

Physics 4410
Quantum Mechanics 2

Lecture 33

Selection rules

November 18, 2020

1. Review spontaneous emission.

2. What happens if we have spherical symmetry?

3. Which transitions are possible?

Activity 1: Transitions in hydrogen.

Describe all possible decay mechanisms for an electron in hydrogen due to spontaneous emission for $n \leq 3$.

Activity 2: Consider a 1d potential $V(x) = V(-x)$.

(a) Why are all the wave functions even ($\psi(x) = \psi(-x)$) or odd ($\psi(x) = -\psi(-x)$)?

(b) One expects that $E_0 < E_1 < E_2 < \dots$, with even/odd n corresponding to even/odd wave functions. Do you think all states can decay to the ground state via spontaneous emission, if the dipole moment is $\mathbf{p} = ax$?