

Activity 35: The pH Scale

Learning Objectives

Part 1 Calculate the pH from the H_3O^+ concentration and vice versa

Part 2 Determine the strength of a weak acid based on its pK_a

Part 3 Predict the predominant form (weak acid or conjugate base) present at a given pH and given the pK_a of a weak acid.

Estimated Completion Time 60 Minutes

Instructor Information

It is important to monitor calculator use during the pH calculations. Part 3 appears to be the most difficult part of this activity.

ANSWERS TO QUESTIONS

Part 1. Calculating pH

1. pH = 7
2. $[H_3O^+] = 8 \times 10^{-5}$; acidic
3. pH = 2.49; acidic
4. False
5. 4×10^{-8} ; 4×10^{-7} ; they differ by $10\times$.
6. A basic substance neutralizes the acid in the stomach (in this case, forms a magnesium salt).

Activity 35: Skill Development—Calculating pH

1.

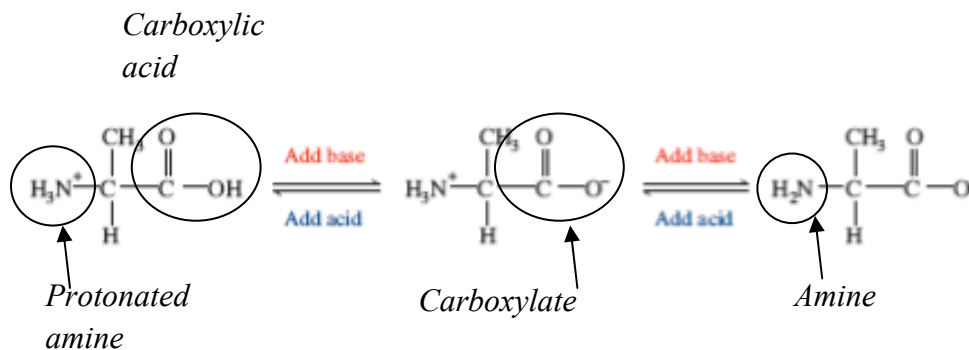
Substance	pH	$[\text{H}_3\text{O}^+]$
Lemon Juice	2.20	6.3×10^{-3}
Coffee	5.00	1.0×10^{-5}
Soil	5.49	3.2×10^{-6}
Apple juice	3.80	1.6×10^{-4}
Seawater	8.49	3.2×10^{-9}
Toothpaste	9.9	1×10^{-10}
Bleach	12.0	1×10^{-12}
Lye (NaOH)	14.00	1.0×10^{-14}

Part 2. Strength of Weak Acids K_a and $\text{p}K_a$

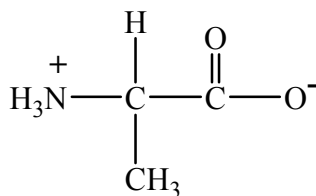
1. Hydrogen sulfate ion; hydrogen sulfate ion
2. $\text{p}K_a = -\log K_a$
3. The smaller the $\text{p}K_a$ the stronger the acid.
4. Formic acid

Part 3. The Relationship Between pH and pK_a

1.



2.



3. a. CH_3COOH

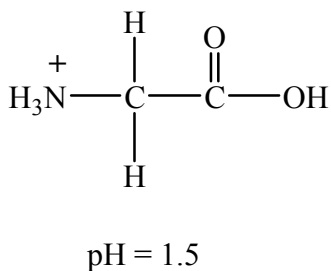
b. $\text{CH}_3\text{COOH} = \text{CH}_3\text{COO}^-$

c. CH_3COO^-

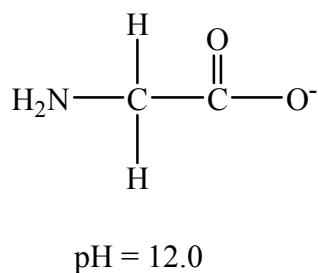
Activity 35: Skill Development—The Relationship Between pH and pK_a

1.

a.



b.



c.

