

Name: _____

Date: _____

- [3 pt] 1. Define the term "Colligative Property". What property(s) is it independent of, and what property(s) is it dependent on?
- [4 pt] 2. For each of the 4 colligative properties write a proportionality indicating what happens to each property as the # moles increases. (ex. As caffeine content of Jays coffee increases, so does the speed at which he talks: \uparrow caffeine \propto \uparrow speed of talking). Which are Directly Proportional (DP) and which are Inversely Proportional (IP)?
- [4 pt] 3. There is some chemistry in colligative properties. What 2 properties of solutes must we take into account when calculating colligative properties? Explain.
- [4 pt] 4. What is the vapor pressure (in mm Hg) of a solution of 16.0 g of glucose ($C_6H_{12}O_6$, considered non-volatile) in 80.0 g of methanol (CH_3OH) at $27^\circ C$? The vapor pressure of pure methanol at $27^\circ C$ is 140 mm Hg

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- [4 pt] 5. At 25°C the vapor pressure of CHCl_3 is 205 mm Hg, and the vapor pressure of CH_2Cl_2 is 415 mm Hg. What is the vapor pressure of a mixture of 15.0 g of CHCl_3 and 37.5 g of CH_2Cl_2 assuming both are volatile substances?
- [4 pt] 6. Sketch a phase diagram, **AND** explain (that means words and sentences! Boiling Point Elevation and Freezing Point Depression using the sketch.
- [2 pt] 7. Does solution (A) 2.25 molal solution of NaCl in water or solution (B) 1.5 molal solution of NaCl in water show the greater freezing point depression? (Which solutions freezing point will change the most?) Explain.
- [2 pt] 8. Does solution (A) 2.5 molal solution of NaCl in water or (B) 2.5 molal solution of KNO_3 in water show the greater freezing point depression? (Which solutions freezing point will change the most?) Explain.

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- [4 pt] 9. What is the freezing point (in °C) of a solution of 10.0 g of urea ($\text{CH}_4\text{N}_2\text{O}$) in 150.0 g of water?
- [4 pt] 10. The van't Hoff factor for KCl is $i = 1.85$. What is the boiling point of a solution of 5.25 molal KCl dissolved in acetic acid?
- [4 pt] 11. A solution of 3.00 g of ascorbic acid ($\text{C}_6\text{H}_8\text{O}_6$) in 50.0 g of acetic acid has a freezing point below that of pure acetic acid of $\Delta T = 1.33^\circ\text{C}$. What is the value of the molal freezing-point-depression constant for acetic acid? (Hint: You can compare your answer to that on the CS to see if you get it right.)
- [4 pt] 12. The freezing point of a solution of 5.00 g of an unknown compound dissolved in 75.0 g of acetic acid is 13.2°C . Calculate the molar mass of the compound. Show work to support your answer.

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- [5 pt] 13. Define Osmotic Pressure using a picture, words and using an equation. Explain the driving force for the process.
- [2 pt] 14. Which has the higher osmotic pressure, solution (A) containing 100.0 g of urea (NH_2CONH_2) in 1.0 kg of water, or a solution (B) containing 100.0 g of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) in 1.0 kg of water. Explain.
- [5 pt] 15. Human blood has an osmotic pressure of 7.7 atm at body temperature (37 °C). If a person is given an intravenous solution of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) to maintain blood pressure, what does the Molarity of the solution need to be to give the same rise in blood pressure as blood?
- [5 pt] 16. What is the Molecular Weight of an unknown compound that when 0.822 g is dissolved in 300.0 mL of water results in a solution with an osmotic pressure of 149 mmHg at 298 K?