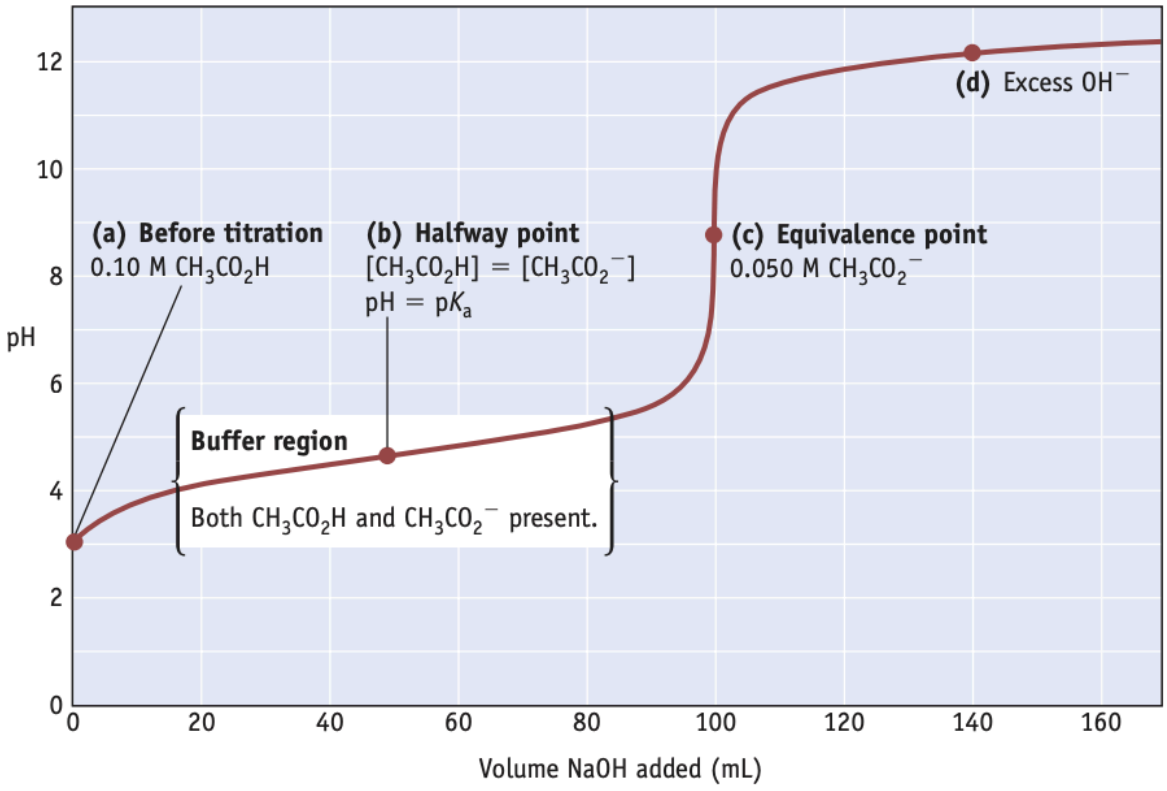
Extra Titration Problems
7/25/24

1) Consider the titration of 100.0 mL of 0.100 M acetic acid ($K_a = 1.8 \times 10^{-5}$) with 0.100 M NaOH.

$$CH_3CO_2H(aq) + OH^-(aq) \rightarrow CH_3CO_2^-(aq) + H2O(\ell)$$



a) What is the pH of the solution when 90.0 mL of 0.100 M NaOH has been added to 100.0 mL of 0.100 M acetic acid?

b) What is the pH at the equivalence point?

c) What is the pH after 110.0 mL of NaOH is added?

2) Phenol, C_6H_5OH, is a weak organic acid. Suppose 0.515 g of the compound is dissolved in enough water to make 125 mL of solution. The resulting solution is titrated with 0.123 M NaOH. (Assume K_a for phenol = 1.3×10^{-10}).

$$C_6H_5OH(aq) + OH^-(aq) \rightleftharpoons C_6H_5O^-(aq) + H2O(\ell)$$

a) What is the pH of the original solution of phenol?

b) What are the concentrations of all of the following ions at the equivalence point: Na^+, H_3O^+, OH^-, and $C_6H_5O^-$?

c) What is the pH of the solution at the equivalence point?

3) You require 36.78 mL of 0.0105 M HCl to reach the equivalence point in the titration of 25.0 mL of aqueous ammonia. (K_a of NH_4^+ = 5.6 x 10^{-10})

a) What was the concentration of NH_3 in the original ammonia solution?

b) What are the concentrations of H_3O^+, OH^-, and NH_4^+ at the equivalence point?

c) What is the pH of the solution at the equivalence point?