

- 5 Two parallel, vertical metal plates are connected to a battery of e.m.f. 24V, as shown in Fig. 5.1.

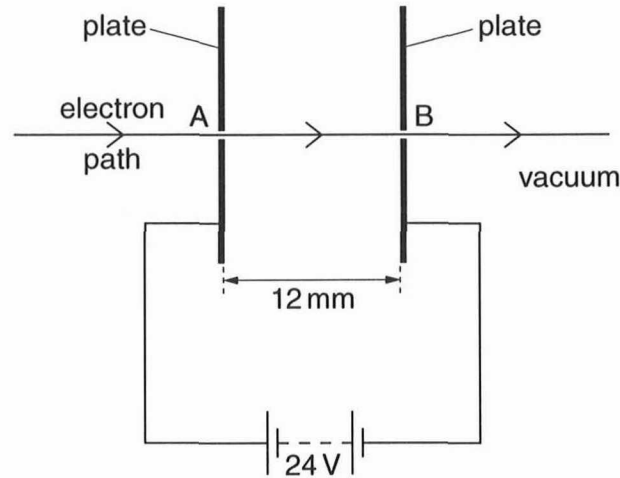


Fig. 5.1

An electron travels in a vacuum and passes through holes A and B, which are at the centre of each plate. The separation of the plates is 12 mm.

The electron has a horizontal velocity of $4.5 \times 10^6 \text{ m s}^{-1}$ when it enters hole A.

- (a) On Fig. 5.1, draw six lines to represent the electric field between the plates. [1]
- (b) (i) Calculate the force F of the electric field on the electron.

$$F = \dots\dots\dots \text{ N [2]}$$

- (ii) Show that the work done by the force F as the electron moves from A to B is $3.8 \times 10^{-18} \text{ J}$.

[1]

- (iii) Calculate the speed of the electron as it leaves hole B.

$$\text{speed} = \dots\dots\dots \text{ m s}^{-1} [3]$$

