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MECHANICAL ENGINEERING

ENG 221 ASSIGNMENT

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.

Answer

Electrons are negatively charged and are attracted towards the direction of the positive terminal of the electric field, therefore the electron will be acted upon by a downward force.

Following Newton's Second Law,

$$F = ma, \text{ also,}$$

$$F = qE$$

$$\Rightarrow ma = qE$$

$$a = \frac{qE}{m}$$

Since the electric field is uniform, then the magnitude and direction of the field will be constant. The force will be constant and the magnitude of the acceleration will also be constant but the direction of the acceleration will be downward.

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

Answer

Electric Field

Electric field is defined mathematically as a vector field that associates to each point in space the force per unit charge exerted on an infinitesimal positive test charge at rest at that point. The space surrounding a charged object is affected by the presence of the charge, an electric field is established in that space. The direction of the field is taken to be in the direction of

the force it would exert on a positive test charge.

## Magnetic Field

A charge that is moving in a magnetic field experiences a force perpendicular to its own velocity and to the magnetic field.

Magnetic fields are produced by moving electric charges and intrinsic magnetic moments of elementary particles. A charge placed in a magnetic field experiences a magnetic force, the charge must be moving for no magnetic force acts on a stationary charge.

## Electric Current

An electric current is simply electric charges / charged particles in motion through an electrical conductor. Current is caused by the flow of electrons, ions or other charged particles. If a neutral object loses electrons, it becomes more positively charged but if a neutral object gains electrons, it becomes more negatively charged.