AQA GCSE Physics | 8463

SPECIFICATION POINT 4.2.1.4

Resistors

Past-paper questions

Tier	**Foundation**
Question groups	**38**
Available paper years	**2003–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

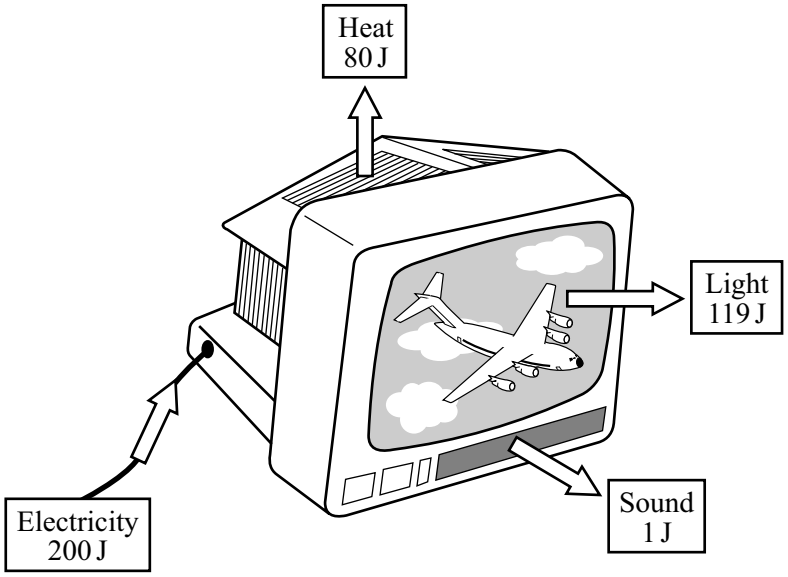
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.1.4 Resistors

Question 01

June 2003 | 3451F | Original Q4 | Legacy

4 (a) The drawing shows the energy transferred each second by a television set.



(i) What form of energy is transferred as waste energy by the television set?

.....

(1 mark)

(ii) What effect will the waste energy have on the air around the television set?

.....

(1 mark)

(iii) Use the following equation to calculate the efficiency of the television set.

$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

.....

.....

Efficiency = ...

(2 marks)

4.2.1.4 Resistors

Question 01 · continued

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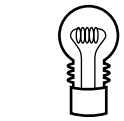
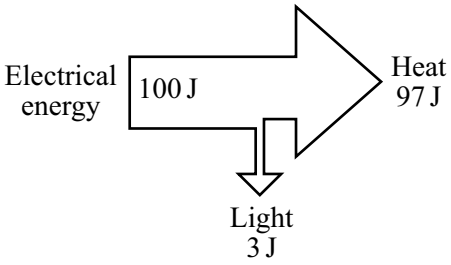
(b) The diagrams show the energy transferred each second for three different types of lamp. For each lamp the electrical energy input each second is 100 joules.

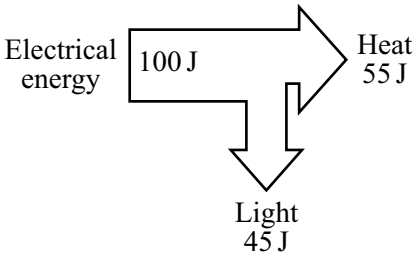


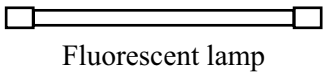
Filament lamp



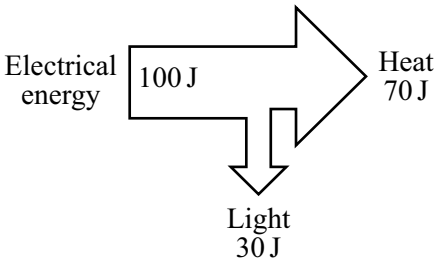


Street lamp





Fluorescent lamp



Which type of lamp is the most efficient?

.....

Give a reason for your choice.

.....

.....

(2 marks)

6

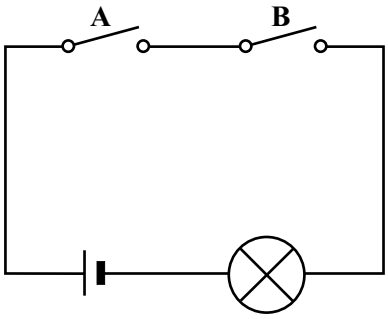
4.2.1.4 Resistors

Question 02

June 2003 | 3451F | Original Q9 | Legacy

9 (a) The diagrams show circuits in which a lamp can be controlled by two switches. The switches are shown in the off position.

