4 **(a)** State what is indicated by the direction of an electric field line.

.....

..... [2]

(b) Fig. 4.1 shows a pair of parallel metal plates with a potential difference (p.d.) of 2400 V between them.

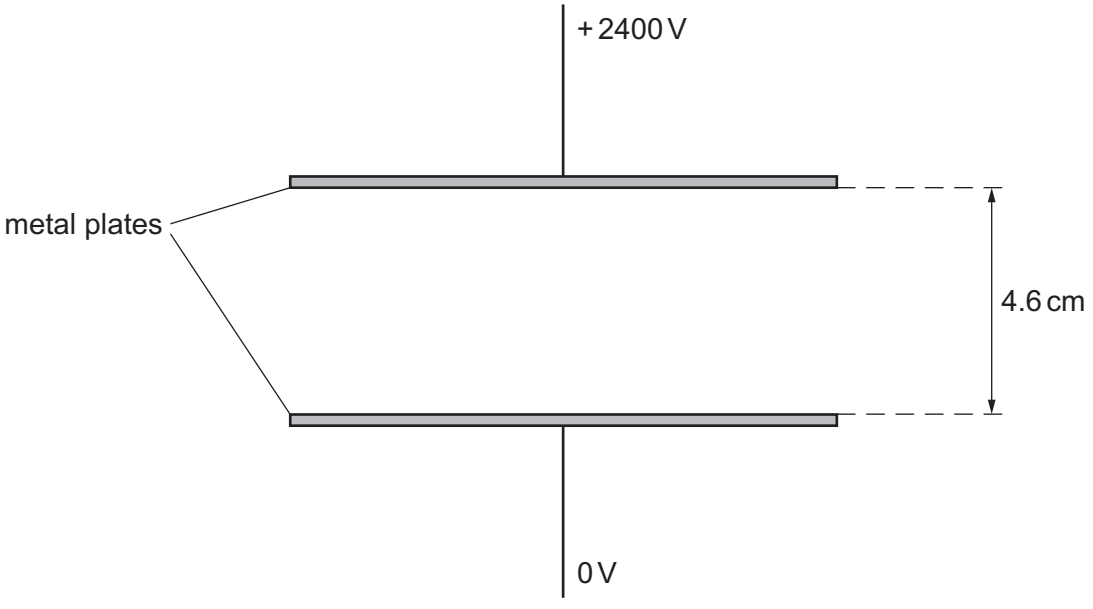

Fig. 4.1

The plates are separated by a distance of 4.6 cm. The plates are in a vacuum.

(i) On Fig. 4.1, draw five lines to represent the electric field in the region between the plates. [3]

(ii) Calculate the strength of the electric field between the plates.

electric field strength = ... $N C^{-1}$ [2]

(c) A moving proton enters the region between the plates from the left, as shown in Fig. 4.2.

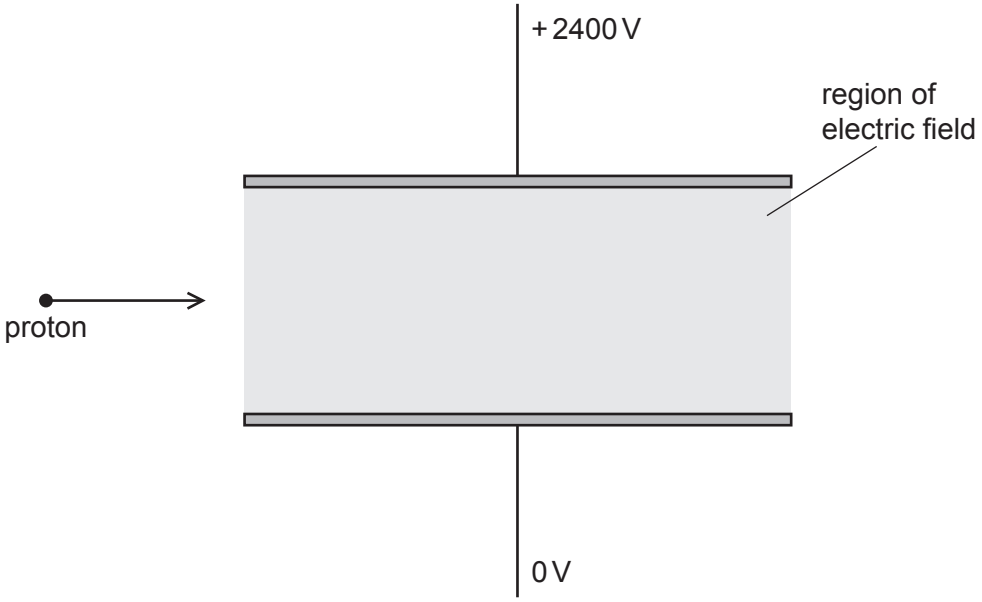

Fig. 4.2

(i) The proton is deflected by the electric field.

On Fig. 4.2, draw a line to show the path of the proton as it moves through and out of the region of the electric field. [2]

(ii) A helium nucleus ($^4_2$He) now enters the region of the electric field along the same initial path as the proton and travelling at the same initial speed.

State and explain how the final speed of the helium nucleus compares with the final speed of the proton after leaving the region of the electric field.

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..... [3]