8 **(a)** A charged particle may experience a force in an electric field and in a magnetic field. State two differences between the forces experienced in the two types of field.

……..

……..

……..

…… [2]

(b) Fig. 7.1 shows a positively charged particle of mass 6.64×10^{-27} kg moving with speed 1.37×10^{6} m s^{-1} in a vacuum through a uniform electric and magnetic field.

The electric field is due to an applied p.d. of 3600 V across the plates and the plates are separated by a distance of 0.0275 m. The length of the plates is 0.10 m. The charged particle enters midway between the two plates.

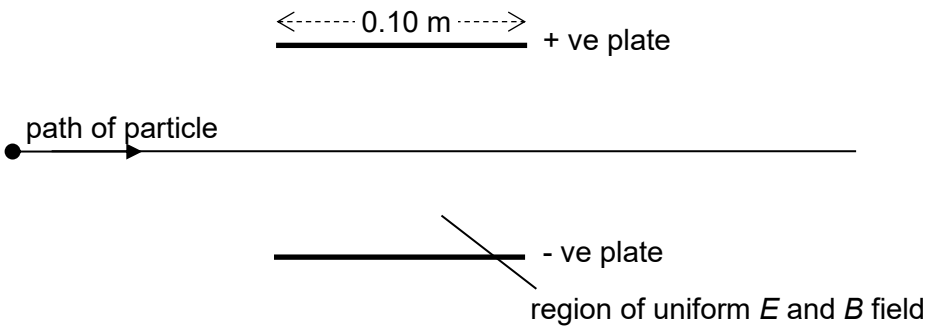


Fig. 7.1

The path of the particle is a straight line both within and outside the region of the fields.

(i) State the direction of the magnetic field. Explain how you arrive at your answer.

……...

……...

……...

……...

……. [3]

(ii) Determine the value of the magnetic flux density.

magnetic flux density = ……..…… T [2]

(iii) The electric field is switched off. Explain why the particle moves in a circular path.

……...

……...

……...

……. [2]

(iv) The particle moves in a circular path of radius 0.300 m. Show that the charged particle may be an alpha particle.

[2]

(v) The electric field is switched back on while the magnetic field is switched off.

Determine whether the charged particle will be able to exit the two plates without colliding with them.

[3]

(c) Two point charges +1.0 μC and –2.0 μC of the same mass are placed 10.0 cm apart, as shown in Fig. 7.2 below.

Fig. 7.2

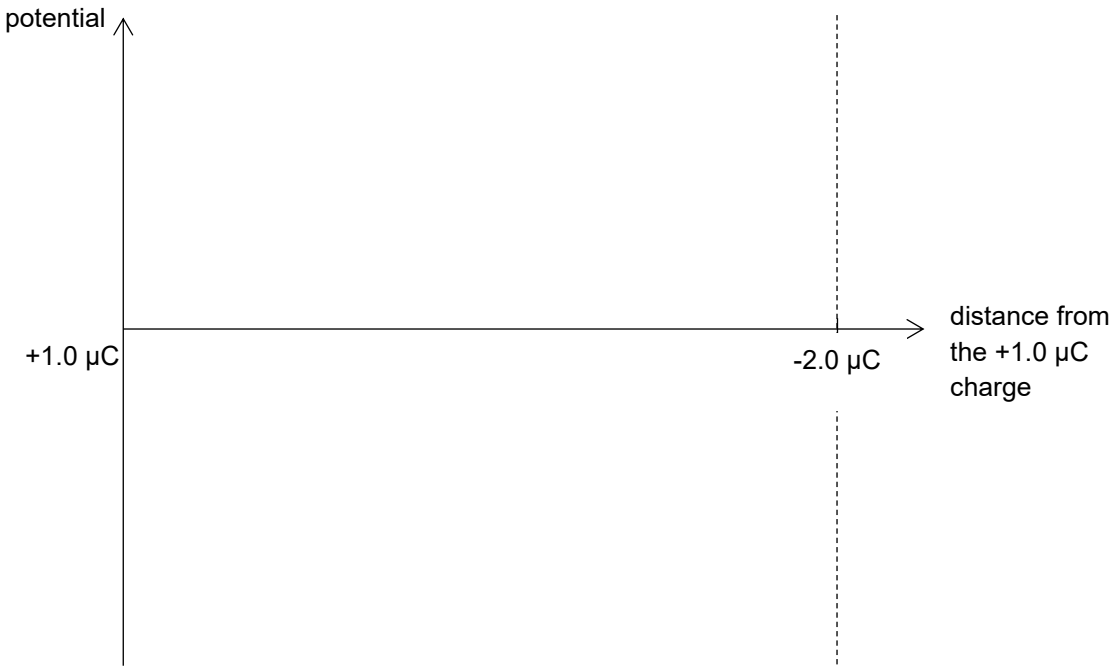
(i) Draw the electric field lines for the two charges in the space provided below.

[2]

(ii) A third charge is placed such that there is no net electrostatic force acting on it. Determine its position *x* with respect to the positive charge.

x = …… m [2]

(iii) Sketch on the axis below the variation of the potential with the distance from the +1.0 μC to the –2.0 μC.



[2]

End of paper