

- 8 A slice of a conducting material has its face QRLK normal to a uniform magnetic field of flux density B , as illustrated in Fig. 8.1.

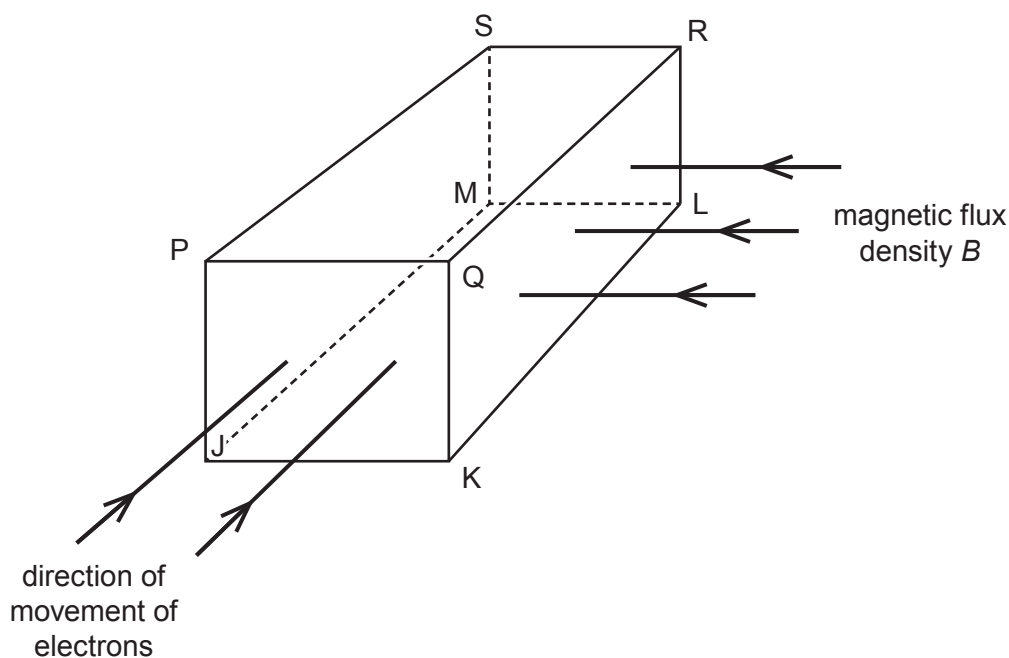


Fig. 8.1

Electrons enter the slice travelling perpendicular to face PQKJ.

(a) For the free electrons moving in the slice:

- (i)** state the direction of the force on an electron due to movement of the electron in the magnetic field

.....
 [1]

- (ii)** identify the faces, using the letters on Fig. 8.1, between which a potential difference is developed.

face and face [1]

(b) Explain why the potential difference in **(a)(ii)** reaches a maximum value.

.....

 [2]

- (c) The number of free electrons per unit volume in the slice of material is $1.3 \times 10^{29} \text{ m}^{-3}$.
 The thickness PQ of the slice is 0.10 mm.
 The magnetic flux density B is $4.6 \times 10^{-3} \text{ T}$.

Calculate the potential difference across the slice for a current of $6.3 \times 10^{-4} \text{ A}$.

potential difference = V [2]

- (d) The slice in (c) is a metal.

By reference to your answer in (c), suggest why Hall probes are usually made using semiconductors rather than metals.

.....

.....

..... [2]