6 The ends of a metal resistance wire are connected to a battery of electromotive force (e.m.f.) 8.0 V and negligible internal resistance, as shown in Fig. 6.1.

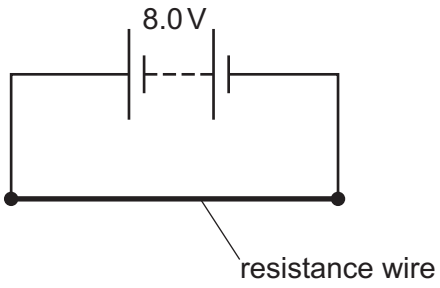

Fig. 6.1

The power dissipated by the resistance wire is 36 W.

(a) Calculate:

(i) the current in the resistance wire

current = ...A [2]

(ii) the number of free electrons that pass through the resistance wire in a time of 50 s

number = ... [2]

(iii) the resistance of the wire.

resistance = ... Ω [2]

(b) The metal of the resistance wire in the circuit has a resistivity of $1.4 \times 10^{-6}\,\Omega\,m$. The cross-sectional area of the wire is $0.25\,mm^2$.

Determine the length of the wire.

length = ... m [2]

(c) The circuit shown in Fig. 6.1 is modified by replacing the original resistance wire with a second resistance wire. The second wire has a greater diameter than the original wire. There are no other differences between the second wire and the original wire.

By reference to resistance, state and explain whether the power dissipated by the second wire is more than, less than or the same as the power dissipated by the original wire.

.....

.....

.....

..... [2]

(d) The circuit shown in Fig. 6.1 is modified by connecting a second battery, of e.m.f. 8.0 V and negligible internal resistance, in parallel with the original battery and the original resistance wire, as shown in Fig. 6.2.

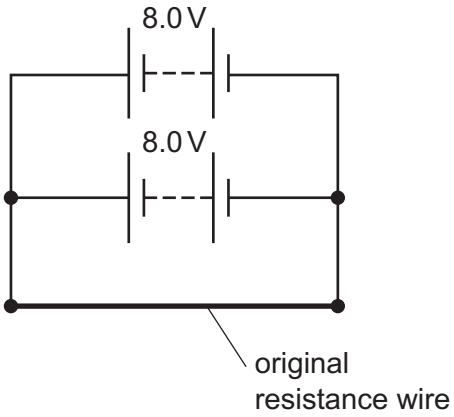

Fig. 6.2

By reference to the current in the resistance wire, state and explain whether the addition of the second battery causes the power in the original resistance wire to decrease, increase or stay the same.

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.....

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..... [2]

[Total: 12]