5 **(a)** The *I*-*V* characteristic graph for a thermistor is shown in Fig. 5.1.

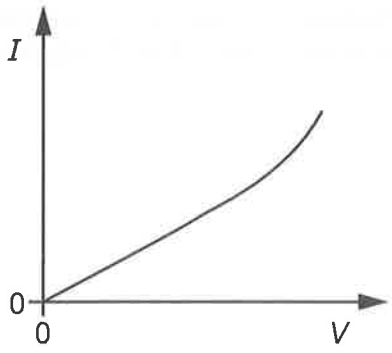

Fig. 5.1

Describe and explain what this graph shows about the resistance of the thermistor as the potential difference (p.d.) across it is increased from zero.

.....

.....

..... [2]

(b) Two resistors are connected to a d.c. power supply with negligible internal resistance. One resistor has a resistance of 220 Ω and the other has a resistance of 640 Ω. They can be connected in series, as shown in Fig. 5.2, or in parallel, as shown in Fig. 5.3.

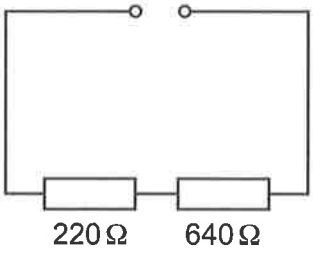

Fig. 5.2

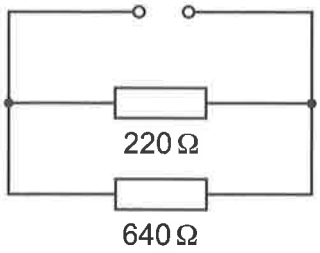

Fig. 5.3

(i) For the two resistors connected in series, show that the ratio:

$$\frac{\text{power dissipated in 220 Ω resistor}}{\text{power dissipated in 640 Ω resistor}} = 0.34.$$

Explain your working.

[2]

(ii) The power supply is replaced with another supply that has an internal resistance.

State and explain the effect on the ratio of the powers in **(b)(i)**.

.....

.....

..... [1]

(iii) For the original power supply with negligible internal resistance, calculate the ratio:

$$\frac{\text{current from supply in series circuit}}{\text{current from supply in parallel circuit}}.$$

Show your working.

ratio = ... [3]

(iv) The power supply is now replaced with an a.c. power supply that has negligible internal resistance. Its peak voltage is equal to the value of the output voltage from the d.c. power supply.

State and explain the effect on the ratio of the currents in **(b)(iii)**.

.....

.....

..... [1]

[Total: 9]