CHAPTER OVERVIEW

9: Perturbation Theory

The Schrödinger equation for realistic systems quickly becomes unwieldy, and analytical solutions are only available for very simple systems - the ones we have described as fundamental systems in this module. Numerical approaches can cope with more complex problems, but are still (and will remain for a good while) limited by the available computer power. Approximations are necessary to cope with real systems. Perturbation theory is one such approximation that is best used for small changes to a known system, whereby the Hamiltonian is modified.

Thumbnail: The unperturbed Hamiltonian (blue curve) of a known system is modified by adding a perturbation (red curve) with a variable control parameter λ, which governs the extent to which the system is perturbed. (CC BY-SA 3.0; Rudolf Winter at Aberystwyth University).
