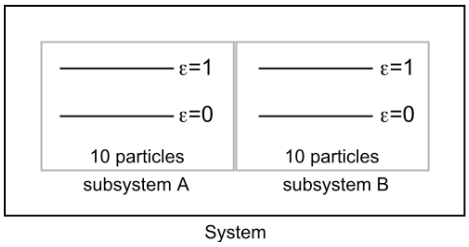
Core Course 2002
Homework Part II, Problem Set 2

1. a) For the two 10-particle, two-state subsystems discussed in class, suppose the total energy to be shared between the two objects (ie., of the system overall) is $U = U_A + U_B = 4$, what is the distribution of energies that gives the highest multiplicity?
In other words, the subsystems can exchange energy, but not particles (mass).



b) Assuming that the energy separation in this system is 3.83×10^{-21} J, what is the temperature of the above system?

c) Express the above energy separation in terms of J/mol of particles.

d) Express the above energy separation in terms of kcal/mol. Compare that to the energies of the various spectroscopies on your hand out of last week.

2. a) Consider an optical transition in the near-IR, at 800 nm. What is the ratio of excited to ground state population at room temperature (25° C)?

b) What is the ratio for that same transition at 77 K, what is the ratio at 10 K?

3. You flip a coin 5 times and record the number of "heads."
Computer W for each of the possible outcomes listed below. Which is most probable?

0 heads	
1 heads	
2 heads	
3 heads	
4 heads	
5 heads	