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Elect/Elect Engineering

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① the mass spectrometer experiment applies both the knowledge of electric and magnetic field to determine the mass of an atom. First of all, a gas of atoms is created by firing a beam of particles of the gas, which either adds electrons to the atoms in it or knocks a few of their electrons off depending on the type particle beam used. This gives the atoms now known as "ions" – a negative or positive electric charge. Next the ions are sent through a tube in which they are subjected to electric and magnetic fields. Both of the fields exert a force on the ions, and the strengths of the two forces are proportional to the ions charge. The electric force causes the ions to change speed, while the magnetic fields bend the path. Magnetic force is always perpendicular to velocity, so that it does no work on the charged particle. Here, the magnetic force supplies the centripetal force.

$F_c = mv^2/r$, noting that $\sin\theta = 1$, we see that $F_c = qvB$ Because the magnetic force F supplies the centripetal force we have $[qvB = mv^2/r]$

Solving for r yields

$$\left[r = \frac{mv}{qB}\right]$$

By way of newton's 2nd law of motion, $F = ma$ removed as $m = F/a$, dividing the total force acting on the ions by their resulting accelerations to determine the ions mass.

(2)

electric field is defined as the electric force per unit charge, or a region around a charged particle or object where it would be limited other charged particles or objects

$E = F/q$, the direction of the field is taken to be the direction of the force it would exact on a positive charge and redirecting toward a negative point charge.

magnetic field is a vector field that describes the magnetic law on moving electric charges, electric currents and magnetic metals. A charge that is moving in a magnetic field experiences an force is perpendicular to its own velocity and to the magnetic field.

Electric current is a flows of charged particles, such as electrons or ions moving through an electro conductor. It is measured at the net rate electric charge port. region

$$I = \frac{V}{R}, \quad I = \frac{Q}{t}$$