

**REVIEW QUESTIONS**

Chapter 14

1. Calculate the mass % of the following solutions:
  - a) 25 g KCl in 125 g of water
  
  
  
  
  
  
  
  
  
  
  - b) 2.0 g of KOH in 20.0 g of water
  
2. How many grams of solute are present in 175 g of 1.80% (m/m) solution of NaCl?
  
  
  
  
  
  
  
  
  
  
3. Calculate the molarity of the following solutions:
  - a) 2.0 mol of glucose in 400. mL of solution.
  
  
  
  
  
  
  
  
  
  
  - b) 4.0 g of KOH in 2.0 L of solution.
  
  
  
  
  
  
  
  
  
  
4. Calculate the grams of solute needed to prepare 2.0 L of 1.5 M NaOH solution.

5. How many grams of  $\text{AgNO}_3$  are needed to prepare 1500. mL of a 0.240 M solution?
  
  
  
  
  
  
  
  
  
  
6. What volume of 0.300 M KCl will contain 15.3 g of KCl?
  
  
  
  
  
  
  
  
  
  
7. A patient received 2.0 g of NaCl in 8 hours. How many mL of a 0.90% (m/m) NaCl (saline) solution were delivered to the patient? Density of solution is 1.05 g/mL.
  
  
  
  
  
  
  
  
  
  
8. Calculate the freezing point of a solution prepared by dissolving 35.0 g of  $\text{K}_2\text{SO}_4$  in 1000. g of water. ( $K_f = 1.86 \text{ }^\circ\text{C/m}$ )

9. A solution is prepared by dissolving 5.00 g of NaCl in 25.0 g of water.
- Calculate the mass % of NaCl in this solution.
  - Calculate the molality of this solution.
  - Calculate the boiling point and freezing points of this solution.  
( $K_b=0.512\text{ }^\circ\text{C/m}$  and  $K_f=1.86\text{ }^\circ\text{C/m}$ )
10. A solution of antifreeze contains 25% by mass ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ) in water. Calculate the boiling point and freezing point for this solution. ( $K_b = 0.512\text{ }^\circ\text{C/m}$  and  $K_f = 1.86\text{ }^\circ\text{C/m}$ )

11. How many grams of ethyl alcohol ( $\text{C}_2\text{H}_5\text{OH}$ ) are needed to drop the freezing temperature of 2.0 L of water to  $-10.0\text{ }^\circ\text{C}$ ? ( $K_f = 1.86\text{ }^\circ\text{C/m}$ ; 1 L water = 1 kg)

12. Which of the following solutions will have the greatest osmotic pressure? Explain.

0.25 M  $\text{C}_6\text{H}_{12}\text{O}_6$

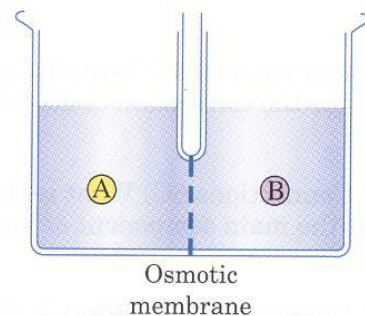
0.15 M  $\text{NaCl}$

0.15 M  $\text{CaCl}_2$

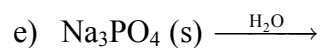
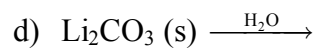
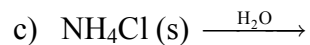
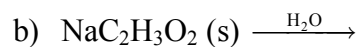
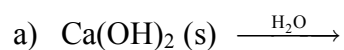
13. Calculate the freezing point of an aqueous solution that boils at  $102.5\text{ }^\circ\text{C}$ . ( $K_f = 1.86\text{ }^\circ\text{C/m}$  and  $K_b = 0.512\text{ }^\circ\text{C/m}$ )

14. Two solutions, A and B, are separated by a semipermeable membrane as shown below. For each case below, determine which side rises due to osmotic pressure.

- |    | <u>A</u>     | <u>B</u>                            |
|----|--------------|-------------------------------------|
| a) | 0.1M glucose | 0.5M glucose                        |
| b) | 1M NaCl      | 0.5M K <sub>2</sub> SO <sub>4</sub> |
| c) | 0.5M KCl     | 0.5M KBr                            |
| d) | 0.1M NaCl    | 0.1M glucose                        |



15. Complete the equations below when each soluble ionic salt dissolves in water, and determine the *i* value for each:



16. In winter, after a snowstorm, salt (NaCl) is spread to melt the ice on the road. How many grams of salt must be added to 1000. g of ice to decrease its freezing point to  $-5.0\text{ }^\circ\text{C}$ ? ( $K_f = 1.86\text{ }^\circ\text{C/m}$ )

17. For each pair of solutions listed below, determine which will have the higher boiling point:

a) 1.5 M NaCl and 0.5 M Al(NO<sub>3</sub>)<sub>3</sub>

b) 2.0 M NaOH and 2.0 M C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>

c) 0.4 M Na<sub>2</sub>CO<sub>3</sub> and 0.7 M KCl

18. Both methanol (CH<sub>3</sub>OH) and ethylene glycol (C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>) are used as antifreeze. Which is more effective—that is, which produces a lower freezing point if equal amounts of each are added to the same amount of water?