6 **(a)** An electrician is connecting two identical electric cookers to a supply. One of the cookers is connected to the supply using wire X, and the other cooker is connected using wire Y. The same current flows in each wire when the cookers are switched on.

Table 6.1 contains information on the two electrical wires X and Y.

wire	cross-sectional area	total length of wire	Resistivity of wire material
X	A	L	ρ
Y	1.50 A	1.50 L	1.58 ρ

Table 6.1

(i) Calculate the ratio

$$\frac{\text{rate at which electrical energy is converted into thermal energy in wire X}}{\text{rate at which electrical energy is converted into thermal energy in wire Y}}$$

ratio = …… [2]

(ii) Suggest with a reason which wire is more suitable for connection to the cooker.

……

……

…… [1]

(iii) In practice, each connecting wire consists of a cable made up of five thin wires which are electrically isolated from each other. Fig. 6.1 shows a cross section of the cable.

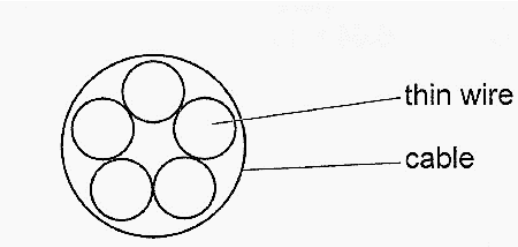


Fig. 6.1

1. The resistance of one of the cables is measured as 0.0458 ∧. Calculate the resistance of a single thin wire.

resistance = ... Ω [2]

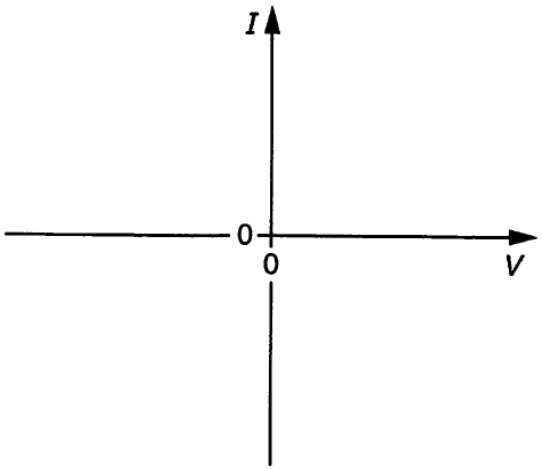
2. Suggest why, for a cooker, a cable made of several thin wires is used rather than a single thick wire with the same resistance.

……

……

…… [1]

(b) **(i)** Sketch, on Fig. 6.2, the I-V characteristic graph for a filament lamp.



[1]

Fig. 6.2

(ii) Explain, in terms of particles, why the I-V characteristic graph for a filament lamp has this shape.

……

……

……

……

…… [3]

(iii) Discuss whether the resistance of the filament lamp can be deduced from:

$$\frac{1}{gradient\ of\ I-V\ characteristic}$$

……

……

…… [1]