

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

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- (b) The apparatus shown in Fig. 8.1 is used in an experiment to find the magnetic flux density  $B$  between the poles of a horseshoe magnet. Assume the magnetic field is uniform between the poles of the magnet and zero elsewhere.

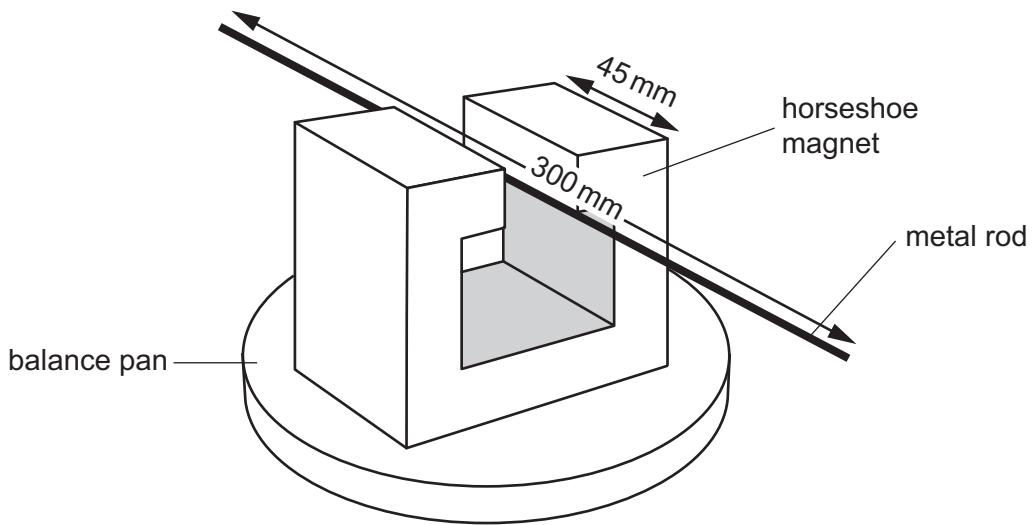
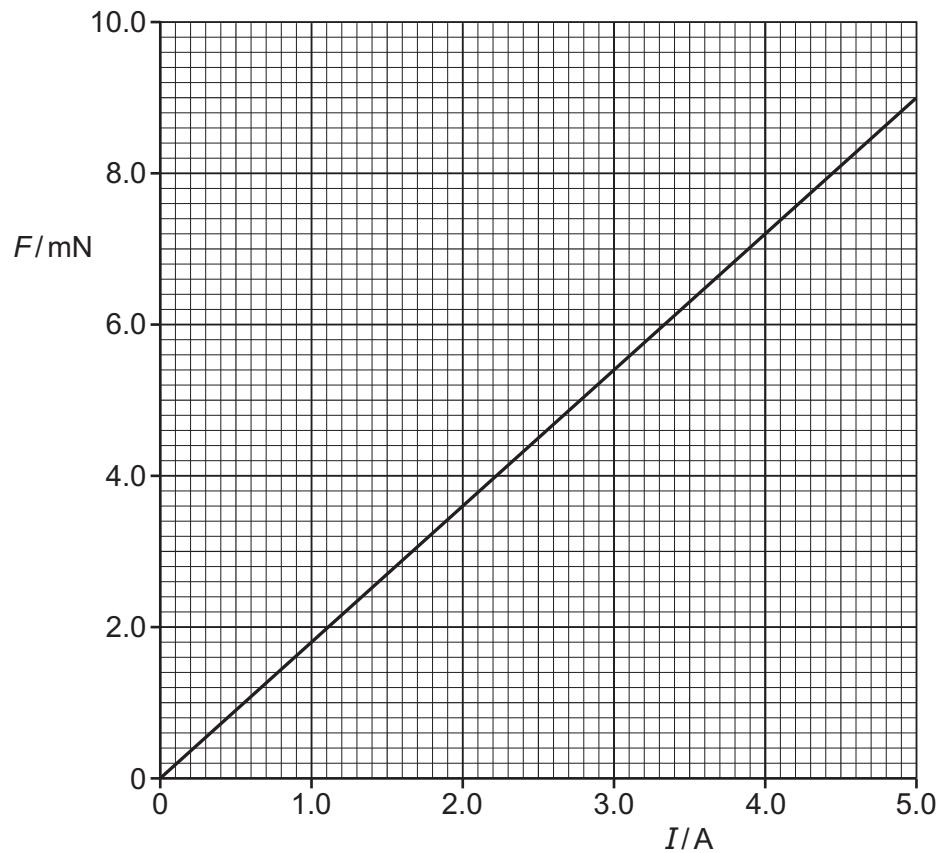


Fig. 8.1

The rigid metal rod of length 300 mm is fixed in position perpendicular to the direction of the magnetic field. The poles of the magnet are both 45 mm long. There is a current in the rod that causes a force on the rod. The balance is used to determine the magnitude of the force.

The variation with current  $I$  of the force  $F$  on the rod is shown in Fig. 8.2.



**Fig. 8.2**

Calculate the magnetic flux density  $B$ .

$$B = \dots \text{ T} [2]$$

- (c) In a different experiment, electrons are accelerated through a potential difference and then enter a region of magnetic field. The magnetic field is into the plane of the paper and is perpendicular to the direction of travel of the electrons, as illustrated in Fig. 8.3.

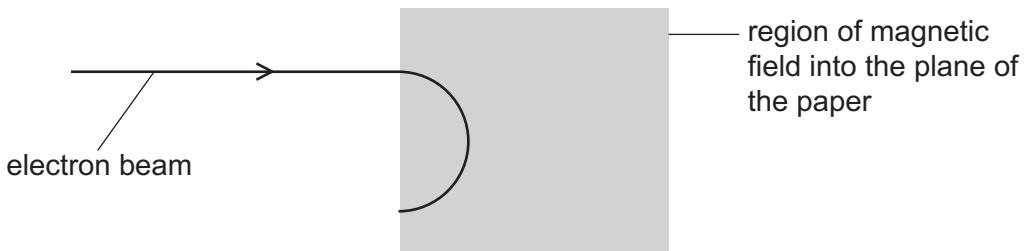


Fig. 8.3

- (i) Explain why the electrons follow a circular path when inside the region of the magnetic field.

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- (ii) State the measurements needed in order to determine the charge to mass ratio,  $e/m_e$ , of an electron.

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