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.
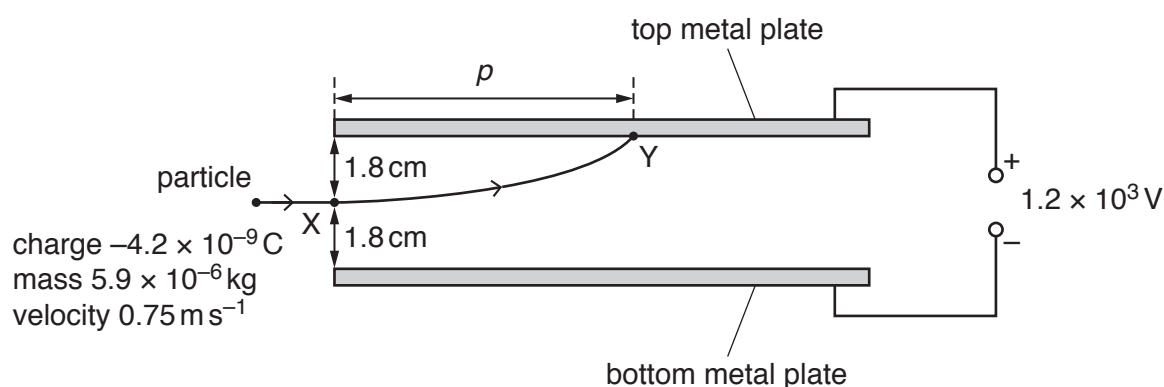

Fig. 3.1 (not to scale)

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.

electric force = ... 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 $14\,\text{m}\,\text{s}^{-2}$.

[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]