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ENG 227

① Describe the magnitude and direction of the acceleration of an electron being shot horizontally into a closed space with a uniform field being directed upward.

Ans: First of all a gas of atoms is bombarded by firing a beam of particles at the gas, which either adds electrons to the atoms or knocks a few of their electrons off depending on the type of particle, beam used. Which gives the atom an electric charge. The ions are then sent through a tube in which they are subjected to both electric and magnetic fields. The fields exert force on the ions and the strengths of the two forces causes the ions to change speed while the magnetic field bend their path. Here, the magnetic force supplies the centripetal force.

$$F = \frac{mv^2}{r}, \quad F = qVB$$

$$\therefore qVB = \frac{mv^2}{r}$$

$$\Rightarrow r = \frac{mV}{qB}$$

By Newton's 2nd Law of Motion, $F = ma$ rearranged as $m = F/a$, dividing the total force acting on the ions by their resulting acceleration to determine the ion's mass

② Describe electric field, magnetic field and electric current with respect to charges.

Ans: Electric field is defined as the electric force per unit charge, or a region around a charged particle or object within which a force would be exerted on other charged particles or objects.

$\vec{E} = \frac{\vec{F}}{q}$, The direction of the field is taken to be the direction of the force it would exert on a positive test charge. The electric field is radially outward from a positive charge and radially inward toward a negative point charge.

Magnetic field is a vector field that describes the magnetic influence on moving electric charges, electric currents, and magnetized materials. A charge that is moving in a magnetic field experiences a force perpendicular to its own velocity and to the magnetic field.

Electric current is a stream of charged particles, such as electrons or ions, moving through an electrical conductor or space. It is measured as the net rate of flow of electric charge past a region.

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