

$$K_a = 1.4 \times 10^{-3} = \frac{[\text{CH}_2\text{ClCOO}^-][\text{H}_3\text{O}^+]}{[\text{CH}_2\text{ClCOOH}]} = \frac{x^2}{C-x} \approx \frac{x^2}{C} \quad x = \sqrt{(1.4 \times 10^{-3})C}$$

and $\frac{1.4 \times 10^{-3}}{[\text{H}_3\text{O}^+]} = \frac{1.4 \times 10^{-3}}{x} = \frac{[\text{CH}_2\text{ClCOO}^-]}{[\text{CH}_2\text{ClCOOH}]} = \frac{x}{C-x}$

(a) $x = [\text{H}_3\text{O}^+] = \sqrt{(1.4 \times 10^{-3})(1\text{M})} = 0.037 \text{ M}$

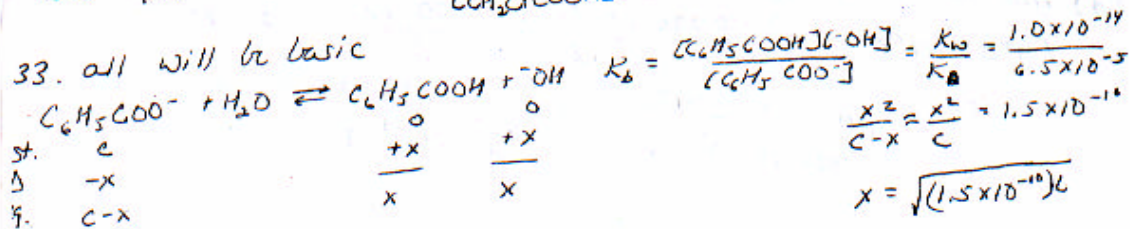
$\text{pH} = -\log [\text{H}_3\text{O}^+] = -\log (0.037) = 1.44$

$\frac{[\text{CH}_2\text{ClCOO}^-]}{[\text{CH}_2\text{ClCOOH}]} = \frac{x}{C-x} = \frac{0.037}{1.000 - 0.037} = 0.038$

(b) as above, $\text{pH} = 1.59$ and $\frac{[\text{CH}_2\text{ClCOO}^-]}{[\text{CH}_2\text{ClCOOH}]} = 0.054$

(c) $\text{pH} = 1.95$ and $\frac{[\text{CH}_2\text{ClCOO}^-]}{[\text{CH}_2\text{ClCOOH}]} = 0.13$

33. all will be basic



$K_b = \frac{[\text{C}_6\text{H}_5\text{COOH}][\text{OH}^-]}{[\text{C}_6\text{H}_5\text{COO}^-]} = \frac{K_w}{K_a} = \frac{1.0 \times 10^{-14}}{6.5 \times 10^{-5}}$

$\frac{x^2}{C-x} \approx \frac{x^2}{C} = 1.5 \times 10^{-10}$

$x = \sqrt{(1.5 \times 10^{-10})C}$

$\text{pOH} = -\log x$

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

(a) 9.09

(b) 8.94

(c) 8.59

(d) 8.09