6 **(a)** Define magnetic flux density.

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[1]

.....

(b) Fig. 6.1 shows two parallel metal plates P and Q placed in a vacuum. P is connected to a positive potential and Q is connected to earth such that a uniform electric field of field strength 500 N C^{-1} is set up in the region between the plates.

A uniform magnetic field is also set up in the region between the plates.

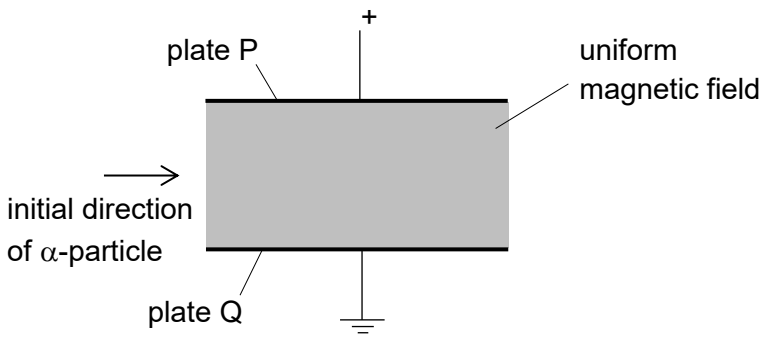

Fig. 6.1

An α-particle of charge +2e, mass 6.64×10^{-27} kg and kinetic energy 120 eV enters the region between the plates at right angles to the electric field. The α-particle travels through the region without any deflection.

(i) State and explain the direction of the magnetic field.

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.....

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[2]

(ii) Show that the electric force on the α-particle is 1.6×10^{-16} N.

[1]

(iii) Calculate the speed of the α-particle.

speed = ... m s^{-1} [2]

(iv) Determine the flux density *B* of the magnetic field.

B = ... T [2]

(v) A proton travels along the same initial path with a kinetic energy of 120 eV. Describe and explain the initial deflection of the proton between the plates.

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[3]

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