Phy 410
Quiz #4, Feb 12, 2010

a) Thermal wave length (λ_{th}) associated with a particle of mass M at temperature τ is 20 Å.

    (i)   What is λ_{th} if the temperature is reduced by a factor of 100?

    (ii)   What is λ_{th} if the mass of the particle quadruples?

b) Partition function for a gas of N identical particles of mass M at temperature τ in volume V is given by

$$Z_N = \frac{(Z_1)^N}{(N)!}; Z_1 = \frac{V}{\lambda_{th}^3}$$

    (i)   What is the partition function for 2N such particles in a volume 2V? (State your answer in terms of λ_{th}, N and V)

    (ii)   What is the partition function for an ideal gas mixture consisting of N_1 A particles and N_2 B particles confined in the same volume V? (State your answer in terms of $\lambda_{th,A}, \lambda_{th,B}$, N_1, N_2 and V)