18. Electric Fields

18.2 Uniform electric fields

Paper 4

Question Paper

1 **(b)** Fig. 5.1 shows two parallel conducting plates that are in a vacuum. The plates are separated by a distance of 6.7 cm and have a potential difference (p.d.) of 430 V between them.

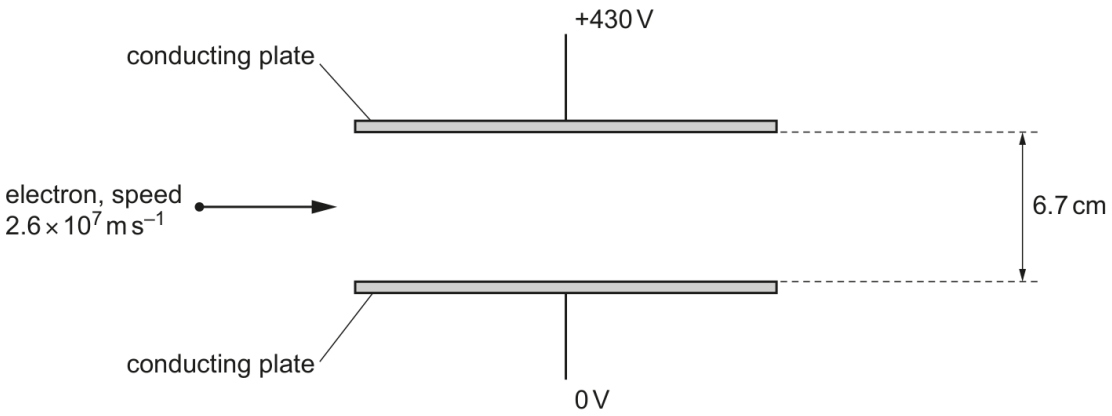


Fig. 5.1

(ii) Determine the strength E of the electric field between the plates.

E = ... N C^{-1} [2]

(iii) An electron travels at a speed of 2.6×10^7 m s^{-1} towards the region between the plates, as shown in Fig. 5.1.

On Fig. 5.1, draw the path of the electron as it moves between and beyond the plates. [2]

2 **(c)** One of the oil droplets in **(b)** is now placed between two horizontal metal plates, as shown in Fig. 5.1.

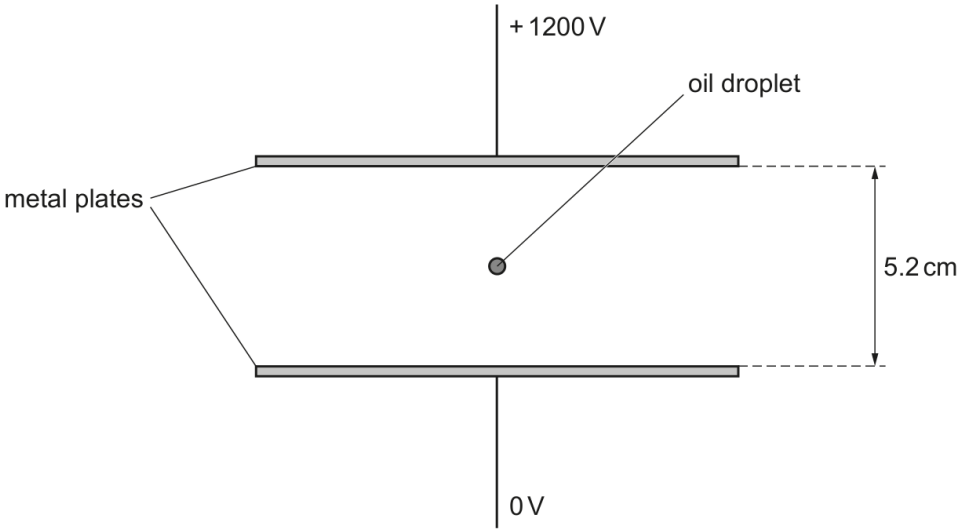


Fig. 5.1 (not to scale)

A potential difference (p.d.) of 1200 V is applied between the plates, with the top plate at the higher potential. The oil droplet is stationary and in equilibrium.

(iii) The distance between the plates is 5.2 cm.

Determine the mass of the oil droplet.

mass = ... kg [3]

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

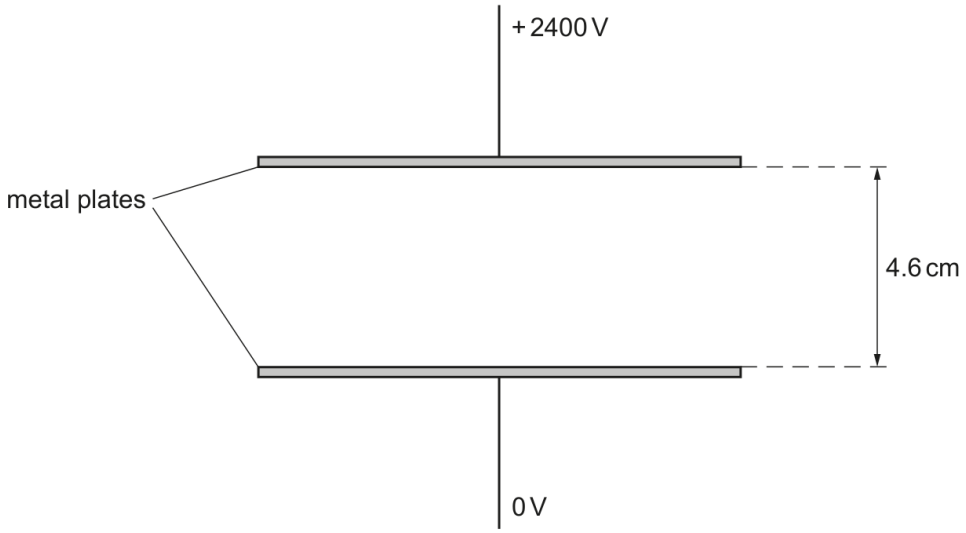


Fig. 4.1

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

(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.

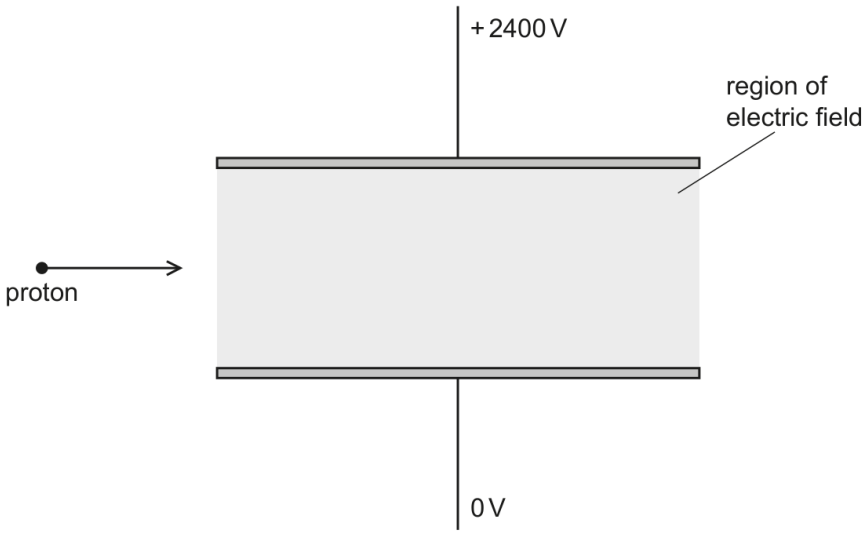


Fig. 4.2

(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]