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

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

1. Explain the common-ion effect.

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 pH = pKa at the half equivalence point.

5. Calculate the pH at the beginning, equivalence point and the half-equivalence point of a titration curve.

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.
    ● calculate the reaction quotient, Q, determine whether precipitation will occur.