

Chemistry 236

Binary System Liquid-Vapor Equilibrium Study Problems -- Answers

- b. The vapor pressure of the mixture is $P_A + P_B$, with these partial pressures given by Eqns. (1-3). The mole fractions of hexane and heptane are calculated to be 0.445 and 0.555 for the given mixture.
- c. The partial pressures of benzene and toluene are again calculated from Raoult's Law, yielding a total pressure of 55 torr. The mole fraction in the gas phase for each component is $x_{i,v} = P_i/P$ (Dalton's law of partial pressures).
- (a) $P_A^* = 344.5$ torr; $P_B^* = 293$ torr.

(b) $P_A = 108.3$ torr; $P_B = 139.7$ torr. [from Dalton's law and the given composition of the gas.]

$$P_{A,id} = x_{A,\ell} P_A^* = 144.3 \text{ torr}; \quad P_{B,id} = 170.3 \text{ torr.}$$
$$a_A = x_{A,\ell} P_A / P_A^* \quad A = P_A / P_{A,id} = 0.751; \quad B = 0.820.$$

[Note: See p. 287 of Levine, 5th edit.]

(c) Acetone-chloroform solutions display significant negative deviations from ideality.
- (a) The cold trap collects condensible vapors.

(b) At the very low T of liquid N_2 , all but the simplest common gases have very low vapor pressures, so they deposit on the glass walls as solids (usually) or liquids (sometimes).

(c) The cold trap keeps the trapped substances from getting into the vacuum pump and contaminating the pump oil. It also keeps pump vapors from getting into the vacuum manifold, which they would otherwise do by a process called backstreaming.
- (a) Quadratic is better, because cubic coefficient is statistically undefined.

$$s_y = 0.00033.$$

(b) $x_{ace} = 0.4212$