

Homework 7, PHY 7500, Fall 2008 (due on October 28, 2008)

1. Consider linear chain of $N + 1$ atoms, each of mass m , with harmonic forces (which might be modeled by N springs of spring constant k) acting between nearest neighbors. The atoms at each end of the chain are fixed.
 - Find the speed of sound (longitudinal polarization)
 - For the case $N \gg 1$ evaluate the internal energy explicitly in the high- and low-temperature limits.
2. Make an estimate for the Fermi energy and Fermi temperature of
 - conducting electrons in a metal,
 - nucleons in an “ordinary” nuclear matter,
 - liquid helium 3.
3. **(8.2)**. For a Fermi gas, we may define a temperature T_0 at which the chemical potential of the gas is zero ($Z = 1$). Express T_0 in terms of the Fermi temperature of the gas.