Buffering Action

Description: When a small amount of strong acid or strong base is added to water, there is a large change in pH. If the solution is buffered, a similar addition of acid/base changes the pH by only a small amount.

Materials:

Buffer solution (1.0 M CH$_3$COOH, 1.0 M CH$_3$COONa)  4 small Petri dishes
1.0 M HCl  2 eyedroppers
1.0 M NaOH  Methyl Orange
4 small Petri dishes  Phenolphthalein (phth)

Procedure:

1. Setup four Petri dishes as follows: Dish # 1 – water and methyl orange; Dish # 2 – buffer solution and methyl orange; Dish # 3 – water and phth; Dish # 4 – buffer solution and phth.

2. Display dishes on an overhead projector or document camera. Add 1.0 M HCl dropwise to Dish # 1 and 2 until the solution becomes red in color. Add 1.0 M NaOH dropwise to Dish # 3 and 4 until the solution turns pink.

Discussion: A buffer is a solution containing a weak acid and its conjugate base in similar amounts. This combination reduces the pH change upon addition of strong acid or base by converting H$^+$ (or OH$^-$) to weaker acids or bases. Base discussion on course level, for example add a quantitative component to the demonstration for CH201.

Safety: Wear proper protective equipment including gloves and safety glasses when preparing and performing this demonstration. Concentrated solutions of acids and bases (>2 M) can irritate the skin and cause burns. Vapors of concentrated acids are extremely irritating to the eyes and respiratory system. When diluting concentrated acids, add the acid to the water to avoid spattering.

Disposal: Materials can be flushed down the drain with plenty of water.

References:

