5 **(a)** Define *magnetic flux density*.

..............................................................................................................

..............................................................................................................

.............................................................................................................. [1]

**(b)** Negatively-charged particles are moving with speed $v$ through a vacuum in a parallel beam. The particles enter a region of uniform magnetic field of flux density 930 μT. Initially, the particles are travelling at right-angles to the magnetic field. The path of a single particle is shown in Fig. 5.1.

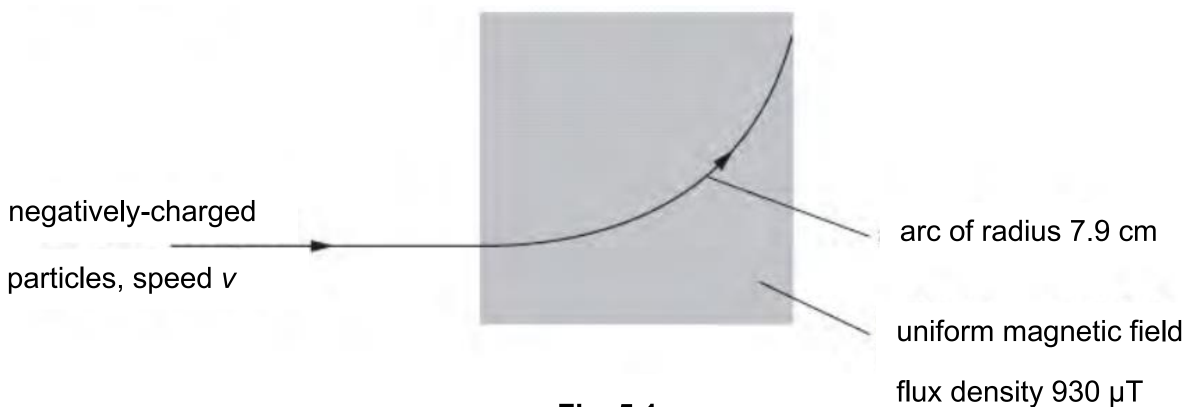


**Fig. 5.1**

The negatively-charged particles follow a curved path of radius 7.9 cm in the magnetic field.

A uniform electric field is then applied in the same region as the magnetic field. For an electric field strength of 12 kV $m^{-1}$, the particles pass through the region of the fields without deviation.

**(i)** On Fig. 5.1, mark with an arrow the direction of the electric field. [1]

**(ii)** Calculate the speed $v$.

$v$ = .................................... m $s^{-1}$ [3]

**(iii)** Calculate the $\frac{\text{charge}}{\text{mass}}$ ratio of the negatively-charged particles.

ratio = .................................... C $kg^{-1}$ [3]

[Total: 8]