5 **(a)** Define *electric field strength*.

.....

.....[1]

(b) Two parallel metal plates in a vacuum are separated by 0.045 m. A potential difference V is applied between the plates, as shown in Fig. 5.1.

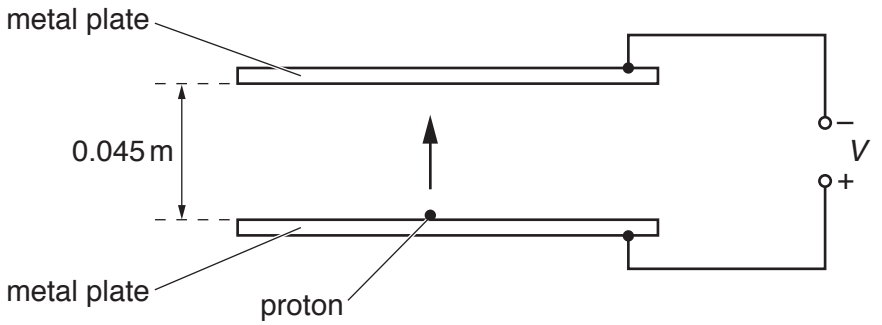

Fig. 5.1

A proton is initially at rest on the surface of the positive plate. The proton in the uniform electric field takes a time of 1.5×10^{-7} s to reach the negative plate.

(i) Show that the acceleration of the proton is $4.0 \times 10^{12}\,m\,s^{-2}$.

[2]

(ii) Calculate the electric force on the proton.

force = ... N [1]

(iii) your answer in **(ii)** to determine

1. the electric field strength,

field strength = ... NC^{-1} [2]

2. the potential difference V between the plates.

V = ... V [2]

(c) An α particle is now accelerated between the two metal plates in **(b)** by the electric field.

Calculate the ratio

$$\frac{\text{acceleration of } \alpha \text{ particle}}{\text{acceleration of proton}}.$$

ratio = ...[2]

[Total: 10]