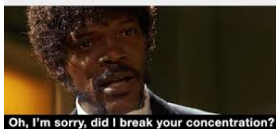


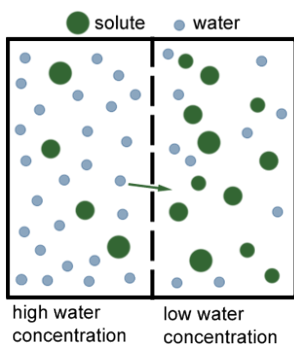
## Chemistry 222 Exam II Review Chapters 10 and 11

When you dilute a solution:



Chemistry 222  
Professor Michael Russell  
MAR

Last update:  
4/27/26



## Midterm II

### Chapters 10 and 11

- Bring: calculator, pencil, "Freezing Point Depression" lab, Exam Prep Worksheet II, "Kinetics I" printed lab
- 12 multiple choice questions, 4 short answer questions, ~90 minutes in length
- Returned following lab period with "summary sheet" **Good luck with your studying!**

**Let's start the review!**

MAR



L1: Wed, 7/15 8:30 AM, AC 2507

Check with instructor to ensure correct dates and times!



Using intermolecular forces, the predicted order of decreasing boiling points for the following substances is

- $\text{CH}_3\text{OH} > \text{CH}_4 > \text{H}_2$
- $\text{CH}_3\text{OH} > \text{H}_2 > \text{CH}_4$
- $\text{CH}_4 > \text{CH}_3\text{OH} > \text{H}_2$
- $\text{CH}_4 > \text{H}_2 > \text{CH}_3\text{OH}$
- $\text{H}_2 > \text{CH}_4 > \text{CH}_3\text{OH}$

MAR

When KCl dissolves in water, what types of intermolecular bonds are formed?

- ion-ion
- ion-dipole
- hydrogen bonds
- ion-ion forces and H-bonds
- matrimony bonds

MAR

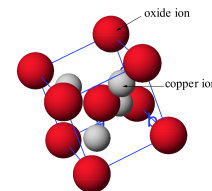
Which of the following should have the highest  $\Delta H_{\text{vap}}$ ?

- $\text{F}_2$
- $\text{CH}_3\text{OH}$
- $\text{H}_2\text{O}$
- $\text{NH}_3$
- all have the same  $\Delta H_{\text{vap}}$  value

MAR

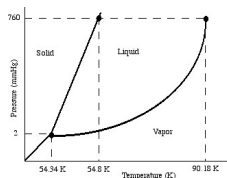
The unit cell for a compound of copper and oxygen is illustrated here. All the grey copper atoms are within the unit cell. Determine the empirical formula of the compound.

- $\text{CuO}$
- $\text{Cu}_2\text{O}$
- $\text{CuO}_2$
- $\text{Cu}_2\text{O}_3$
- $\text{Cu}_4\text{O}_9$



MAR

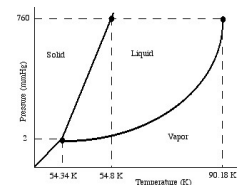
Below is a phase diagram for O<sub>2</sub>. What is the name of the point at P = 2 mm Hg and T = 54.34 K?



- A. normal freezing point
- B. triple point
- C. normal boiling point
- D. critical point
- E. freak out point

MAR

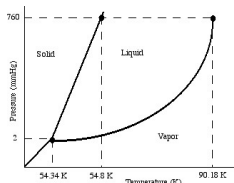
At right is a phase diagram for O<sub>2</sub>. Which statement is correct regarding the densities of solid and liquid O<sub>2</sub> at the same temperature?



- A. The density of liquid O<sub>2</sub> is 1.426 g/cm<sup>3</sup> whereas the density of solid O<sub>2</sub> is 1.149 g/cm<sup>3</sup>.
- B. The density of solid O<sub>2</sub> is 1.426 g/cm<sup>3</sup> whereas the density of liquid O<sub>2</sub> is 1.149 g/cm<sup>3</sup>.
- C. The densities of solid and liquid O<sub>2</sub> are the same.

MAR

Below is a phase diagram for O<sub>2</sub>. In what phase is oxygen found at a pressure of 1 mmHg and a temperature of 55 K?



- A. solid
- B. liquid
- C. vapor
- D. plasma

MAR

Calculate the energy required to convert 1.00 L of liquid ethanol at 25.0 °C to a gas at 78.3 °C.

Constants for ethanol:

- density = 0.7849 g/mL
- molar mass = 46.08 g/mol
- boiling point = 78.3 °C
- heat capacity = 2.44 J/g·K
- heat of vaporization = 38.56 kJ/mol

- A. -329 kJ
- B. 329 kJ
- C. -759 kJ
- D. 759 kJ
- E. 0 kJ

MAR

You dissolve 92.0 grams of CH<sub>3</sub>CH<sub>2</sub>OH, ethanol, in 270 g of water. What is the mole fraction of ethanol in the solution?

