MC10 Practice

1. 100 mL of 0.200 M HCl is titrated with 0.400 M NaOH.
   (a) What is the pH after 30 mL of base has been added?

   (b) What is the pH at the equivalence point?

2. A certain weak acid HA has a K_a value of 5.61×10^{-6} and is titrated with NaOH.
   (a) What is the pH of the solution if 9.00 mmol of HA is titrated with 2.00 mmol of the base?

   (b) What is the pH of the solution at the equivalence point if the total volume is 43 mL?

3. 68.0 mL of 0.25 M HBr is titrated with 0.50 M KOH. Calculate the pH after the addition of 34.0 mL of KOH at 25°C.

4. Calculate the pH after 40.0 mL of 0.20 M NH_3 is titrated with 20.0 mL of 0.40 M HNO_3. The K_b for NH_3 is 1.8×10^{-5}.

5. 30.0 mL of 0.50 M CH_3COOH was titrated with 30 mL of 0.50 M NaOH. The K_a of CH_3COOH is 1.8×10^{-5}.

6. BONUS: H_2SO_3 has $K_{a1} = 5.9 \times 10^{-3}$ and $K_{a2} = 6.0 \times 10^{-6}$. Calculate the pH of a solution of 70 mL of 0.10 M H_2SO_3 titrated with:

   (a) 0 mL of 0.10 M KOH (Before titration)

   (b) 50 mL of 0.10 M KOH

   (c) 70 mL of 0.10 M KOH

   (d) 120 mL of 0.10 M KOH

   (e) 200 mL of 0.10 M KOH

   (f) Draw a pH vs volume plot for this reaction and identify the equivalence point(s) and half equivalence point(s). What is significant about the pH at a half equivalence point?