Test 3 — April 27 2001

Answer all questions. This test is optional. It is due at 10 am on May 2, 2001.

- 1. The transition temperature of grey and white tin at a pressure of one atmosphere is 291 K, grey being the stable below this temperature. The change in enthalpy for this transition is 2238 J/mol. The densities of grey and white tin are 5.75 and 7.30 g cm³ respectively, and the atomic weight of tin is 118.7. What is the change in the phase transition temperature if the pressure is changed to 1000 atmospheres.
- 2. The latent heat of fusion and the latent heat of vaporization of neon at the triple point are 335 and 1803 J mol respectively. Neon's triple point temperature is 24.57 K. What is the latent heat of sublimation of neon at the triple point? What is the change in entropy when one mole of liquid neon at the triple point is vaporized?
- 3. A semiconductor possesses n donor levels whose energy is $-\varepsilon_0$. A donor level can be occupied by a spin up electron (so the energy is $-\varepsilon_0$), a spin down electron (so the energy is ε_0), or it can be unoccupied. Each of the n donor levels can be in any one of the three states, independently of the others. Find the grand partition function for electron in the donor levels. Use it to find the number of electrons in the donor levels.
- 4. A system has s components in a single phase. Show all steps of the calculation leading to the result

$$\sum_{i=1}^{s} N_i \mu_i = -S \mathrm{d}T + V \mathrm{d}P$$

5. Do problem 1 on page 301 of your textbook.