

- 4 Two parallel plates P and Q are separated by a distance of 7.6 mm in a vacuum. There is a potential difference of 250V between the plates, as illustrated in Fig. 4.1.

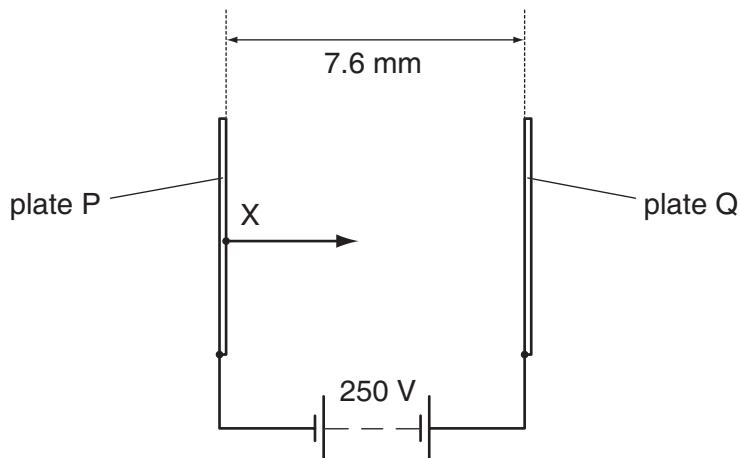


Fig. 4.1

Electrons are produced at X on plate P. These electrons accelerate from rest and travel to plate Q.

The electric field between the plates may be assumed to be uniform.

- (a) (i) Determine the force on an electron due to the electric field.

$$\text{force} = \dots \text{N} \quad [3]$$

- (ii) Show that the change in kinetic energy of an electron as it moves from plate P to plate Q is $4.0 \times 10^{-17} \text{ J}$.

[2]

- (iii) Determine the speed of an electron as it reaches plate Q.

speed = ms^{-1} [2]

- (b) The positions of the plates are adjusted so that the electric field between them is not uniform. The potential difference remains unchanged.

State and explain the effect, if any, of this adjustment on the speed of an electron as it reaches plate Q.

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[3]