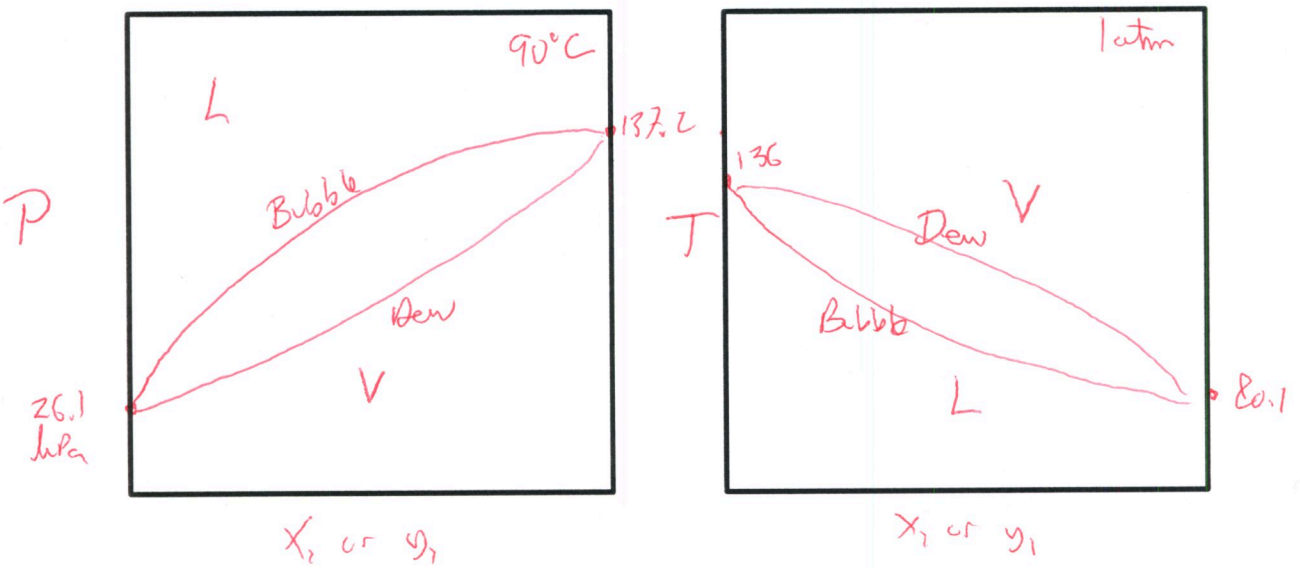
ChBE 3130A Lively Quiz 1 **Date:** Jan 21, 2016

Name: Solution

[5pts] **Problem 1:** Assuming Raoult's law is valid, prepare a *Pxy* diagram for a temperature of 90°C and a *Txy* diagram for a pressure of 101 kPa for the benzene (1) / ethylbenzene (2) system. Label the dew & bubble lines

Data: Normal boiling point, benzene: 80.1°C ; normal boiling point, ethylbenzene: 136°C

p^*(90°C), pure benzene = 137.2 kPa ; p^*(90°C), pure ethylbenzene = 26.1 kPa



[5pts] **Problem 2:** 1 mol of an equimolar ethanol-water liquid mixture are introduced into a drum operating 82.5°C and 1 atm. What are the compositions of the vapor and liquid phases and how many moles go into the vapor phase?

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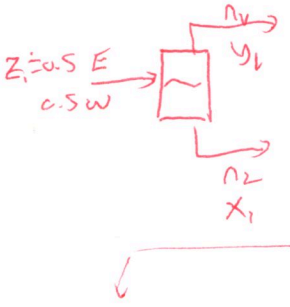


$y_1 = 0.42$ $y_2 = 0.58$

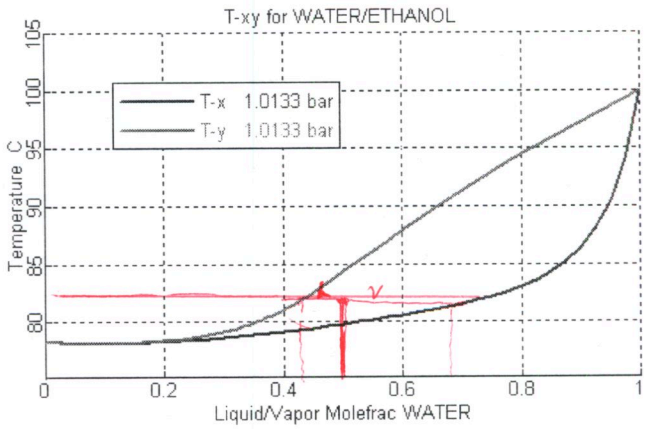
$x_1 = 0.68$ $x_2 = 0.32$

0.5

$0.5 = 0.42 n_V + 0.68 n_L$

$n_F = n_V + n_L$

$1 = n_V + n_L$



$n_V = 1 - n_L$

$0.5 = 0.42(1 - n_L) + 0.68 n_L$

$0.5 = 0.42 - 0.42 n_L + 0.68 n_L$

$0.08 = 0.26 n_L$

$n_L = 0.30$ mol

$n_V = 0.70$ mol

3 pts

L = 6mm

L + V = 24mm

$f = 6/24 = 0.25$

$\therefore$ $f = 0.25$ mol

(will accept both)