

- 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]

- (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.

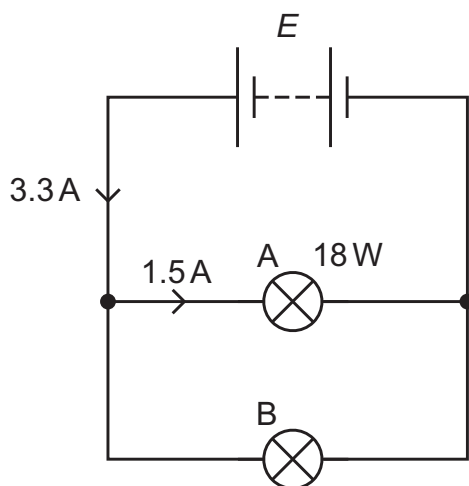


Fig. 5.2

The current in the battery is  $3.3\text{ A}$  and the current in lamp A is  $1.5\text{ A}$ . The power dissipated in lamp A is  $18\text{ W}$ .

- (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.

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

[Total: 8]