CHAPTER 14
AQUEOUS EQUILIBRIA: ACIDS AND BASES

We will spend four lecture days on this chapter.

- ❖ Day 1. Sections 1 – 7: During the first two class meetings we will introduce acids and bases and some of the theories that have been developed to describe them, especially the Bronsted-Lowry Theory. We will review the strong acids and weak acids (from Chapter 4) and go into a lot more detail about acid dissociation in water, the pH scale, calculating pH of strong acids and bases. We will also cover the dissociation of water itself.
- ❖ Day 2. Section 8 and 9: We'll discuss weak acid equilibria, and how to calculate the pH of weak acids in solution.
- ❖ Day 3. Sections 10, 12 and 13: We will discuss percent dissociation, weak base equilibria and the relationship between weak acids and their weak bases.
- ❖ Day 4. Sections 11, 14 – 16: We will discuss polyprotic acids. Finally, we will learn how to predict the pH of salts. We will also discuss factors affecting acid-base strength and Lewis acids and bases.

Section 14.1
❏ Define an acid and a base according to the Arrhenius and Brønsted-Lowry theories.
❏ Write balanced equations for the dissociation of Brønsted-Lowry acids.
❏ From electron-dot structures, determine which chemical species can act as a Brønsted-Lowry acid, a Brønsted-Lowry base, or both.
❏ From a chemical equation for a proton-transfer reaction, identify the conjugate acid-base pairs.
❏ Do problems 1 – 3.

Section 14.2
❏ Given the extent of dissociation of an acid in water, determine whether the acid is a stronger or weaker acid than water and whether the conjugate base of the acid is a stronger or weaker base than water.
❏ Given a chemical equation representing a proton-transfer reaction and the relative strengths of each acid and base involved in the reaction, determine whether the reaction is favored to the right or to the left.
❏ Do problem 4, 5, 34, and 44 – 52 even..

Section 14.3
❏ Draw electron-dot structures of H_3O^+ and explain how it represents a hydrated proton.

Section 14.4
❏ Calculate H_3O^+ concentration from OH^- concentration and K_w and vice versa. From these concentrations, determine whether the solution is acidic, neutral, or basic.
❏ Do problems 7 – 9.

Section 14.5
❏ Interconvert pH and $[H_3O^+]$. Classify the solution as acidic, neutral, or basic.
❏ Do problems 10 and 11.

Section 14.6
❏ Determine pH from the color of indicator solutions. Do 54 – 62 even.

Section 14.7
❏ Given the molar concentration of a strong acid or a strong base, determine the pH of the solution.
❏ Do problem 12, 13, 64, 66.

Section 14.8
❏ Given the pH of a weak acid solution, determine the K_a and pK_a of the acid.
❏ Do problems 14 and 15.

Section 14.9
❏ Given the K_a value and the initial concentration of a weak monoprotic acid, calculate the concentrations of all species at equilibrium, and the pH of the solution.
❏ Do problems 16 and 17.

Professor Glickman, the lab practical joker, deftly places a single drop of hydrochloric acid on the back of Professor Bingham's neck.

Section 14.10 ❑ From molarity and K_a calculate the percent dissociation of a weak acid.
❑ Do problem 18, 68 – 74 even.

Section 14.11 ❑ Given the K_a values and the initial concentration of a weak diprotic acid, calculate the concentrations of all species at equilibrium and the pH of the solution.
❑ Do problems 19, 20, 36, 76, 78, and 80.

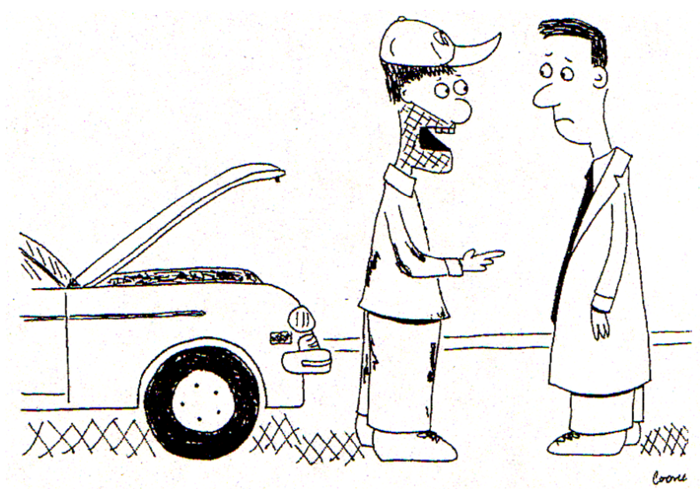
Section 14.12 ❑ Given the K_b value and the initial concentration of a weak base, calculate the concentrations of all species at equilibrium and the pH of the solution.
❑ Do problems 21 and 22.

Section 14.13 ❑ Interconvert K_a and K_b, pK_a, and pK_b
❑ Do problem 23 and 82 – 88, even.

Section 14.14 ❑ Classify salt solutions as acidic, neutral, or basic. Calculate the pH of these solutions.
❑ Do problem 24(a), 25 – 27, 38, and 90 – 94 even.

Section 14.15 ❑ Identify which of two binary acids or two oxoacids is more acidic.
❑ Do problems 28, 96, 98, and 100.

Section 14.16 ❑ Identify the Lewis acid and the Lewis base in a chemical reaction.
❑ Do problem 29, 30, 102, 104, and 106.



Your engine pH is 2.2. This car is definitely a lemon