

This quiz contains examples from previous years exams. Working on solving these problems might help you prepare for the mid-term exam.

Problem 1. (2005) Consider electron in the hydrogen atom. Assume it has been excited to a 2p orbital.

1. Determine the most probable distance of this electron from the nucleus. (You can express the result in the units of the Bohr's radius, a_0)
2. Is the electron on average closer to or farther away from the nucleus compared to the ground state (1s)? Explain your reasoning.
3. The electron can return to the ground state ($n=1$) by emitting the excess energy. Alternatively, the electron could leave the atom if it absorbs enough energy (ionization). Which transition involves a greater change in the energy: down to the ground state ($n=1$) or the ionization of the electron ($n=\infty$)?

Problem 2. (2006) Consider electron in the hydrogen atom. Assume it has been excited to the 3d orbital.

1. Determine the most probable distance of the electron from the nucleus. (You can express the result in the units of the Bohr's radius, a_0) Compare it with the most probable distance for the ground state (1s) that we discussed in class.
2. Calculate the average distance from the nucleus for this orbital. (You can express the result in the units of the Bohr's radius, a_0) Compare it with the average distance from the nucleus for the ground state.