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19/ENG05/007
Mechatronics Engineering
BASIC ELECT
ENG 221

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 upwards.

Answer

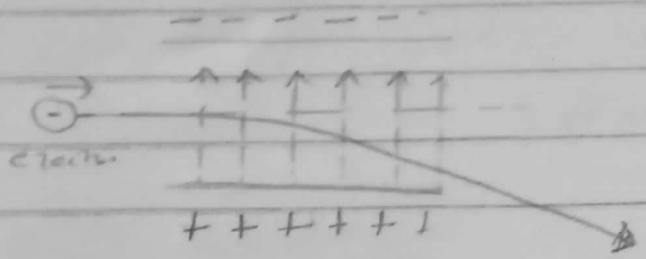
The magnitude of force on a charge q in an electric field is given $F = |qE|$ where E is the magnitude of electric field. The magnitude of the electron's charge is $e = 1.602 \times 10^{-19} C$ so the magnitude of the force on the electron is

$$F = |qE| = (1.602 \times 10^{-19} C)(2.00 \times 10^{4} N/C)$$
$$= 3.2 \times 10^{-15} N$$

Newtons 2nd law relates the magnitudes of the force and acceleration $F = ma$, so the acceleration of the electron has magnitude

$$a = \frac{F}{m} = \frac{(3.20 \times 10^{-15} N)}{(9.11 \times 10^{-31} kg)} = 3.51 \times 10^{15} m/s^2$$

This is the magnitude of the electrons acceleration. Since the electron has a negative charge the direction of the force on the electron (and also the acceleration) is opposite the direction of the electric field which is "Downwards".



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

When an electric charge is moving in a wire an electric Current is the result. And when an electric charge is in motion an electric Current is produced and when an electric Current passes through a wire, the spinning and orbiting of the particles produces a magnetic field. The direction of the spin and orbit determine the direction of the magnetic field. An electric field is Considered an electric property associated with a charge present in space in any form. Magnetic fields are produced from charges in motion while electric fields exist of the space around any charge (stationary)