

10-6 Cont.

(c) $V_b = 10.1 \text{ mL} > V_e$ so this is beyond the equiv. pt.; excess or unreacted OH^- determines pH

$$\text{mol OH}^- \text{ added} = (1.00 \frac{\text{mol}}{\text{L}})(0.0101 \text{ L}) = 0.0101$$

$$\text{mol OH}^- \text{ unreacted} = \underset{\text{added}}{0.0101 \text{ mol}} - \underset{\text{reacted at eq. pt.}}{0.0100 \text{ mol}} = 1.00 \times 10^{-4}$$

$$\text{Total volume of solution} = 100.0 \text{ mL titrated HA} + 10.1 \text{ mL OH}^- = 110.1 \text{ mL}$$

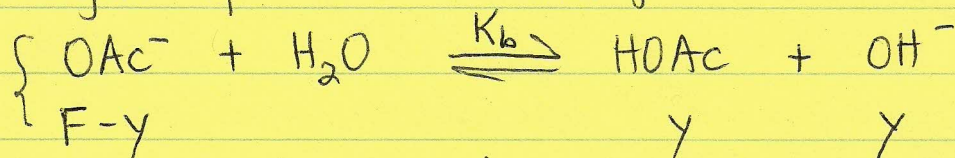
$$\Sigma[\text{OH}^-] = \frac{1.00 \times 10^{-4} \text{ mol}}{0.1101 \text{ L}} = 9.08 \times 10^{-4} \text{ M} \rightarrow \text{pOH} = 3.04$$

$\rightarrow \text{pH} = 10.96$

10-8 Calc. pH at equiv. pt. when 0.100 M HOAc is titrated with 0.0500 M KOH. App. G $\text{p}K_{\text{a}(\text{HOAc})} = 3.832$ (or $K_{\text{a}} = 1.48 \times 10^{-4}$)

Work: At the equiv. pt., all of HOAc reacted to form OAc^- with all of OH^-

Hydrolysis of OAc^- determines pH



First, we need to calc. F_{OAc^-} from $\Sigma[\text{HOAc}]$ initially present. Since $[\text{OH}^-] = \frac{1}{2} \Sigma[\text{HOAc}]$, we need twice as much mL OH^- to neutralize HOAc. Assuming 100 mL HOAc initially present, $V_e = 200 \text{ mL}$ so $V_{\text{total}} = 300 \text{ mL}$

$$F_{\text{OAc}^-} = \frac{\underset{V_{\text{HOAc}}}{(0.100 \text{ L})} (\underset{M_{\text{HOAc}}}{0.100 \frac{\text{mol}}{\text{L}}})}{0.300 \text{ L}} \leftarrow \begin{array}{l} \text{Since mol HOAc} = \text{mol OAc}^- \\ \text{reacted} \qquad \qquad \text{formed} \end{array}$$

$\leftarrow \text{total volume of sol'n at equiv. pt.}$

$$= 3.33 \times 10^{-2} \text{ M}$$

$$K_b = \frac{1 \times 10^{-14}}{1.48 \times 10^{-4}} = 6.76 \times 10^{-11} = \frac{y^2}{(3.33 \times 10^{-2} - y)} \approx 0$$

$$y^2 = 2.252 \times 10^{-12} \Rightarrow y = [\text{OH}^-] = 1.50 \times 10^{-6} \text{ M} \quad \text{Assume } y \ll 3.33 \times 10^{-2}$$

pOH = 5.82 $\text{pH} = 8.18$