8 (a) Explain what is meant by a *magnetic field*.

....

....

....[2]

(b) A particle has mass *m*, charge +*q* and speed *v*.

The particle enters a uniform magnetic field of flux density *B* such that, on entry, it is moving normal to the magnetic field, as shown in Fig. 8.1.
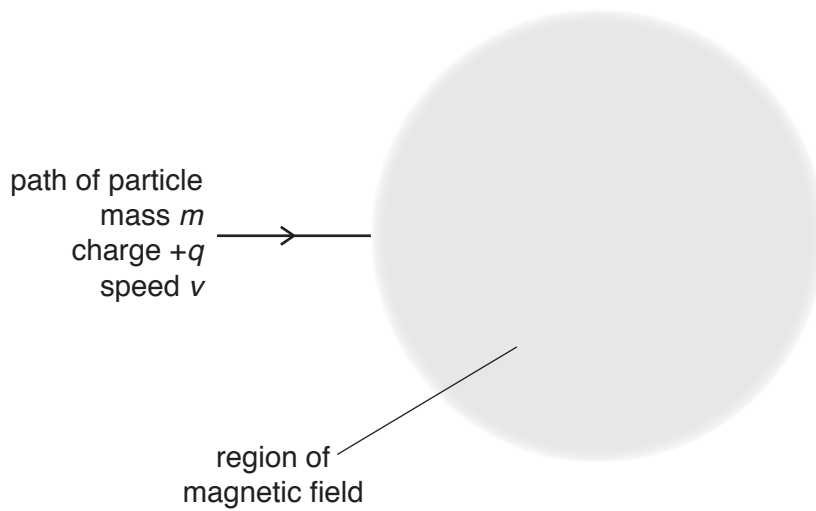
path of particle
mass *m*
charge +*q*   →
speed *v*

region of
magnetic field

Fig. 8.1

The direction of the magnetic field is perpendicular to, and into, the plane of the paper.

(i) On Fig. 8.1, draw the path of the particle through, and beyond, the region of the magnetic field. [3]

(ii) There is a force acting on the particle, causing it to accelerate.
Explain why the speed of the particle on leaving the magnetic field is *v*.

....

....

....[1]

(c) The particle in **(b)** loses an electron so that its charge becomes $+2q$. Its change in mass is negligible.

Determine, in terms of v, the initial speed of the particle such that its path through the magnetic field is unchanged. Explain your working.

speed = ... [3]

[Total: 9]