- A. 2.0
- B. 0.12
- C. 0.067
- D. 0.0083
- E. 0

MAR

You dissolve 92.0 grams of CH<sub>3</sub>CH<sub>2</sub>OH, ethanol, in 270. g of water. What is the mass percent of ethanol in the solution?

- A. 34.1 %
- B. 17.0 %
- C. 25.4 %
- D. 74.8 %
- E. 100. %

MAR

You dissolve 92.0 grams of  $\text{CH}_3\text{CH}_2\text{OH}$ , ethanol, in 270. g of water. What is the molality of ethanol in the solution?

- A. 341 *m*
- B. 170. *m*
- C. 0.341 *m*
- D. 7.41 *m*
- E. 18.0 *m*

MAR

You dissolve 92.0 grams of  $\text{CH}_3\text{CH}_2\text{OH}$ , ethanol, in 270. g of water, and the density of the solution is 0.9780 g/mL. What is the molarity of ethanol in the solution?

- A. 0.370 M
- B. 2.00 M
- C. 7.42 M
- D. 3.05 M
- E. 5.41 M

MAR

An aqueous solution of ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ ) has a solution density of 0.9163 g/mL and a concentration of 0.801 M. What is the mole fraction of ethanol in the solution?

- A. 0.911
- B. 1.1111
- C. 0.9839
- D. 0.0161
- E. 4.03

MAR

The Henry's Law constant for  $\text{N}_2$  in water at 53 °C is  $8.4 \times 10^{-7}$  M/mm Hg, and the vapor pressure of water at 53 °C is 107 torr. Find the equilibrium concentration of  $\text{N}_2$  in water if the total pressure equals 1 atm.

- A.  $5.5 \times 10^{-4}$  M
- B.  $9.0 \times 10^{-5}$  M
- C.  $6.4 \times 10^{-4}$  M
- D.  $3.2 \times 10^{-5}$  M
- E. 42 M

MAR

0.0400 mol of  $\text{I}_2$  (10.1 g) is dissolved in 1.96 mol of  $\text{CCl}_4$  (300 g) at 65 °C. Given that the vapor pressure of pure  $\text{CCl}_4$  is 504 mm Hg at this temperature, what is the vapor pressure of the  $\text{CCl}_4$  over this solution?

- A. 504 mm Hg
- B. 514 mm Hg
- C. 494 mm Hg
- D. 10.1 mm Hg
- E. Too much pressure!

MAR

What mass of ethylene glycol ( $\text{HOCH}_2\text{CH}_2\text{OH}$ , molar mass = 62.0 g/mol) must be added to 125 g of water to raise the boiling point by 1.00 °C? ( $k_{\text{bp}}(\text{H}_2\text{O}) = +0.512$  °C/m)

- A. 1.95 g
- B. 0.244 g
- C. 15.1 g
- D. 31.0 g
- E. 0 g

MAR

Which water-based solution is expected to have the higher boiling point?

- A. 0.10 molal NaCl
- B. 0.15 molal sugar
- C. both the same
- D. not enough information

MAR

29.3 g of NaCl (molar mass = 58.5 g/mol) is dissolved in 500. grams water. What is the boiling point of this solution? ( $k_{bp}(\text{H}_2\text{O}) = +0.512\text{ }^\circ\text{C/m}$ )

- A. 100.512  $^\circ\text{C}$
- B. 98.976  $^\circ\text{C}$
- C. 101.02  $^\circ\text{C}$
- D. 1.024  $^\circ\text{C}$
- E. 10<sup>4</sup>  $^\circ\text{K}$

MAR

Erythritol occurs naturally in algae and fungi. A solution of 2.50 g of erythritol in 50.0 g of water freezes at  $-0.762\text{ }^\circ\text{C}$ . What is the molar mass of the compound? ( $k_{fp}(\text{H}_2\text{O}) = 1.86\text{ }^\circ\text{C/m}$ )

- A. 26.9 g/mol
- B. 35.5 g/mol
- C. 122 g/mol
- D. 224 g/mol
- E. 0.0100 g/mol

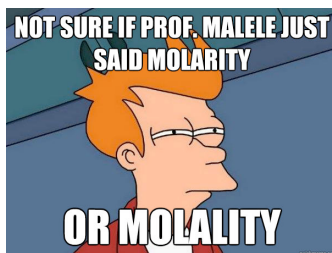
MAR

Insulin (20.0 mg) dissolved in 5.00 mL of water at 300. K provides an osmotic pressure of 12.5 mm Hg. What is the molar mass of insulin?

- A. 18.0 g/mol
- B. 42.0 g/mol
- C. 3980 g/mol
- D. 6010 g/mol
- E. 12,100 g/mol

MAR

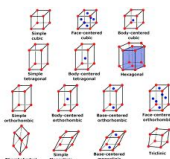
**End of Review - good luck with your studying!**



Need more practice?

- Practice Problem Sets (Companion and online)
- Concept Guides (Companion and online)
- Chapter Guides (online)
- End of Chapter Problems in Textbook (every other question has answer at end)

Good luck with your studying!



MAR