4 An electron travelling horizontally with a velocity of 9.0 x 10^6 m s^{-1} enters perpendicularly into a uniform electric field set up by 2 parallel metal plates as shown in Fig. 4.1. After leaving the electric field, it travels into a region of uniform magnetic field of magnetic flux density 0.72 mT. The magnetic field is directed normally into the plane of the paper. Assume that viscous drag and gravitational force are negligible.

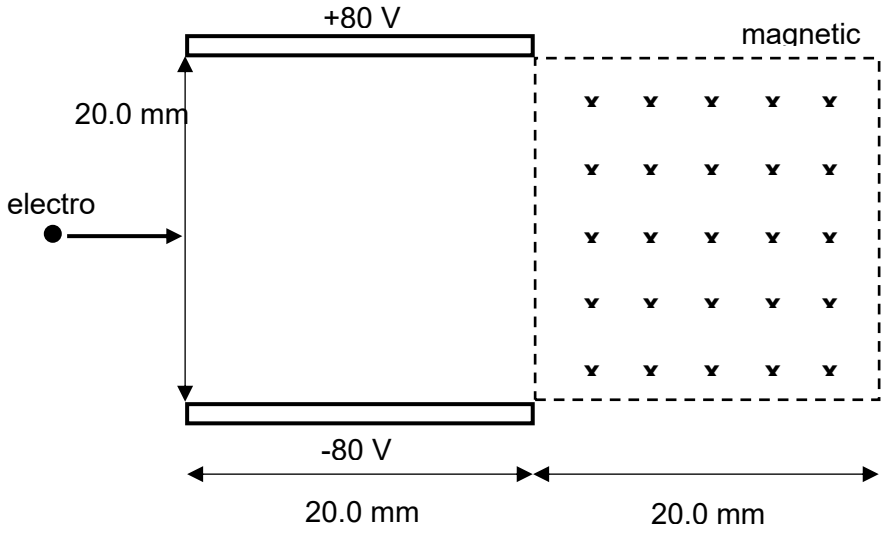

Fig. 4.1 (not drawn to scale)

(a) Determine the time taken for the electron to travel through the electric field.

time = …….. s [1]

(b) Show that the magnitude of the acceleration experienced by the electron while inside the electric field is 1.41 x 10^{15} m s^{-2}.

[2]

(c) Hence, find the vertical displacement of the electron when it leaves the electric field.

vertical displacement = …….. m [2]

(d) Calculate the speed with which the electron leaves the electric field.

speed = …….. m s^{-1} [2]

(e) Hence, determine the radius of the path taken by the electron when it enters the magnetic field.

radius = …….. m [3]

(f) Sketch on Fig. 4.1 a possible path taken by electron in the electric and magnetic field. [2]