CHAPTER REVIEW

For more practice, go to the Problem Bank in Appendix D.

Aqueous Solutions and the Concept of pH

SECTION 1 REVIEW

1. Why is pure water a very weak electric conductor?
2. What does it mean when the formula of a particular ion or molecule is enclosed in brackets?
3. a. What is the $[H_3O^+]$ of pure water at 25°C?
   b. Is this true at all temperatures? Why or why not?
4. a. What is always true about the $[H_3O^+]$ value of acidic solutions?
   b. What is true about the $[H_3O^+]$ value of acidic solutions at 25°C?
5. a. Describe what is meant by the pH of a solution.
   b. Write the equation for determining pH.
   c. Explain and illustrate what is meant by the common logarithm of a number.
6. Identify each of the following solutions that are at 25°C as acidic, basic, or neutral:
   a. $[H_3O^+] = 1.0 \times 10^{-7}$ M
   b. $[H_3O^+] = 1.0 \times 10^{-10}$ M
   c. $[OH^-] = 1.0 \times 10^{-7}$ M
   d. $[OH^-] = 1.0 \times 10^{-11}$ M
   e. $[H_3O^+] = [OH^-]$
   f. pH = 3.0
   g. pH = 13.0
7. Arrange the following common substances in order of increasing pH:
   a. eggs
   b. apples
   c. tomatoes
   d. milk
   e. bananas
   f. potatoes
   g. lemons
   h. milk of magnesia
   i. sea water

PRACTICE PROBLEMS

8. Calculate the $[H_3O^+]$ and $[OH^-]$ for each of the following. (Hint: See Sample Problem A.)
   a. 0.030 M HCl
   b. 1.0×10^{-4} M NaOH
   c. 5.0×10^{-3} M HNO_3
   d. 0.010 M $Ca(OH)_2$
9. Determine the pH of each of the following solutions. (Hint: See Sample Problem B.)
   a. 1.0×10^{-2} M HCl
   b. 1.0×10^{-3} M HNO_3
   c. 1.0×10^{-5} M HI
   d. 1.0×10^{-4} M HBr
10. Given the following $[OH^-]$ values, determine the pH of each solution.
    a. 1.0×10^{-6} M
    b. 1.0×10^{-9} M
    c. 1.0×10^{-2} M
    d. 1.0×10^{-7} M
11. Determine the pH of each solution.
    a. 1.0×10^{-2} M NaOH
    b. 1.0×10^{-3} M KOH
    c. 1.0×10^{-4} M LiOH
12. Determine the pH of solutions with each of the following $[H_3O^+]$. (Hint: See Sample Problem C.)
    a. 2.0×10^{-5} M
    b. 4.7×10^{-7} M
    c. 3.8×10^{-3} M
13. Given the following pH values, determine the $[H_3O^+]$ for each solution. (Hint: See Sample Problem D.)
    a. 3.0
    b. 7.00
    c. 11.0
    d. 5.0
14. Given the following pH values, determine the $[OH^-]$ for each solution.
    a. 7.00
    b. 11.00
    c. 4.00
    d. 6.00
15. Determine $[H_3O^+]$ for solutions with the following pH values. (Hint: See Sample Problem E.)
    a. 4.23
    b. 7.65
    c. 9.48
16. A nitric acid solution is found to have a pH of 2.70. Determine each of the following:
    a. $[H_3O^+]$
    b. $[OH^-]$
    c. the number of moles of HNO_3 required to prepare 5.50 L of this solution
    d. the mass of HNO_3 in the solution in part (c)
    e. the milliliters of concentrated acid needed to prepare the solution in part (c) (Concentrated nitric acid is 69.5% HNO_3 by mass and has a density of 1.42 g/mL.)