

- 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.

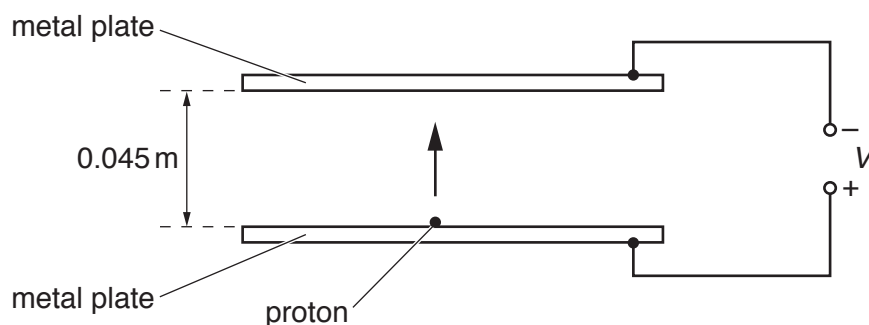


Fig. 5.1

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 $4.0 \times 10^{12} \text{ m s}^{-2}$.

[2]

- (ii) Calculate the electric force on the proton.

force = N [1]

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

1. the electric field strength,

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

2. the potential difference V between the plates.

$V = \dots\dots\dots$ 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]