Chapter I

Experimental Necessity for the Quantum Theory

Although somewhat abstract in its formulation, quantum mechanics has been made necessary by the results of experimental work. It has been invented to describe the results of observations and experiments made in the study of atomic physics where it was found that the use of ordinary methods of description led to inconsistencies and contradictions. Because of this it is desirable to begin a study of quantum mechanics with a compilation and analysis of some of the principal types of experiments that have led to its formulation.


This first class of experiments includes those dealing with electrons, protons, alpha particles, or atomic nuclei, which indicate that those things are charged particles whose behavior can be described by ordinary mechanics, including the relativity theory.

a) Experiments to determine c/m.

A particle of atomic dimensions is characterized almost uniquely by its specific charge. The ordinary method of measuring this quantity is indicated in Fig. 1. The particles are emitted from the source S with a small velocity and pass through the two slits A and D. Between these two