

Chapter 16
Additional Aqueous Equilibria: Chemistry and the Ocean
Learning Objectives

To satisfy the minimum requirements for this course, you should be able to:

1. Define the meaning of the term “common-ion effect” as applied to aqueous equilibrium - specifically, be able to describe how addition of a common-ion to an equilibrium mixture alters its composition.
2. Explain how a buffer works at the molecular level and be able to
 - describe how to prepare a buffer of a given pH.
 - define buffer capacity and explain its importance.
 - use a RICE table or the Henderson-Hasselbalch equation to calculate the pH of a solution in which the concentrations of acid and conjugate base are known, i.e. a buffer.
 - calculate the change in pH of a simple buffer solution of known composition caused by adding a small amount of strong acid or strong base.
3. Sketch the general shapes of acid-base titration curves and given a titration curve, identify the titration as a:
 - titration of a strong acid with a strong base (or vice-versa).
 - titration of a weak acid with a strong base.
 - titration of a weak base with a strong acid.
4. Inspect a titration curve and:
 - identify the dominant species present at various points in a titration.
 - identify the equivalence point and calculate the volume of titrant required to reach the equivalence point.
 - identify the buffer region for the titration of a weak acid with a strong base or the titration of a weak base with a strong acid and recognize that $\text{pH} = \text{pK}_a$ at the half equivalence point.
5. Calculate the pH at the initial point, equivalence point and half-equivalence point of a weak acid or weak base titration.
6. Define the solubility-product constant (K_{sp} found in Table A5.4, Appendix 5, pp. APP-28) for a salt and
 - write the K_{sp} expression for a given reaction or the balanced chemical equation for a given K_{sp} .
 - calculate K_{sp} from solubility data and solubility from the value of K_{sp} .
 - describe and calculate the effect of an added common ion on the solubility of a slightly soluble salt.
 - describe the qualitative effect of a change in pH on the solubility of salts.
 - given appropriate data, calculate the value of the reaction quotient, Q_{sp} , for a mixture of ions and predict whether or not precipitation will occur.

Note – Sections 16.5, 16.6 & 16.7 are not assigned.