

## Worksheet 14: Titrations

### Objectives

1. Understand why titration curves have a particular shape and recognize the difference in the titration curves of acid/base titrations
2. Describe how molar concentrations of a weak acid and its conjugate base vary with pH
3. Identify the major species in solution and calculate the pH at various points during a titration

### Key Questions

1. The following questions concern the titration of 25 mL of 0.1 M  $\text{NH}_3$  with 0.05 M HCl. The  $K_b$  of ammonia is  $1.8 \times 10^{-5}$ .
  - (a) Calculate the pH of the solution before the addition of any HCl.
  - (b) Calculate the pH after the addition of 1 mL of HCl.
  - (c) Calculate the pH after the addition of 10 mL of HCl.
  - (d) Calculate the pH after the addition of 25 mL of HCl.
  - (e) Calculate the pH after the addition of 50 mL of HCl.
  - (f) Calculate the pH after the addition of 100 mL of HCl.
  - (g) Use your results from the previous problems to draw a graph of pH vs volume of HCl. Indicate the equivalence point, the half equivalence point, and the buffer region.