

SECTION 19.3 STRENGTHS OF ACIDS AND BASES

- Rank 1M of these compounds in order of increasing hydrogen ion concentration: weak acid, strong acid, strong base, weak base, hydrofluoric acid, HF
- Write the expression for the acid dissociation constant of the strong acid weak base. Hydrazine reacts with water to form the $N_2H_5^+$ ion.
- Write the expression for the base dissociation constant for hydrazine, N_2H_4 , a weak base. Hydrazine reacts with water to form the $N_2H_5^+$ ion.
- Use Table 19.8 in your textbook to rank these acids from weakest to strongest: $HOOCOOH$, HCO_3^- , $H_2PO_4^-$, $HCOOH$.
- Write the equilibrium equation and the acid dissociation constant for the following weak acids.
 - H_2S
 - NH_4^+
 - C_6H_5COOH
- Match each solution with its correct description.
 - dilute, weak acid
 - dilute, strong base
 - concentrated, strong acid
 - dilute, strong acid
 - concentrated, weak base
- Write the base dissociation constant expression for the weak base aniline, $C_6H_5NH_2$.

$$C_6H_5NH_2(aq) + H_2O(l) \rightleftharpoons C_6H_5NH_3^+(aq) + OH^-(aq)$$
- A 0.10M solution of formic acid has an equilibrium $[H^+] = 4.2 \times 10^{-3}M$.

$$HCOOH(aq) \rightarrow H^+(aq) + HCOO^-(aq)$$

What is the K_a of formic acid?

- The K_a of benzoic acid, C_6H_5COOH , is 6.3×10^{-5} . What is the equilibrium $[H^+]$ in a 0.20M solution of benzoic acid?
- A 0.10M solution of hydrocyanic acid, HCN, has an equilibrium hydrogen ion concentration of $6.3 \times 10^{-6}M$. What is the K_a of hydrocyanic acid?

SECTION 19.4 NEUTRALIZATION REACTIONS

- What is the molarity of a sodium hydroxide solution if 38 mL of the solution is titrated to the end point with 14 mL of 0.75M sulfuric acid?
- If 24.6 mL of a $Ca(OH)_2$ solution is needed to neutralize 14.2 mL of 0.0140M $H_2C_2O_4$, what is the concentration of the calcium hydroxide solution?
- A 12.4 mL solution of H_2SO_4 is completely neutralized by 19.8 mL of 0.0100M $Ca(OH)_2$. What is the concentration of the H_2SO_4 solution?
- What volume of 0.12M $Ba(OH)_2$ is needed to neutralize 12.2 mL of 0.25M HCl?
- A 55.0-mg sample of $Al(OH)_3$ is reacted with 0.200M HCl. How many milliliters of the acid are needed to neutralize the $Al(OH)_3$?

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ACIDS, BASES, AND SALTS

Practice Problems

In your notebook, solve the following problems.

SECTION 19.1 ACID-BASE THEORIES

- Identify the hydrogen ion donor(s) and hydrogen ion acceptor(s) for ionization of H_2SO_4 in water. Label the conjugate acid-base pairs.
- Identify all of the ions that may be formed when H_3PO_4 ionizes in water.
- Classify the following acids as monoprotic, diprotic, or triprotic.
 - $HCOOH$
 - HBr
 - H_2SO_3
 - H_3ClO_4
- What would you expect to happen when lithium metal is added to water? Show the chemical reaction.
- In the following chemical reaction, identify the Lewis acid and base.

$$BF_3 + F^- \rightleftharpoons BF_4^-$$
- Describe some distinctive properties of acids.
- Describe some distinctive properties of bases.

SECTION 19.2 HYDROGEN IONS AND ACIDITY

- A solution has a hydrogen ion concentration of $1 \times 10^{-6}M$. What is its pH?
- What is the pH of a solution if the $[H^+] = 7.2 \times 10^{-9}M$?
- What is the pOH of a solution if the $[OH^-] = 3.5 \times 10^{-2}M$?
- What is the pOH of a solution that has a pH of 3.4?
- Classify each solution as acidic, basic, or neutral.
 - $[H^+] = 2.5 \times 10^{-9}M$
 - pOH = 12.0
 - $[OH^-] = 9.8 \times 10^{-11}M$
 - $[H^+] = 1 \times 10^{-5}M$
 - $[H^+] = 4.4 \times 10^{-11}M$
- Calculate the pH of each solution.
 - $[H^+] = 1 \times 10^{-5}M$
 - $[H^+] = 4.4 \times 10^{-11}M$
 - $[OH^-] = 2.2 \times 10^{-7}M$
 - pOH = 1.4
- Classify the solutions in problem 6 as acidic or basic.
- Why is there a minus sign in the definition of pH?
- A solution has a pOH of 12.4. What is the pH of this solution?
- What is the pH of a solution with $[H^+] = 1 \times 10^{-3}M$?