

- 6 (a) Define magnetic flux density.
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[2]

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

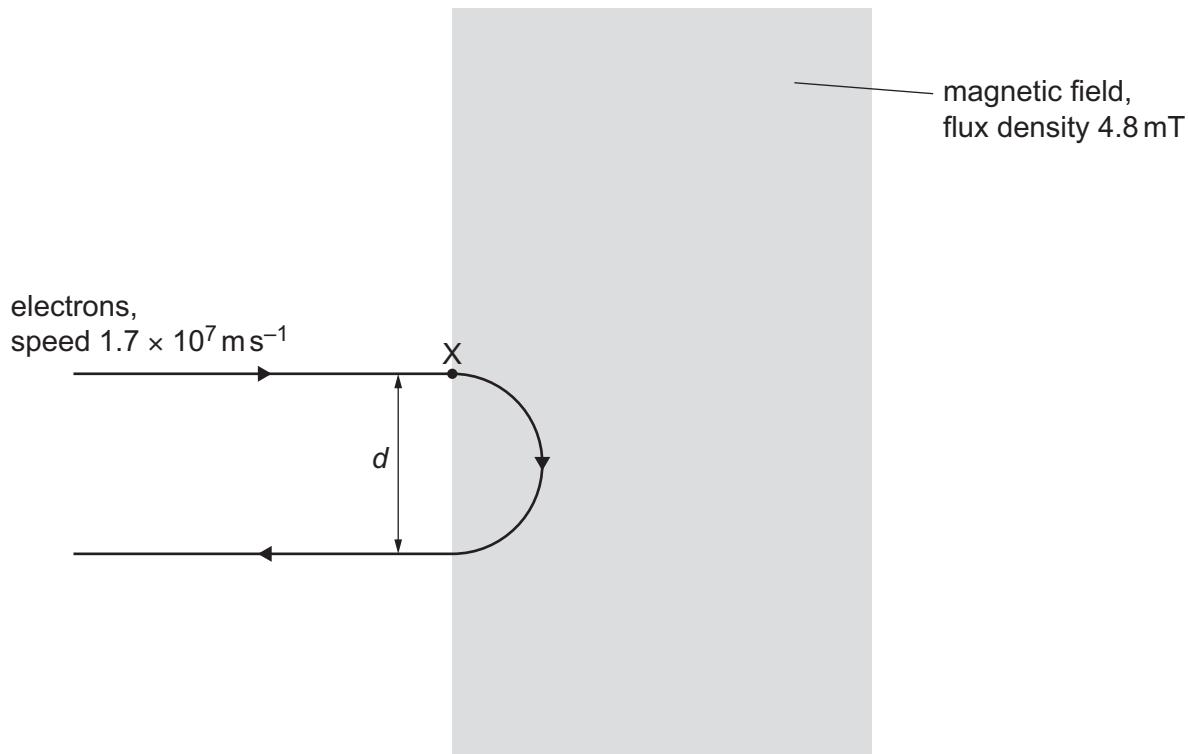


Fig. 6.1

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

- (i) State the direction of the magnetic field.
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[1]

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

[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.

$$d = \dots \text{ m} \quad [3]$$

- (c) The electrons in (b) are replaced with positrons that are moving with speed $3.4 \times 10^7 \text{ ms}^{-1}$ 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]