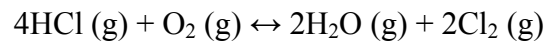


**King Fahd University of Petroleum & Minerals**  
**Chemical Engineering Department**  
**CHE 303 – Chemical Engineering Thermodynamics II**  
**2008 - 2009 (082)**

**HW#11**

Submission Not Required

The following reaction reaches equilibrium at 500 °C and 2 bar:



If the system initially contains 5 mol HCl for each mole of O<sub>2</sub>, perform the following tasks:

- (a) Develop expressions for the mole fractions of each species as functions of the reaction coordinate.
- (b) Calculate the reaction equilibrium constant at the above conditions (do not assume  $\Delta H_r$  constant). Use this answer for parts (d) and (e).
- (c) Repeat (b) by assuming  $\Delta H_r$  constant.
- (d) Assuming that the reaction mixture forms an ideal solution, calculate the reaction equilibrium coordinate and the equilibrium conversion of HCl.
- (e) Repeat (d) by assuming ideal gases.