(i) Complete the Output column in the table.



Inputs		Output
Switch **A**	Switch **B**	Lamp
off	off	off
off	on	
on	off	
on	on	

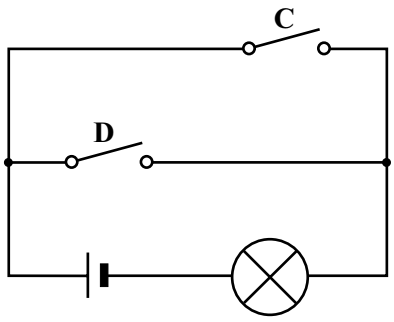
(1 mark)

(ii) What is the name of the logic gate which behaves like the two switches in this circuit?

.....

(1 mark)

(iii) Complete the Output column in the table.



Inputs		Output
Switch **C**	Switch **D**	Lamp
off	off	off
off	on	
on	off	
on	on	

(1 mark)

(iv) What is the name of the logic gate which behaves like the two switches in this circuit?

.....

(1 mark)

(b) (i) Complete the truth table for a NOT gate by writing either **1** or **0** in each of the four boxes.

Input	Output

(1 mark)

(ii) Draw the symbol for a NOT gate.

(1 mark)

4.2.1.4 Resistors

Question 02 · continued

1 /

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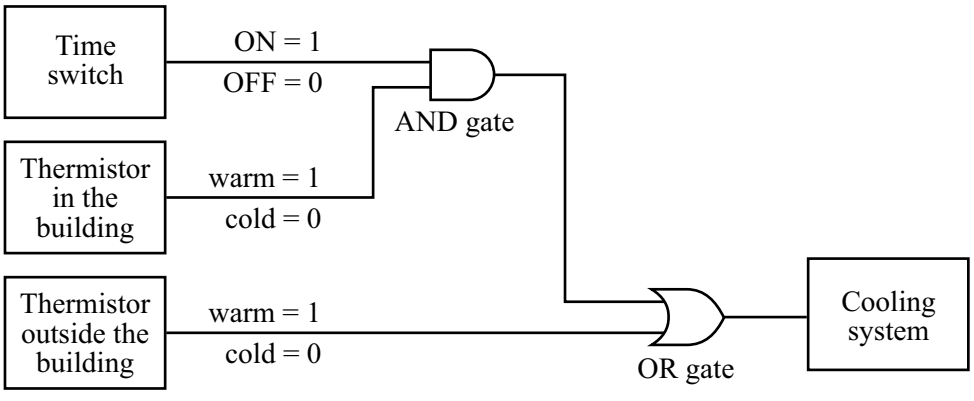
(c) The diagram shows a system which can switch a cooling system either ON (1) or OFF (0).



Complete the Output to cooling system column in the truth table by writing either **1** or **0** in each box.

Inputs to AND gate		**Inputs to OR gate**		**Output to cooling system**
Time switch	Thermistor in the building	Output from AND gate	Thermistor outside the building	
0	0	0	0	
0	1	0	0	
1	0	0	0	
1	1	1	0	
0	0	0	1	
0	1	0	1	
1	0	0	1	
1	1	1	1	

(4 marks)

(d) (i) Draw the symbol for a thermistor.

(1 mark)

(ii) What property of a thermistor enables it to detect a change in temperature?

.....

.....

(2 marks)

