



Benha university
Faculty of science
Chemistry department

3rd year students
Applied chemistry
Thermodynamic of
solutions

Date : 9-1-2014
Time: 2 hours
Code:335

Answer for four questions only

- 1- Show the relation between lowering of vapour pressure and mole fraction of non-volatile solute(x_2).
- 2- Which of the following derivatives are equal to chemical potentials and which are equal to the partial molar quantity?
 - i- $(\partial A/\partial n_i)_{T,V,n_j}$
 - ii- $(\partial E/\partial n_i)_{T,P,n_j}$
 - iii- $(\partial H/\partial n_i)_{S,P,n_j}$
 - iv- $(\partial E/\partial n_i)_{S,V,n_j}$
 - v- $(\partial H/\partial n_i)_{T,P,n_j}$
 - vi- $(\partial V/\partial n_i)_{T,P,n_j}$
 - vii- $(\partial S/\partial n_i)_{T,P,n_j}$
 - viii- $(\partial G/\partial n_i)_{T,P,n_j}$
- 3- 100 g each of ethanol and methanol are mixed at 20°C to prepare an ideal mixture. The vapour pressure of pure methanol is 88.7 mm and that of ethanol is 44.5 at 20°C
Calculate
 - i) the partial vapour pressure of ethanol and methanol in solution
 - ii) the vapour pressure of solution, and iii) the vapour phase composition.
- 4- Derive the general form of Gibbs-Duhem equation.
- 5- Calculate the enthalpy, entropy and free-energy of mixing of one mole toluene and two mole of benzene at 25°C.

$$R=8.314 \text{ J/K.mol}$$

Good luck