

## A Simple Demonstration of Buffer Action

### Purpose

To visually demonstrate the capability of buffers in a solution to resist pH changes upon the addition of a strong acid or base

### Materials

0.1M Acetic Acid

Sodium Acetate

1x 400mL beaker

2x 250mL beakers

Bromophenol blue indicator (or Methyl red indicator)

0.1M Hydrochloric acid (or 0.1M Sodium Hydroxide)

### Procedure

#### Preparation

1. Make a solution of 0.1M Sodium acetate by mixing 0.41g of Sodium acetate in 50mL of DI water (use a 50mL Volumetric Flask)
2. In one of the 250mL beakers, mix 50mL of 0.1M Sodium acetate with 50mL of 0.1M Acetic acid. This will be "Solution 1".
3. In the 400mL, add 250mL of DI water and 6 drops of 0.1M Acetic acid to make dilute Acetic acid.
4. Pour out 100mL of the dilute Acetic acid into the other 250mL beaker. This will be "Solution 2".
5. Add Bromophenol Blue to each solution until they are both a vibrant purple color. You may not be able to get them to turn the exact same shade as one another, but you should be able to get them fairly close.

#### Demonstration

1. Add 0.1M Hydrochloric acid dropwise into Solution 2. After 5-6 drops, the color should change to yellow. The beaker may need to be swirled slightly for the effect to occur uniformly.
2. Start adding drops of 0.1M Hydrochloric acid to Solution 1. After about 20 drops, the color should remain purple. You can then directly pour the HCl into Solution 1 until it turns yellow to demonstrate the buffer's resistance to pH change.

### Notes

This demonstration can also show buffer action upon addition of a base. Follow the preparation steps 1-4 to make the same solutions, however substitute 5 drops of Methyl red indicator for Bromophenol blue. The solutions should have a pale-pink color. To Solution 2, add 4 drops of 0.1M NaOH and swirl the solution. This should turn it a pale yellow color. To Solution 1, add

0.1M NaOH 2mL at a time. The solution should start changing color around 14mL added, and match the color of Solution 2 after approximately 52mL of 0.1M NaOH is added.

### References

Marilyn D. Duerst

*Journal of Chemical Education* **1985** 62 (5), 435

DOI: 10.1021/ed062p435