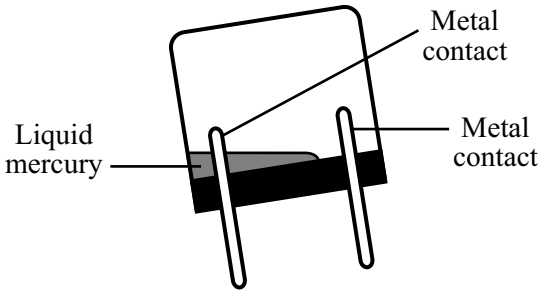
4.2.1.4 Resistors

Question 03

June 2003 | 3451F | Original Q16 | Legacy

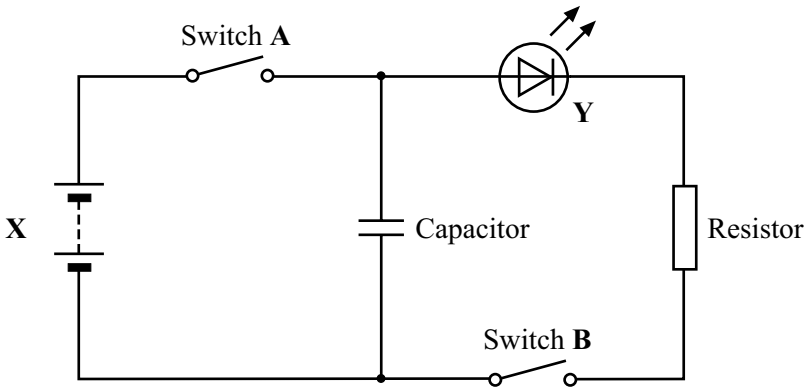
16 (a) In one design of tilt switch, two metal contacts are sealed inside a small plastic container. There is some mercury inside the container. Mercury is a metal which is a liquid at room temperature.

The switch is shown in an OFF position. Next to it, draw the same switch in an ON position.



OFF **ON** *(2 marks)*

(b) The diagram shows the circuit used in an experiment. Both switches are shown in the open (off) position.



(i) Name component **X** and component **Y**.

X is a ..... **Y** is a.....

(2 marks)

(ii) Switch **A** was closed for three minutes. Switch **A** was then opened. Switch **B** was then closed and the time, t, was measured for how long component **Y** stayed on.

The experiment was then repeated, using a resistor of greater resistance.

How would this change affect the time, t?

.....

(1 mark)

4.2.1.4 Resistors

Question 03 · continued

MARGIN
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(iii) Explain the reason for your answer to part (b) (ii).

.....

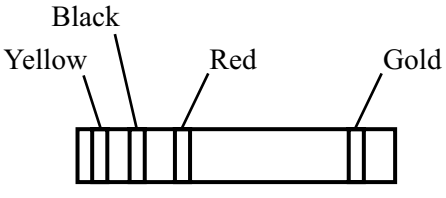
.....

.....

.....

(2 marks)

(c) The diagram shows the coloured bands on a resistor.



The gold band tells you that the tolerance is ± 5%.

The colour code for resistors is given in the table.

Figure	Colour
0	black
1	brown
2	red
3	orange
4	yellow
5	green
6	blue
7	violet
8	grey
9	white

What is the **maximum** value of the resistance of the resistor shown in the diagram?

Show clearly how you work out your final answer and give the unit.

.....

.....

.....

Maximum resistance = ...

(3 marks)

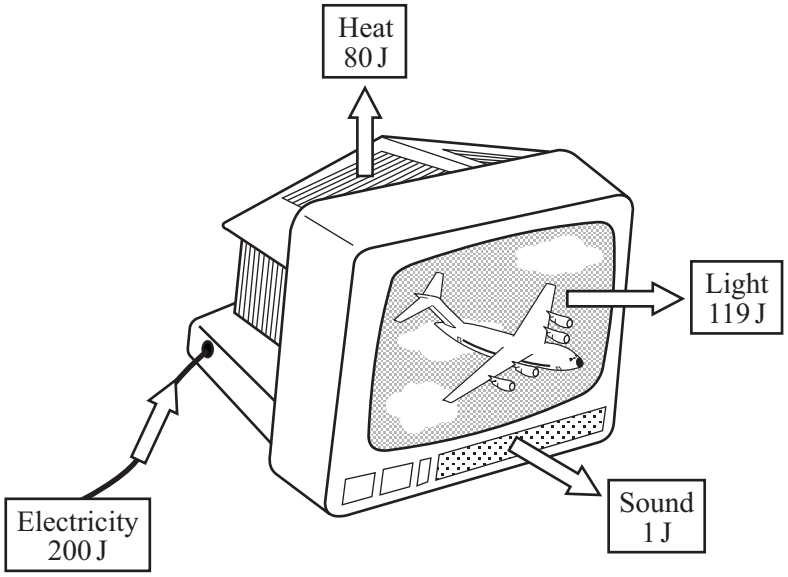
10

4.2.1.4 Resistors

Question 04

June 2003 | 3462F3 | Original Q4 | Legacy

4 (a) The drawing shows the energy transferred each second by a television set.



(i) What form of energy is transferred as waste energy by the television set?

.....

(1 mark)

(ii) What effect will the waste energy have on the air around the television set?

.....

(1 mark)

(iii) Use the following equation to calculate the efficiency of the television set.

$$\text{efficiency} = \frac{\text{useful energy transferred by device}}{\text{total energy supplied to device}}$$

.....

.....

Efficiency = ...

