

Name Key Section _____ Date _____

Chapter 16 Acids and Bases

I. Matching

Match the description in Column B with the correct term in Column A. Write the letter in the blank provided. Each term matches with only one description, so be sure to choose the best description for each term.

Column A

- M 1. Arrhenius acid
- C 2. Arrhenius base
- F 3. Bronsted-Lowry acid
- L 4. Bronsted-Lowry base
- D 5. strong acid
- J 6. weak acid
- A 7. amphoteric
- B 8. neutral solution
- H 9. acidic solution
- E 10. basic solution
- G 11. indicator
- I 12. equivalence point
- K 13. buffered solution

Column B

- can act as an acid or a base
- $[H^+] = [OH^-]$
- produces OH^- ions in aqueous solution
- completely dissociates in water
- $[OH^-] > [H^+]$
- proton (H^+) donor
- changes color in acidic or basic solution
- $[H^+] > [OH^-]$
- exactly enough titrant has been added to react with all the unknown present
- partially dissociates in water
- a weak acid and its conjugate base are both present in solution
- proton (H^+) acceptor
- produces H^+ ions in aqueous solution

II. Multiple Choice

Choose the one best answer and write its letter in the blank.

- A 14. Which one of the following 1 M solutions would have a pH of 14?
 a) NaOH c) HF
 b) HCl d) H₂O
- B 15. When the pH of a solution decreases, the [H⁺]/[OH⁻] ratio
 a) decreases. c) stays the same.
 b) increases. d) can increase or decrease.
- D 16. If the pH of a solution is _____ the solution is basic
 a) 2 b) 5 c) 7 d) 10
- C 17. Which of the following statements is INCORRECT?
 a) an acid may be both strong and dilute
 b) no substance may be both a strong acid and a strong base
 c) water is not an amphoteric substance
 d) the ion product constant for water is 1×10^{-14} at 25°C
- A 18. pH is a measure of
 a) hydrogen ion concentration. c) hydroxide ion concentration.
 b) hydrogen gas concentration. d) hydrolysis.
- B 19. Which of the following is NOT a conjugate acid/conjugate base pair?
 a) HCl/Cl⁻ c) HC₂H₃O₂/C₂H₃O₂⁻
 b) H₂O/O²⁻ d) NH₄⁺/NH₃
- C 20. Calculate [H⁺] in a solution if [OH⁻] = 4.20×10^{-8} M at 25°C, and tell if the solution is acidic, basic, or neutral.
 a) [H⁺] = 2.38×10^{-7} M, basic c) [H⁺] = 2.38×10^{-7} M, acidic
 b) [H⁺] = 7.37×10^{-7} M, basic d) [H⁺] = 4.20×10^{-7} M, neutral
- B 21. What is the pH of a solution if [OH⁻] is 1.0×10^{-4} M?
 a) 4.00 c) 7.00
 b) 10.00 d) 14.00

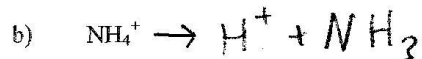
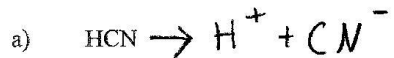
Name _____ Section _____ Date _____

- D 22. If the pOH of a solution is 5.25, what is $[H^+]$?
- a) 8.75 M c) 5.6×10^{-6} M
b) 5.25 M d) 1.8×10^{-9} M
- B 23. What is the pH of a 0.015 M HCl solution?
- a) 1.50 c) 12.18
b) 1.82 d) 12.50
- D 24. Calculate the pH of a solution that has $[H^+] = 2.5 \times 10^{-10}$ M, and tell if the solution is acidic, basic, or neutral.
- a) 4.40, acidic c) 4.40, basic
b) 9.60, acidic d) 9.60, basic
- A 25. A solution containing a weak acid and its _____ is called a buffer.
- a) conjugate base c) salt
b) indicator d) solvent
- D 26. A neutralization reaction between an acid and a base always produces _____.
- a) salt and acidic anhydride. c) water and basic anhydride.
b) salt and basic anhydride. d) salt and water.

III. Free Response

Answer the questions in the space provided. Show your work for any calculations.

27. Write a chemical equation that show how each of the following species behaves as an *acid* when dissolved in water.



Name _____ Section _____ Date _____

28. Calculate $[H^+]$ for each of the following solutions, and tell whether the solution is acidic, basic, or neutral. ~~$[H^+] \times [OH^-] = 1 \times 10^{-14}$~~ $[H^+] = \frac{1 \times 10^{-14}}{[OH^-]}$

a) $[OH^-] = 7.26 \times 10^{-2} M$ $[H^+] = \frac{1 \times 10^{-14}}{7.26 \times 10^{-2}} = 1.38 \times 10^{-13} M$

b) $[OH^-] = 3.90 \times 10^{-11} M$ $[H^+] = \frac{1 \times 10^{-14}}{3.90 \times 10^{-11}} = 2.56 \times 10^{-4} M$

c) $[OH^-] = 1.00 \times 10^{-7} M$ $[H^+] = \frac{1.0 \times 10^{-14}}{1.0 \times 10^{-7}} = 1 \times 10^{-7} M$

29. Calculate the hydrogen ion concentration, in moles per liter, for solutions with each of the following pH or pOH values, and tell whether the solution is acidic, basic, or neutral.

a) $pH = 6.44$ $[H^+] = INV \text{ Log}(-6.44)$ or $10^{-6.44} = 3.63 \times 10^{-7} M$ Acidic

b) $pH = 12.75$ $[H^+] = 10^{-12.75} = 1.78 \times 10^{-13} M$ Basic

c) $pOH = 10.50$ $pH = 3.50$ $[H^+] = 10^{-3.50} = 3.16 \times 10^{-4} M$ Acidic

~~X~~ If 50.0 mL of a HCl solution requires 20.0 mL of 0.20 M NaOH to titrate it to the equivalence point, what is the concentration, in moles per liter, of the HCl solution?