M513 Equilibrium Statistical Mechanics and Kinetic Theory Ninnat Dangniam

Homework Assignment 2

DUE: Thursday 5 Jan? 60 points

1. Entropy of mixing (10 points). Pathria 3.13.

You may use the partition function for the ideal gas in the *canonical ensemble* computed in the lectures or given on p.55 of Pathria.

For part **(a)**, compute the Helmholtz free energy F, the internal energy E, the pressure P, and the entropy S of the mixed gas.

For part **(b)**, is there an entropy difference between the two cases if the two species of gas molecules have the same mass?

2. Relativistic gas I (10 points). Pathria 3.15

3. Relativistic gas II (10 points). Pathria 3.24

4. Electric dipoles in an external field (10 points) Pathria 3.35.

5. Mean force between dipoles (10 points) Pathria 3.36

6. Magnetic susceptibility (10 points) Pathria 3.43