

## CS1025

### Problem Sheet 6

1. A negative point charge of  $10^{-6}$  C is situated in air at the origin of a rectangular coordinate system. A second negative point charge of  $10^{-4}$  C is situated on the positive x-axis at a distance of 50 cm from the origin. What is the force on the second charge?
2. Determine the resultant force acting on a point charge of  $-2.0 \times 10^{-6}$  C situated at the origin of a rectangular coordinate system in the vicinity of point charges  $3.0 \times 10^{-6}$  C and  $-4.0 \times 10^{-6}$  C at distances 0.12 m along the positive x-axis and 0.08m along the half-line  $y = x$  where  $x, y \leq 0$  respectively.
3. Compute the Electric Field Strength midway between two point charges of  $30 \mu\text{C}$  and  $40 \mu\text{C}$  when the charges are placed 10cm apart in air.
4. An electron, starting from rest, moves unimpeded in an electric field of strength  $E$  V/m.  
Taking  $q = 1.602 \times 10^{-19}$  C and  $m_e = 9.11 \times 10^{-31}$  Kg find:
  - (i) the force it experiences,
  - (ii) its acceleration,
5. A single turn loop of very thin conductor situated in air has a uniform magnetic field normal to its plane. The area bounded by the loop is  $5 \text{ m}^2$ . What is the emf appearing at the terminals of the loop if the rate of change of flux density is  $2 \text{ Wb/m}^2\text{s}$ .
6. Will a 10A fuse blow for a steady state charge flow of 45,000 C/hour?

### Answers:

Q1.  $F = 3.6 \text{ N}$ ; Q2.  $14.15 < 34.20^\circ \text{ N}$ ; Q3.  $E = 36 \times 10^6 \text{ N/C}$  directed from the  $40 \mu\text{C}$  charge to the  $30 \mu\text{C}$  charge; Q5.  $10 \text{ V}$ ; Q6.  $12.5 \text{ A} > 10 \text{ A}$ .