5 A cell of e.m.f. 1.2 V and negligible internal resistance is connected to three resistors and a semiconductor diode, as shown in Fig. 5.1.

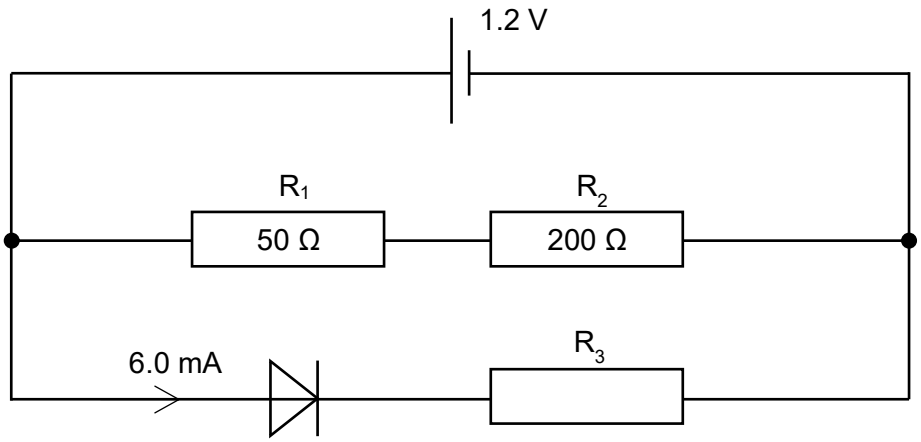

Fig. 5.1

The *I*-*V* characteristic of the semiconductor diode is shown in Fig. 5.2.

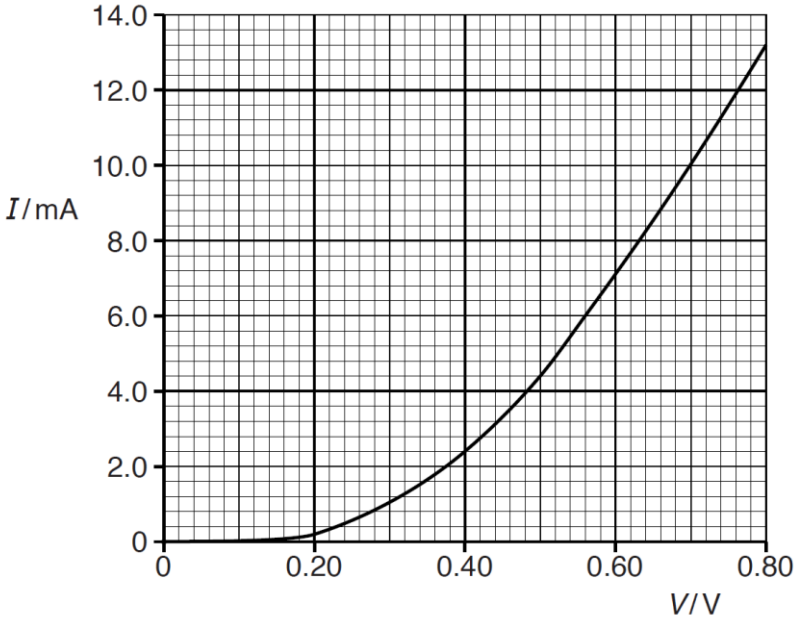

Fig. 5.2

The current in the diode is 6.0 mA.

(a) Use Fig. 5.2 to determine the resistance of the diode for a current of 6.0 mA.

resistance = ... Ω [1]

(b) Determine the resistance of R_3.

resistance = ... Ω [2]

(c) Determine the current in R_1.

current = ... A [2]

(d) Determine the total power dissipated in the circuit.

total power = ... W [2]

(e) A 1.0 m metal wire is added to the circuit as shown in Fig. 5.3.

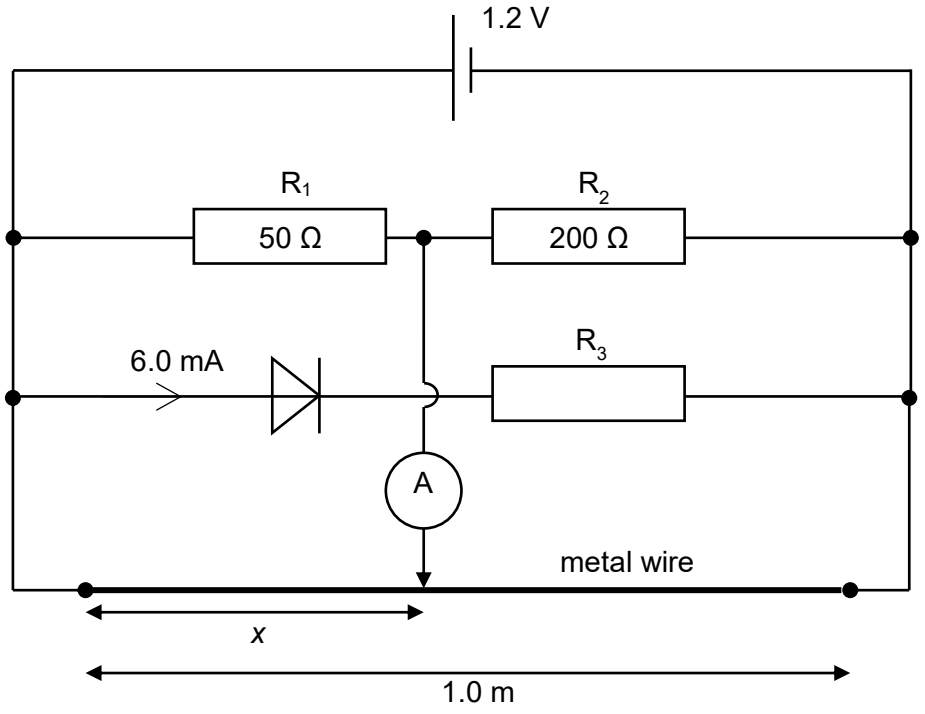

Fig. 5.3

Determine length *x* such that there is no current flowing through the ammeter.

x = ... m [2]

[Total: 9]

BLANK