# CHE221A
# Assignment 8
## Questions

1. Consider a binary mixture of n-propanol and water in vapor-liquid equilibrium (VLE). Let n-propanol be designated species 1 and water, species 2. A plot of the activity coefficients for this system at 100°C follows. The Lewis/Randall reference state is chosen for both species. The mole fraction of n-propanol in the liquid, $x_1$ is 0.2, and the temperature is 100°C. The saturation pressure of n-propanol at 100°C is 1.12 bar.

    (a) Label the curve that corresponds to the activity coefficient for n-propanol, $y_1$, and the curve that corresponds to the activity coefficient for water, $y_2$ Explain.
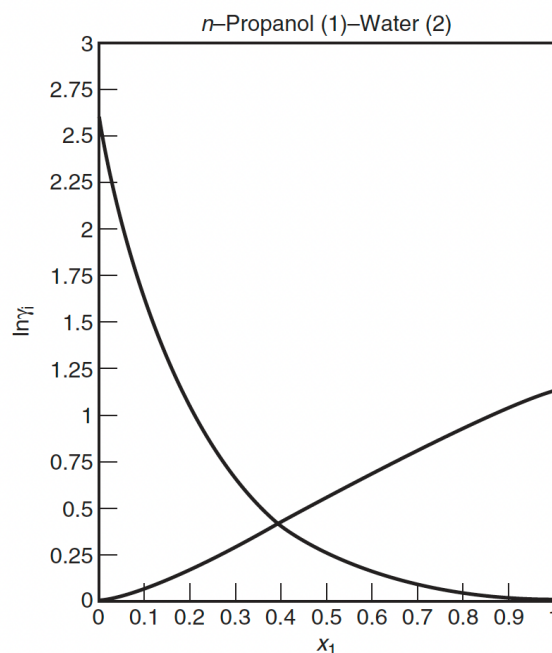
    (b) Are like or unlike interactions stronger? Explain.

    (e) Find the total pressure of the system.

    (d) Find the mole fraction of n-propanol in the vapor phase.

    (e) Estimate the value of the Henry's law constant of n-propanol in water, $H_1$
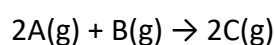
    (f) Does this system exhibit an azeotrope? Explain.



n–Propanol (1)–Water (2)

2. The Gibbs energies for the liquid phase and the vapor phase vs. mole fraction of a for two systems (system I and system II) follow. These plots are at constant temperature and pressure. What type of behavior does each of these plots correspond to?
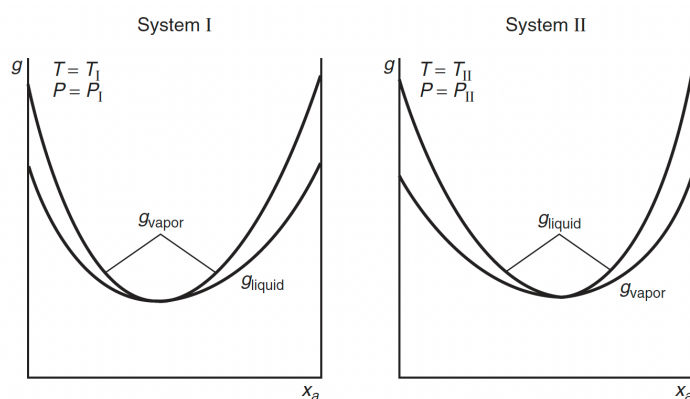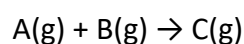


3. Consider the following reaction:

$$2A(g) + B(g) \rightarrow 2C(g)$$

The Gibbs energy of reaction at 298 K is determined to be $\Delta g^0_{rxn,298}$ = -1,000 J/mol, and at a given temperature, the equilibrium constant is reported to be $K_T$ = 16. Now consider the reaction is written as follows:

$$A(g) + 0.5\ B(g) \rightarrow C(g)$$
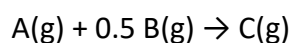
What are the values of $\Delta g^0_{rxn,298}$ = and $K_T$?

4. At 300 K and 1 bar, the equilibrium constant for the following reaction:
$$A(g) + B(g) \rightarrow C(g)$$
Is reported to be 10. What is the equilibrium constant at 300 K and 10 bar? You may assume ideal gas behavior.