**Activity 35: The pH Scale**

***Learning Objectives***

*Part 1 Calculate the pH from the H3O+ concentration and vice versa*

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

*Part 3 Predict the predominant form (weak acid or conjugate base) present at a given pH and given the pKa 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. [H3O+] = 8 × 10-5; acidic

3. pH = 2.49; acidic

4. False

5. 4 × 10-8; 4 × 10-7; they differ by 10×.

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** | **[H3O+]** |
| 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 p*K*a**

1. Hydrogen sulfate ion; hydrogen sulfate ion

2. pKa = –log *K*a

3. The smaller the p*K*a the stronger the acid.

4. Formic acid

**Part 3. The Relationship Between pH and p*K*a**

1.

*Carboxylic   
acid*



*Carboxylate*

*Protonated*

*amine*

*Amine*

2.



3. a. CH3COOH b. CH3COOH = CH3COO- c. CH3COO-

**Activity 35: Skill Development—The Relationship Between pH and p*K*a**

1.

