7 Two oppositely-charged parallel metal plates are situated in a vacuum, as shown in Fig. 7.1.

For Examiner's Use

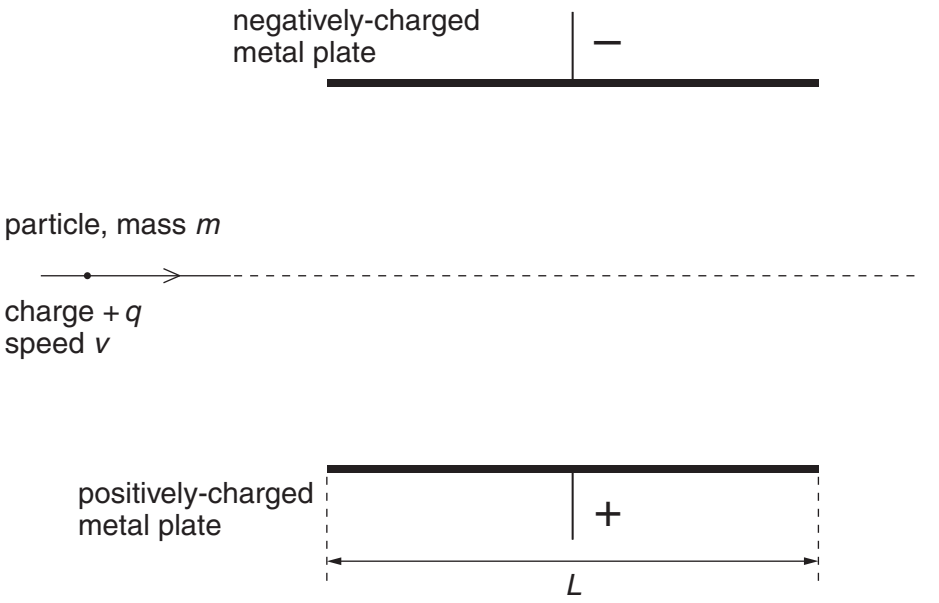

Fig. 7.1

The plates have length L.
The uniform electric field between the plates has magnitude E. The electric field outside the plates is zero.

A positively-charged particle has mass m and charge $+q$. Before the particle reaches the region between the plates, it is travelling with speed v parallel to the plates.
The particle passes between the plates and into the region beyond them.

(a) (i) On Fig. 7.1, draw the path of the particle between the plates and beyond them. [2]

(ii) For the particle in the region between the plates, state expressions, in terms of E, m, q, v and L, as appropriate, for

1. the force F on the particle,

..... [1]

2. the time t for the particle to cross the region between the plates.

..... [1]

(b) (i) State the law of conservation of linear momentum.

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.....

..... [2]

(ii) Use your answers in **(a)(ii)** to state an expression for the change in momentum of the particle.

..... [1]

(iii) Suggest and explain whether the law of conservation of linear momentum applies to the particle moving between the plates.

.....

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..... [2]