

9 (a) State what is meant by a *magnetic field*.

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..... [2]

(b) A rectangular piece of aluminium foil is situated in a uniform magnetic field of flux density  $B$ , as shown in Fig. 9.1.

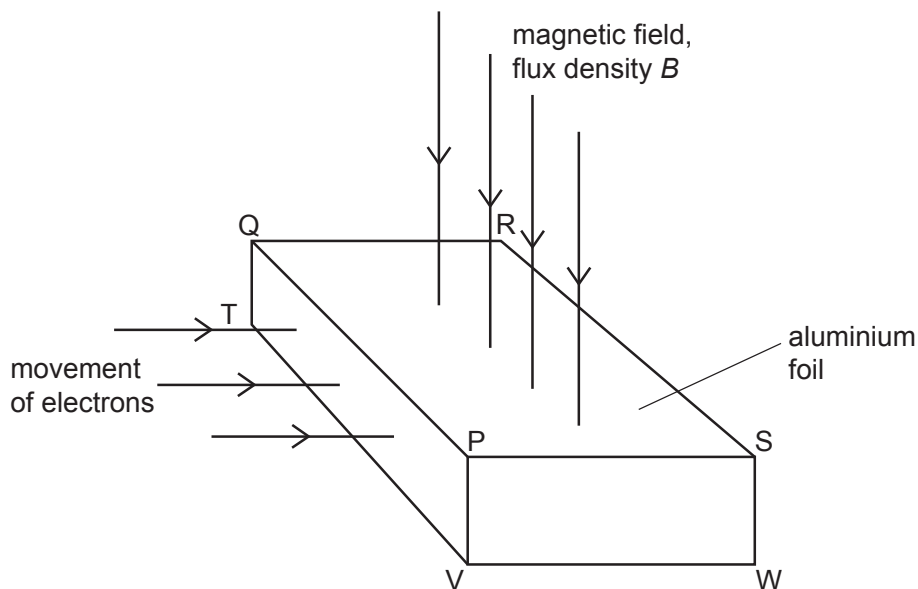


Fig. 9.1

The magnetic field is normal to the face PQRS of the foil.

Electrons, each of charge  $-q$ , enter the foil at right angles to the face PQTV.

(i) On Fig. 9.1, shade the face of the foil on which electrons initially accumulate. [1]

(ii) Explain why electrons do not continuously accumulate on the face you have shaded.

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..... [3]

- (c) The Hall voltage  $V_H$  developed across the foil in (b) is given by the expression

$$V_H = \frac{BI}{ntq}$$

where  $I$  is the current in the foil.

- (i) State the meaning of the quantity  $n$ .

.....  
 ..... [1]

- (ii) Using the letters on Fig. 9.1, identify the distance  $t$ .

..... [1]

- (d) Suggest why, in practice, Hall probes are usually made using a semiconductor material rather than a metal.

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 ..... [1]