(b) (i)	(as temperature rises), resistance of (thermistor) decreases	M1	
	either resistance of parallel combination decreases		
	or p.d. across 5 kΩ resistor / thermistor decreases	M1	
	p.d. across 2000 Ω resistor / voltmeter reading increases	A1	[3]

(ii) if R is the resistance of the parallel combination,

either $3.6 = (2 \times 6) / (2 + R)$	*or* current in 2 kΩ resistor = 1.8 mA	C1	
$R = 1.33$ kΩ	current in 5 kΩ resistor = 0.48 mA	C1	
$\frac{1}{1.33} = \frac{1}{5} + \frac{1}{T}$	current in thermistor = 1.32 mA	C1	
$T = 1.82$ kΩ	$T = 2.4 / 1.32 = 1.82$ kΩ	A1	[4]

Total **[6]**

1)

(a) *either* $V = E R_1 / (R_1 + R_2)$ *or* $I = E / (R_1 + R_2)$ — C1

$= \frac{1800}{3000} \times 4.50$ — $V = \frac{1800}{3000} \times 4.50$ — M1

$= 2.70$ V — $= 2.70$ V — A0 **[2]**

(b) (i) for a wire, $V = I \times (\rho L/A)$ — M1

I, ρ *and* A are constant — A1

so $V \propto L$ — A0 **[2]**

2) **(ii)** **1** 2.70 V — A1 **[1]**

2 $\frac{L}{100} = \frac{2.70}{4.50}$ — C1

$L = 60.0$ cm — A1 **[2]**

(iii) thermistor resistance decreases as temperature rises — M1

so QM is shorter — A1 **[2]**

3)

(a) *either* $V = IP$ — B1

current in circuit = $E / (P + Q)$ — B1

hence $V = EP / (P + Q)$ — A0 [2]

or current is the same throughout the circuit (M1)

$V / P = E / (P + Q)$ (A1)

hence $V = EP / (P + Q)$ (A0)

(b) (i) (as temperature rises), resistance of (thermistor) decreases — M1

either resistance of parallel combination decreases

or p.d. across 5 kΩ resistor / thermistor decreases — M1

p.d. across 2000 Ω resistor / voltmeter reading increases — A1 [3]

(ii) if R is the resistance of the parallel combination,

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$\frac{1}{1.33} = \frac{1}{5} + \frac{1}{T}$	current in thermistor = 1.32 mA	C1	
$T = 1.82$ kΩ	$T = 2.4 / 1.32 = 1.82$ kΩ	A1	[4]

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