

CHAPTER 13 REVIEW*Ions in Aqueous Solutions and Colligative Properties***MIXED REVIEW****SHORT ANSWER** Answer the following questions in the space provided.**1.** Match the four compounds on the right to their descriptions on the left.

- | | |
|---|--------------------------------------|
| _____ an ionic compound that is quite soluble in water | (a) HCl |
| _____ an ionic compound that is not very soluble in water | (b) NaNO ₃ |
| _____ a molecular compound that ionizes in water | (c) AgCl |
| _____ a molecular compound that does not ionize in water | (d) C ₂ H ₅ OH |

2. Consider nonvolatile nonelectrolytes dissolved in various liquid solvents to complete the following statements:

- _____ a. The change in the boiling point does *not* vary with the identity of the _____ (solute, solvent), assuming all other factors remain constant.
- _____ b. The change in the boiling point varies with the identity of the _____ (solute, solvent), assuming all other factors remain constant.
- _____ c. The change in the boiling point becomes greater as the concentration of the solute in solution _____ (increases, decreases).

3. a. Name two compounds in solution that could be combined to cause the formation of a calcium carbonate precipitate.

b. Identify any spectator ions in the system you described in part a.

c. Write the net ionic equation for the formation of calcium carbonate.

4. Explain why applying rock salt (impure NaCl) to an icy sidewalk hastens the melting process.

MIXED REVIEW continued

PROBLEMS Write the answer on the line to the left. Show all your work in the space provided.

5. _____ Some insects survive cold winters by generating an antifreeze inside their cells. The antifreeze produced is glycerol, $C_3H_5(OH)_3$, a nonvolatile nonelectrolyte that is quite soluble in water. What must the molality of a glycerol solution be to lower the freezing point of water to -25.0°C ?
6. _____ How many grams of methanol, CH_3OH , should be added to 200. g of acetic acid to lower its freezing point by 1.30°C ? Refer to **Table 2** on page 448 of the text for any necessary data.
7. _____ The boiling point of a solution of glucose, $C_6H_{12}O_6$, and water was recorded to be 100.34°C . Calculate the molality of this solution.
8. $HF(aq)$ is a weak acid. A 0.05 mol sample of HF is added to 1.0 kg of water.
- a. Write the equation for the ionization of HF to form hydronium ions.
- _____
- _____ b. If HF became 100% ionized, how many moles of its ions would be released?
9. _____ Which solution has the highest osmotic pressure?
- a. 0.1 *m* glucose
b. 0.1 *m* sucrose
c. 0.5 *m* glucose
d. 0.2 *m* sucrose

CHAPTER 13 REVIEW*Ions in Aqueous Solutions and Colligative Properties***MIXED REVIEW****SHORT ANSWER** Answer the following questions in the space provided.

1. Match the four compounds on the right to their descriptions on the left.

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| <u> b </u> an ionic compound that is quite soluble in water | (a) HCl |
| <u> c </u> an ionic compound that is not very soluble in water | (b) NaNO ₃ |
| <u> a </u> a molecular compound that ionizes in water | (c) AgCl |
| <u> d </u> a molecular compound that does not ionize in water | (d) C ₂ H ₅ OH |

2. Consider nonvolatile nonelectrolytes dissolved in various liquid solvents to complete the following statements:

- | | |
|--------------------------------------|--|
| <u> solute </u> | a. The change in the boiling point does <i>not</i> vary with the identity of the ____ (solute, solvent), assuming all other factors remain constant. |
| <u> solvent </u> | b. The change in the boiling point varies with the identity of the ____ (solute, solvent), assuming all other factors remain constant. |
| <u> increases </u> | c. The change in the boiling point becomes greater as the concentration of the solute in solution ____ (increases, decreases). |

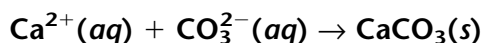
3. a. Name two compounds in solution that could be combined to cause the formation of a calcium carbonate precipitate.

Answers will vary; any soluble calcium salt mixed with any soluble carbonate will form the precipitate. One example is calcium nitrate with sodium carbonate.

b. Identify any spectator ions in the system you described in part a.

In the example given, sodium and nitrate ions are spectator ions.

c. Write the net ionic equation for the formation of calcium carbonate.



4. Explain why applying rock salt (impure NaCl) to an icy sidewalk hastens the melting process.

The vapor pressure of the NaCl solution that forms is lower than the vapor pressure of pure water at 0°C. The lower vapor pressure of the NaCl solution results in a lower freezing point.

MIXED REVIEW continued

PROBLEMS Write the answer on the line to the left. Show all your work in the space provided.

5. 13.4 m Some insects survive cold winters by generating an antifreeze inside their cells. The antifreeze produced is glycerol, $C_3H_5(OH)_3$, a nonvolatile nonelectrolyte that is quite soluble in water. What must the molality of a glycerol solution be to lower the freezing point of water to -25.0°C ?
6. 2.14 g How many grams of methanol, CH_3OH , should be added to 200. g of acetic acid to lower its freezing point by 1.30°C ? Refer to **Table 2** on page 448 of the text for any necessary data.
7. 0.67 m The boiling point of a solution of glucose, $C_6H_{12}O_6$, and water was recorded to be 100.34°C . Calculate the molality of this solution.
8. $HF(aq)$ is a weak acid. A 0.05 mol sample of HF is added to 1.0 kg of water.
- a. Write the equation for the ionization of HF to form hydronium ions.
- $HF(aq) + H_2O(l) \rightarrow H_3O^+(aq) + F^-(aq)$
-
- 0.10 mol b. If HF became 100% ionized, how many moles of its ions would be released?
9. c Which solution has the highest osmotic pressure?
- a. 0.1 *m* glucose
b. 0.1 *m* sucrose
c. 0.5 *m* glucose
d. 0.2 *m* sucrose