Phys 741
Statistical Mechanics
Problem Set # 4

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1. A lattice gas consists of N_0 sites, each of which may be occupied by at most one atom. The energy of a site is ε if occupied and 0 if empty. Assuming all atoms are indistinguishable,
   (a) Calculate the grand partition function $Z(z,T)$ at fugacity z and temperature T
   (b) What fraction of the sites are occupied
   (c) Find the average energy of the lattice gas
   (d) Find the heat capacity as a function of T at fixed z
2. Pathria 4.1
3. Pathria 4.4
4. Pathria 4.12
5. Show that for an ideal gas, the grand canonical partition function can be written as

$$Z(V,T,\mu) = \exp(e^{\beta\mu}\frac{V}{\lambda^3})$$

Good Luck