

Problem Set #10

Physics 436

Friday, 01 April 2022

The following problems come from Schroeder's *An Introduction to Thermal Physics*:

- Problem 5.1 on page 152 (*10 points*) \Rightarrow This problem will give you a feel for the size of the thermodynamic potentials of a mole of monatomic ideal gas. You will need to evaluate the entropy of an ideal gas. Because we did not go through the derivation of S in class, just use the result. The Sackur-Tetrode equation is given by equation (2.49) on page 77.
- Problem 5.2 on page 152 (*10 points*) \Rightarrow This is the one chemistry problem you need to do from Chapter 5. It is a short problem that gives you more practice using the table on pages 404-405.
- Problem 5.15 on page 159 (*15 points*) \Rightarrow You will derive the same result for $C_P - C_V$ that we derived in class. Your starting point will, however, be different. You might begin with the definition of C_P in terms of the enthalpy. Also needed are the total differentials of $U = U(T, V)$ and $V = V(T, P)$. Use what we did in class to finish the problem. This is a problem where you simply need to play with the various derivatives until the desired result falls out.
- Problem 6.1 on page 224 (*15 points*) \Rightarrow This problem will get you reacquainted with the Einstein solid. Feel free to use your *Mathematica* file or spreadsheet file from Problem 2.10.
- Problem 6.2 on page 224 (*10 points*) \Rightarrow This short problem shows you how the Helmholtz free energy enters into the Boltzmann factor when states are degenerate.

Due date: **Friday, 08 April 2022**