PHY 410
HW#5
Assigned 9 Feb 09: Due 16 Feb 09

5.1 What are the thermal wavelengths λ_{th} (or quantum lengths l_Q) for the following particles

(i) N_2 molecules at T=300K; (ii) Electrons at 300K; (iii) He atoms at 1K

If the densities for these three systems are 10^{19}/cc, 10^{22}/cc, and 10^{22}/cc respectively which systems can be treated as classical. (6 points)

5.2 An ideal gas is isothermally compressed from volume V to V/2 keeping N fixed. What is the change in entropy σ per particle? If the same gas is heated from τ to 2τ keeping the volume and N fixed what is the change in σ per particle? (4 points)

5.3 Problem 6, Chapter 3 of the Text (Kittel & Kroemer). This problem deals with rotation of diatomic molecules. (12 points)

5.4 Problem 8, Chapter 3 of the Text (Kittel & Kroemer). (10 points)

5.5 Problem 11, Chapter 3 of the Text (Kittel & Kroemer). This problem deals with the relationship between thermodynamics (or statistical physics) and the dimensionality of the physical system. (8 points)