3 Fig. 3.1 shows two large, vertical parallel plates, A and B, with plate B being connected to earth. An electron was emitted perpendicularly from plate A with an initial velocity v of 4.30 x 10^6 m s^{-1}. The electron experiences an electric force of 1.12 x 10^{-16} N towards plate A in the region between the two plates.

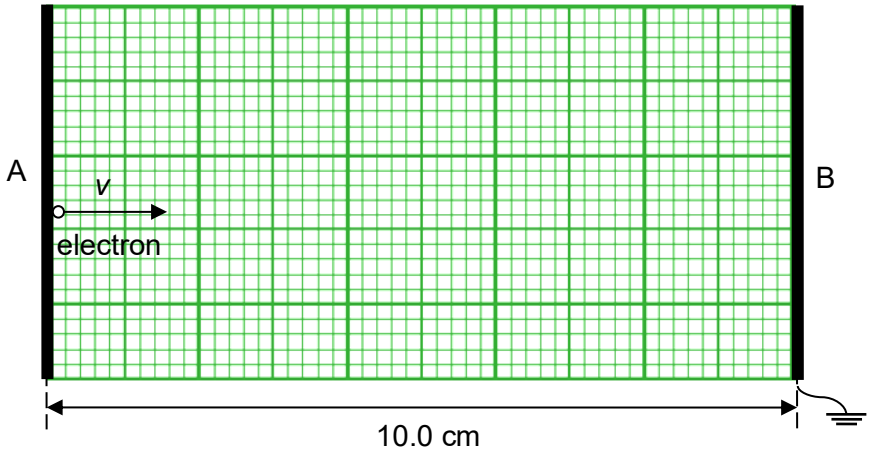

Fig. 3.1

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(a) Calculate the potential of plate A.

potential of plate A = ... V [2]

(b) **(i)** The electron comes to a stop momentarily at a point P. Use your answer in **(a)** to determine the potential at P.

potential at P = ... V [2]

(ii) On Fig. 3.1, draw the equipotential line passing through P. [2]

(c) Another electron of the same speed is now ejected from plate A towards plate B at an angle less than 90° to plate A. State, with a reason, whether the electron will stop before, at or beyond the equipotential line passing through P.

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..... [2]

(d) A proton is projected with a velocity of 3.5×10^6 m s^{-1} along the axis midway between two parallel plates of length 20 cm as shown in Fig. 3.2. The uniform electric field between the plates has an intensity of 2.0×10^4 N C^{-1} and is directed upward.

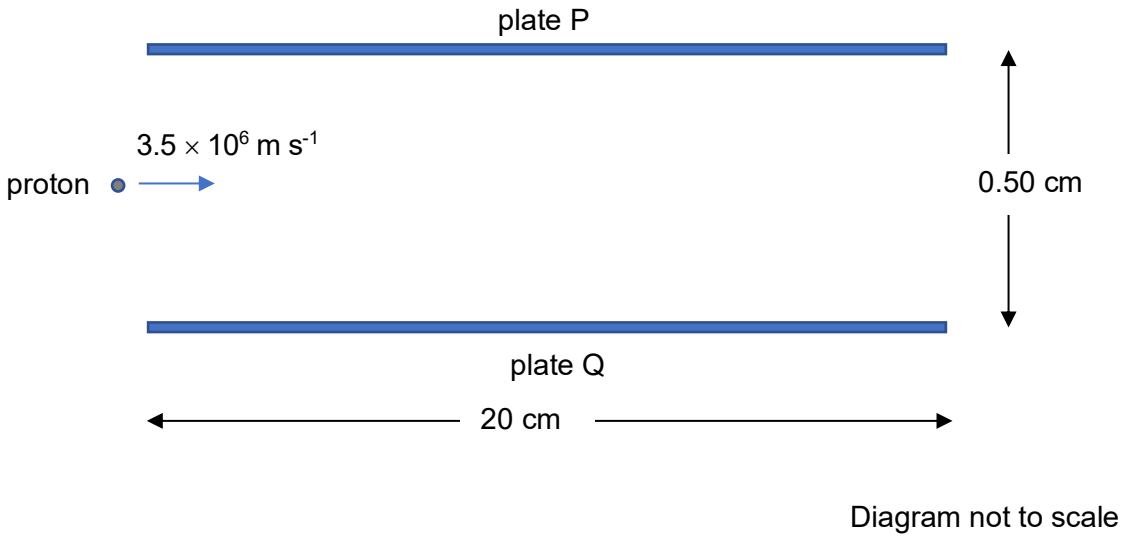

Diagram not to scale

Fig. 3.2

(i) Determine the position where the proton will strike plate P.

proton will strike P at ..... cm from point of entry [3]

(ii) An alpha particle that enters the electric field at the same point and with the same velocity as the proton. Describe and explain with some calculations whether the alpha particle will hit or exit the plates.

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..... [3]

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