5 Positively charged particles are travelling in a vacuum through three narrow slits S_1, S_2 and S_3, as shown in Fig. 5.1.

For Examiner's Use

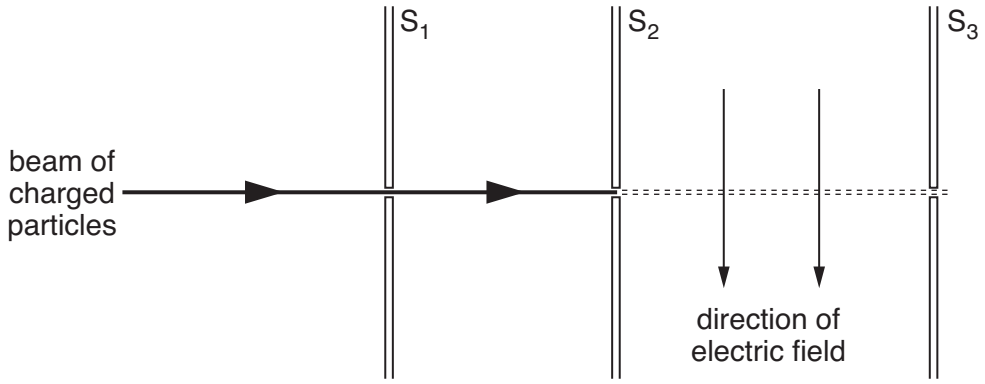

Fig. 5.1

Each particle has speed v and charge q.
There is a uniform magnetic field of flux density B and a uniform electric field of field strength E in the region between the slits S_2 and S_3.

(a) State the expression for the force F acting on a charged particle due to

(i) the magnetic field,

.....[1]

(ii) the electric field.

.....[1]

(b) The electric field acts downwards in the plane of the paper, as shown in Fig. 5.1.
State and explain the direction of the magnetic field so that the positively charged particles may pass undeviated through the region between slits S_2 and S_3.

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.....[2]