

Solutions

Each answer shows the steps, then the **result**.

2.1

- NO_3^-

2.2

- $\text{pH} = -\log(0.010) = 2.0$

3.1 B

- A weak acid and its salt make a buffer

3.2 C

- $[\text{H}^+] = 10^{-14}/0.10 = 10^{-13}$, so $\text{pH} = 13$

3.3

(a)

- $[\text{H}^+] = \sqrt{K_a[\text{HA}]} = \sqrt{1.8 \times 10^{-5} \times 0.10} = \sqrt{1.8 \times 10^{-6}} = 1.34 \times 10^{-3}$; $\text{pH} = -\log(1.34 \times 10^{-3}) = 2.87$

(b)

- HA is only partly dissociated, so $[\text{H}^+]$ is lower than for fully-dissociated HCl, giving a higher pH

3.4

(a)

- $[\text{H}^+] = K_a \frac{[\text{HA}]}{[\text{A}^-]} = 1.8 \times 10^{-5} \times \frac{0.20}{0.20} = 1.8 \times 10^{-5}$; $\text{pH} = 4.74$

(b)

- added H^+ reacts with the ethanoate ion: $\text{CH}_3\text{COO}^- + \text{H}^+ \rightarrow \text{CH}_3\text{COOH}$, removing most of the added H^+ so the pH barely changes