16. In what units is molarity expressed?

17. Under what circumstances might we prefer to express solution concentrations in terms of
   a. molarity?
   b. molality?

18. If you dissolve 2.00 mol KI in 1.00 L of water, will you get a 2.00 M solution? Explain.

PRACTICE PROBLEMS

19. a. Suppose you wanted to dissolve 106 g of Na_2CO_3 in enough H_2O to make 6.00 L of solution.
   (1) What is the molar mass of Na_2CO_3?
   (2) What is the molarity of this solution?
   b. What is the molarity of a solution of 14.0 g NH_4Br in enough H_2O to make 150 mL of solution?

20. a. Suppose you wanted to produce 1.00 L of a 3.50 M aqueous solution of H_2SO_4.
   (1) What is the solute?
   (2) What is the solvent?
   (3) How many grams of solute are needed to make this solution?
   b. How many grams of solute are needed to make 2.50 L of a 1.75 M solution of $Ba(NO_3)_2$?

21. How many moles of NaOH are contained in 65.0 mL of a 2.20 M solution of NaOH in H_2O? (Hint: See Sample Problem B.)

22. A solution is made by dissolving 26.42 g of $(NH_4)_2SO_4$ in enough H_2O to make 50.00 mL of solution.
   a. What is the molar mass of $(NH_4)_2SO_4$?
   b. What is the molarity of this solution?

23. Suppose you wanted to find out how many milliliters of 1.0 M $AgNO_3$ are needed to provide 169.9 g of pure $AgNO_3$.
   a. What is step 1 in solving the problem?
   b. What is the molar mass of $AgNO_3$?
   c. How many milliliters of solution are needed?

24. a. Balance the equation:
   $$H_3PO_4 + Ca(OH)_2 \longrightarrow Ca_3(PO_4)_2 + H_2O$$
   b. What mass of each product results if 750 mL of 6.00 M H_3PO_4 reacts according to the equation?

25. How many milliliters of 0.750 M H_3PO_4 are required to react with 250. mL of 0.150 M $Ba(OH)_2$ if the products are barium phosphate and water?

26. 75.0 mL of an $AgNO_3$ solution reacts with enough Cu to produce 0.250 g of Ag by single displacement. What is the molarity of the initial $AgNO_3$ solution if $Cu(NO_3)_2$ is the other product?

27. Determine the number of grams of solute needed to make each of the following molal solutions:
   a. a 4.50 m solution of H_2SO_4 in 1.00 kg H_2O
   b. a 1.00 m solution of HNO_3 in 2.00 kg H_2O

28. A solution is prepared by dissolving 17.1 g of sucrose, $C_{12}H_{22}O_{11}$, in 275 g of H_2O.
   a. What is the molar mass of sucrose?
   b. What is the molality of that solution?

29. How many kilograms of H_2O must be added to 75.5 g of $Ca(NO_3)_2$ to form a 0.500 m solution?

30. A solution made from ethanol, C_2H_5OH, and water is 1.75 m in ethanol. How many grams of C_2H_5OH are contained per 250. g of water?

MIXED REVIEW

31. Na_2SO_4 is dissolved in water to make 450. mL of a 0.250 M solution.
   a. What is the molar mass of Na_2SO_4?
   b. How many moles of Na_2SO_4 are needed?

32. Citric acid is one component of some soft drinks. Suppose that 2.00 L of solution are made from 150. mg of citric acid, $C_6H_8O_7$.
   a. What is the molar mass of citric acid?
   b. What is the molarity of citric acid in the solution?

33. Suppose you wanted to know how many grams of KCl would be left if 350 mL of a 2.0 M KCl solution were evaporated to dryness.
   a. What is the molar mass of KCl?
   b. How would heating the solution affect the mass of KCl remaining?
   c. How many grams of KCl would remain?