(2 marks)

4.2.1.4 Resistors

Question 04 · continued

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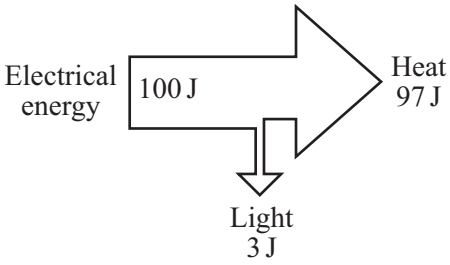
(b) The diagrams show the energy transferred each second for three different types of lamp. For each lamp the electrical energy input each second is 100 joules.

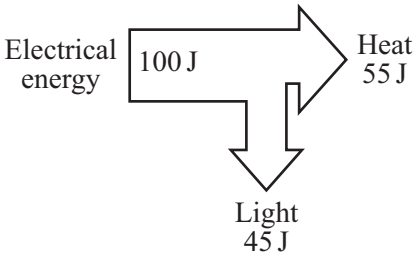


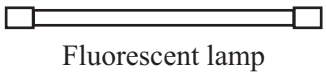
Filament lamp



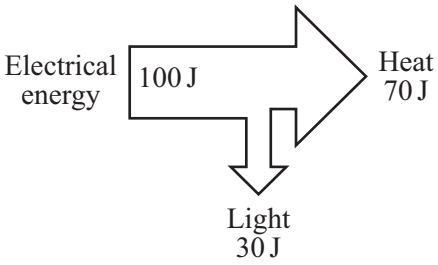


Street lamp





Fluorescent lamp



Which type of lamp is the most efficient?

.....

Give a reason for your choice.

.....

.....

(2 marks)

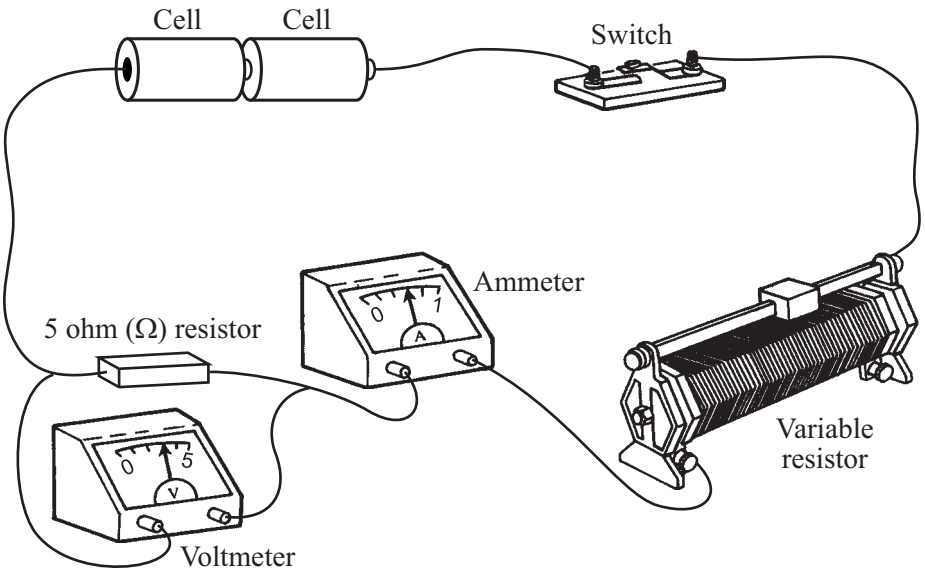
6

4.2.1.4 Resistors

Question 05

June 2004 | 3451F | Original Q10 | Legacy

10 The drawing shows the circuit used to investigate how the current through a 5 ohm (Ω) resistor changes as the potential difference (voltage) across the resistor changes.



(a) Draw, in the space below, a circuit diagram of this circuit. Use the correct symbols for each part of the circuit.

(2 marks)

4.2.1.4 Resistors

Question 05 · continued

MARGIN BLANK

(b) (i) Write down the equation that links current, potential difference and resistance.

.....

(1 mark)

(ii) Calculate the potential difference across the 5 ohm (Ω) resistor when the current through the resistor equals 0.4 A. Show clearly how you work out your final answer.

