CHAPTER OVERVIEW

11: Time-Independent Perturbation Theory

Consider the following very commonly occurring problem. The Hamiltonian of a quantum mechanical system is written

$$H = H_0 + H_1. \tag{11.1}$$

Here, H_0 is a simple Hamiltonian whose eigenvalues and eigenstates are known exactly. H_1 introduces some interesting additional physics into the problem, but is sufficiently complicated that when we add it to H_0 we can no longer find the exact energy eigenvalues and eigenstates. However, H_1 can, in some sense (which we shall specify more precisely later on), be regarded as small compared to H_0. Can we find approximate eigenvalues and eigenstates of the modified Hamiltonian, $H_0 + H_1$, by performing some sort of perturbation expansion about the eigenvalues and eigenstates of the original Hamiltonian, H_0? Let us investigate.

Incidentally, in this chapter, we shall only discuss so-called *time-independent perturbation theory*, in which the modification to the Hamiltonian, H_1, has no explicit dependence on time. It is also assumed that the unperturbed Hamiltonian, H_0, is time independent.

This page titled 11: Time-Independent Perturbation Theory is shared under a not declared license and was authored, remixed, and/or curated by Richard Fitzpatrick.