

HW02 - Colligative Properties

Question 1

2 pts

Some distilled water is added to an empty beaker. A gram of copper (II) nitrate is added to the beaker and while the water is being stirred. After a few minutes, what is in the beaker?

- copper ions, nitrate ions, and water
- nitrogen gas, copper atoms, electrons, and water
- solid copper (II), nitrate, and water
- solid copper, nitrate ions, and water

Question 2

2 pts

In which of the following pairs do both compounds have a van't Hoff factor (i) of 2?

- glucose and sodium chloride
- sodium sulfate and potassium chloride
- perchloric acid and barium hydroxide
- sodium chloride and magnesium sulfate

Question 3

2 pts

For solutions of a non-electrolyte, the van't Hoff factor is:

- $i = 0$
- $i = 3$
- $i = 1$
- $i = 2$

Question 4

2 pts

How many moles of ions are contained in 1.27 L of a 1.75 M solution of $\text{Mg}(\text{NO}_3)_2$?

- 6.67 mol
- 4.45 mol
- 2.22 mol
- 0.741 mol

Question 5

2 pts

Theoretically, it should be harder to dissolve (NaCl / Al_2S_3) in water because the (higher / lower) the charge density of a substance, the lower its solubility.

- Al_2S_3 , lower
- NaCl , lower
- Al_2S_3 , higher
- NaCl , higher

Question 6

3 pts

The freezing point of seawater is about -1.85°C . Assume that seawater is an aqueous solution of sodium chloride and then calculate the molality of NaCl in seawater. The K_f for water is 1.86 K/m.

- 0.995 m
- -0.497 m
- 0.497 m
- 1.99 m

Question 7

3 pts

What will be the freezing point of a solution of 8 moles of sodium dichromate ($\text{Na}_2\text{Cr}_2\text{O}_7$) dissolved in 16 kg of water? Use the following values:

$$K_b = 0.512 \text{ K/m}$$

$$K_f = 1.86 \text{ K/m}$$

- 272.2 K
- 2.8°C
- 270.2 K
- 275.8 K

Question 8

3 pts

Calculate the vapor pressure at 20°C of a solution containing 0.61g of naphthalene in 16g of chloroform (CHCl_3). Naphthalene (C_{10}H_8) has a low vapor pressure and may be assumed to be nonvolatile. The vapor pressure of chloroform at 20°C is 156 torr.

- 150.65 torr
- The vapor pressure would not change as naphthalene is considered non-volatile.
- 28.10 torr
- 20.90 torr

Question 9

2 pts

Rank the following aqueous solutions from lowest to highest boiling point: 0.5 m NaCl , 1 m KCl , 0.5 m BaCl_2 , and 1 m $\text{Ba}(\text{NO}_3)_2$. All salt are dissolved in water.

- 1 m KCl < 1 m $\text{Ba}(\text{NO}_3)_2$ < 0.5 m NaCl < 0.5 m BaCl_2
- 1 m $\text{Ba}(\text{NO}_3)_2$ < 0.5 m NaCl < 0.5 m BaCl_2 < 1 m KCl
- 0.5 m BaCl_2 < 1 m KCl < 1 m $\text{Ba}(\text{NO}_3)_2$ < 0.5 m NaCl
- 0.5 m NaCl < 0.5 m BaCl_2 < 1 m KCl < 1 m $\text{Ba}(\text{NO}_3)_2$

Question 10

2 pts

A semi-permeable membrane can withstand an osmotic pressure of 0.75 atm. What molarity of aqueous magnesium bromide solution would reach the limit for this membrane? (Assume $RT = 25 \text{ L}\cdot\text{atm}\cdot\text{mol}^{-1}$)

- 0.01 M
- 0.03 mM
- 0.03 M
- 0.01 mM

Question 11

3 pts

Catalase (a liver enzyme) dissolves in water. A 14mL solution containing 0.166g of catalase exhibits an osmotic pressure of 1.2 Torr at 20°C . What is the molar mass of catalase?

- $2.81 \times 10^5 \text{ g/mol}$
- $1.69 \times 10^5 \text{ g/mol}$
- $1.81 \times 10^5 \text{ g/mol}$
- $1.49 \times 10^5 \text{ g/mol}$

Question 12

2 pts

Two aqueous solutions are separated by a semi-permeable membrane:

Solution A = 0.34 M KCl

Solution B = 0.34 M MgCl_2

Which of the following statements is TRUE?

- There is a net flow of H_2O molecules from solution A to solution B.
- There is a net flow of H_2O molecules from solution B to solution A.
- There is no net flow of H_2O molecules from one solution to another.
- There is a net flow of Cl^- ions from solution B to solution A.

Question 13

2 pts

Red blood cells contain Na^+ ions, K^+ ions, and water. If we place some red blood cells into a beaker full of pure water, what will happen to them?

- they will wiggle around rapidly
- nothing
- they will swell and burst
- they will shrivel and collapse