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

....

....

....

.... [2]

(b) Electrons are moving in a vacuum with speed $1.7 \times 10^7\,\mathrm{m\,s^{-1}}$. The electrons enter a uniform magnetic field of flux density 4.8 mT. Fig. 6.1 shows the path of the electrons.

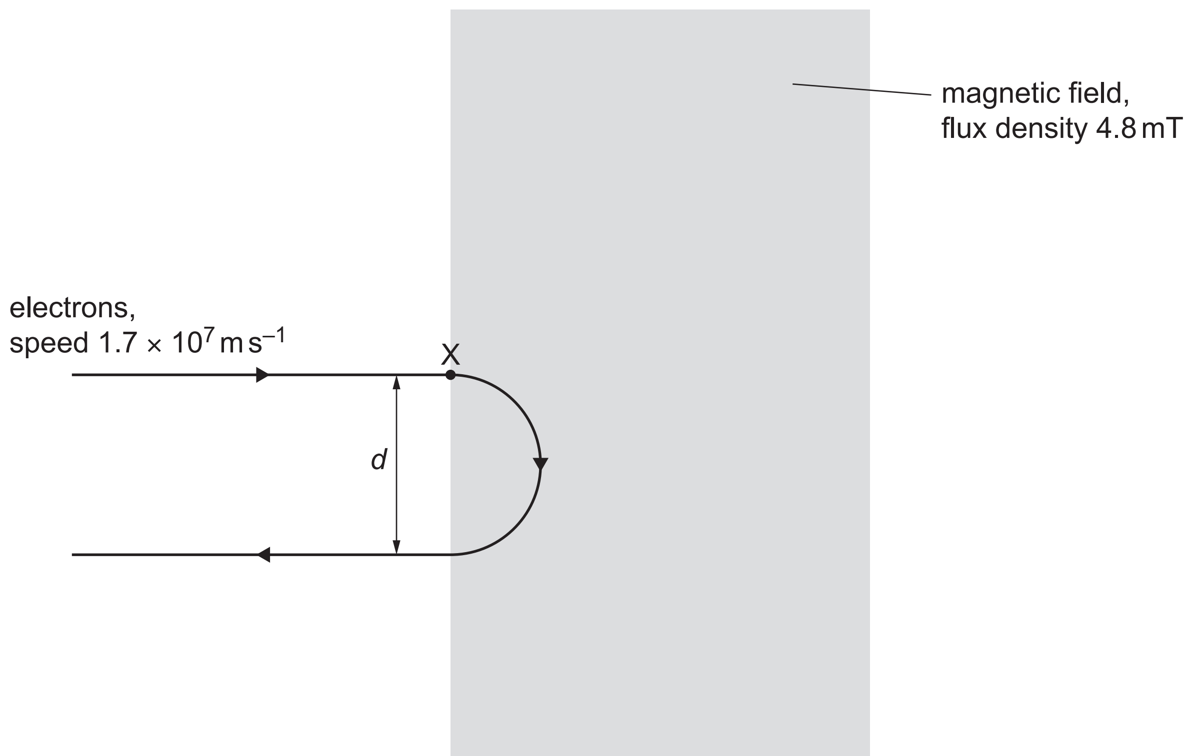

Fig. 6.1

The path of the electrons remains in the plane of the page.

(i) State the direction of the magnetic field.

....

.... [1]

(ii) Show that the magnitude of the force exerted on each electron by the magnetic field is 1.3×10^{-14} N.

[2]

(iii) On Fig. 6.1, draw an arrow to indicate the direction of the centripetal acceleration of the electron where it enters the magnetic field at point X. [1]

(iv) Use the information in **(b)(ii)** to calculate the distance *d* between the path of the electrons entering the magnetic field and the path of the electrons leaving it.

d = ... m [3]

(c) The electrons in **(b)** are replaced with positrons that are moving with speed $3.4 \times 10^{7}\,\text{m}\,\text{s}^{-1}$ along the same initial path as the electrons.
The positrons enter the magnetic field at point X on Fig. 6.1.

On Fig. 6.1, draw a line to show the path of the positrons through the magnetic field. [3]