Thermodynamics Exam – Spring 2007
Calculator may be used

Problem 1) A solid material has a heat capacity which varies linearly with temperature, modeled by C = a + b T, where C is the heat capacity, a = 5 J/kg K and b = 0.03 J/kg K^2. Two objects A and B are made of this material. Object A has a mass of 1 kg and is initially at 200 K; object B has a mass of 2 kg and is initially at 500 K. The two objects are brought into contact with each other and isolated. Determine the final equilibrium temperature and the entropy generated. Considering A+B as the system, discuss the entropy increase from a statistical point of view.

Problem 2) Equal moles of diatomic nitrogen and oxygen are heated at 1 atm to a temperature of 2800 K. The global reaction may be described as

$$N_2 + O_2 \leftrightarrow 2NO$$

For this reaction at 2800 K, ln K_p = -4.72. At equilibrium, find the mole fractions of N_2, O_2, and NO. Describe qualitatively how the results would depend on pressure and why.