

General Chemistry II

RR # 7
Summer 2022

1. . Given that the K_a for acetic acid, CH_3COOH , is 1.8×10^{-5} , calculate the pH of a 0.20 mol/L solution. Assume x is negligibly small compared to the original concentration of acetic acid.
2. A student prepares a 0.45 M solution of a monoprotic weak acid and determines the pH to be 3.68. What is the K_a of this weak acid? . Assume x is negligibly small compared to the original concentration of acid.
3. The value of K_w depends on temperature. At body temperature (37°C), $K_w = 2.4 \times 10^{-14}$
 - a. What is the $[\text{H}_3\text{O}^+]$ of pure water at body temperature?

b. What is the $[\text{OH}^-]$ of pure water at body temperature?

c. What is the pH of pure water at body temperature?

d. What is the pOH of pure water at body temperature?

4. Calculate $[\text{H}^+]$ for each of the following solutions, and indicate whether the solution is acidic, basic, or neutral:

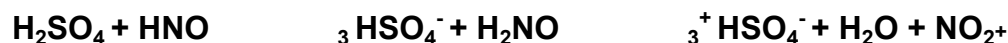
a. $[\text{OH}^-] = 0.00045 \text{ M}$

b. $[\text{OH}^-] = 8.8 \times 10^{-9} \text{ M}$

c. A solution in which $[\text{OH}^-]$ is 100 times greater than $[\text{H}^+]$

MCAT Style Questions

5. By what factor does $[H^+]$ change for a pH change of 2.00 units?
- 2
 - 100
 - 200
 - 2000
6. The conjugate acid of the $H_2SiO_4^{2-}$ (dihydrogen orthosilicate) anion is:
- $H_2SiO_4^{2-}$
 - $H_3SiO_4^-$
 - H_4SiO_4
 - H_3O^+
7. The first step of a nitration reaction involves using a mixture of sulfuric acid and nitric acid to form an NO_2^+ electrophile, as shown below.



In the forward reaction of the equilibrium, which of the following molecules acts as a Bronsted-Lowry base?

- H_2SO_4
 - HNO_3
 - HSO_4^-
 - $H_2NO_3^+$
8. Hypochlorous acid dissociates in water to create hydronium ions and hypochlorite ions: $HOCl + H_2O \rightleftharpoons H_3O^+ + OCl^-$. Suppose that additional hypochlorite ions are added to the solution. Which of the following correctly describes the resultant effect on the concentration of $HOCl$?
- It depends on the number of hydronium ions
 - It remains the same
 - It increases

- d. It decreases
9. Suppose a large organic molecule X is classified as a Lewis acid, while another large molecule Y is classified as a Bronsted-Lowry acid. Which of the following most accurately describes a similarity in their behaviors in solution?
- a. Both molecules will tend to acquire a net positive charge
 - b. Both molecules will release hydroxide ions
 - c. Both molecules will release hydrogen gas
 - d. Both molecules will tend to acquire a net negative charge
10. Suppose an equilibrated, dilute solution containing an acid HA with $K_a = 10^{-4}$ is measured to have $\text{pH} = 6$ and $[\text{HA}] = 10^{-8} \text{ M}$. Which of the following gives the best estimate of $[\text{A}^-]$?
- a. 10^{-4}
 - b. 10^{-6}
 - c. 10^{-14}
 - d. 10^{-16}