5 **(a)** A thermistor and a filament bulb are connected in parallel to a battery as shown in Fig 5.1. The e.m.f. *E* of the battery is unknown and its internal resistance is negligible.

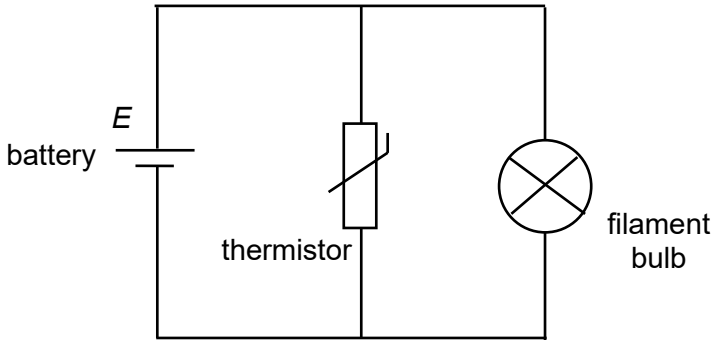

Fig 5.1

Fig. 5.2 shows the current-voltage (*I*-*V*) characteristics of the filament bulb and the thermistor.

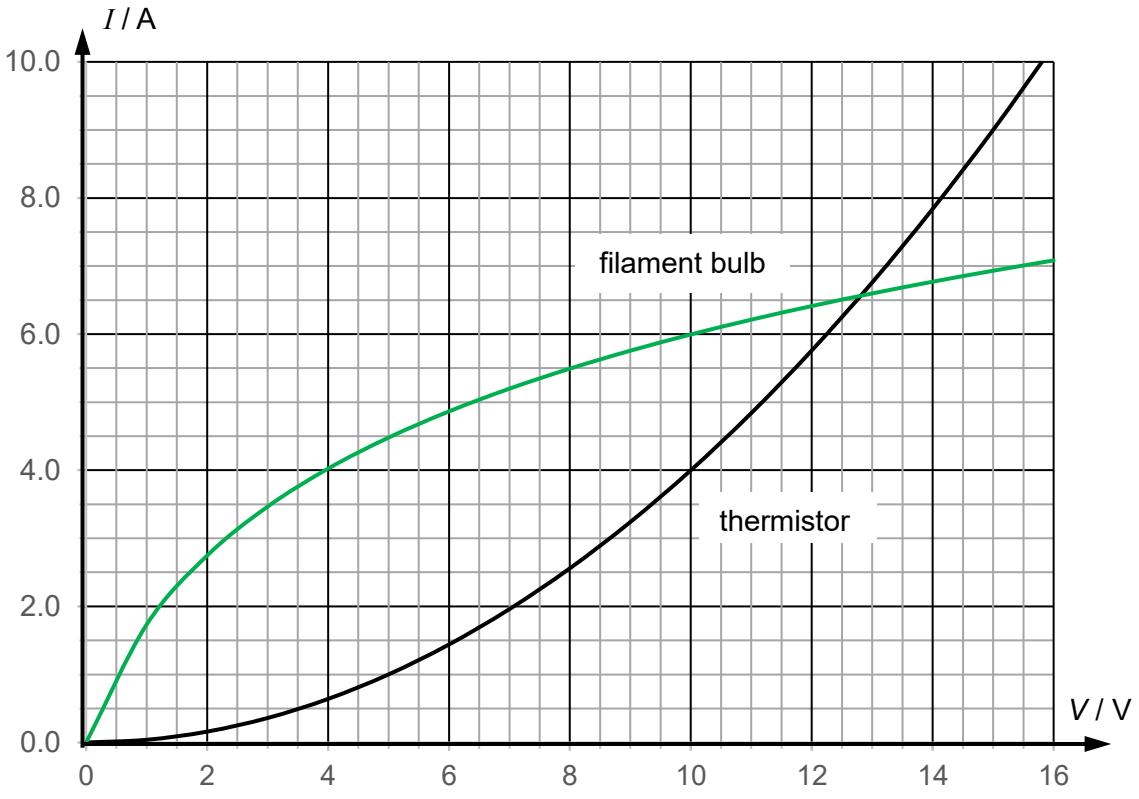

Fig 5.2

(i) Describe the main features of Fig. 5.2 that show the characteristics of the negative temperature coefficient thermistor in terms of current, voltage and resistance.

……..

……..

……..

……..… [2]

(ii) The current through the battery is 8.0 A.

