

IB2 HL Chemistry

3. Acid-Bases Equilibria

Read: Zumdahl² Chapter 14: Sections 14.1-4, 14.5 (only pp. 666-670), 14.6, 14.8-12;

Zumdahl² Chapter 15: Sections 15.2 (only pp 716-717, 720, 722-724) 15.3 (only pp. 726, 728-729), 15.4-5;

Damji & Green Chapter 9.

Presumed knowledge (from GCSE)

Properties of acids and bases

- Arrhenius theory, strong acid, weak acid

Concepts to be mastered:

To master a concept, you must be able to do three things:

1. define the concept,
2. explain the concept, and
3. give an example of the concept.

Properties of acids and bases

- alkalis, ionization, Bronstead-Lowry theory, Lewis theory, Lewis acid, Lewis base, neutralization
- monoprotic acid, diprotic acid, polyprotic acid, strong acid, weak acid, oxyacid, conjugate acid, conjugate base
- pH scale, amphiprotic, autoionization, ion-product constant, acidity, basicity,
- acid-dissociation constant, base-dissociation constant, autoionization of water,
- hydrolysis, polarization,
- indicator, titration, titrant, analyte, titration curve, equivalence point, end-point, titration curve
- buffer, common ion effect, buffering action, buffering capacity

Skills to be mastered:

To master a skill, you must be able to

1. recognize when the skill is needed,
2. recognize what information is needed to execute the skill,
3. execute the skill, and
4. assess whether the skill has been executed correctly.

Textbook
problems

Strong and weak acids and bases

- Given a strong and weak acid be able to differentiate them in terms of extent of dissociation, reaction with water, and conductance of electricity **14.33-38, 9.2 1, 2, 3, 4, 5**
- Suggest simple experimental procedures to distinguish between strong and weak acids and bases, and to determine the relative acidities of substances **9.2 1, 2, 3, 4, 5 9.3 8,**

Calculations involving acids and bases

- Given one of pH or pOH determine the other **14.43-46**

- Calculate pH, pOH, $[H^+(aq)]$ and $[OH^-(aq)]$ from specified concentrations 14.39-46, 488, 50-60, 77-79, 85-88, 9.3 1, 2, 4, 5, 7,
- Describe and explain the relationship between K_a and pK_a , and between K_b and pK_b 14.71-76
- Given K_a or pK_a values compare the strengths of acids or their conjugate bases

Buffer solutions

- Describe ways of preparing buffer solutions 15.47-48 9.4 3
- For any acid or base or salt, state what would have to be added to the system to form a buffer 15.32 9.4 1
- Calculate the pH of a specified buffer system involving the transfer of a single proton 15.23-24, 33-34, 37-38,

Salt solutions

- Write the equation for the reaction of any anion or cation with water 14.111-112,
- Predict whether the solution of any specified salt would be acidic, basic, or neutral 14.113-118,

Acid-base titrations

- Sketch and explain the general shape of graphs showing pH against volume of titrant for titrations involving only monoprotic acids and bases 15.51-52

Indicators

- Explain qualitatively how an acid-base indicator works
- Explain how the pH range of an acid-base indicator relates to its value of pK_a
- Explain the choice of an appropriate indicator for a titration, given the equivalence point of the titration and K_a (or pK_a) values for possible indicators

Additional problems:

14.119-124, 15.21-22, 15.41-43, 15.45-50