PHYS143
Physics for Engineers
Tutorial - Chapter 42

Question 1
An isolated atom of a certain element emits light of wavelength 520 nm when the atom falls from its fifth excited state into its second excited state. The atom emits a photon of wavelength 410 nm when it drops from its sixth excited state into its second excited state. Find the wavelength of the light radiated when the atom makes a transition from its sixth to its fifth excited state.

Question 2
A photon is emitted when a hydrogen atom undergoes a transition from the n = 5 state to the n = 3 state. Calculate (a) the energy (in electron volts), (b) the wavelength, and (c) the frequency of the emitted photon.

Question 3
For a hydrogen atom in its ground state, compute (a) the orbital speed of the electron, (b) the kinetic energy of the electron, and (c) the electric potential energy of the atom. ($a_0 = 0.0529$ nm)

Question 4
A hydrogen atom is in its first excited state (n = 2). Calculate (a) the radius of the orbit, (b) the linear momentum of the electron, (c) the angular momentum of the electron, (d) the kinetic energy of the electron, (e) the potential energy of the system, and (f) the total energy of the system. ($a_0 = 0.0529$ nm)

Question 5
List the possible sets of quantum numbers for the hydrogen atom associated with (a) the 3d subshell and (b) the 3p subshell.

Question 6
Find all possible values of (a) L, (b) L_z, and (c) θ for a hydrogen atom in a 3d state.

Question 7
A hydrogen atom is in its fifth excited state, with principal quantum number 6. The atom emits a photon with a wavelength of 1 090 nm. Determine the maximum possible magnitude of the orbital angular momentum of the atom after emission.