

Lab 7: Making a buffer solution

Objective: Plan and make a buffer solution, and demonstrate its buffering characteristics.

Buffers are extremely useful solutions because of their ability to resist rapid pH changes as other solutions are added. In this lab, you will be making a buffer out of solid sodium acetate trihydrate ($\text{NaC}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$, molar mass = 136.08 g/mol) and a stock solution of acetic acid ($\text{HC}_2\text{H}_3\text{O}_2$, sometimes written CH_3COOH , molar mass = 60.05 g/mol).

Prelab:

- Let me know **who you plan to work with** for this lab (teams of **two** people, please. In return, I will assign you and your partner the pH I want your buffer to be.

Read section 10.8 in the text.

In order to make this lab possible, I want the final concentration of acetic acid in your buffer to be 1.00 M.

- Write a recipe, ahead of time, for the buffer you will make. It should have the format:

“To make 50.00 mL of pH _____ sodium acetate/acetic acid buffer solution:

Place _____ g of sodium acetate trihydrate in a 50 mL volumetric flask. Add enough distilled water to dissolve the solid. Add _____ mL of 6.00 M acetic acid. Fill up to the mark on the flask with distilled water. Cap the flask and mix thoroughly. Adjust to the final pH by adding a few drops of concentrated HCl or NaOH.”

Materials provided:

- solid sodium acetate trihydrate
- 50 mL volumetric flask
- concentrated hydrochloric acid
- various other glassware as needed
- stock 6.0 M solution of acetic acid
- digital pH meter
- concentrated NaOH solution

Safety issues: There will be strong acids and bases in this lab; please wear goggles and tie back long hair. In addition, there will be plenty of glassware so be aware of your surroundings while you are working and while you are transporting glassware.

Procedure:

0. (It will save a great deal of time if you do this in advance) **Write a recipe** for making 50.00 mL of a buffer at the pH you have been assigned using sodium acetate trihydrate and acetic acid. The recipe should include the mass of sodium acetate trihydrate you will use and the volume of the stock solution of acetic acid you will use, along with a few procedure steps to explain how you will make the buffer. The printed copy of the *correct* recipe is worth 10 points for both you and your partner (so only one copy for the both of you is due).

1. Prepare the buffer. After your buffer has reached the required pH, call me over and demonstrate, by adding a few drops of HCl or NaOH, that the pH of the buffer does not change by more than 0.2 pH unit. My witnessing this demonstration of buffering capacity is worth 10 points to you and your partner.

Waste: Please pour all solutions into the waste container provided; Metro requires that any solution poured into the drains be between pH 5.5 and pH 12. I will check after lab that we meet this requirement.