

$$K_a = \frac{[\text{H}^+][\text{A}^-]}{[\text{HA}]} = \frac{x^2}{F-x}$$

assume  $F \gg x$

$$[\text{H}^+] = \sqrt{K_a F} = 1.8916 \times 10^{-3} \text{ M}$$

$x = 3.3\% F$  fails  $\rightarrow$  quadratic

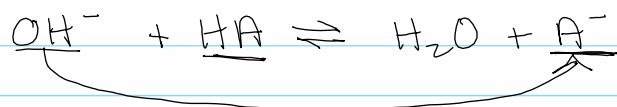
$\uparrow$   $[\text{HA}] + [\text{A}^-]$

$$0 = x^2 + K_a x - F K_a = x^2 + 6.309 \times 10^{-5} x - 3.6 \times 10^{-6}$$

$$x = 1.86 \times 10^{-3} \text{ M}$$

$$\text{pH} = 2.73$$

$$\text{pH} \neq 4.20$$



$$\text{pH} = \text{p}K_a + \log \frac{[\text{A}^-]}{[\text{HA}]}$$

$$\text{moles OH}^- = \text{moles A}^- = 0.073 \frac{\text{mol}}{\text{L}} \cdot 0.014 \text{ L} = 1.022 \times 10^{-3} \text{ mol}$$

$$\text{moles HA} = 0.057 \frac{\text{mol}}{\text{L}} \cdot 0.05 \text{ L} = 2.85 \times 10^{-3} \text{ moles}$$

$$\text{moles HA} = 2.85 \times 10^{-3} \text{ moles} - 1.022 \times 10^{-3} \text{ moles}$$

$$\text{pH} = 4.20 + \log \frac{1.022 \times 10^{-3} \text{ mol}}{1.828 \times 10^{-3} \text{ mol}} = 4.20 - 0.25 = 3.95$$

$$\text{pH} = \text{p}K_a = 4.20$$