

4d) a) $\text{NH}_3 - \text{NH}_3$ has hydrogen bonding between molecules

b) $\text{CH}_3\text{CN} - \text{CH}_3\text{CN}$ is polar while CH_2CH_3 is non polar

c) $\text{CH}_3\text{CO}_2\text{H}$ - has hydrogen bonding between molecules

4e) * as length of hydrocarbon chain increases solubility decreases.

* the $-\text{OH}$ end of alcohols can H-bond with water, but the long hydrocarbon chain is nonpolar and interacts poorly with water

* the effect of the $-\text{OH}$ decreases as the alcohol gets larger

4a) $P = nC$

$$0.790 \text{ atm} = n \left(8.21 \times 10^{-4} \frac{\text{mol}}{\text{L}} \right)$$

$$n = 962 \frac{\text{atm L}}{\text{mol}}$$

$$P = nC$$

$$1.10 \text{ atm} = n \left(1.04 \times 10^{-4} \frac{\text{mol}}{\text{L}} \right)$$

$$n = 1.06 \times 10^4 \frac{\text{atm L}}{\text{mol}}$$

$$51) \text{ mole } C_3H_8O_3 = 164 \frac{\text{mole}}{92.09g} = 1.78 \text{ mole } C_3H_8O_3$$

$$\text{mole } H_2O = 338 \text{ ml } \frac{0.992g}{1 \text{ ml}} \bigg/ \frac{18.02g}{1 \text{ mole}} = 18.6 \text{ mole } H_2O$$

$$P_{\text{soln}} = \left(\frac{18.6}{18.6 + 1.78} \right) (54.74 \text{ torr}) = 50.0 \text{ torr}$$

$$52) P_{\text{soln}} = \chi_{\text{solu}} \cdot P_{\text{solu}}$$

$$710.0 \text{ torr} = \chi_{\text{solu}} \cdot 760.0 \text{ torr}$$

$$\chi_{\text{solu}} = 0.9342$$

$$56) 25.8g \text{ } C_4H_{10} \frac{1 \text{ mole}}{60.06g} = 0.430 \text{ mole } C_4H_{10}$$

$$275g \text{ } H_2O \frac{1 \text{ mole}}{18.02g} = 15.3 \text{ mole } H_2O$$

$$\chi_{H_2O} = \frac{15.3}{15.3 + 0.430} = 0.973$$

$$P_{\text{soln}} = (0.973)(23.8 \text{ torr}) = 23.2 \text{ torr @ } 25^\circ C$$

$$P_{\text{soln}} = (0.973)(71.9 \text{ torr}) = 70.0 \text{ torr @ } 45^\circ C$$

$$57) \quad a) \quad 25 \text{ ml } C_5H_{12} \quad \frac{0.63 \text{ g}}{1 \text{ ml}} \cdot \frac{1 \text{ mol}}{72.15 \text{ g}} = 0.22 \text{ mol } C_5H_{12}$$

$$45 \text{ ml } C_6H_{14} \quad \frac{0.66 \text{ g}}{1 \text{ ml}} \cdot \frac{1 \text{ mol}}{86.17 \text{ g}} = 0.34 \text{ mol } C_6H_{14}$$

$$\chi_{C_5H_{12}} = \frac{0.22}{0.22 + 0.34} = 0.39$$

$$\chi_{C_6H_{14}} = \frac{0.34}{0.22 + 0.34} = 0.61$$

$$P_{C_5H_{12}} = \chi_{C_5H_{12}} \cdot P_{C_5H_{12}}^* = (0.39)(511 \text{ torr}) = 200 \text{ torr}$$

$$P_{C_6H_{14}} = \chi_{C_6H_{14}} \cdot P_{C_6H_{14}}^* = (0.61)(150. \text{ torr}) = 92 \text{ torr}$$

$$P_{\text{tot}} = P_{C_5H_{12}} + P_{C_6H_{14}} = 200 + 92 = 290 \text{ torr}$$

b) $P \propto n$ moles

$$\chi_{C_5H_{12}}(v) = \frac{n_{C_5H_{12}}}{\text{total } n} = \frac{P_{C_5H_{12}}}{P_{C_6H_{14}}} = \frac{200}{290} = 0.69$$