#6. Derive the average energy $E_{\text{avg}} = kT$ for a classical oscillator from their classical energy distribution: According to the Boltzmann distribution, the probability for an oscillator to have energy $E$ is $P(E) = A_0 \exp(-E/kT)$, where $k$ is the Boltzmann constant and $A_0$ is some number (the normalization constant). That is, if you have a very large number of oscillators and want to know how many of them have energies in some small interval between $E$ and $E+dE$, that number is $N(E) = P(E)dE = A_0 \exp(-E/kT)dE$. Your task is to calculate the average energy per oscillator.  

*Hint:* The average energy is the total energy of the system divided by the number of oscillators.