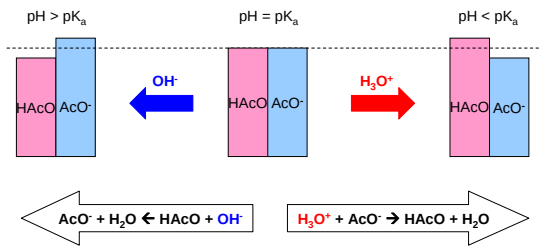
Key Concepts

1. **Buffer pH Range:** $pK_A \pm 1$

2. **Buffer Capacity:**
   The Acid and Conjugate Base concentrations determine the capacity to absorb strong acid or strong base.
   Large Concentrations → Large Capacity

3. **Titrations** permit determinations of:
   (i) the amount of acid (or base) present,
   (ii) whether an acid (or base) is strong or weak, and
   (iii) the pK_A (or pK_B) in of a weak acid (or base)

Buffer Action



$pH = pK_a + \log([AcO^-]/[HAcO])$

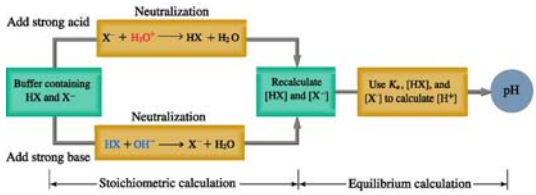
Buffer Range

1. The effective buffer range corresponds to the pH range where the acid and its conjugate base are ***both*** present in significant amounts.
2. As a rule of thumb, this corresponds to values for $[A^-]/[HA]$ between 0.1 and 10.
3. The center of the range is determined by the pK_A. This can be seen in the HH equation:

$$pH = pK_A + \log([A^-]/[HA])$$

Buffer range: $pK_a \pm 1$

Calculating the pH of a solution when using a buffer

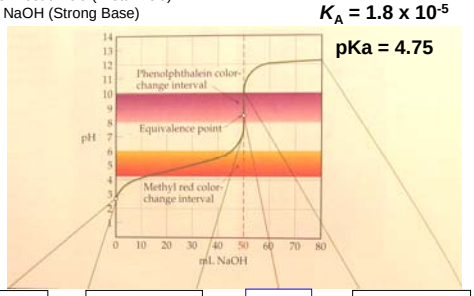


Adding a Strong base to a Weak acid

Titration of Acetic Acid (Weak Acid) with NaOH (Strong Base)

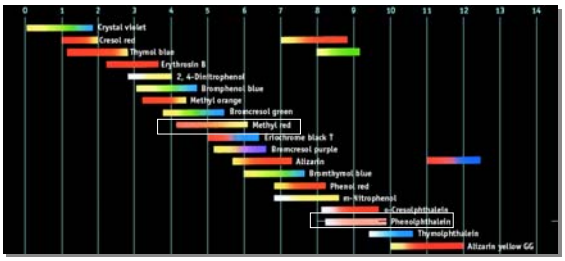
$K_A = 1.8 \times 10^{-5}$

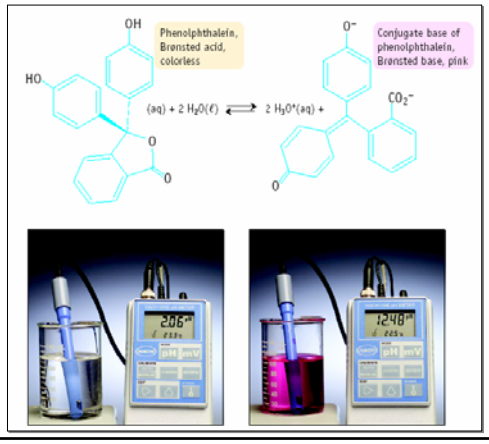
pKa = 4.75



HAcO 0.100 M, 50 ml	HAcO + NaAcO	NaAcO 0.050 M	NaAcO + NaOH

Acid-Base Indicators



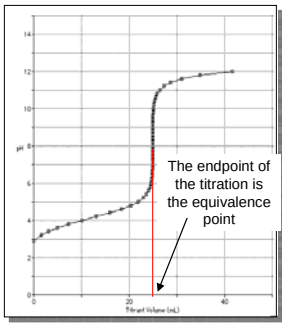


Equivalence Point

For a Weak Acid.

The moles of NaOH needed to reach the end point is equal to the number of moles of the acid present initially.

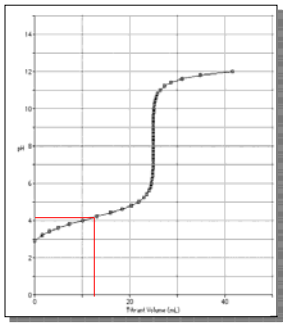
The pH at the equivalence point is equal to the pH of a solution of the salt with the same concentration



Weak Acid Titration – ½ Complete

When the titration is ½ complete, the pH is equal to the pK_A

Benzoic Acid

K_A = 6.25 x 10^{-5}

pK_a = 4.2