1. Consider one mole of solid copper at 300 K and atmospheric pressure and adopt the bedspring model for this solid. The density of copper is $\rho = 8.92$ g cm^{-3} and its linear coefficient of expansion is $\alpha = 16.65 \times 10^{-6}$/K.
(a) Calculate c_v and c_P (both molar-specific).
(b) Compare your results with the measured values shown in the graph of #16 on the Phy 372 home page. How good is the bedspring model for this solid?

2. **(a)** Compute the entropy, S, for one mole of Neon at room temperature and atmospheric pressure.
(b) Compute the rms velocity and corresponding momentum for the atoms of this gas.
(c) Compare your results to Helium (see Eqn. 2.50 in the text). Why is there a difference?

3. Starting with the Sackur-Tetrode equation, find an expression for the change in entropy, ΔS, when the temperature of a monatomic ideal gas changes from T_i to T_f, all other parameters held fixed.
(b) Suppose 1000 moles of a Helium gas in a cylinder cools from 100° C to room temperature. Compute the change in the specific entropy, Δs.
(c) Is Δs positive or negative for this gas? If it is negative, is the second law of thermodynamics violated? Explain.

4. The pressure on a block of copper at a temperature of 20° Celsius is increased isothermally from 1 atm to 1000 atm. Assume that the parameters, β, κ_T, and density, ρ are approximately constant during the compression and look up their values if necessary. Do *not* assume that only quadratic degrees of freedom are present (i.e. the bedspring model is insufficient for this problem).
(a) Calculate the specific work, w, done on the copper [hint: think about the definition of expansive/compressive work as well as the definition of κ_T].
(b) Calculate the specific heat, q, that is extracted during the process.
(c) What would be the rise in temperature if the compression were adiabatic rather than isothermal?