Exercise A.1: Use Trouton's Law and the fact that the boiling point of benzene is 353 K to estimate the vapor pressure of benzene at 298 K.

Exercise A.2: What is the partial pressure of a drop of cyclohexane of radius 100. nm at 293 K. Given: the density of liquid cyclohexane is 0.778 g/mL, the vapor pressure is 78 Torr, and the surface tension is 0.025 J/m^2.

Problem 1. What is the equilibrium partial pressure of SF_6 vapor at 150.00 K for a spherical crystal of radius 10.0 nm (Dr. Dibble did experiments on crystals this size!)

Given: the sublimation temperature of SF_6 is -63.50 ˚C, and its vapor pressure equals 10 Torr at -114.70 ˚C. For SF_6, $\rho(s)$ = 2.73 g/mL and the surface tension is 0.030 J/m^2.

Exercise B. Starting with 100.00 grams of water, ethanol was added to make a series of solutions of increasing methanol concentration.

a) compute the partial molar volume of ethanol (in mL/mole) at mass fraction ethanol of 0.025

b) compute the number to fill in the blanks of the last two rows

c) compute the partial molar volume of ethanol (in mL/mole) at mass fraction ethanol of 0.165

Mass fraction ethanol	Mass of ethanol (g)	Moles of ethanol	Total volume (mL)	Density (g/mL)
0.02	2.041	0.044	102.421	0.99629
0.03	3.093	0.067	103.662	0.99451
0.16	19.048		122.025	
0.17	20.482		123.659	

Problem 2. Use the data in the Table at right to compute the chemical potential of A in a mixture of A and B at:

a) n_A = 0.115 moles

b) n_A = 1.505 moles

c) n_A = 2.405 moles

Moles of A	G(Total, Joules)
0.11	-7782
0.12	-7855
1.5	-11866
1.51	-11876
2.4	-12190.7
2.41	-12188.9

Exercise C. Mercury has a density of 13.53 g/mL and a surface tension of 0.43 J/m^2. It is more strongly attracted to itself than to glass, so it will exhibit capillary fall rather than rise. What is its capillary fall in a tube of radius 1.0 mm?

Problem 3. The observed capillary fall for mercury is 3.2 cm. What is the radius of the tube?

Exercise D. Exercise 5.8 of the 8th or 9th editions of the textbook.

Problem 4. A box containing 2.00 moles of He at 1.00×10^5 Pa and 298.15 K is mixed with a box containing 0.50 moles of Ar at 1.00×10^5 Pa and 298.15 K.

a) Why is it reasonable to treat these gases as ideal?

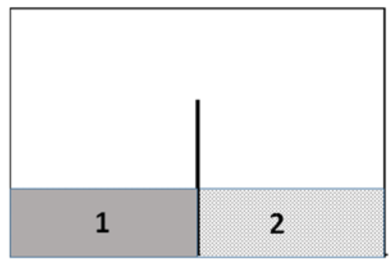
b) Calculate the entropy and Gibbs free energy of mixing.

Exercise E.1 Consider a solution that has 5 mole % n-hexane in n-pentane at 298 K. P* for n-pentane is 420 Torr and for n-hexane P* is 153 Torr.

Assuming this solution behaves ideally, what is the partial pressure of n-pentane and n-hexane in equilibrium with the solution.

Exercise E.2 Consider the box at right with two separated solutions at 298 K. Compartment 1 has pure n-pentane and compartment 2 has 5 mole % n-hexane in n-pentane.

As it approaches to equilibrium, will either compartment increase the amount of n-hexane and/or n-pentane? Explain.



Problem 5. Consider a box like the one above, but for the various conditions below. Assume any solution acts as an ideal solution. Indicate whether any component will be transferred from one compartment to the other, which way it will be transferred, and explain your logic.

Condition	Compartment 1	Compartment 2
1	Water ice at 270. K	Water liquid at 270. K.
2	5 mole % benzene in n-pentane at 298 K	5 mole % n-hexane in n-pentane at 298 K
3	Liquid benzene at P_{ext}=50 bar and 298 K	Liquid benzene at P_{ext}=1 bar and 298 K
4	0.5 molal NaCl in water at 298 K	Liquid water at 298 K

Exercise F. Using the phase diagram of sulfur at https://socratic.org/questions/how-would-you-explain-the-phase-diagram-of-sulphur, determine and EXPLAIN if the rhombic or monoclinic phase of S has the larger molar volume.

Problem 6. As Exercise F, but explain which phase has the larger molar entropy

Review Exercise:

1) Consider a sample of pure liquid water at 25 °C under external pressure P. Given that $\mu - \mu^\circ = 1825$ J/mole, determine the pressure P.