

CHAPTER OVERVIEW

12: Time-Dependent Perturbation Theory

Consider a system whose Hamiltonian can be written

$$H(t) = H_0 + H_1(t). \quad (12.1)$$

Here, H_0 is again a simple time-independent Hamiltonian whose eigenvalues and eigenstates are known exactly. However, H_1 now represents a small time-dependent external perturbation. Let the eigenstates of H_0 take the form

$$H_0 \psi_m = E_m \psi_m. \quad (12.2)$$

We know (see Section [\[sstat\]](#)) that if the system is in one of these eigenstates then, in the absence of an external perturbation, it remains in this state for ever. However, the presence of a small time-dependent perturbation can, in principle, give rise to a finite probability that if the system is initially in some eigenstate ψ_n of the unperturbed Hamiltonian then it is found in some other eigenstate at a subsequent time (because ψ_n is no longer an exact eigenstate of the total Hamiltonian). In other words, a time-dependent perturbation allows the system to make transitions between its unperturbed energy eigenstates. Let us investigate such transitions.

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Contributors and Attributions

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