

CHAPTER OVERVIEW

7: Approximation Methods

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. Within limits, we can use a pick and mix approach, *i.e.* use *linear combinations* of solutions of the fundamental systems to build up something akin to the real system. There are two mathematical techniques, *perturbation* and *variation* theory, which can provide a good approximation along with an estimate of its accuracy. These two approximation techniques are described in this chapter.

[7.1: The Variational Method Approximation](#)

[7.2: Linear Variational Method and the Secular Determinant](#)

[7.3: Trial Functions Can Be Linear Combinations of Functions That Also Contain Variational Parameters](#)

[7.4: Perturbation Theory Expresses the Solutions in Terms of Solved Problems](#)

[7.E: Approximation Methods \(Exercises\)](#)

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