5 **Fig. 5.1** shows the top view of two large, parallel metal plates P and Q. The plates are placed 10.0 cm apart in vacuum, with P at a potential of +12.0 V and Q at −12.0 V. Each plate has a length of 15.0 cm.

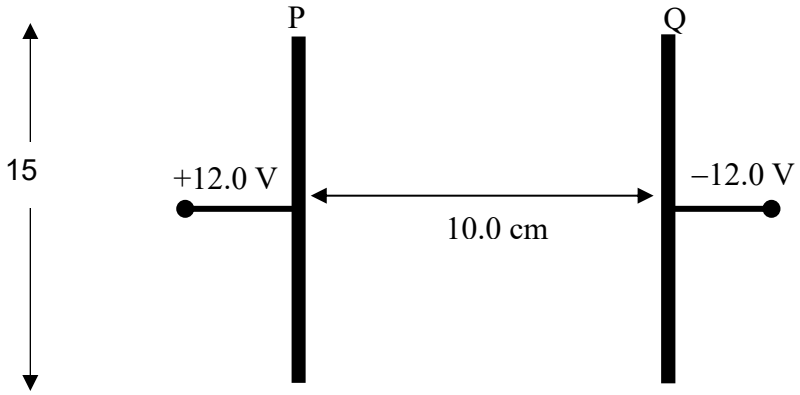

Fig. 5.1 (plan view)

(a) Draw, on **Fig. 5.1**, at least five arrows to represent the electric field inside the plates. [1]

(b) A beam of electrons enters the field along a horizontal path, parallel to the plates and equidistant to the plates as shown in **Fig. 5.2**. Each electron has a velocity of 4.5×10^6 m s^{-1}.

(i) Show quantitatively that the electrons would clear the plates.

[4]

(ii) Sketch on **Fig. 5.2** the path of the electron beam between and beyond the plates. State an assumption made in drawing the path.

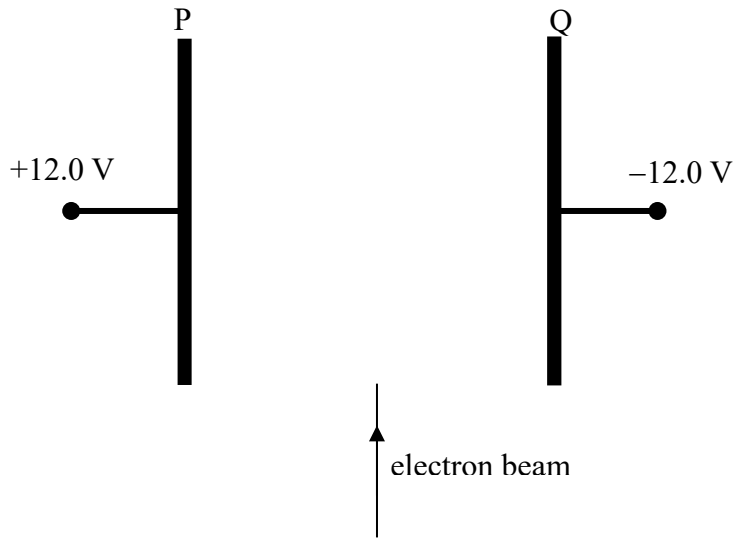

Fig. 5.2 (plan view)

Assumption: …….

……..[3]

(c) If a beam of protons were to enter the plates with the same velocity as the electrons in **Fig. 5.2,** state and explain whether they can clear the plates.

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