Problem Session # 8

1) Calculate the change in the Helmholtz energy for the reversible isothermal compression of mole of an ideal gas from 100.0 L to 22.4 L. Assume that the temperature is 298 K.

2) Determine ΔG_r (25°C=298 K) for the following chemical reaction using both methods for determining ΔG_r, and show that they yield the same answer. Assume standard conditions.

$2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (l)$

	H_2 (g)	**O_2 (g)**	**H_2O (l)**
ΔH_f , kJ/mol	0	0	-285.83
S, J/mol.K	130.68	205.14	69.91
ΔG_f , kJ/mol	0	0	-237.13

3) Helium is expressed isothermally and reversibly at 100^0C from a pressure of 2 bar to 10 bar. Calculate

a) Q per mole

b) W per mole

c) $\Delta \bar{G}$

d) $\Delta \bar{A}$

e) $\Delta \bar{H}$

f) $\Delta \bar{E}$

g) $\Delta \bar{S}$

4) Toluene is vaporized at its boiling point, 111°C. The heat of vaporization at this temperature is 361.9 $J.g^{-1}$. For the vaporization of toluene, calculate

a) W per mole

b) Q per mole

c) $\Delta \bar{H}$

d) $\Delta \bar{E}$

e) $\Delta \bar{G}$

f) $\Delta \bar{S}$

5) a) Liquid water at 100°C is in equilibrium with water vapor at 1 atm pressure. If the enthalpy change associated with the vaporization of liquid water at 100°C is 40.60 kJ.mol^{-1}, what are ΔG and ΔS?

b) Suppose that water at 100°C is in contact with water vapor at 0.900 atm. Calculate ΔG and ΔS for the vaporization process.