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Mechatronics Engineering
ENG 221

Question 1

Using the concept of Newton's second law of motion, 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.

Answers

Newton's Second law of motion states that the acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force and inversely proportional to the mass of object.

Therefore on entering the field, there is a vertical downward force acting on the electron. This is because electric force acts in the opposite direction as the electric field and the electric field is directed upwards.

The magnitude of the force is given by $E = Gq$, where E is the electric field strength and q is the charge of electron. No force acts horizontally. Hence, the magnitude of electron is gotten using Newton's 2nd law

$F = ma$ where m = mass, F = force, a = acceleration

$$a = \frac{F}{m} = \frac{Eq}{m}$$

The direction of a is downward just like the way forces F is directed because according to Newton's 2nd law, force is directly proportional to acceleration.

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

Electric feild is the region around a charge in which another charge can experience electric force. If the test charge ~~can~~ is ~~experience elect~~ positive, the direction of electric feild and electric force are the same when the test charge is negative, the direction is opposite electric feild is not a single vector quantities associated with each point in space, this is called the vector feild.

Therefore: ∴ an electric field exist within a conductor, the field exerts a force in every charge in the conductor.

Electric current is the flow of electric charges

$\vec{E} = \frac{\vec{F}}{q}$ where $\vec{E}$ = Electric field

F = force

q = Charge