5 **(a)** State Kirchhoff's second law.

.....

..... [1]

(b) A battery of electromotive force (e.m.f.) 9.0 V and negligible internal resistance is connected in series with a variable resistor X and a thermistor Y as shown in Fig. 5.1.

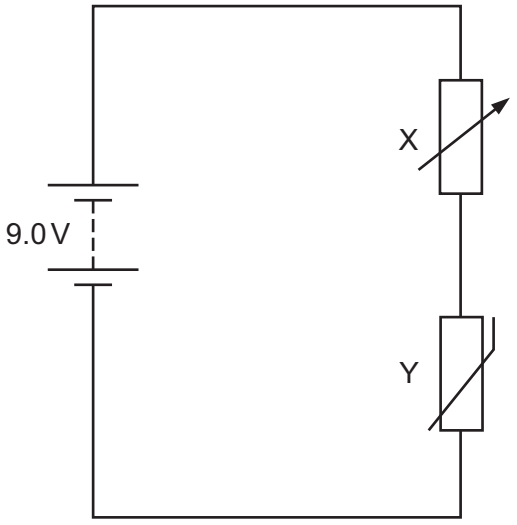

Fig. 5.1

Fig. 5.2 shows the relationship between temperature and resistance for the thermistor.

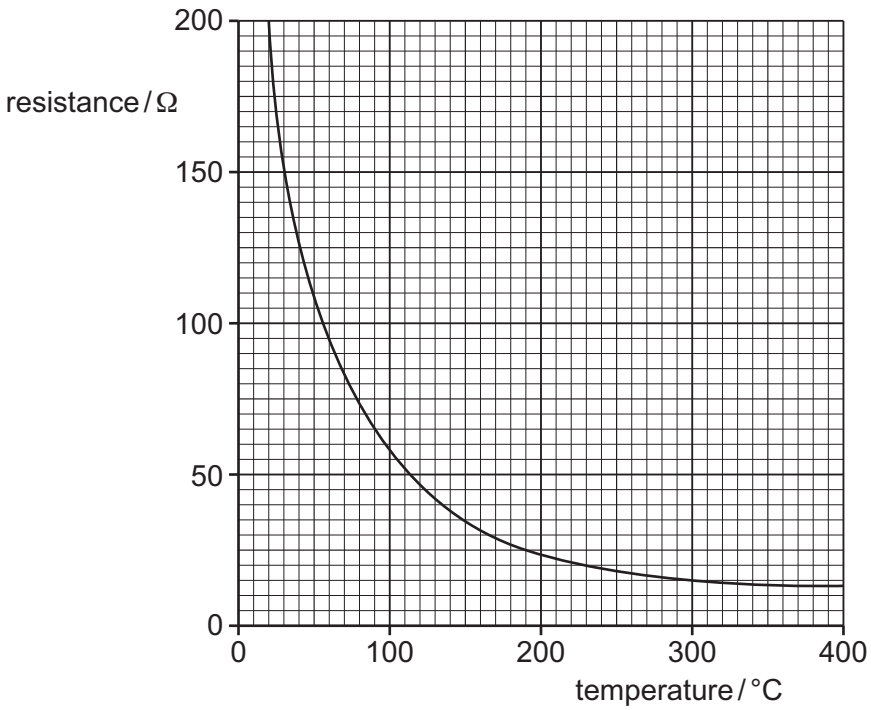

Fig. 5.2

(i) The current in the circuit is 1.1×10^{-2} A. The potential difference across Y is 4.0 V.

Calculate the resistance of X.

resistance = ... Ω [2]

(ii) The temperature of Y is changed to 190 °C. The resistance of X remains unchanged.

Determine the new potential difference across Y.

potential difference = ... V [3]

(iii) The resistance of X is increased. The temperature of Y remains at 190 °C.

By reference to the current in the circuit, state and explain the effect of this change, if any, on the potential difference **across Y**.

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..... [3]

[Total: 9]