Chemistry 230 -- Quiz 8

October 31, 2001 — Tellinghuisen

Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

1. (4) Give the number of degrees of freedom f for each of the following systems:

   (a) An aqueous solution of sucrose in equilibrium with solid sucrose and water vapor: _____

   (b) An aqueous solution of KBr and NaCl in equilibrium with water vapor: _____

   (c) Liquid water and liquid benzene (mutually almost completely immiscible): _____

   (d) $CaCO_3(s)$ in equilibrium with $CaO(s)$, $CO_2(g)$, $CaCO_3(g)$, and $CaO(g)$: _____

2. (2) For each pair, state which substance has the greater $H_{m,vap}$ at its normal boiling point:

   (a) Ne or Ar _____ (b) H_2O or H_2S _____

3. (2) For the H_2O phase diagram, state the number of degrees of freedom

   (a) at the triple point _____ (b) along the solid/vapor line _____

4. (4) <u>True or False</u>: (All of these concern ideal-gas chemical reactions.)

   (a) If $G° > 0$, then no products can form when the reaction is run at constant T and P: _____

   (b) In a closed system with P-V work only, G is always minimized at equilibrium: _____

   (c) S of a closed system can decrease substantially in an irreversible process: _____

   (d) $G°$ for an ideal-gas reaction is a function of T and P: _____

5. (2) Suppose the standard state for ideal gases were changed from $P° = 1.00$ bar to $P° = 1000$ torr. Indicate (yes or no) whether $K_P°$ would change as a result of this, for each of the following:

   (a) $H_2(g) + Cl_2(g)$ $2 HCl(g)$: _____ (b) $N_2O_4(g)$ $2 NO_2(g)$: _____

6. (15) Equilibrium data for a certain gas-phase reaction are found to fit the following expression:

$$\ln K_P° = a + b/T + c \ln T.$$

where a, b, and c are fitted parameters, and T is the temperature in K. Obtain expressions for $G°$, $H°$, and $C_P°$ for this reaction.