SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY
DEPARTMENT OF METALLURGICAL ENGINEERING

MET 320 Short Exam 4b Dec. 6, 2012

Closed Book - No Calculators - No Notes

Constants:

R = 1.987 cal/K•gmole = 8.31 J/K•gmole; $\mathcal{F}$ = 96,525 Joule/(volt*Equivalent)

1. (25 points) ***Sodium Production by Electrolysis***

$$2\,Na_{(l)} + Cl_{2(g)} = 2\,NaCl_{(l)} \qquad \Delta G^\circ_{1000\,K} = -152{,}400 \text{ cal/gmole}$$

   a) Calculate the cell potential for the electrolysis of pure, liquid NaCl at 1000 K to form Cl_2 at 1 atm and pure, liquid Na.
   b) How would the cell potential change if the Na were in a solution having an activity of Na of 0.01 relative to pure, liquid Na?

Ans a

Ans b

2. (10 points) ***Heat of Mixing***

Use the data given below for the liquid Cu-Sb system at 1190 K to determine the enthalpy change when 4 moles of liquid Sb at 1190 K are dissolved in 1,000,000 moles of Cu-Sb alloy at 1190 K having a mole fraction of Cu of 0.6.

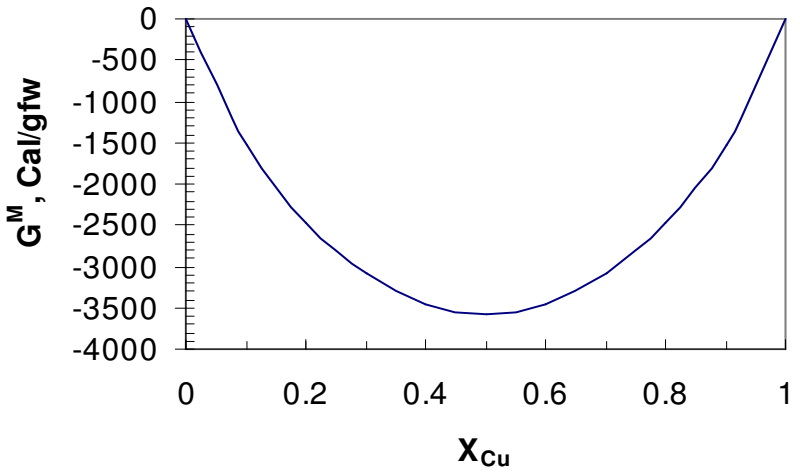
Data for the Liquid Cu-Sb System at 1190 K

X_{cu}	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
H^M (cal/mole)	-983	-1474	-2399	-2458	-2487	-2017	-1586	-978	98
H^M_{Sb} (cal/mole)	81	266	465	698	1093	1053	-66	-2929	-6800

3. (15 points) ***<u>Activity and Activity Coefficient from Integral Molar Gibbs Energy</u>***
Show how to find the activity **<u>and</u>** the activity coefficient of Au in a liquid Au-Cu alloy at 1550 K that is 40 atomic percent Cu from the following data:

Gibbs energy of Mixing for the Liquid Au-Cu System at 1550 K

X_{Cu}	G^M
0	0
0.1	-1519
0.2	-2461
0.3	-3089
0.4	-3453
0.5	-3572
0.6	-3453
0.7	-3089
0.8	-2461
0.9	-1519
1	0



Gibbs Energy of Mixing for theLiquid Au-Cu System at 1550 K

Extra paper (use as needed)

Scratch Paper - discard