Name: Uwalaka Onyedikachi R

Department: Chemical Engineering

Matric No: 19/ENG01/015

Assignment 1:

Question 1

Newton's second law of motion states that the vector sum of the forces F acting on an object is equal to the mass of the object multiplied by the acceleration of the object. From the law, when an electron is being shot horizontally into a closed space with uniform field being upward, there is a vertically downward force acting on the electron because the point charge is an electron which is ~~nega~~ negative. Meaning that the electric field and electric force are acting in opposite directions. The magnitude of the force is $F = qE$

where q is the charge of the electron and

E is the electric field strength

Since acceleration is directly proportional to force, it will also act downwards just as the force acts downwards.

Magnitude of the acceleration!

$$F = ma \quad -①$$

$$F = qE \quad -②$$

Equate eqn ① and eqn ②

$$ma = qE$$

$$\therefore a = \frac{qE}{m}$$ and it acts downwards.

Question 2:

Electric field

Electric field is defined as the electric force per unit charge on a region around a charged particle or object with which a force would be exerted on other charged particles or objects. Sub-atomic particles

like electrons and protons have an electric field around them with the lines of force of an electron moving towards its centre and that of a proton moving outwards. Neutrons are neutral (hence its name) and has no charge. The magnitude of the electric field at a point charge could be given as

$$E = \frac{k|q|}{r^2}$$

where q is the charge of the particle
r is the distance away from the point charge.

Magnetic field

Magnetic field is a vector field that describes the magnetic influence on moving electric charges, electric currents and magnetic materials. A charge that is moving in a magnetic field experiences a force perpendicular to its own velocity and to the magnetic field. All moving charged particles create magnetic field and can detect magnetic field thereby resulting in magnetic force. A simple source of magnetic field is the electric current flowing in a conductor.

Magnetic force is given as: $F = qVB\sin\theta$

where q = charge of the particle
V = velocity at which the charge moves
B = magnetic field strength.

Electric Current.

Electric current is a stream of charged particles such as electrons or ions moving through an electrical conductor. It is measured as the net rate of flow of electric charge past a region. The moving particles are known as charge carriers which may differ depending on the conductor. The charge carriers could be electrons, holes, ions, etc. Electric currents create magnetic fields which are used in motors, generators, inductors and trans

formers. The S.I unit is Ampere and its measured with an ammeter. It could be derived using;

$$I = \frac{V}{R} \quad \text{(Ohm's law)}$$