

3. Write the Fundamental Equations.

$$dU = TdS - PdV$$

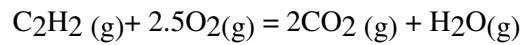
$$dH =$$

$$dA =$$

$$dG =$$

4. Water for your mountain climbing party's tea boils at 90 °C. What is the atmospheric pressure at your location?

5. Find the adiabatic flame temperature for the combustion of C_2H_2 with pure O_2 . The O_2 and the C_2H_2 start at 800 K. Use the data provided below only.



Species	Heats of Formation (calories/g mole at 298°K)	C_p (cal/ gmole °K)
$C_2H_2(g)$	54,190	19.0
$H_2O(g)$	-57,800	10.5
$CO_2(g)$	-94,000	13.6
$O_2(g)$		8.6
$N_2(g)$		7.0

6. What pressure of O_2 would be required to oxidize pure, solid Ag to pure, solid Ag_2O at 400 K?
7. Pure, liquid PbO at 1200 K is to undergo electrolysis to form O_2 gas at a pressure of 0.003 atm and pure, liquid Pb. What cell potential is needed?

8. Use the data given below for the liquid Cu-Sn system at 1400 K to determine the enthalpy change when (assume all components start in the liquid state at 1400 K)

a) 60 moles of Sn and 40 moles of Cu are mixed at 1400 K

b) 2 moles of Sn are dissolved in a large quantity of Cu-Sn alloy having a mole fraction of Cu of 0.9.

Heats of Mixing for Liquid Cu-Sn Alloys at 1400 K

X_{Sn}	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
H^M (cal/mole)	-666	-979	-934	-715	-475	-264	-97	13	52
H_{Sn}^M (cal/mole)	-5233	-1901	252	706	681	506	311	176	49

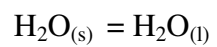
9. Can one set both the temperature and the pressure in a system composed of $CaO_{(s)}$, $CaCO_{3(s)}$, $CO_{2(g)}$, and $N_{2(g)}$? Show work.

10. Short answer:

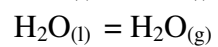
- a) What condition must exist if one is to compute activities from the phase diagram using the formula?

$$\ln a_i = \frac{\Delta H_{fusion, T_f}^o}{R} \left[\frac{1}{T_f} - \frac{1}{T_l} \right] + \frac{A - C - BT_l}{R} \left[1 - \frac{T_f}{T_l} \right] + \frac{A - C}{R} \ln \left[\frac{T_f}{T_l} \right] + \frac{B}{2RT_l} [T_l^2 - T_f^2] ?$$

- b) What is the difference between ΔG and ΔG° ?
- c) How does one get one partial molar quantity from another?
- d) What is the Relative partial molar heat of mixing for an Ideal solution?

DATA:

$$\Delta H^\circ = 6,028 \text{ J/gmole}$$



$$\Delta H^\circ = 43,267 \text{ J/gmole}$$

Constants:

$$R = 1.987 \text{ cal/K}\cdot\text{gmole} = 8.31 \text{ J/K}\cdot\text{gmole}$$

$$F = 23,059 \text{ cal/volt}\cdot\text{gram equivalent} = 96,487 \text{ Joule/volt}\cdot\text{gram_equivalent}$$

Scratch Paper: