

## CHAPTER OVERVIEW

### 4: Some Important Tools of Theory

#### Learning Objectives

In this Chapter, you should have learned about the following things:

- Rayleigh-Schrödinger perturbation theory with several example applications.
- The variational method for optimizing trial wave functions.
- The use of point group symmetry.
- Time dependent perturbation theory, primarily for sinusoidal perturbations characteristic of electromagnetic radiation.

For all but the most elementary problems, many of which serve as fundamental approximations to the real behavior of molecules (e.g., the Hydrogenic atom, the harmonic oscillator, the rigid rotor, particles in boxes), the Schrödinger equation can not be solved exactly. It is therefore extremely useful to have tools that allow one to approach these insoluble problems by solving other Schrödinger equations that can be trusted to reasonably describe the solutions of the impossible problem. The approaches discussed in this Chapter are the most important tools of this type.

[4.1: Perturbation Theory](#)

[4.2: The Variational Method](#)

[4.3: Linear Variational Method](#)

[4.4: Point Group Symmetry](#)

[4.5: Character Tables](#)

[4.6: Time Dependent Perturbation Theory](#)

#### Contributors and Attributions

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