

- 4 (a) Express the ohm (Ω) in SI base units.

base units = [3]

- (b) An electrician is connecting two identical electric cookers to a supply.

One of the cookers is connected to the supply using wire A, and the other cooker is connected using wire B.

The current in each wire is 25.0A when the cookers are switched on.

Table 4.1 contains information on the two electrical wires A and B.

Table 4.1

wire	cross-sectional area/mm ²	total length of wire/m	resistivity of wire material / Ω m	voltage drop per metre /Vm ⁻¹
A	4.00	8.0	1.68×10^{-8}	
B	6.00	12.0	2.65×10^{-8}	

- (i) Calculate the rate at which electrical energy is converted into thermal energy in each wire. Give the unit.

rate for wire A =

rate for wire B =

[4]

- (ii) Complete Table 4.1 to give the voltage drop per metre for each wire. [2]

- (iii) Explain which wire is the most suitable for the connection to the cooker.

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[1]





- (c) In practice, for each of the connecting wires the electrician uses a cable made up of five thin wires which are electrically isolated from each other. Fig. 4.1 shows a cross-section of the cable.

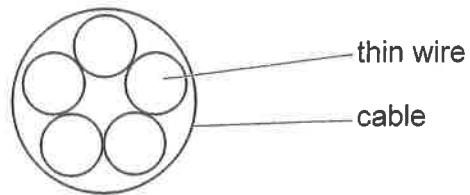


Fig. 4.1

- (i) Draw a circuit diagram, representing each thin wire as a separate resistor, to show one of these cables.

[1]

- (ii) The electrician measures the resistance of one of the cables as $0.0458\ \Omega$.

Calculate the resistance of a single thin wire.

$$\text{resistance} = \dots \Omega \quad [2]$$

- (iii) Suggest why, for a cooker, a cable made of several thin wires is used rather than a single thick wire with the same resistance.

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[2]

[Total: 15]

