

16.2 Simple Buffer action

Subjects: Acids/Bases, buffers

Description: Simple buffer action is demonstrated by adding acid and base to equal volumes of water and buffer solutions at pH 4.

Materials:

4 250 mL beakers

Disposable pipets

DI water

pH 4 acetic acid/sodium acetate buffer solution[‡]

Universal indicator (or use pH probe)[‡]

0.1 M NaOH[‡]

0.1 M HCl[‡]

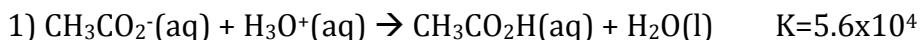
[‡] Located in the cabinets under the hood. Universal indicator is located in the flammables cabinet.

Procedure:

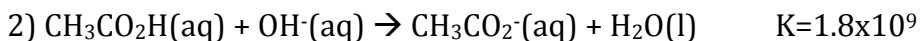
1. Label beakers prior to start of experiment
2. Add water to two beakers and buffer solution to the other two beakers.
3. Add 5-8 drops universal indicator to each beaker.
4. Add sodium hydroxide drop wise to the water beaker.
5. Add sodium hydroxide drop wise to the buffer beaker.
6. Note the number of drops it takes to obtain a permanent blue color for water and for the buffer.
7. Repeat the above steps with acid.
8. Note the number of drops it takes to obtain a permanent red color

Discussion:

A buffer solution resists changes in pH when either acid or base is added. A buffer consists of a weak acid and its conjugate base. An acetate buffer reacts with acids and bases as follows:



The weak acetate ion reacts with any hydronium ion that enters the solution.



The weak acid consumes any outside hydroxide ions added to the solution.

The equilibrium constants are large due to the fact that hydronium and hydroxide ions are much stronger than the acetic acid and acetate ions in the buffer.

Safety: Use proper protective equipment including gloves and glasses when working with acids and bases.

Disposal: Liquids can be flushed down the sink with water.

References:

1. L. Summerlin; C. Borgford; J. Ealy; *Chemical Demonstrations: A Sourcebook for Teachers*; Volume 2; 1987; p. 172-173