

Unit 12: Acid-Base Reactions and Solution Equilibria

adapted from http://www.phschool.com/advanced/lesson_plans/chem_brown_2003/index.html

Objectives:

- List general properties that characterize acidic and basic solutions and the ions responsible.
- Understand the Brønsted-Lowry theory and be able to identify conjugate acids and bases.
- Explain the autoionization of water and write the K_w expression.
- Define pH and be able to interconvert between $[H^+]$, $[OH^-]$, pH, and pOH.
- Understand what is meant by strength of an acid or a base.
- Given the acid concentration, be able to interconvert between K_a and pH. Given the base concentration, be able to interconvert between K_b and pH.
- Calculate the percent ionization from the K_a or the K_b , and vice versa.
- Understand the relationship between the strength of an acid and the strength of its conjugate base; interconvert between K_a and K_b .
- Predict whether the solution of a particular salt will be acidic, basic, or neutral.
- Define an acid and a base in the Lewis sense.
- Calculate the concentration of each species in a solution formed by mixing an acid and a base.
- Describe how a buffer solution works and how one can be made at a particular pH.
- Calculate the change in pH of a buffer upon the addition of a strong acid or a strong base.
- Distinguish between the various titration curves.
- Calculate the pH at any point in an acid-base titration.
- Write a K_{sp} expression for a salt.
- Interconvert between solubility and K_{sp} .
- Calculate the effect of a common ion on the solubility of a slightly soluble salt.
- Predict whether a precipitate will form when two solutions are mixed.
- Understand the effect of pH on the solubility equilibrium of an acidic or basic ion.

Lab Objectives:

- Learn the operation of a pH meter and how to use it to calculate the K_a of a weak acid.
- Understand the concept of hydrolysis and the behavior of buffer solutions; observe the use of acid base indicators.
- Become familiar with the equilibrium of sparingly soluble salts and determine the value of K_{sp} .

Suggested Labs:

- Determination of the Dissociation Constant of a Weak Acid
- Hydrolysis of Salts and pH of Buffer Solutions
- Determination of the K_{sp} for a Sparingly Soluble Salt

Key Words:

hydronium ion	pH	carboxylic acids	titration
Brønsted-Lowry acid and base	pOH	common-ion effect	pH titration curve
conjugate acid and base	polyprotic acid	acid-dissociation constant	equivalence point
conjugate acid-base pair	base-dissociation constant	Henderson-Hasselbalch equation	end point
autoionization	hydrolysis	solubility product constant	ion-product constant
	oxyacid		



Tips:

- Acid-Base Equilibria is always a major topic on the exam.
- Common-ion effect and buffers are probably the most difficult concepts in *General Chemistry* and will always appear on the exam.

