

# Chapter 14 — Problem Set 2

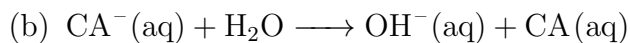
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1. (a)

$$\begin{aligned} .0037 \cdot .512 &= .0019[\text{mol}] \\ .025 \cdot .181 &= .004525[\text{mol}] \\ -\log_{10} \left( \frac{.004525 - .0019}{.0019} \cdot 1.9 \cdot 10^{-4} \right) &= 3.58 \end{aligned} \tag{1}$$



$$\begin{aligned} V &= \frac{.181 \cdot .025}{.512} = .00884[\text{mL}] \\ k_b &= \frac{k_w}{k_a} = 5.26 \cdot 10^{-11} \\ M_{\text{CA}^-} &= .1337[\text{M}] \\ \frac{x^2}{.1337} &= 5.26 \cdot 10^{-11} \\ x &= 2.652 \cdot 10^{-6} \\ 14 + \log_{10} (2.652 \cdot 10^{-6}) &= 8.42 \end{aligned} \tag{2}$$

2. (a)

$$\begin{aligned} .075 \cdot .1025 &= .0076875[\text{mol}] \\ .05 \cdot .232 &= .0116[\text{mol}] \\ -\log_{10} \left( \frac{.0116 - .0076875}{.0076875} \cdot 7.14 \cdot 10^{-11} \right) &= 10.44 \\ 14 - 10.44 &= 3.56 \end{aligned} \tag{3}$$

(b)

$$\begin{aligned}V &= \frac{.05 \cdot .232}{.1025} = .113[\text{mL}] \\k_a &= \frac{k_w}{k_b} = 1.4 \cdot 10^{-4} \\M_{\text{NO}_3^-} &= .0711[\text{M}] \\ \frac{x^2}{.0711} &= 1.4 \cdot 10^{-4} \\x &= .003155 \\-\log_{10} (.003155) &= 2.5\end{aligned}\tag{4}$$

3.

$$\begin{aligned}.02 \cdot .5 &= .01[\text{mol}] \\\cdot 00745 \cdot .5 &= .003725[\text{mol}] \\-\log_{10} \left( \frac{.01 - .003725}{.003725} \cdot 1.7 \cdot 10^{-5} \right) &= 4.54\end{aligned}\tag{5}$$