

- 5 (a) Define the *coulomb*.

.....[1]

- (b) Two vertical metal plates in a vacuum have a separation of 4.0 cm. A potential difference of  $2.0 \times 10^2 \text{ V}$  is applied between the plates. Fig. 5.1 shows a side view of this arrangement.

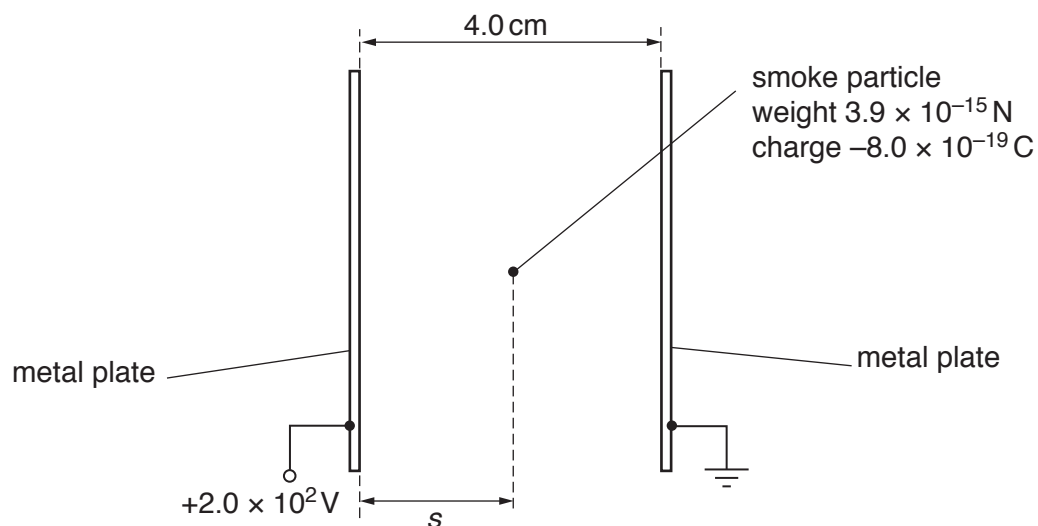


Fig. 5.1

A smoke particle is in the uniform electric field between the plates. The particle has weight  $3.9 \times 10^{-15} \text{ N}$  and charge  $-8.0 \times 10^{-19} \text{ C}$ .

- (i) Show that the electric force acting on the particle is  $4.0 \times 10^{-15} \text{ N}$ .

[2]

- (ii) On Fig. 5.1, draw labelled arrows to show the directions of the two forces acting on the smoke particle.

[1]

(iii) The resultant force acting on the particle is  $F$ .

Determine

1. the magnitude of  $F$ ,

magnitude = ..... N

2. the angle of  $F$  to the horizontal.

angle = .....°  
[3]

(c) The electric field in (b) is switched on at time  $t = 0$  when the particle is at a horizontal displacement  $s = 2.0$  cm from the left-hand plate. At time  $t = 0$  the horizontal velocity of the particle is zero. The particle is then moved by the electric field until it hits a plate at time  $t = T$ .

On Fig. 5.2, sketch the variation with time  $t$  of the horizontal displacement  $s$  of the particle from the left-hand plate.

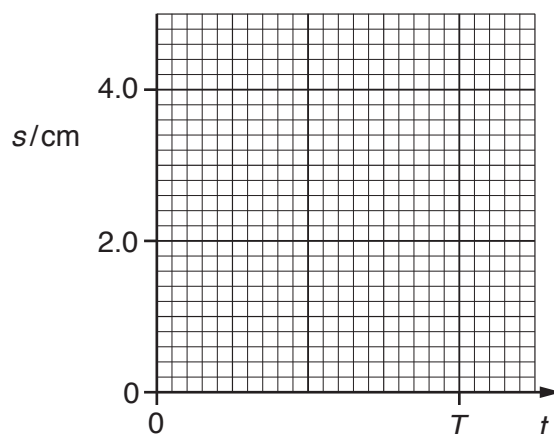


Fig. 5.2

[2]

[Total: 9]