UNIVERSITY OF JORDAN
CHEMICAL ENGINEERING DEPARTMENT

0905323 – CHEMICAL ENGINEERING THERMODYNAMICS 2

Name	
University ID	

Course ChE Thermodynamics II (905323)	
Exam	Midterm II
Date	Thursday, 10/5/2007
Time	50 minutes open book part
Instructor	Dr. Ali Al-matar

Problem	Full Mark	Mark
1	10	
2	10	
3	20	
4	60	
Total	**100**	

وقّع على القسَم التالي المتعلق بالغش الأكاديمي:

اقسم بالله أنني لم اغش في هذا الامتحان ولم أساعد أي شخص على الغش سواءً لمنفعتي الشخصية أو لمنفعة الآخرين، وعلى هذا أوقّع.

التوقيع:

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1. (10 marks) which of the following solutions should have the lowest boiling point? Justify your answer.

a. 0.01 m NaCl
b. 0.008 m $CaCl_2$
c. 0.006 m $Mg(OH)_2$
d. 0.005 m Na_2SO_4
e. 0.01 m sucrose

2. (10 marks) which of the following solutions should have the lowest freezing point? Justify your answer.

a. 0.02 m NaCl
b. 0.012 m $(NH4)_2SO_4$
c. 0.012 m $ScCl_3$
d. 0.02 m KNO_3
e. 0.012 m $Ce(NO_3)_4$

3. (20 marks) what is the osmotic pressure developed if one gram of a protein or polymer of molecular weight 60,000 is dissolved in 100 mL of water and placed in an osmometer at 25°C.

4. (60 marks) Consider the benzene (1) and ethanol (2) system which exhibits an azeotrope at 760 mm Hg and 68.24°C containing 44.8 mole% ethanol. Calculate the composition of the vapor in equilibrium with an equimolar liquid solution at 760 mm Hg given the Antoine constants:

$$\log P_1^{sat} = 6.87987 - \frac{1196.76}{T + 219.61}$$

$$\log P_2^{sat} = 8.1122 - \frac{1592.86}{T + 226.18}$$

Use the van Laar equation to describe the activity coefficients in the liquid phase. Trial and errors solution is required; carry out two iterations basing your initial guess on an educated heuristic.