

- 4 A battery B, a variable resistor R and a uniform resistance wire PQ are connected in series, as shown in Fig. 4.1

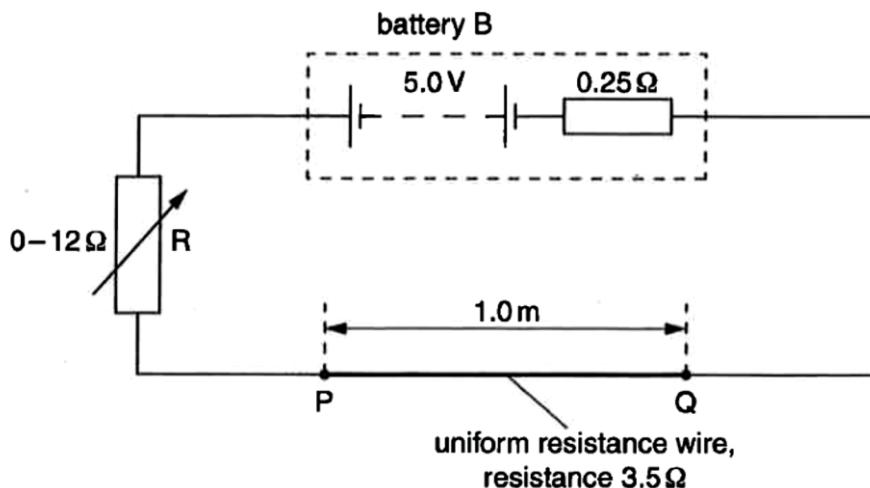


Fig. 4.1

Battery B has electromotive force (e.m.f.) 5.0 V and internal resistance 0.25 Ω.

Wire PQ has length 1.0 m and resistance 3.5 Ω at room temperature.

- (a) The resistance of R is set to 4.0 Ω.

Calculate, when the circuit is just turned on,

- (i) the potential difference across wire PQ,

$$\text{p.d.} = \dots \text{V} \quad [2]$$

- (ii) the percentage of total power transferred to wire PQ.

$$\text{percentage} = \dots \% \quad [2]$$

[Turn over

- (b) The temperature of the wire is gradually increased from room temperature to a maximum steady temperature.
- (i) Describe and explain the variation in the terminal potential difference (p.d.) across B.
Numerical values are not required.

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- (ii) Suggest why the temperature of the wire will reach a steady maximum value.

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