3 Two parallel metal plates, each of length 7.5 cm, are separated by a distance of 3.6 cm, as illustrated in Fig. 3.1.

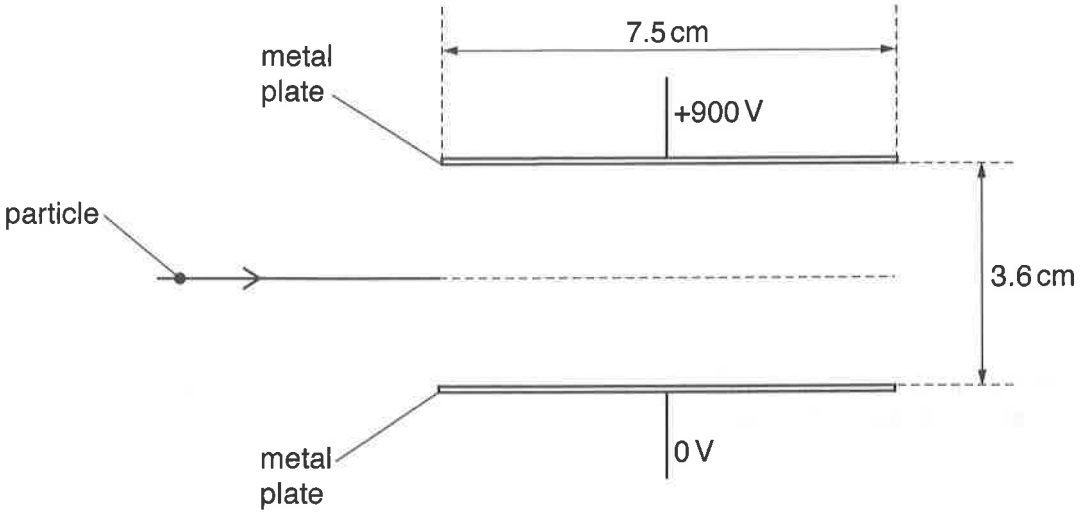

Fig. 3.1 (not to scale)

The plates are in a vacuum.

The potential difference of 900 V between the plates gives rise to a uniform electric field in the region between the plates.

A particle of charge $+3.2 \times 10^{-19}$ C and mass 6.6×10^{-27} kg has an initial speed of 4.1×10^{5} m s^{-1}. It is travelling parallel to the metal plates and enters the electric field mid-way between the plates, as shown in Fig. 3.1.

(a) For the charged particle travelling between the plates,

(i) show that the electric force on the particle is 8.0×10^{-15} N

[2]

(ii) calculate the acceleration a of the particle in the direction of the electric field.

$a =$ ..... $m\,s^{-2}$ [2]

(b) Use your answer in **(a)(ii)** to determine whether the particle travels beyond the plates or collides with the lower plate.

.....

.....[3]

[Total: 7]