Homework: due at the beginning of class, Thursday April 21

1. Starting with the formula for the density function for non-relativistic, low-density gas, integrate the function to find the total number density of particles, then invert this to derive an expression for the chemical potential of Helium atoms.

2. Following the class notes, rederive the Saha equation giving the ionization state of a gas atom at equilibrium at some temperature $T$. Look up characteristics of the sun (temperature, density, etc.) on the Internet and use the Saha equation to derive:

   (a) The mass fraction of ionized Hydrogen (relative to all Hydrogen in the form of protons or atomic Hydrogen) in the core of the sun.

   (b) The same mass fraction of ionized Hydrogen in the photosphere of the sun (use the surface temperature) the ratio of helium to helium nuclei and electrons).

   (c) The mass fraction in the solar corona (assume thermal equilibrium using the corona temperature and density).

3. Problem 3 in Chapter 4 of Rose.

4. Problem 6 in Chapter 6 of Rose.