> Answers without **supporting work** or **necessary unit** will not be given full credit. If the meaning of the question isn't clear, please ask TA! You have **25mins** to complete this mini-test.

Q.1 Consider a hydrogen laser which occurring between two excited states of the hydrogen atom from $n = 3$ to $n = 2$. If a population inversion is not generated, what is the ratio of the population of atom in state E_3 to the population in the ~~ground~~ state E_2 with the atoms at $T = 30000$ [K]? (10 point)

Q.2 Fifteen electrons are confined to a 3D infinity potential well with widths $L_x = L_y = L_z = L$. Assume that the electrons do not electrically interact with one another, so they follow Pauli principle. What are the ground state and first excited state of this system? To simplify complicated calculations, we define $\frac{h^2}{8m_e L^2} = \alpha$. Please use α to express your answer! (10 points)