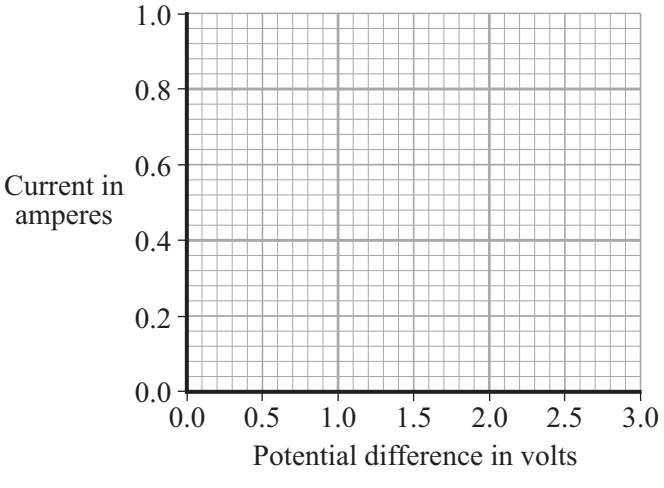
.....

.....

potential difference =.....volts

(2 marks)

(iii) Complete the graph to show how the current through the resistor changes as the potential difference across the resistor increases from 0 V to 3 V. Assume the resistor stays at a constant temperature.



(2 marks)

(c) The resistor is replaced by a 3 V filament lamp. The resistance of the lamp increases as the potential difference across it increases. Why?

.....

.....

(1 mark)

8

4.2.1.4 Resistors

Question 06

June 2004 | 3451F | Original Q14 | Legacy

14 (a) A physics textbook says that:

"The *flow of electrons* through a circuit can be controlled by using a fixed resistor or a variable resistor."

(i) What word can be used for the *flow of electrons*?

.....

(1 mark)

(ii) The flow of electrons can also be controlled by a *thermistor*.

How is a *thermistor* affected by an increase in temperature?

.....

.....

.....

(2 marks)

(b) Draw straight lines to link each part of an electronic circuit with its description.

Part of electronic circuit	Description
input sensor	controlled by the processor
processor	detects changes in the environment
output device	decides what action is needed

(2 marks)

Question 06 · continued

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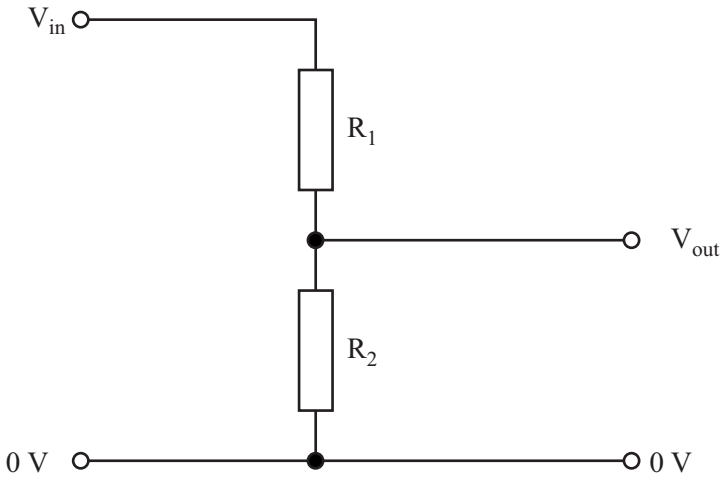
(c) The diagram shows part of an electronic circuit. This part is connected to the processor.



(i) What is the name of this part?

.....

(1 mark)

(ii) The input potential difference (voltage) is 6 volts, the value of R_1 is 15 ohms and the value of R_2 is 30 ohms.

Use the following equation to calculate the value of the output potential difference.

$$V_{out} = V_{in} \times \frac{R_2}{(R_1 + R_2)}$$

.....

.....

Output potential difference = ...volts

(2 marks)

(iii) The resistor R_1 is replaced by another resistor with a higher value. The resistor R_2 is not changed.

What effect will this have on:

the potential difference across the new resistor;

.....

the potential difference across R_2?

.....

