Problem Set #11
Physics 436

Friday, 08 April 2022

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

- Problem 6.3 on page 225 (*10 points*) ⇒ Make a nice computer plot of $Z(T)$ versus T using real temperature units. Use the range $0\,\mathrm{K} \leq T \leq 300,000\,\mathrm{K}$.
- Problem 6.12 on page 228 (*10 points*) ⇒ Read page 226 to the top of page 227. Be very careful with equation (6.11) on page 226. The ratio in that equation involves probabilities for given quantum *states*. It does *not* represent the ratio of the probability of an atom (or molecule) having an *energy* E_2 to the probability of an atom (or molecule) having an *energy* E_1. If you want a probability ratio involving *energies*, you need to include *degeneracy*. Read the paragraph under equation (6.11) *very carefully*. After finding the temperature in this problem, comment on whether or not it is in the ballpark of what you expected. What is the "reservoir" to which the problem statement refers?
- Problem 6.20 on page 233 (*15 points*) ⇒ You should find that our new statistical mechanics techniques help get results much faster than you were able to get them in Problem 3.25. Go ahead and do part (e), especially if you were unsuccessful getting it when you did Problem 3.25. To understand the two limiting cases, go back and read pages 92 and 95 again.
- Problem 6.31 on page 240 (*10 points*) ⇒ You should not have to do an integral in this problem!
- Problem 6.34 on page 246 (*10 points*) ⇒ This is an easy problem. Make a very nice graph!
- Problem 6.39 on page 246 (*10 points*) ⇒ Feel free to use *Mathematica* for the integrals. Be sure to turn in a copy of your code.

Due date: **Friday, 15 April 2022**