

11: Electronics – Topic questions

Paper 3

The questions in this document have been compiled from a number of past papers, as indicated in the table below.

Use these questions to formatively assess your learners' understanding of this topic.

Question	Year	Series	Paper number
9	2015	June	21
12	2015	June	22
9	2015	November	21

The mark scheme for each question is provided at the end of the document.

You can find the complete question papers and the complete mark schemes (with additional notes where available) on the School Support Hub at www.cambridgeinternational.org/support

- 9 In cold weather, houses are often heated with an electrical heater. Fig. 9.1 shows a simplified electrical circuit for a household heater.

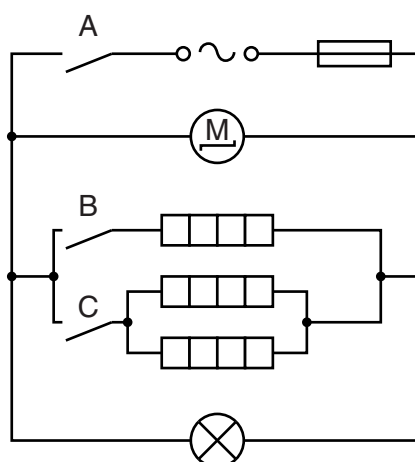


Fig. 9.1

- (a) What does the symbol $\text{---}\circ\sim\circ\text{---}$ represent?

..... [1]

- (b) The heater has three identical heating elements, a fan driven by a motor and a lamp.

Name the components that are working when switch A only is closed.

..... [1]

- (c) The heater has two switches, B and C, to give high, medium and low heat settings.

Identify how each heat setting is obtained. Complete the table by adding ticks to represent a closed switch.

heater settings	switch B	switch C
high		
medium		
low		

[3]

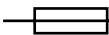
- (d) Write down the equation that relates resistance, potential difference (p.d.) and current.

..... [1]

- (e) The current in one of the heating elements is 5.0 A. The resistance of the heating element is $50\ \Omega$.

Calculate the p.d. across the heating element. Include the appropriate unit.

p.d. = [2]

- (f) Explain how the component with the symbol  protects the circuit.

.....

.....

.....

..... [2]

[Total: 10]

12 A student sets up the circuit shown in Fig. 12.1.

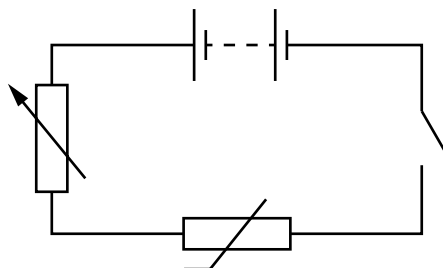


Fig. 12.1

(a) On Fig. 12.1, label the thermistor with a T. [1]

(b) The student wants to determine the resistance of the thermistor at different temperatures.

Complete the sentences for the meters he should use in the circuit.

(i) The meter to be connected in series with the thermistor is [1]

(ii) The meter to be connected in parallel with the thermistor is [1]

(c) These are the student's results for a temperature of 20 °C.

p.d. across thermistor/V	current in thermistor/A
3.2	0.0050

(i) Calculate the resistance of the thermistor at 20 °C.

resistance = Ω [3]

(ii) When the temperature increases, the resistance of the thermistor decreases.

State what happens, if anything, to the current in the thermistor.

.....[1]

[Total: 7]

- 9 A student investigates how the resistance of a thermistor changes with temperature. Fig. 9.1 shows the circuit that the student uses.

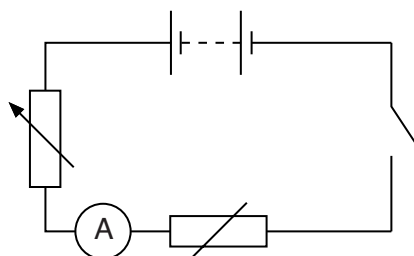


Fig. 9.1

- (a) (i) Label clearly the thermistor in Fig. 9.1. [1]
- (ii) On Fig. 9.1, draw a voltmeter connected so that the resistance of the thermistor can be determined. [2]
- (b) The student varies the temperature of the thermistor and records the ammeter readings. The results are shown in Table 9.1.

Table 9.1

temperature of thermistor/ $^{\circ}\text{C}$	0	10	20	30	40	50
current in thermistor/mA	1.0	2.0	4.0	7.5	14.0	24.5

- (i) The potential difference (p.d.) across the thermistor is 6.0V at 20 $^{\circ}\text{C}$.

Calculate the resistance of the thermistor at 20 $^{\circ}\text{C}$. Include the unit.

resistance = [4]

(ii) Fig. 9.2 shows the student's results plotted on a graph.

