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CIVIL ENGINEERING

BASIC ELECTRICAL 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 the 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 force acts in the opposite direction, as the electric field and the electric field is directed upward.

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

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

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

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

The direction of a is downward just like the way force 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 field is the region around a charge in which another charge can experience electric force. If the test charge is positive, the direction of electric field and electric force are the same. When the test charge is ~~positive~~ ^{negative}, the direction of electric field and electric force ~~are~~ is opposite. Electric field is not a single vector quantity associated with each point in space, this is called the vector field.

Therefore: if an electric field exist within a conductor, the field exerts a force in every charge in the conductor, causing the free charges to move. This explains the theory of electric current flow.

Electric current is the flow of electric charge.

$$\vec{E} = \frac{\vec{F}}{q}$$

where \vec{E} = Electric field

F = force

q = charge