Department of Physics, University of Maryland, College Park, MD 20742-4111

Physics 404 **HOMEWORK ASSIGNMENT #6** **Fall 2014**

Due date: Tuesday, Oct. 21 **Deadline:** Thursday, Oct. 23

1. (10) 4.15 Thermodynamics of an absorption refrigerator. Start by drawing an energy-flow diagram.

1. (10) 5.6 (cf. 1.51) Describing operation of a muscle as a fuel cell. Hint: $\Delta H = -2803$ kJ.

3. (10) 5.13 and 5.14 d, e (a, b, c done in class) Another Maxwell relation problem and exploring the implications of the result 5.14c obtained in class.

4. (10) 5.16 Similar to 5.14 a,b,c, but for isothermal and adiabatic compressibilities, to make sure you understand 5.14 a,b,c. Do NOT do the ideal gas part, but note that in this special case $\kappa_S = 1/\gamma p$ (and you should have found κ_T in the previous problem).

   Hints: Consider V as V(p,T) and expand dV. Note that one term is essentially κ_T. To deal with the other term, consider T as T(p,S) and expand dT and plug back in to find $(\partial V/\partial p)_S$, using dS = 0 in the dT expansion. Show

   $$\kappa_T - \kappa_S = \beta\,(\partial T/\partial p)_S$$

   Then use a Maxwell relation to get the given result.

   Again, the ideal gas part is not assigned.

5. (5) 5.20 Examining the free energy of a simple system.

6. (5) 5.28 Calcite and aragonite: extension of analysis of diamond and graphite.

Students who have taken PHYS 411 would do well to look at 5.17 (also 5.47). Some results, for general information are: $dU = T\,dS + \mu_0 \mathscr{H}\,dM$ and $dG = -S\,dT - \mu_0 M\,d\mathscr{H}$

For those of you who are interested in Stirling engines, note problem 4.21.