

1. 25 points

In a binary solution, a certain partial molar property, m , for each component can be written:

$$\begin{aligned}\bar{m}_1 &= Ax_2^2 \\ \bar{m}_2 &= Bx_1^2\end{aligned}$$

where A & B are constants.

a. 15 points

How must A be related to B?

b. 10 points

What is m (the molar property of the solution) in terms of x_1 , x_2 , and A?

2. 50 points

a. 40 points

On the attached graph paper, draw the P versus x_1 & y_1 for the mixture carbon tetrachloride (1)/chloroform (2) system at 100°C given the pure component vapor pressures:

$$\log_{10} P = (-0.2185 A/K) + B$$

where:

P = torr (mmHg absolute)
A = const
B = const
K = temperature in °K

	A	B
carbon tetrachloride (1)	7628.8	7.586045
chloroform (2)	7500.5	7.735083

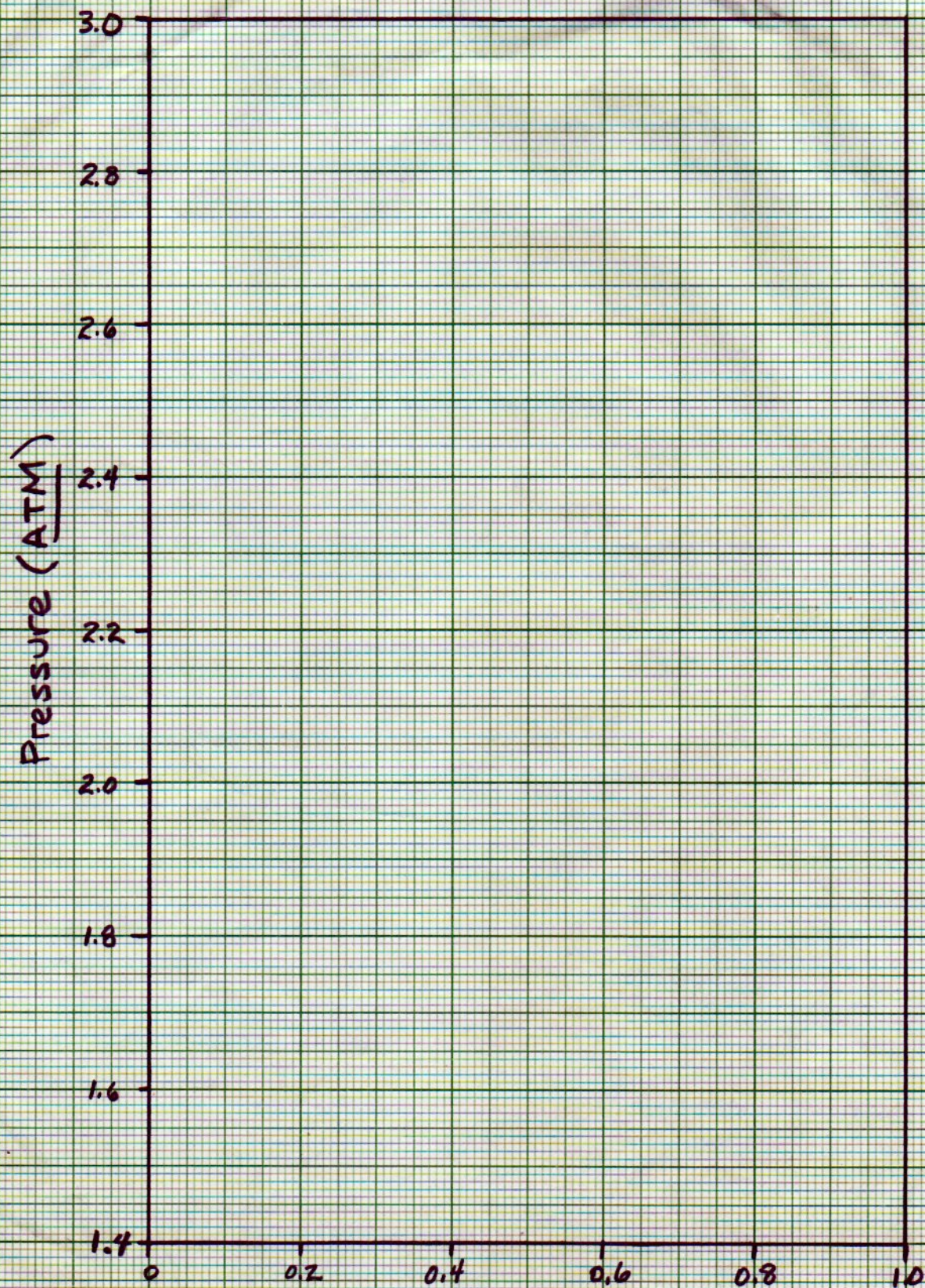
Assume Raoult's Law holds. Label the vapor and liquid curves.

b. 10 points

Four moles of carbon tetrachloride and six moles of chloroform are mixed and the system equilibrated at 100°C and 2.40 atm. What is the composition of the vapor and the liquid? How many moles of chloroform are in the vapor and how many in the liquid?

3. 25 points

Calculate the fugacity of liquid chloroform at 100°C and 100 atm. The density of liquid chloroform at 100°C is 1.4 gr/cm³ (independent of pressure), the molecular weight is 119.4 gr/mole, and the fugacity coefficient of chloroform vapor at 100°C and 2.900 atm is 0.9.



$x, y,$