

Chemistry 342  
Spring, 2001  
Problem Set 10

Due Wednesday, November 14.

Read Chapter 7.1-7.3

Do exercises 1b, 2b, 3b and 4b. Also do problems 1, 2, and 15. In problem 15, it is very helpful first to convert the mole fractions to ratios of mole numbers..

Also, answer the following questions:

1. Suppose that  $V_A = V_{A,m} + c_1b + c_2b^2$ , where  $b$  is the molality of A. Derive an expression for  $V_B$  and the total volume,  $V$ , in terms of the mole numbers,  $n_A$  and  $n_B$ , and the constants  $c_1$  and  $c_2$ .
2. The density of a methanol-water solution that is 12.0% methanol by weight equals  $0.97942 \text{ gm/cm}^3$ . The density of a 13% solution is  $0.97799$ . Calculate the partial molar volumes of methanol and water. (You may assume that the partial molar volumes are the same in both solutions.)
3. The vapor pressure of benzene at 20 C is 74.7 Torr, and that of toluene is 22.3 Torr. A certain solution of benzene and toluene at 20 C has a vapor pressure of 46.0 Torr. Calculate the mole fraction of benzene in the liquid and vapor phases.