

6 Fig. 6.1 shows a thin slice of semiconducting material used in a Hall probe.

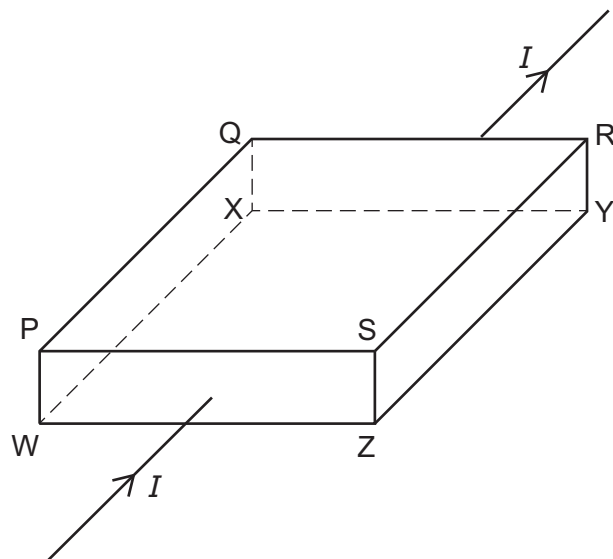


Fig. 6.1 (not to scale)

Current I passes through the slice in the direction shown.

The slice is placed in a uniform magnetic field of flux density B , so that two of its faces are perpendicular to the magnetic field.

A steady Hall voltage V_H is developed between face PQXW and face SRYZ.

- (a) (i) Use the letters in Fig. 6.1 to identify the faces that are perpendicular to the magnetic field.

..... and [1]

- (ii) Explain how the steady Hall voltage V_H is developed between faces PQXW and SRYZ.

.....
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.....
.....
..... [3]

(b) The magnitude of V_H is given by the equation

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

(i) State the meaning of the symbols n , t and q . You may refer to the letters in Fig. 6.1.

n :

t :

q :

[3]

(ii) Suggest, with reference to the equation, why the slice of the material used in a Hall probe is thin.

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..... [2]