South Dakota School of Mines and Technology
Department of Materials and Metallurgical Engineering

MET 320 HQ 3 Dec 6, 2007
(Data from the text and Hultgren were provided)

1. a) Referring to Table 8.1, cite the gases that exhibit a two phase gas-liquid behavior at room temperature (298 K).

b) Telemetry from the Space Shuttle oxygen tank shows T= 184 K and P = 149 atm. How many gram moles of oxygen remain in the 30-Liter tank?

2. Show on the attached Ellingham Diagram
The pressure of O_2 in equilibrium with Si and SiO_2 at 1300°C

a) The H_2/H_2O ratio in equilibrium with Si and SiO_2 at 1300°C

b) The CO/CO_2 ratio in equilibrium with Si and SiO_2 at 1300°C

c) Estimate the for one gram mole of Mg
i) Heat of Fusion

ii) Heat of Vaporization.

3. Solve for the equilibrium moles of HI at 500 K and total pressure of 5 atm.

$$H_{2\,(g)} + I_{2\,(g)} = 2\ HI_{(g)} \qquad \Delta G^{o} = -RT \ln K = \text{(see text)}$$

The table below shows the number of moles of each component initially.

Species	Initial Moles		
HI	3		
H_2	10		
I_2	4		
total			

4. Calculate the Gibbs energy change for the oxidation of pure, liquid Mg with Cl_2 at a pressure of $1x10^{-8}$ atm to form pure, solid $MgCl_2$ oxide at 1200 K. Use the data from Table A-1 in the text.

5. What is the ΔH of for the following scenarios? (Use the handouts from class for data.)
   a) Three moles of liquid Al at 1273 K mix with 7 moles of liquid Ag at 1273 K.

   b) Two moles of liquid Al at 1273 mix with a million moles of Ag-Al alloy at 1273 K with a mole fraction of 0.3 Al.