

## Homework 5 – Simple Mixtures

Name: \_\_\_\_\_

**Exercise 5A.8(a)** (5 points)

At 300 K, the partial vapor pressure of HCl (that is, the partial pressure of the HCl vapor) in liquid  $\text{GeCl}_4$  is as follows:

$\chi_{\text{HCl}}$	0.005	0.012	0.019
$p_{\text{HCl}}(kPa)$	32.0	76.9	121.8

Show that the solution obeys Henry's law in this range of mole fractions, and calculate the Henry's law constant at 300 K

**Exercise 5B.2(a)** (5 points)

The vapor pressure of benzene is 53.3 kPa at 60.6°C, but it fell to 51.5 kPa when 19.0 g of a non-volatile organic compound was dissolved in 500 g of benzene. Calculate the molar mass of the compound

**Exercise 5B.8(a)** (5 points)

The enthalpy of fusion of anthracene is  $28.8 \frac{\text{kJ}}{\text{mol}}$  and its melting point is  $217^\circ\text{C}$ . Calculate its ideal solubility in benzene at  $25^\circ\text{C}$ .

**Exercise 5C.3(a)** (5 points)

Phenol and water form non-ideal liquid mixtures. When  $7.32 \text{ g}$  of phenol and  $7.95 \text{ g}$  of water are mixed together at  $60^\circ\text{C}$  they form two immiscible liquid phases with mole fractions of phenol of 0.042 and 0.161. (i) Calculate the overall mole fraction of the phenol in the mixture. (ii) Use the lever rule to determine the relative amounts of the two phases.

**Exercise 5F.2(a)** (5 points)

Substances  $A$  and  $B$  are both volatile liquids with  $p_A^* = 300 \text{ Torr}$ ,  $p_B^* = 250 \text{ Torr}$ , and  $K_B = 200 \text{ Torr}$  (For concentration expressed in mole fraction). When  $\chi_A = 0.900$ ,  $p_A = 250 \text{ Torr}$ , and  $p_B = 25 \text{ Torr}$ . Calculate the activities of  $A$  and  $B$ . Use the mole fraction, Raoult's law basis system for  $A$  and the Henry's law basis system for  $B$ . Go on to calculate the activity coefficients of  $A$  and  $B$ .

**Exercise 5F.7(a)** (5 points)

Estimate the mean ionic activity coefficient ( $\gamma_{\pm}$ ) and activity of a solution at  $25^\circ\text{C}$  that is  $0.010 \text{ mol/kg}$   $\text{CaCl}_2(\text{aq})$  and  $0.030 \text{ mol/kg}$   $\text{NaF}(\text{aq})$ .

## *Slaverships*

By Lucille Clifton

loaded like spoons  
into the belly of Jesus  
where we lay for weeks for months  
in the sweat and stink  
of our own breathing  
Jesus  
why do you not protect us  
chained to the heart of the Angel  
where the prayers we never tell  
and hot and red  
as our bloody ankles  
Jesus  
Angel  
can these be men  
who vomit us out from ships  
called Jesus Angel Grace of God  
onto a heathen country  
Jesus  
Angel  
ever again  
can this tongue speak  
can these bones walk  
Grace Of God  
can this sin live