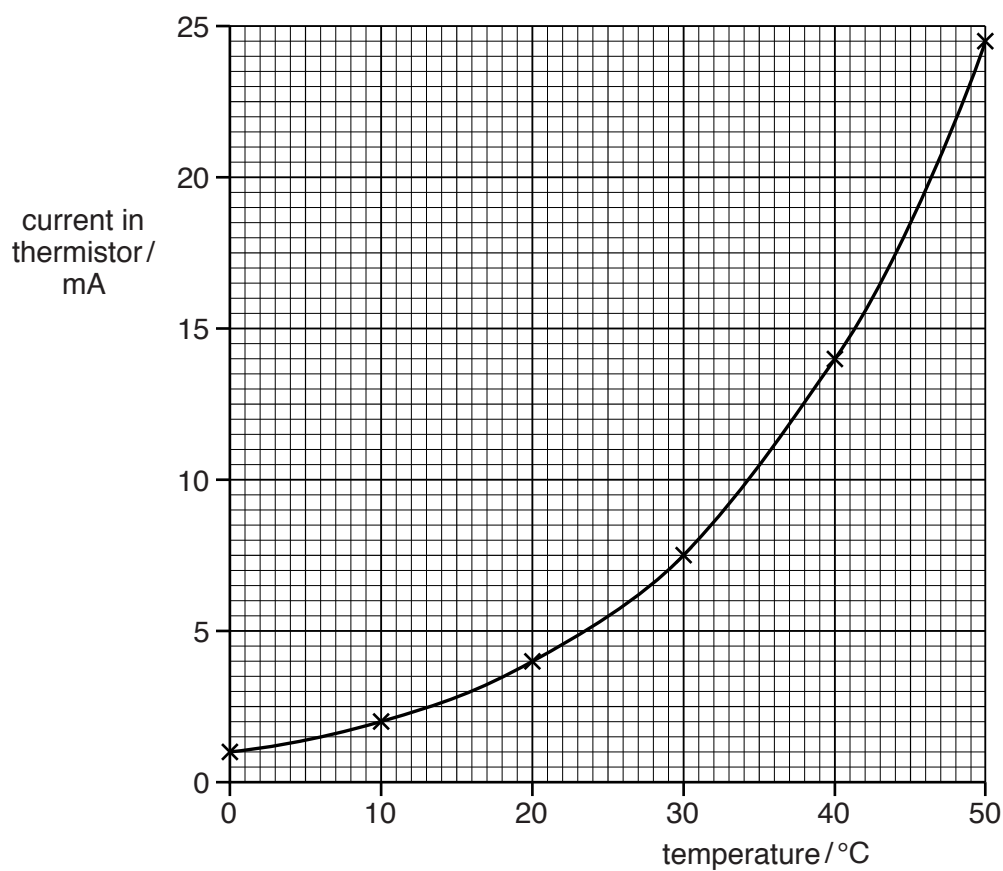


Fig. 9.2

The student suggests that the current in the thermistor is directly proportional to the temperature of the thermistor.

Explain how the graph shown in Fig. 9.2 shows that the suggestion is incorrect.

.....

..... [1]

[Total: 8]

Question	Answer	Mark												
9 (a)	alternating voltage OR a.c. (supply)	B1												
9 (b)	motor (accept fan) AND lamp	B1												
9 (c)	<table border="1"> <tr> <td>heater settings</td><td>switch B</td><td>switch C</td></tr> <tr> <td>high</td><td>✓</td><td>✓</td></tr> <tr> <td>medium</td><td></td><td>✓</td></tr> <tr> <td>low</td><td>✓</td><td></td></tr> </table>	heater settings	switch B	switch C	high	✓	✓	medium		✓	low	✓		B3
heater settings	switch B	switch C												
high	✓	✓												
medium		✓												
low	✓													
9 (d)	$V = IR$ in any form	B1												
9 (e)	50 x 5 250 <u>V</u>	C1 A1												
9 (f)	any two from: <ul style="list-style-type: none"> current too large fuse wire melts/"blows" breaks circuit prevents overheating/fires/damage to other components 	B2												
		Total: 10												
12 (a)	thermistor correctly identified (by letter T)	B1												
12 (b) (i)	ammeter NOT ampmeter	B1												
12 (b) (ii)	voltmeter	B1												
12 (c) (i)	$(R =) V \div I$ in any form 3.2 \div 0.005 640 (Ω)	C1 C1 A1												
12 (c) (ii)	increases	B1												
		Total: 7												
9 (a)	thermistor correctly labelled	B1												
9 (a) (i)	correct symbol for voltmeter voltmeter in parallel with thermistor OR e.c.f. (a) (i)	B1 B1												
9 (b) (i)	$V = IR$ in any form 6.0 \div 0.004 OR 6.0 \div 4.0 1500 Ω OR ohm(s)	C1 C1 A1 B1												
9 (b) (ii)	not a straight line / constant gradient OR not through origin	B1												
		Total: 8												

Notes about the mark scheme are available separately.