5 A uniform resistance wire AB has length 50 cm and diameter 0.36 mm. The resistivity of the metal of the wire is $5.1 \times 10^{-7}\,\Omega\,\text{m}$.

(a) Show that the resistance of the wire AB is 2.5 Ω.

[2]

(b) The wire AB is connected in series with a power supply E and a resistor R as shown in Fig. 5.1.

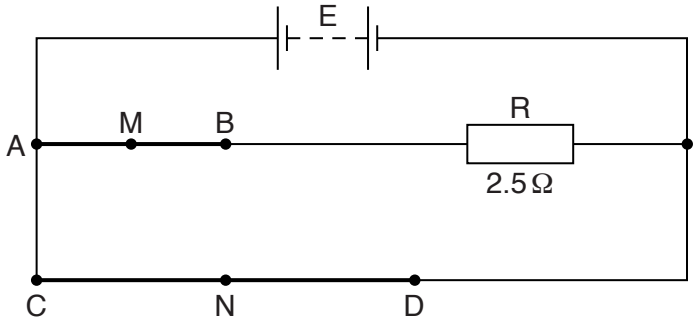

Fig. 5.1

The electromotive force (e.m.f.) of E is 6.0 V and its internal resistance is negligible. The resistance of R is 2.5 Ω. A second uniform wire CD is connected across the terminals of E. The wire CD has length 100 cm, diameter 0.18 mm and is made of the same metal as wire AB.

Calculate

(i) the current supplied by E,

current = ... A [4]

(ii) the power transformed in wire AB,

power = ... W [2]

(iii) the potential difference (p.d.) between the midpoint M of wire AB and the midpoint N of wire CD.

p.d. = ... V [2]

[Turn over