Worksheet 13: Buffers

Objectives

1. Recognize how the molar concentrations of a weak acid and its conjugate base influence pH calculations
2. Calculate the pH of a buffer solution or the conjugate acid/base ratio based on the buffer pH

Key Questions

1. Given the pK_a of acetic acid is 4.8, what is the pH of a solution made by adding 0.02 moles of acetic acid to 1 L of water?

2. Calculate the pH of the solution from the previous problem after the addition of 0.008 moles of sodium hydroxide. Ignore any changes in volume due to the addition.

3. Calculate the pH of the solution above after the addition of 0.012 more moles of sodium hydroxide.

4. What are the limitations of the Henderson-Hasselbalch equation?

5. What is the ratio of NH_3/NH_4^+ necessary to produce a pH of 8.55? The K_b of ammonia is 1.8×10^{-5}.

6. Explain how you could create a buffer with pH 7.00 using phosphoric acid and sodium hydroxide given the K_a values for phosphoric acid are 7.5×10^{-3}, 6.2×10^{-8}, and 4.8×10^{-13}.