6 Fig. 6.1 shows two parallel metal plates each of length 10 cm, at a distance of 4.0 cm apart, in a vacuum environment. A proton with speed 6.5×10^5 m s^{-1} is emitted from a proton source.

The proton travels along a straight path exactly down the middle of the region between the parallel plates when there is no electric potential difference between the metal plates. It then strikes a screen where it shows up as a scintillation.

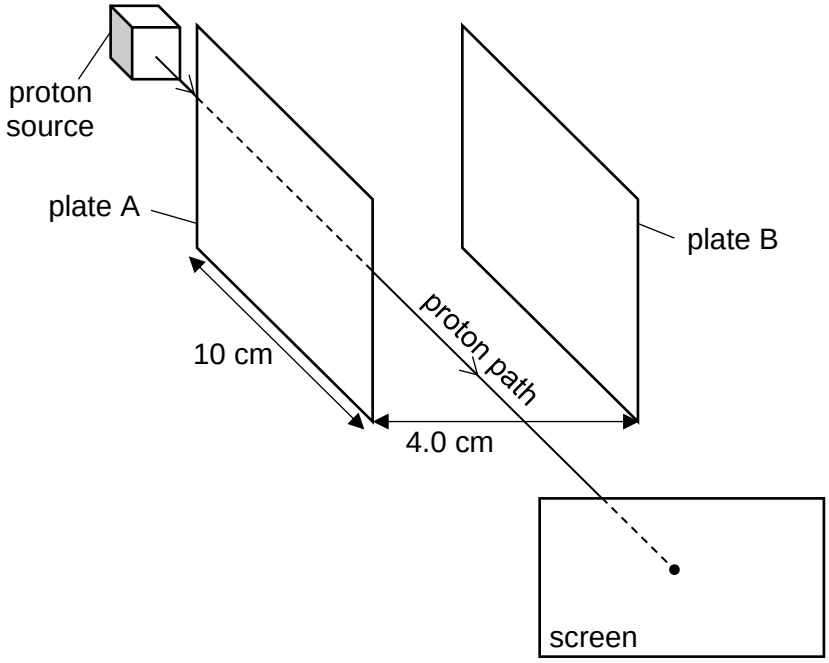

Fig. 6.1 (not to scale)

(a) When a potential of +250 V and − 250 V is applied to plates A and B respectively, a region of uniform electric field is set up between the metal plates.

(i) Determine the speed at which the proton emerges from the region of uniform electric field.

speed = ... m s^{-1} [4]

(ii) Calculate the electric potential at the point where the proton emerges from the region of uniform electric field.

potential = …….. V [2]

(b) In Fig. 6.1, indicate with a cross (×) where the deflected proton is likely to hit the screen. [1]

(c) Suggest how the set up in Fig. 6.1 can be modified to be used as a velocity selector.

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..... [3]

[Total: 10]