4 An electron is travelling at right angles to a uniform magnetic field of flux density 1.2 mT, as illustrated in Fig. 4.1.

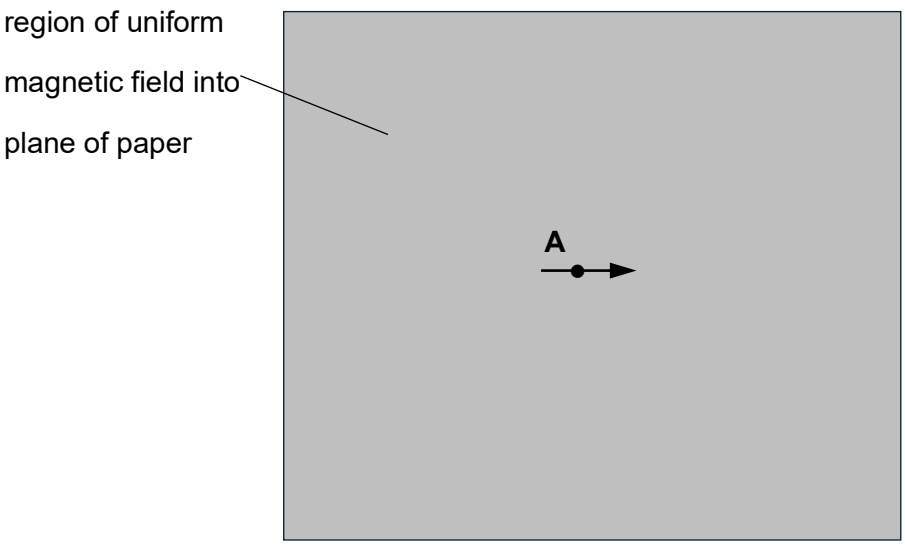

Fig. 4.1

The magnetic field is directed into the plane of the paper.

When the electron is at A, its velocity is 2.8×10^7 m s^{-1} in the direction shown. This is normal to the magnetic field.

(a) **(i)** On Fig. 4.1, sketch the path of the electron, assuming that it does not leave the region of the magnetic field. [1]

(ii) Show that the radius of the path of the electron is 13 cm.

[2]

(b) **(i)** A uniform electric field is applied in the same region so that the electron now moves undeflected through the magnetic field.

1. Draw on Fig. 4.1 the direction of the electric field. Label your arrow **E**.

2. Determine the magnitude of the electric field strength.

magnitude of electric field strength = ... N C^{-1} [3]

(ii) If however, the direction of the uniform electric field is in the same direction as the magnetic field, describe the shape of the resultant path of the electron.

You may draw a sketch to illustrate the path if you wish.

.....

..... [2]

[Total: 8]