Using Fig. 5.2, determine

1. the current through the filament bulb and the thermistor

current through the filament bulb = ……. A [1]

current through the thermistor = ……. A [1]

2. the e.m.f. of the battery.

e.m.f. = ……. V [1]

(b) The filament bulb is now connected in series with a fixed resistor of 2.5 Ω and a battery, as shown in Fig 5.3. The e.m.f. *E* of the battery is 14.0 V and its internal resistance is negligible.

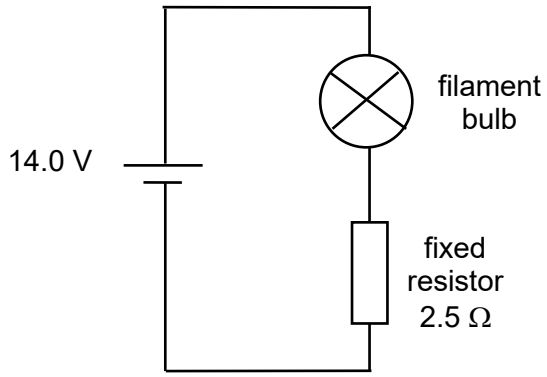

Fig. 5.3

The variation with the potential difference V of the current I for the filament bulb is shown in Fig. 5.4.

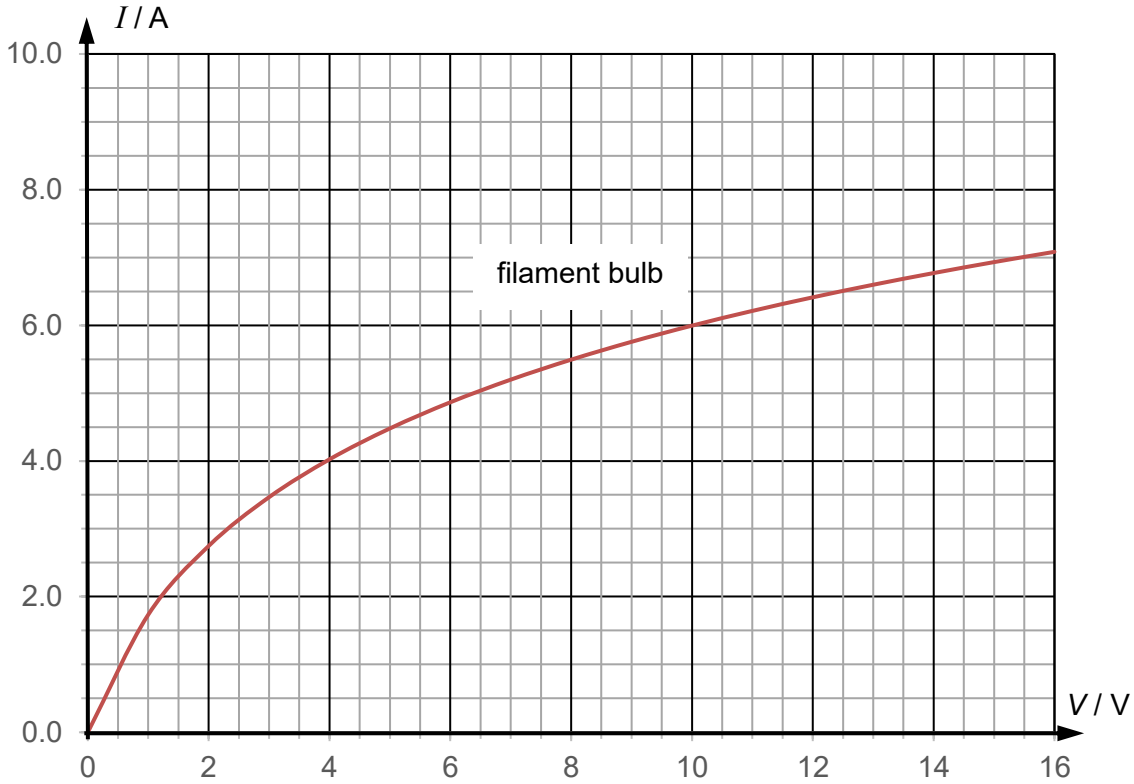

Fig 5.4

(i) On Fig 5.4, draw a line to show the variation with the potential difference V of the current I through the fixed resistor. [1]

(ii) Using Fig. 5.4, determine the current through the filament bulb.

current = ... A [1]

(iii) Using Fig. 5.4, determine the potential difference across the fixed resistor.

potential difference = ... V [1]

[Total: 8]