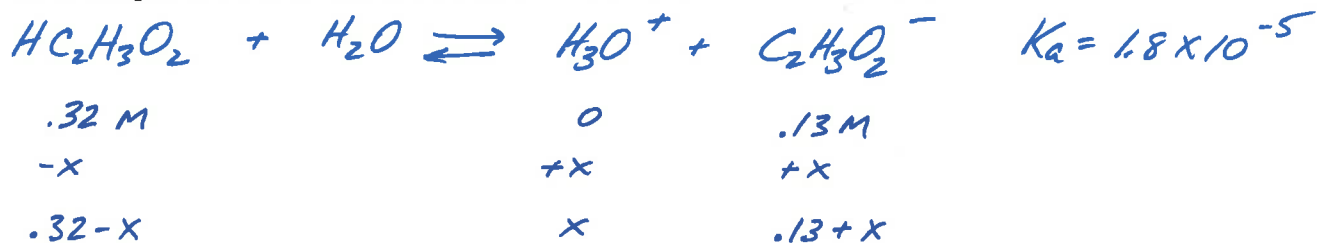


Acids & Bases Worksheet #4: Buffers

1. What is the pH of a buffer that is 0.32 M $\text{HC}_2\text{H}_3\text{O}_2$ and 0.13 M $\text{NaC}_2\text{H}_3\text{O}_2$?



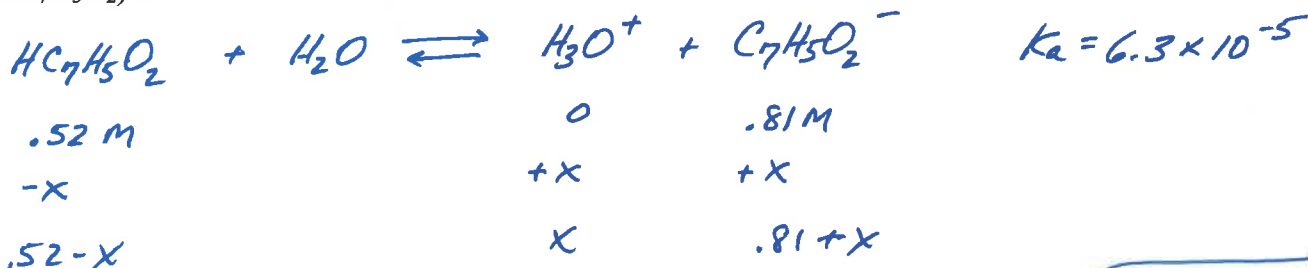
$$1.8 \times 10^{-5} = \frac{[x][.13+x]}{[.32-x]}$$

$$x = 4.4 \times 10^{-5}$$

$$[\text{H}_3\text{O}^+] = 4.4 \times 10^{-5} \text{ M}$$

pH = 4.36

2. What is the pH of a buffer made from 0.52 M benzoic acid ($\text{HC}_7\text{H}_5\text{O}_2$) and 0.81 M sodium benzoate ($\text{NaC}_7\text{H}_5\text{O}_2$)?



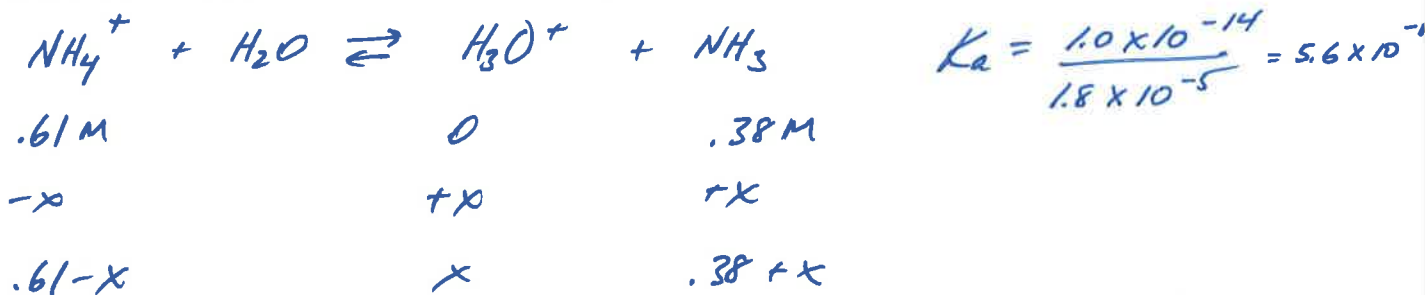
$$6.3 \times 10^{-5} = \frac{[x][.81+x]}{[.52-x]}$$

$$x = 4.0 \times 10^{-5}$$

$$[\text{H}_3\text{O}^+] = 4.0 \times 10^{-5} \text{ M}$$

pH = 4.39

3. What is the pH of a buffer made from 0.38 M NH_3 and 0.61 M NH_4Cl ?



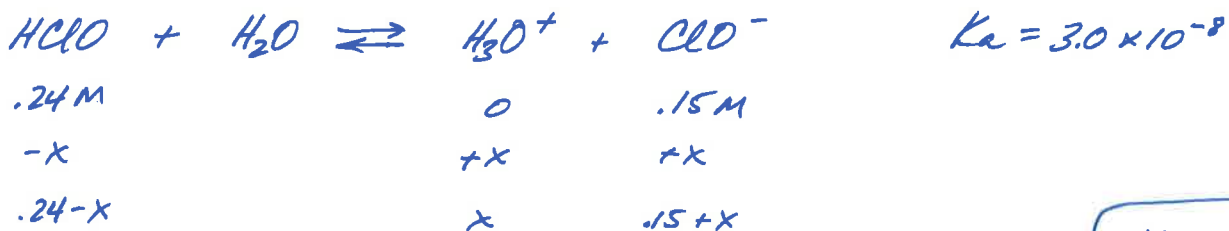
$$5.6 \times 10^{-10} = \frac{[x][.38+x]}{[.61-x]}$$

