Problem Set 12: Solutions, Concentration and Osmosis

1. How many moles of sodium sulfate are in 1 L of a 2.50 M solution?

2. How many grams of sodium sulfate are in 1 L of a 2.50 M solution?

3. How many moles of barium chloride are in 2.8 L of a 1.25 M solution?

4. How many grams of barium chloride are in 2.8 L of a 1.25 M solution?

5. Which of the following would you expect to be more soluble in water?

   a. hexane ($CH_3CH_2CH_2CH_2CH_2CH_3$)
   b. methanol (CH_3OH)

6. Normal saline is used in intravenous drips, and has a concentration of 0.90% m/v of NaCl. Answer the following questions about preparing a solution of normal saline.

   a. How many grams of sodium chloride are needed to prepare 100 mL of normal saline?

   b. How many grams of sodium chloride are needed to prepare 150 mL of normal saline?

7. Which of the following solutions has a higher osmolarity?

   a. 0.25 M potassium chloride or 0.25 M potassium sulfate

   b. 0.30 M sodium chloride or 0.30% m/v sodium chloride

8. Assume red blood cells are placed in an aqueous solution of 0.25 M NaCl. Which of the following correctly describes the direction of water flow?

   a. Water will have a net flow into the red blood cells and cause them to swell because the solution is hypotonic with respect to the contents of the cells.
   b. Water will have a net flow out of the red blood cells and cause them to shrivel because the solution is hypertonic with respect to the contents of the cells.
   c. Water will flow in and out of the red blood cells at equal rates because the solution is isotonic with the contents of the cells.

9. How many milliliters of a 1.0 M NaOH solution should be used to prepare 500 mL of a 0.15 M NaOH solution?

10. Assume you need to add 0.055 moles of HCl to a reaction. How many milliliters of a 1.55 M HCl solution should you use?