

Recitation Worksheet 5 Solutions 2 (10/6/2020)

Name:

UGA ID:

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is sre13137). **Do not use your 81x number.**
- If you do not have a printer, type your answers in the then upload the worksheet template to Gradescope by Tuesday, October 6 at 11:59 p.m. Write your work on separate sheets of paper, convert to a PDF and upload to eLC.
- If you have a printer download the worksheet, convert it to a PDF and upload to Gradescope by Tuesday, October 6 at 11:59 p.m. You do not need to upload anything to eLC.
- For full credit, **show your work.**

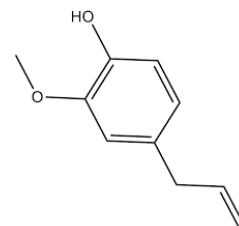
1. A 0.0200 *m* aqueous solution of an ionic compound, $\text{Co}(\text{NH}_3)_4\text{Cl}_3$, freezes at $-0.0640\text{ }^\circ\text{C}$. What is the van't Hoff factor for this compound? The K_{fp} for water is -1.86 .

2. The freezing point depression and boiling point elevation constants for a number of liquids are given in the table below. Which of the following solutions' freezing point is decreased by the greatest amount when 1 mole of solute is dissolved in 1 kg of the solvent?

Solvent	K_{f}	K_{b}
A. Acetic acid	3.90	3.07
B. Benzene	5.12	2.53
C. Nitrobenzene	8.1	5.24
D. Phenol	7.27	3.56
E. Water	1.86	0.512

3. Eugenol, a compound found in nutmeg and cloves, has the formula $\text{C}_{10}\text{H}_{12}\text{O}_2$. What is the boiling point of a solution containing 0.144 g of eugenol dissolved in 10.0 g of benzene? The K_{bp} for benzene is $+2.53\text{ }^\circ\text{C}/m$ and the normal boiling point is $80.10\text{ }^\circ\text{C}$.

$^\circ\text{C}$



4. What is the mole fraction of acetone, $(\text{CH}_3)_2\text{CO}$, in a solution containing 500 g of acetone in 800 g of benzene, C_6H_6 ?

5. What is the osmotic pressure of a solution containing 541 mg of the artificial sweetener, aspartame, $(\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5)$ in a total volume of 60.0 mL of water at 25°C ?

atm



6. What is the change in boiling point of a solution of 31.1 g Na_3PO_4 in 750. g of water? K_b for water is $0.512^\circ\text{C}/m$. Assume ideal behavior.

$^\circ\text{C}$

7. A KCl solution is prepared by dissolving 25.0 g KCl in 250.0 g of water at 25°C . What is the vapor pressure of the solution if the vapor pressure of water at 25°C is 23.76 mm Hg?

mm Hg

8. Choose the aqueous solution below with the **highest** freezing point.

- A. $0.200\ m\ \text{Mg}(\text{ClO}_4)_2$
- B. $0.200\ m\ \text{Na}_3\text{PO}_3$
- C. $0.200\ m\ \text{HOCH}_2\text{CH}_2\text{OH}$
- D. $0.200\ m\ \text{Ba}(\text{NO}_3)_2$
- E. These all have the same freezing point.

9. Choose the aqueous solution with the **highest** vapor pressure.

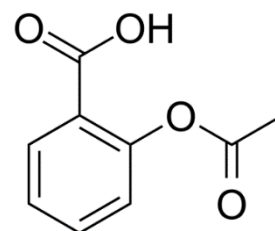
- A. $0.50\ m\ \text{C}_4\text{H}_{10}\text{O}_4$
- B. $0.50\ m\ \text{C}_2\text{H}_6\text{O}_2$
- C. $0.50\ m\ \text{C}_5\text{H}_{12}\text{O}_5$
- D. $0.50\ m\ \text{C}_{11}\text{H}_{24}\text{O}_{11}$
- E. They all have about the same vapor pressure.

10. Place the following solutions in order of **decreasing** osmotic pressure.

- I. $0.15\ \text{M}\ \text{C}_2\text{H}_6\text{O}_2$ II. $0.15\ \text{M}\ \text{BaCl}_2$ III. $0.15\ \text{M}\ \text{NaI}$

11. The osmotic pressure of a solution formed by dissolving 25.0 mg of aspirin ($\text{C}_9\text{H}_8\text{O}_4$) in enough water to make 0.250 L of solution at $25\ ^\circ\text{C}$ is _____ atm.

atm.



12. A solution is prepared by dissolving 7.00 g of glycerin ($\text{C}_3\text{H}_8\text{O}_3$) in 201 g of ethanol ($\text{C}_2\text{H}_5\text{OH}$). The freezing point of the solution is _____ $^{\circ}\text{C}$. The freezing point of pure ethanol is -114.6°C at 1 atm. The molal-freezing-point-depression constant (K_f) for ethanol is $1.99^{\circ}\text{C}/m$.

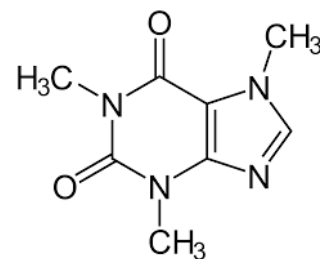
$^{\circ}\text{C}$

13. An aqueous solution is 0.467 M in HCl. What is the molality of the solution if the density is 1.23 g/mL?

m

14. What is the weight percent of a caffeine solution made by dissolving 8.35 g of caffeine, $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$, in 75 g of benzene, C_6H_6 ?

%



15. Calculate the mass of oxygen (in mg) dissolved in a 5.00 L bucket of water exposed to a pressure of 1.13 atm of air. Assume the mole fraction of oxygen in air to be 0.21 given that k_H for O_2 is $1.3 \times 10^{-3} \text{ M/atm}$ at this temperature.

mg