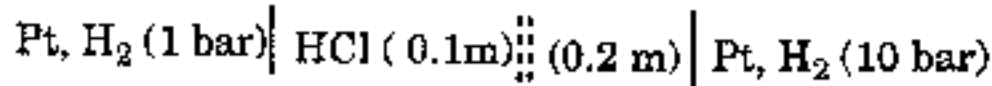


八十五學年度材料科學工程研究所(康系(所)) 甲三 組碩士班研究生入學考試  
科目 物理化學(I) 科號 2101 共 3 頁第 1 頁 \*請在試卷【答案卷】內作答  
2201

1. (12%) 描述高分子的分子量何以使用平均分子量?
2. (13%) 什麼情形下，氣體可以稱做理想氣體？溶液可以稱做理想溶液？
3. (12%) 在溶液中，fugacity  $f$  是何種指標？什麼情形下，它就等於分壓？
4. (13%) 理想橡膠的彈性係數，在受到拉力拉張狀況下，當溫度升高，它會如何？這種現象由什麼彈性(elasticity)所造成的？
- (4%) 5. In a study of the osmotic pressure of hemoglobin at 276.15 K, the pressure was found to be equal to that of a column of water 3.51 cm in height. The concentration was 1g per 0.100 dm<sup>3</sup>. Calculate the molar mass.
- (4%) 6. Why do positive and negative deviations from Raoult's law occur?
- (2%) 7. Determine the number of degrees of freedom for the system of an unsaturated solution of potassium chloride in water at the equilibrium pressure.
- (4%) 8. Show that if a solute follows Henry's law in the form of  $P_2=k'x_2$ , then the solvent must follow Raoult's law.

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 科目 物理化學(I) 科號 2101 共 3 頁第 2 頁 \*請在試卷【答案卷】內作答  
2201

(4%) 9. Calculate the emf of the cell

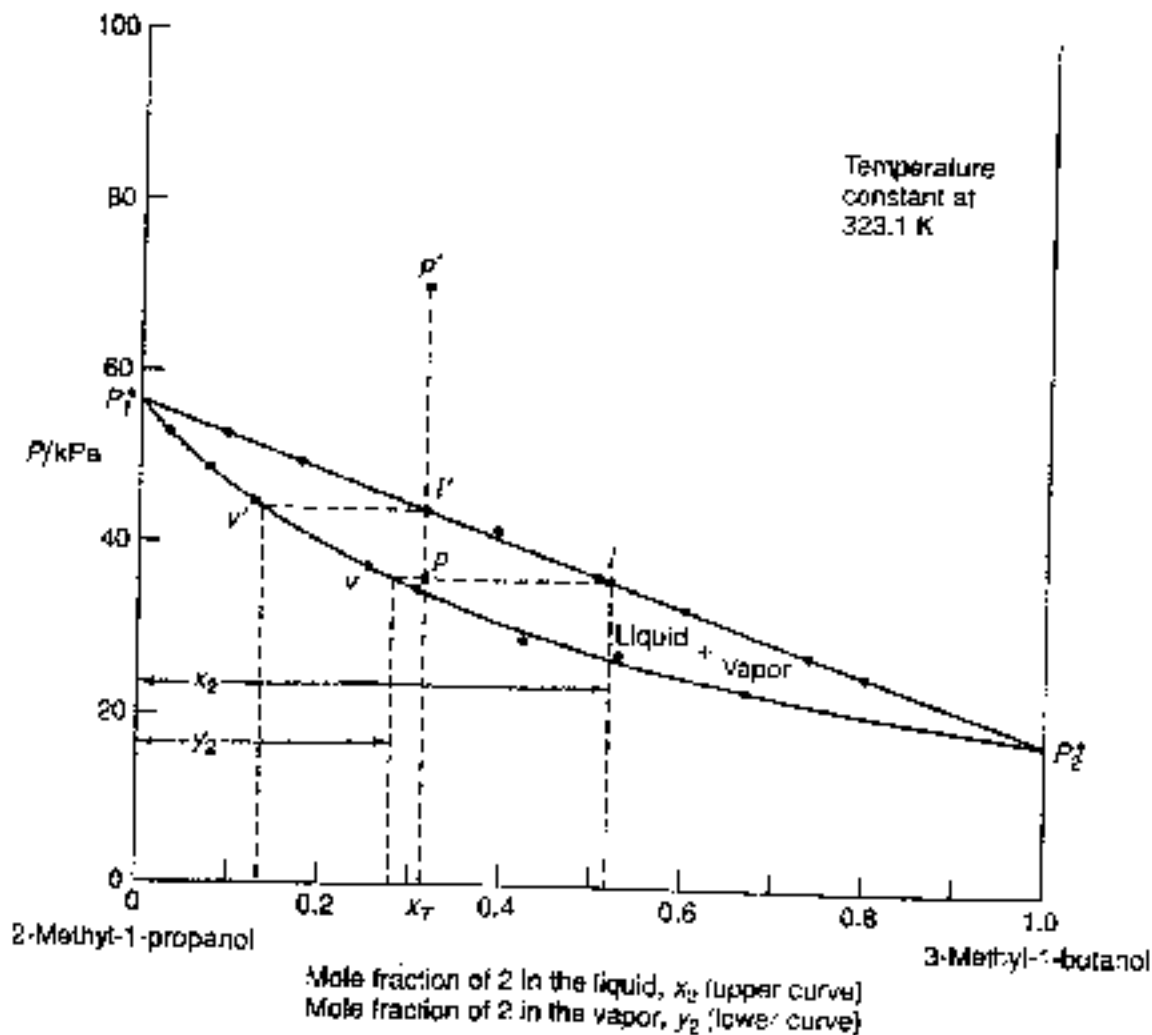


(5%) 10. The figure shown below the pressure-composition diagram for two volatile components showing liquid-vapor equilibrium as a function of vapor pressure and mole fraction for the system isobutyl alcohol (component 1) isoamyl alcohol (component 2) at 323.1 K.

Prove the lever rule

$$\frac{n_l}{n_v} = \frac{\bar{p}_v}{\bar{l}_p}$$

where  $n_l$  denotes the amount (mole) of substrate in the liquid state and  $n_v$  in the vapor state, respectively.



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科目 物理化學(I) 科號 2101 共 3 頁第 3 頁 \*請在試卷【答案卷】內作答  
2201

- (8%) 11. Schematically plot the free energy  $G$  and enthalpy  $H$  vs. temperature for the first-order and second-order phase transitions according to Tisza's theory.
- (6%) 12. The Gibbs energies of formation of  $\text{NO}_2(\text{g})$  and  $\text{N}_2\text{O}_4(\text{g})$  are  $51.30$  and  $102.00 \text{ kJmol}^{-1}$ , respectively (standard state: 1 bar and  $25^\circ\text{C}$ ), at what total pressure is  $\text{N}_2\text{O}_4$  50% dissociated?
- (8%) 13. Derive two different methods of determining the activity coefficients of solutions.
- (5%) 14. Determine the range for the Gibbs energy of mixing for an ideal 50/50 mixture at 300 K.