CHAPTER OVERVIEW

5: Translational States

In this chapter we apply the principles of Quantum Mechanics to the simplest possible physical system, a free particle in one dimension. This particle could be an electron or, if we only consider translational motion, an atom or a molecule. Free means that no forces are acting on the particle. Since a force is produced by a change in the potential energy, the potential energy must be constant if there is no force. This constant can be taken to be zero because energy is relative not absolute. By saying energy is relative, we mean we are concerned with adding and removing energy from systems not with the absolute value of the energy content. The discussion of the free particle in this chapter further illustrates the fundamental ideas of Quantum Mechanics and introduces solutions to new problems. Specifically the energy, momentum and probability density for a free particle are discussed, and a connection is made between the wave property of matter and the uncertainty principle.