

- 7 (a) Define electric field strength at a point.

.....
..... [2]

- (b) An electron is initially stationary in a vacuum. It is accelerated horizontally in a uniform electric field of $3.0 \times 10^5 \text{ NC}^{-1}$ over a distance of 1.0 cm.

By considering energy changes calculate the final horizontal velocity v of the electron.

$v = \dots\dots\dots \text{ ms}^{-1}$ [3]

- (c) The electron from part (b) now travels at a constant horizontal velocity.

It enters a uniform electric field between two 10 cm long, horizontal plates which are separated by a distance of 5.0 cm.

Outside the region between the plates there is no electric field.

- (i) On Fig. 7.1 draw field lines to represent the pattern and direction of the electric field. [2]

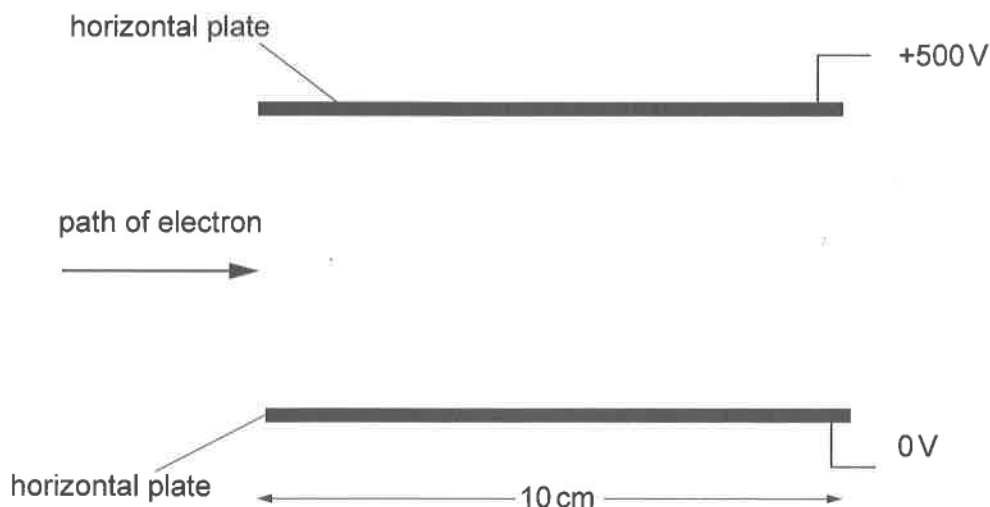


Fig. 7.1



- (ii) When passing between the plates, the electron accelerates in a direction perpendicular to its initial path. The electric field strength E is given by the equation:

$$E = \frac{V}{d}$$

where V is the potential difference between the plates and d is the separation of the plates.

Show that the force to charge ratio of the electron is given by the equation:

$$F/e = 1.0 \times 10^4 \text{ NC}^{-1}$$

[2]

- (iii) Calculate the acceleration of the electron and state its direction.

acceleration = ms^{-2}

direction

[2]

- (iv) Calculate the perpendicular displacement of the electron from its initial path as it leaves the region between the two metal plates.

displacement = m [4]





- (d) (i) Sketch the path of the electron on Fig. 7.1 as it passes through the electric field and after it leaves the electric field.

[3]

- (ii) Explain why the path of the electron is not noticeably affected by gravity.

.....
..... [1]

- (e) The current caused by N electrons moving through the apparatus each second is 0.15A.

Calculate N .

$N =$ [1]

[Total: 20]

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