**7** A potential divider circuit consists of two resistors of resistances *P* and *Q*, as shown in Fig. 7.1.
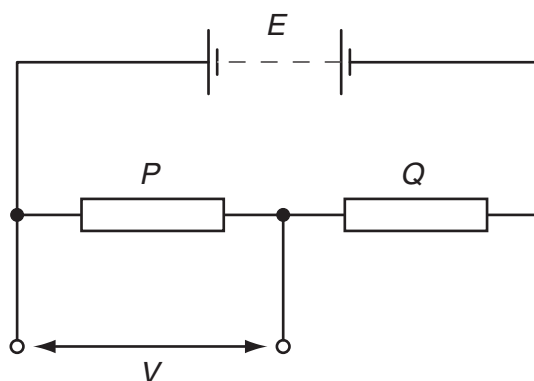
**Fig. 7.1**

The battery has e.m.f. *E* and negligible internal resistance.

**(a)** Deduce that the potential difference *V* across the resistor of resistance *P* is given by the expression

$$V = \frac{P}{P + Q} E.$$

[2]

**(b)** The resistances *P* and *Q* are 2000 Ω and 5000 Ω respectively.
A voltmeter is connected in parallel with the 2000 Ω resistor and a thermistor is connected in parallel with the 5000 Ω resistor, as shown in Fig. 7.2.
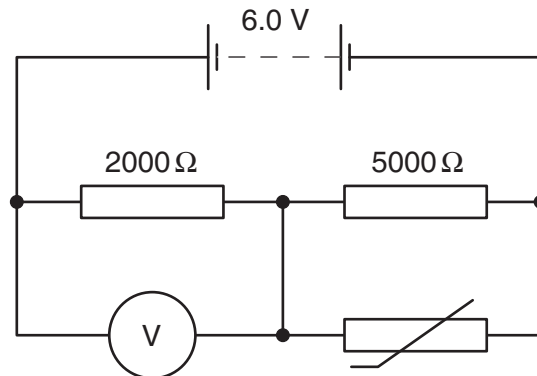


**Fig. 7.2**

The battery has e.m.f. 6.0 V. The voltmeter has infinite resistance.

**(i)** State and explain qualitatively the change in the reading of the voltmeter as the temperature of the thermistor is raised.

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**(ii)** The voltmeter reads 3.6 V when the temperature of the thermistor is 19 °C.
Calculate the resistance of the thermistor at 19 °C.

resistance = ………………….….. Ω [4]