$$x = 9.0 \times 10^{-10}$$

$$[\text{H}_3\text{O}^+] = 9.0 \times 10^{-10}$$

pH = 9.05

4. What is the pH of a buffer made from 0.15 M NaClO and 0.24 M HClO?

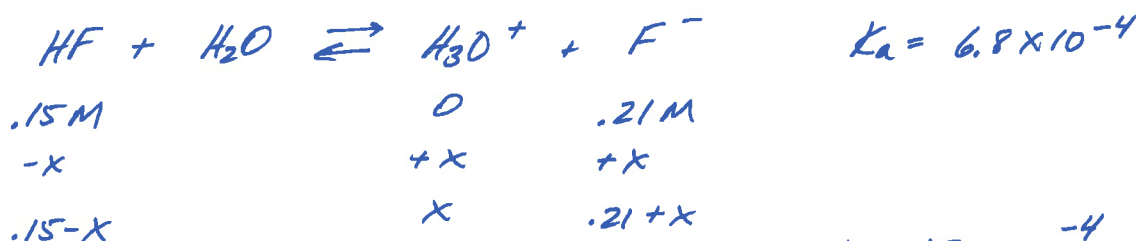


$$3.0 \times 10^{-8} = \frac{[x][.15+x]}{[.24-x]} \quad x = 4.80 \times 10^{-8}$$

$$[\text{H}_3\text{O}^+] = 4.80 \times 10^{-8} \text{ M}$$

pH = 7.32

5. What is the pH of a buffer made from 0.15 M HF and 0.21 M NaF?

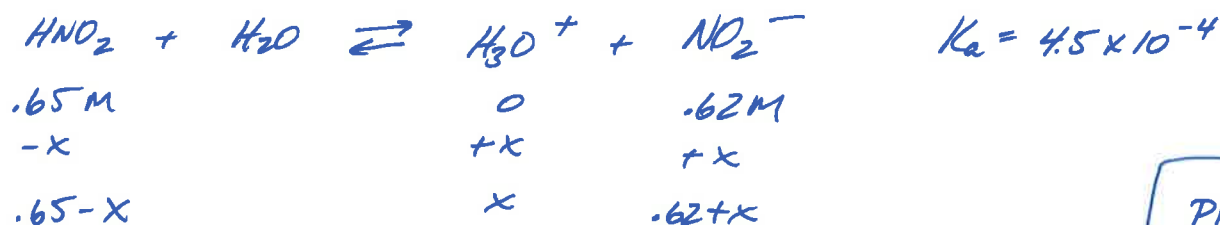


$$6.8 \times 10^{-4} = \frac{[x][.21+x]}{[.15-x]} \quad x = 4.83 \times 10^{-4}$$

$$[\text{H}_3\text{O}^+] = 4.83 \times 10^{-4} \text{ M}$$

pH = 3.32

6. What is the pH of a buffer made from 0.65 M HNO₂ and 0.62 M KNO₂?

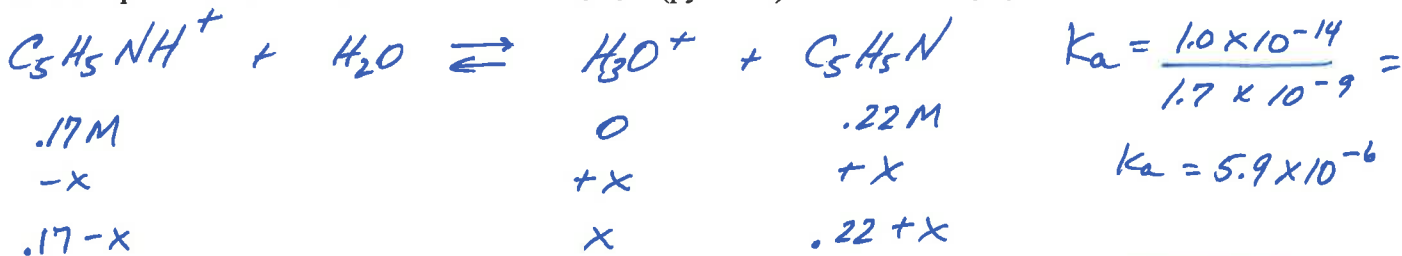


$$4.5 \times 10^{-4} = \frac{[x][.62+x]}{[.65-x]} \quad x = 4.71 \times 10^{-4}$$

$$[\text{H}_3\text{O}^+] = 4.71 \times 10^{-4} \text{ M}$$

pH = 3.33

7. What is the pH of a buffer made from 0.22 M C₅H₅N (pyridine) and 0.17 M C₅H₅NHCl?



$$5.9 \times 10^{-6} = \frac{[x][.22+x]}{[.17-x]} \quad x = 4.56 \times 10^{-6}$$

$$[\text{H}_3\text{O}^+] = 4.56 \times 10^{-6} \text{ M}$$

pH = 5.34