TUTORIAL QUESTIONS CHARGED PARTICLES

Question 1

Negative plate

Electric force

Oil droplet

Positive charge

Weight

E-field

Plates

Positive plate
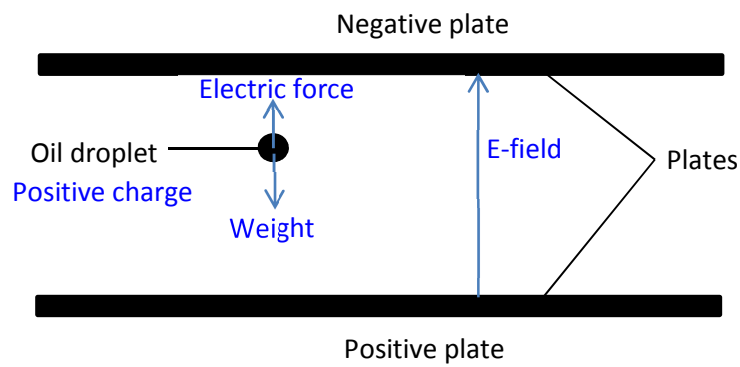
Question 2
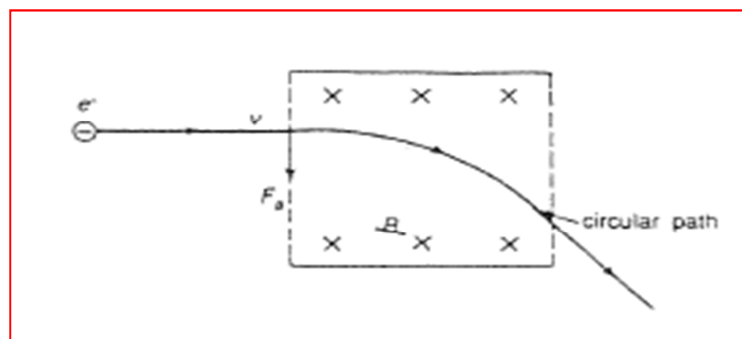
a.) $E = 2000 / 0.074 = $ **2.7×10^4 Vm^{-1}**

b.) $K.E = eV = 1.6 \times 10^{-19} \times 2000 = $ **3.2×10^{-16} J**

c.) $K.E = \frac{1}{2} mv^2$

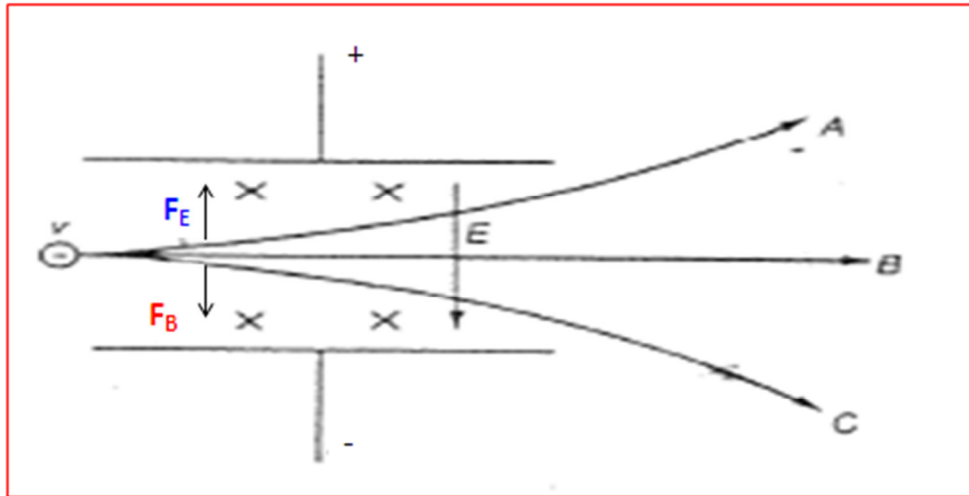$v = $ **2.65×10^7 ms^{-1}**

Question 3

a.)

b.) $r = mv / Bq = $ **0.0285 m**

c.) $Bqv = qE$

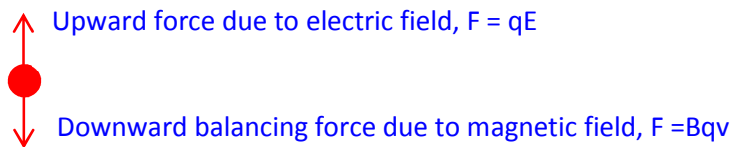$E = Bv = 0.0086 \times 4.3 \times 10^7 = $ **3.70×10^5 Vm^{-1}**

d.)

- Path B : $F_E = F_B$ → $qE = Bqv$ → $v = E/B$

- Path A : $F_E > F_B$ → $qE > Bqv$ → $v < E/B$; $v < v$

- Path C : $F_E < F_B$ → $qE < Bqv$ → $v > E/B$; $v > v$

Question 4

a.) $\frac{1}{2} mv^2 = qV$

$v = $ **1.84×10^5 ms^{-1}**

b.)   Upward force due to electric field, $F = qE$

     Downward balancing force due to magnetic field, $F = Bqv$

c.) $E = Bv = $ **1.53×10^5 Vm^{-1}**

d.) The move in a circular path downwards.

Question 5

a.) They are either approximately equals to 1.6 x 10^{-19} C or a whole number multiple of this value. Quantisation implies that no fraction is possible and that charge cannot simply take on any value, therefore charge is quantised.

b.) charge of 1 electron = Total charge / number of electrons

$$= 40.075 \times 10^{-19} / 25 = \textbf{1.603 x 10}^{\textbf{-19}}\textbf{ C}$$

c.) Path is circular in the field and bending downwards. Path is straight upon leaving the field.

   Slow electrons have smaller radius, fast electrons have bigger radius.

Question 6

Refer to notes on Milikan's Oil drop Experiment.