

- 3 (a) State what is meant by electric current.

- (b) A current-carrying conductor has length l and cross-sectional area A , as shown in Fig. 3.1. [1]

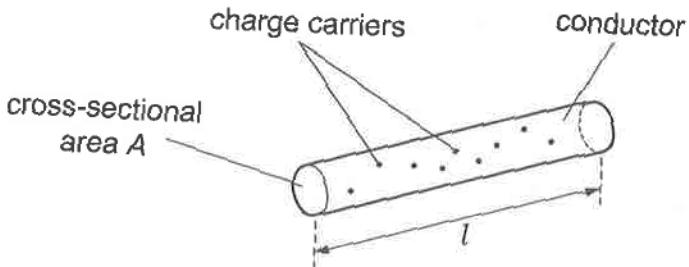


Fig. 3.1

The number density of charge carriers in the conductor is n . The charge carriers move with a drift velocity v when a potential difference (p.d.) is applied across the conductor.

Show that the current I in the conductor is given by the equation:

$$I = nAvq$$

where q is the charge on each of the charge carriers.

[3]





- (c) There is a current of 2.00A in a tungsten wire of diameter 1.80 mm and length 3.00 m. There are 1.45×10^{23} conduction electrons in the wire.

(i) Calculate the drift velocity v of the conduction electrons in the wire.

$$v = \dots \text{ ms}^{-1} [3]$$

(ii) The mean speed of a conduction electron in the tungsten wire is very much greater than the answer obtained in (c)(i).

Explain this observation.

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[2]

[Total: 9]

