][\text{CH}_3\text{CH}_2\text{COO}^-]}{[\text{CH}_3\text{CH}_2\text{COOH}]}$$

$$x = 0.0011$$

$$\text{pH} = -\log(0.0011)$$

$$\text{pH} = 2.96$$

$$1.3 \times 10^{-5} = \frac{x^2}{.1 - x}$$

* assume x is small

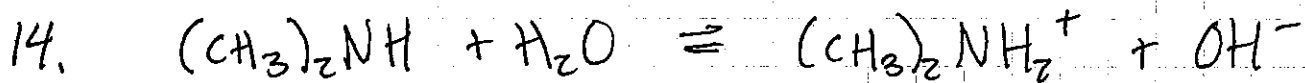
$$1.3 \times 10^{-6} = x^2$$

$$x = 0.0011$$

* check assumption

$$0.0011 / .1 = 1.1\%$$

* assumption valid



I	1.5	0	0
C	-x	+x	+x
E	1.5-x	x	x

$$K_b = \frac{[(\text{CH}_3)_2\text{NH}_2^+][\text{OH}^-]}{[(\text{CH}_3)_2\text{NH}]}$$

$$8.9 \times 10^{-4} = \frac{x^2}{1.5-x}$$

* assume x is small
 $x^2 = 0.001335$
 $x = 0.0365$

* check assumption
 $0.0365 / 1.5 = 2.4\%$
 * assumption valid

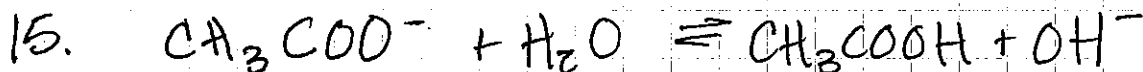
$$[\text{OH}^-] = 0.0365$$

$$\text{pOH} = -\log(0.0365)$$

$$\text{pOH} = 1.44$$

$$\text{pH} = 14 - 1.44$$

$$\text{pH} = 12.56$$



I	.25	0	0
C	-x	+x	+x
E	.25-x	x	x

$$K_b = \frac{1 \times 10^{-14}}{K_a}$$

$$K_b = \frac{1 \times 10^{-14}}{1.8 \times 10^{-5}}$$

$$K_b = 5.55 \times 10^{-10}$$

* assume x is small
 $1.389 \times 10^{-10} = x$
 $x = 1.1785 \times 10^{-5}$

* check assumption
 $1.1785 \times 10^{-5} / .25 \ll 5\%$
 * assumption valid

$$[\text{OH}^-] = 1.1785 \times 10^{-5}$$

$$\text{pOH} = -\log(1.1785 \times 10^{-5})$$

$$\text{pOH} = 4.93$$

$$\text{pH} = 14 - 4.93$$

$$\text{pH} = 9.07$$

$$K_b = \frac{[\text{CH}_3\text{COOH}][\text{OH}^-]}{[\text{CH}_3\text{COO}^-]}$$

$$5.55 \times 10^{-10} = \frac{x^2}{.25-x}$$