

- 5 (a) (i) State and explain the effect, if any, on the resistance of a filament wire in a lamp as the current in the wire decreases.

.....
 [1]

- (ii) On Fig. 5.1, sketch the I - V characteristic of a filament lamp.

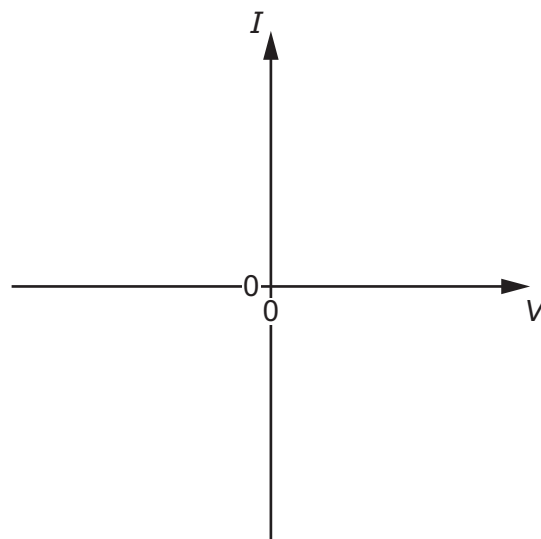


Fig. 5.1

[2]

- (b) A battery of electromotive force (e.m.f.) E and negligible internal resistance is connected in parallel with two filament lamps A and B, as shown in Fig. 5.2.

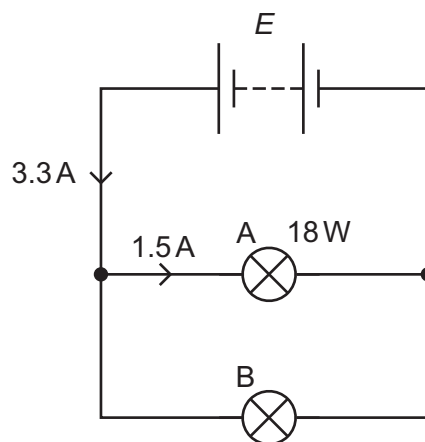


Fig. 5.2

The current in the battery is 3.3 A and the current in lamp A is 1.5 A. The power dissipated in lamp A is 18 W.





- (i) Calculate the e.m.f. E of the battery.

$$E = \dots\dots\dots \text{ V [2]}$$

- (ii) The filament wire of lamp B has a cross-sectional area of $1.4 \times 10^{-9} \text{ m}^2$. The number of free (conduction) electrons per unit volume in the metal of the filament wire is $3.4 \times 10^{28} \text{ m}^{-3}$.

Calculate the average drift speed of the free electrons in the filament wire of lamp B.

$$\text{average drift speed} = \dots\dots\dots \text{ ms}^{-1} \text{ [3]}$$