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ATOMIC NUCLEI[1]

I. INTRODUCTION

THE conception that atoms consisted of central positively charged nuclei of small dimensions surrounded by one or more systems of electrons whose aggregate charge of negative electricity exactly neutralized the nuclear positive charge, arose in an attempt by Rutherford[2] to explain the large angle scattering of α rays obtained when these traversed thin foils or sheets of various metals.

To account for the results obtained it was found necessary to assume that the positively charged nucleus contained nearly all the mass of an atom and that the dimensions of the nucleus were very small compared with the ordinarily accepted magnitude of the diameter of the atom.

On this view the electric field close to the nucleus was very intense and therefore sufficient to deflect α particles which in traversing sheets of metal happened to pass close to nuclei.

Assuming the electric field of nuclei to be central and to follow the inverse square law, Rutherford showed that an α particle projected so as to pass close to the nucleus of an atom would describe a hyperbolic orbit about the nucleus and that the magnitude of the deflection impressed upon it was determined by the closeness of its approach to the nucleus.

(a) The electric charge on nuclei.

On this theory Rutherford showed by deductions made from observations on the single encounter large angle scattering of α rays that the resultant charge on the nucleus was about $\frac{1}{2}$ A e where A is the atomic weight of the

[1] Address of the vice-president and chairman of Section B—Physics, the American Association for the Advancement of Science, Toronto, December 29, 1921.

[2] Rutherford, *Phil. Mag.*, Vol. 21, p. 669, 1911; *Phil. Mag.*, Vol. 27, p. 448, 1914.