1 Distribution function for double occupancy statistics

Let us imagine a new mechanics in which the allowed occupancies of an orbital are 0, 1, and 2. The values of the energy associated with these occupancies are assumed to be 0, ε, and 2ε, respectively.

(a) Derive an expression for the ensemble average occupancy $\langle N \rangle$, when the system composed of this orbital is in thermal and diffusive contact with a resevoir at temperature T and chemical potential μ.

(b) Return now to the usual quantum mechanics, and derive an expression for the ensemble average occupancy of an energy level which is doubly degenerate; that is, two orbitals have the identical energy ε. If both orbitals are occupied the toal energy is 2ε. How does this differ from part (a)?