6 **(a)** A cell of e.m.f. 1.5V and internal resistance 0.25 Ω is connected in series with a resistor R, as shown in Fig. 6.1.

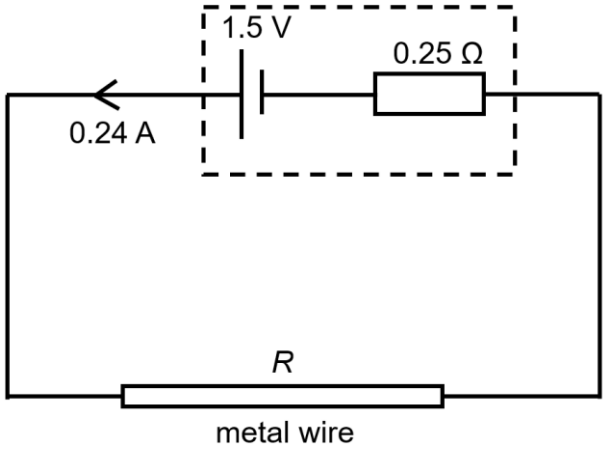

Fig. 6.1

The resistor R is made of metal wire.

A current of 0.24 A passes through R for a time of 5.0 minutes.

Calculate

(i) the charge that passes through the cell,

charge = ... C [1]

(ii) the total energy transferred by the cell,

energy = ... J [2]

(iii) the energy transferred in the resistor R,

energy = ... J [2]

(iv) the resistance of R.

resistance = ... Ω [2]

(b) Two cells identical to the one in **(a)** are now connected in series with a fixed resistor of resistance 2000 Ω and a thermistor, as shown in Fig. 6.2.

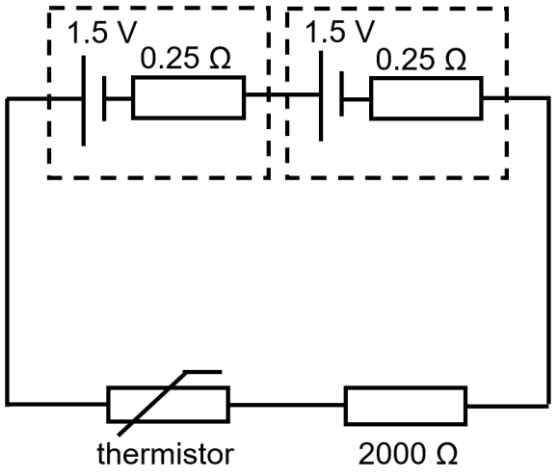

Fig. 6.2

The thermistor has resistance 4000 Ω at 0 °C and 1800 Ω at 20 °C.

(i) Explain why, in this circuit, the internal resistance of the cells may be considered to be negligible.

.....

.....

.....[1]

(ii) In one particular application of the circuit of Fig. 6.2, it is desired that the potential difference across the **fixed** resistor should range from 1.2 V at 0 °C to 2.4 V at 20 °C.

Determine whether it is possible to achieve this range of potential differences.

.....

.....

.....[3]

[Total: 11]