

Take-home Test

For atmospheric pressure hydrogen plasma at an equilibrium temperature of 10,000 K write a program to calculate the following parameters:

- 1- all energy states of hydrogen atoms in eV. (Use the Bohr's model, $\Delta E_i=0.25$ eV; $E_i=13.595$ eV).
- 2- number density of H, H^+ , and electrons. (Use Saha-Equation; Z_e and $Z_{ions}=2$; for Z_a see [Table II](#))
- 3- average energies and velocities of H, H^+ and electrons. (see Maxwell's distribution)
- 4- partition function of hydrogen plasma. ($g_i=2n^2$)
- 5- population density of the excited states including the ground state. (See Boltzmann Distribution)
- 6- minimum kinetic energy of an H^+ that could excite an hydrogen atom from its ground state. Assume hydrogen atoms are at rest.
- 7- maximum number of electrons per m^{-3} that could excite hydrogen atoms from their ground state.
- 8- wavelength and the radiation energy emitted by the transition from the first excited state to the ground state. (see table for [transition probabilities](#))