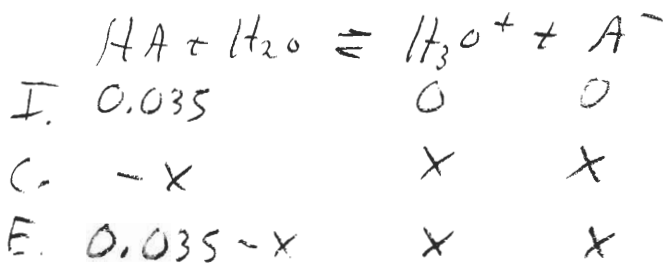


Key

1. (8 Pts) A 0.035 M solution of a weak acid (HA) has a pH of 4.88. Determine the  $K_a$  of the acid.

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

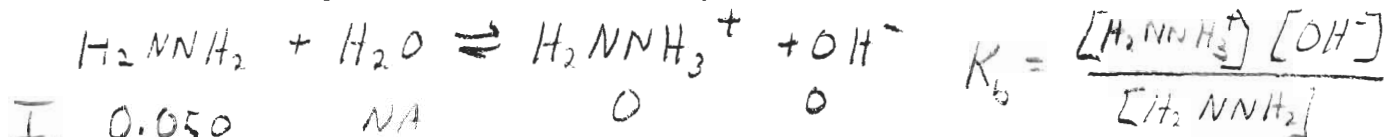
$$K_a = \frac{(1.32 \times 10^{-5})^2}{(0.035 - 1.32 \times 10^{-5})}$$



$$x = 10^{-4.88} = [H_3O^+] = 1.32 \times 10^{-5}$$

$$K_a = \frac{4.97 \times 10^{-9}}{5.0 \times 10^{-9}}$$

2. (8 Pts) What is the pH of a 0.050 M solution of hydrazine ( $H_2NNH_2$ ),  $K_b = 1.3 \times 10^{-6}$ ?



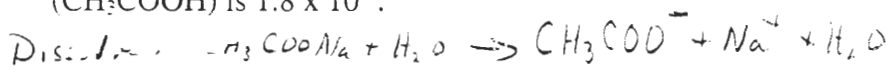
$$K_b = \frac{[H_2NNH_3^+][OH^-]}{[H_2NNH_2]}$$

$$1.3 \times 10^{-6} = \frac{x^2}{0.050 - x} \leftarrow \text{Drop}$$

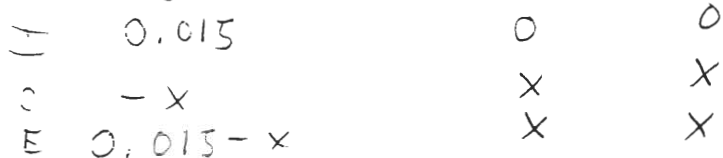
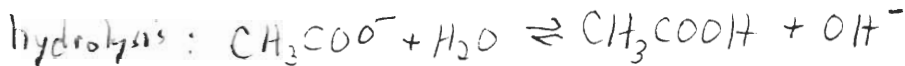
$$x = 2.54 \times 10^{-4} = [OH^-]$$

$$pOH = 3.59 \quad pH = 14 - pOH = 10.41$$

3. (8 Pts) What is the pH of a 0.015 M solution of sodium acetate ( $CH_3COONa$ )? The  $K_a$  of acetic acid ( $CH_3COOH$ ) is  $1.8 \times 10^{-5}$ .



$$K_b = \frac{K_w}{K_a} = \frac{10^{-14}}{1.8 \times 10^{-5}} = 5.6 \times 10^{-10}$$



$$K_b = \frac{[CH_3COOH][OH^-]}{[CH_3COO^-]}$$

$$5.6 \times 10^{-10} = \frac{x^2}{0.015 - x} \leftarrow \text{drop?}$$

$$x = 2.89 \times 10^{-6} = [OH^-]$$

$$pOH = 5.54 \quad pH = 14 - pOH = 8.46$$

4 (1 Pt) Which is the stronger acid, one with a  $pK_a$  of 4.7 or one with a  $pK_a$  of 2.25?

$pK_a$  of 2.25 gives stronger Acid.