1. Use the graph to determine each of the following.
   a. the solubility of CaCl$_2$ at 5°C
   b. the solubility of CaCl$_2$ at 25°C
   c. the mass of Ce$_2$(SO$_4$)$_3$ that will dissolve in 50 g of water at 10°C
   d. the mass of Ce$_2$(SO$_4$)$_3$ that will dissolve in 50 g of water at 0°C
   e. the mass of additional KClO$_3$ that will dissolve in 200 g of water if the water temperature is raised from 30°C to 90°C

2. A gas has a solubility of 0.086 g/L at a pressure of 3.5 atm. At what pressure would its solubility be 2.3 g/L?

3. The solubility of a gas changes from 0.95 g/L to 0.72 g/L. If the initial pressure was 2.8 atm, what is the final pressure?

4. What is the percent by mass of sodium carbonate in a water solution containing 0.497 g NaCO$_3$ in 58.3 g of solution?

5. The percent by mass of magnesium chloride in a water solution is 1.47%. How many grams of solute are dissolved in each 500.00 g of solution?

6. What is the mass of the solvent in Practice Problem 5?

7. What is the percent by volume of isopropyl alcohol in a solution made by mixing 75 mL of the alcohol with enough water to make 288 mL of solution?

8. What volume of acetone was used to make 3.11 L of a water solution if the percent acetone by volume is 27.9%?
9. A solution is made by dissolving 13.0 g of sodium iodide (NaI) in enough water to make 387 mL of solution. What is the molarity of the solution?

10. Calculate the molarity of a water solution of CaCl$_2$, given that 5.04 L of the solution contains 312 g of CaCl$_2$.

11. Suppose you wished to make 0.879 L of 0.150 M silver nitrate by diluting a stock solution of 0.275 M silver nitrate. How many milliliters of the stock solution would you need to use?

12. If 55.0 mL of a 4.45 M stock solution of sucrose is diluted with water to make 168 mL of sucrose solution, what is the molarity of the final solution?

13. What is the molality of the solution formed by mixing 104 g of silver nitrate (AgNO$_3$) with 3.75 kg of water?

14. Suppose that 5.25 g of sulfur (S$_8$) is dissolved in 482 g of the liquid solvent carbon disulfide (CS$_2$). What is the molality of the sulfur solution?

15. Determine the mole fraction of the solvent and solute in each of the following solutions.
   a. 655 g water, 348 g ethanol (C$_2$H$_5$OH)
   b. 461.0 g water, 20.01 g calcium chloride (CaCl$_2$)
   c. 1145 g carbon tetrachloride (CCl$_4$), 765 g benzene (C$_6$H$_6$)
14.3 Factors Affecting Solvation

16. What are the boiling and freezing points of a 1.34\textit{m} water solution of calcium chloride (CaCl$_2$)?

17. Calculate the molality of a water solution of a nonelectrolyte, given that the freezing point depression of the solution is 4.33°C.

14.4 Colligative Properties of Solutions

18. Four mixtures having the following properties are examined. Identify each mixture as a solution, a suspension, or a colloid. If the properties are not conclusive for identification, state which types of mixtures are possible.

   a. quickly settles out into a watery liquid and an oily liquid

   b. is transparent and does not settle out

   c. is transparent, scatters the light from a flashlight beam, and shows zigzag motions when observed through a microscope

   d. is transparent and does not scatter the light from a flashlight beam

Unit 14 Review

19. Define \textit{solvation}. Explain what happens in terms of attractive forces when a substance dissolves in a solvent.

20. Contrast saturated, unsaturated, and supersaturated solutions.

21. State Henry’s law in words, and write the equation for it.

22. Explain how percent by mass is calculated.

23. What is the difference between a 2\textit{M} solution and a 2\textit{m} solution?

24. Define colligative property, and identify four colligative properties.

25. Would you expect the freezing point depression of a 1\textit{m}-solution of sucrose and that of a 1\textit{m}-solution of sodium chloride to be the same? Explain.

26. Contrast a solution, a suspension, and a colloid in terms of their nature, properties, and particle size.