

## PHY6938 Optics and Thermodynamics Spring 2000

1. An ideal classical gas made of  $N$  point-like atoms with mass  $m$  is placed in a confining potential:  $V(x, y, z) = \frac{1}{2}(k_x x^2 + k_y y^2 + k_z z^2)$ . The temperature of the gas is  $T$  and there is no external container.

a) Calculate the average kinetic energy of each gas atom.

b) Calculate the average potential energy of each gas atom.

c) Calculate the heat capacity of the gas.

d) At low temperatures, the gas has to be considered as composed of quantum mechanical particles, and the fact that their energy levels are discrete is important. Briefly discuss what happens to the specific heat at low temperatures (no calculation is required).

11. Four equally spaced coherent light sources with wavelength of 500 nm are separated by a distance of  $d = 0.1$  mm. The interference pattern is viewed on a screen at a distance of 1.4 m. Find the positions of the principal interference maxima and compare their width with that for just two sources with the same spacing..