

4. (b) A vessel contains 1 mole of a certain gas maintained at fixed temperature T . Each of the gas particle can exist in one of four energy states with energies 0.0043 eV, 0.0129 eV, 0.0215 eV and 0.0301 eV respectively. According to the theory in classical statistical physics, in a large ensemble of particles, the probability, $p(E)$, that a particle possesses energy E at temperature T is:

$$p(E) = \frac{e^{-\frac{E}{kT}}}{Z}$$

where k is the Boltzmann constant and Z is the normalization constant. It is found that 63% of the gas particles in the vessel exists in the lowest energy state; i.e. 0.0043 eV and 23% of them occupies the first excited state; i.e. 0.0129 eV. Estimate the number of gas particles existing in the 0.0215 eV state.

[6 marks]