

3 (a) State the property of an object that experiences a force when the object is placed in:

- (i) a gravitational field

[1]

- (ii) an electric field.

[1]

(b) A potential difference of 1.2×10^3 V is applied between a pair of horizontal metal plates in a vacuum, as shown in Fig. 3.1.

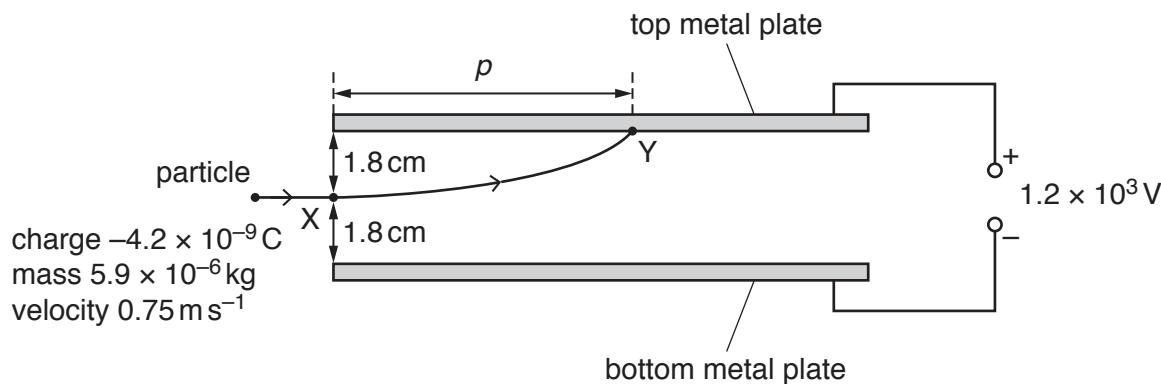


Fig. 3.1 (not to scale)

The separation of the plates is 3.6 cm. The electric field between the plates is uniform.

A particle of mass 5.9×10^{-6} kg and charge -4.2×10^{-9} C enters the field at point X with a horizontal velocity of 0.75 m s^{-1} along a line midway between the two plates.

The particle is deflected by the field and hits the top plate at point Y.

- (i) Calculate the magnitude of the electric force acting on the particle in the field.

$$\text{electric force} = \dots \text{ N} [3]$$

- (ii) By considering the resultant vertical force acting on the particle, show that the acceleration of the particle in the electric and gravitational fields is 14 m s^{-2} .

[4]

- (iii) Determine:

1. the time taken for the particle to move from X to Y

time taken = s [2]

2. the distance p of point Y from the left-hand edge of the top plate.

p = m [1]

[Total: 12]

