

Exercise 10: pH and ionization of acids and bases

1. a. To treat extreme cases of scurvy (caused by a Vitamin C deficiency), administration of a 0.100 M solution of **ascorbic acid** (we'll write it as "HAsc", since the ascorbate ion has a complex formula) are prescribed. $K_a = 7.9 \times 10^{-5}$ for ascorbic acid. Write the **dissociation equation** for ascorbic acid (remember that it is an equilibrium process!).

b. Write the **equilibrium expression** for K_a for ascorbic acid.

c. Using the expression in part b, calculate the **pH** of a 0.100 M solution of ascorbic acid. If the human stomach can handle ingested materials with pH greater than 2, is the ascorbic acid solution too acidic to drink?

d. The crucial part of the ascorbic acid molecule for human physiology is the ascorbate ion. Would a solution of sodium ascorbate (use the formula NaAsc) be acidic, basic or neutral? Show the appropriate chemical equations that led you to your conclusion.

2. Write a **recipe** to make 500. mL of an **acetic acid** ($\text{HC}_2\text{H}_3\text{O}_2$ – molar mass 60.05 g/mol)/**sodium acetate** ($\text{NaC}_2\text{H}_3\text{O}_2$ – molar mass 82.03 g/mol) **buffer** with a pH of 5.0. The K_a of acetic acid is 1.8×10^{-5} . You must state the **volume** of 12.0 M acetic acid and the number of **grams** of sodium acetate you will need, and demonstrate that the pH of the resulting solution will be 5.0.