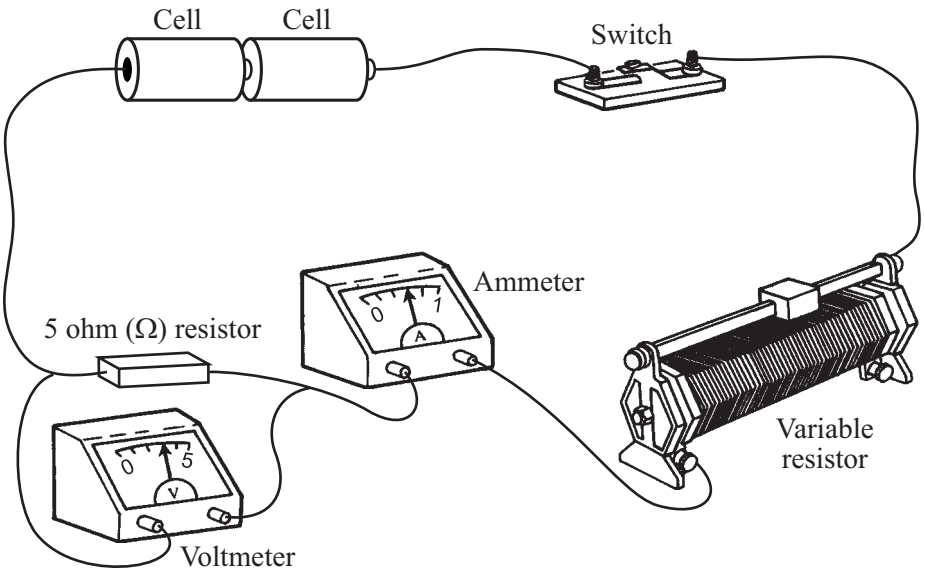
(2 marks)

4.2.1.4 Resistors

Question 07

June 2004 | 3462F3 | Original Q8 | Legacy

8 The drawing shows the circuit used to investigate how the current through a 5 ohm (Ω) resistor changes as the potential difference (voltage) across the resistor changes.



(a) Draw, in the space below, a circuit diagram of this circuit. Use the correct symbols for each part of the circuit.

(2 marks)

4.2.1.4 Resistors

Question 07 · continued

MARGIN BLANK

(b) (i) Write down the equation that links current, potential difference and resistance.

.....

(1 mark)

(ii) Calculate the potential difference across the 5 ohm (Ω) resistor when the current through the resistor equals 0.4 A. Show clearly how you work out your final answer.

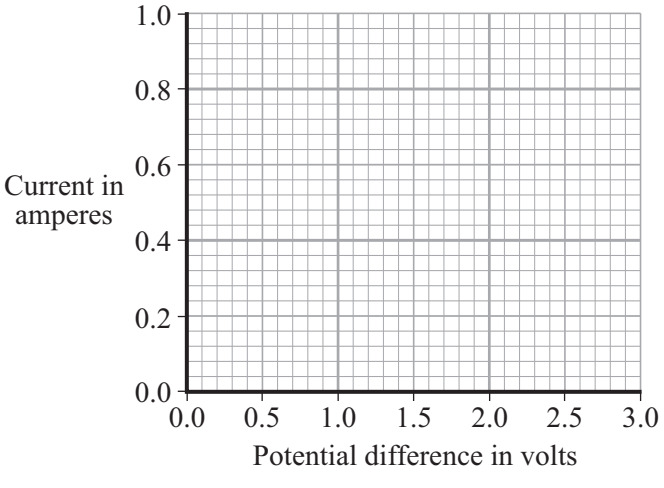
.....

.....

potential difference =.....volts

(2 marks)

(iii) Complete the graph to show how the current through the resistor changes as the potential difference across the resistor increases from 0 V to 3 V. Assume the resistor stays at a constant temperature.



(2 marks)

(c) The resistor is replaced by a 3 V filament lamp. The resistance of the lamp increases as the potential difference across it increases. Why?

.....

.....

(1 mark)

8

4.2.1.4 Resistors

Question 08

June 2006 | 3451 | Original Q10 | Legacy

10 (a) The diagram shows an electronic system.



Use a word from the box to fill in each space. Each word should be used only once.

buzzers	LDRs	LEDs	motors	switches	thermistors

Input sensors include:

- ..... which respond to changes in temperature;
- ..... which respond to changes in light;
- ..... which respond to changes in pressure.

Processors can be made using logic gates.

Output devices include:

- ..... which produce light;
- ..... which produce sound;
- ..... which produce movement.

(6 marks)

Question 08 · continued

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(b) Complete the truth tables by writing **1** or **0** in each space in the output column.

(i) AND gate

1st input	2nd input	Output
0	0	.....
1	0	.....
0	1	.....
1	1	1

(1 mark)

(ii) NOT gate

Input	Output
0	.....
1	.....

(1 mark)

(iii) OR gate

1st input	2nd input	Output
0	0	0
1	0	.....
0	1	.....
1	0	.....

(1 mark)

(c) Capacitors can be used as simple timers in electronic circuits.

(i) Draw a circuit symbol for a capacitor.

(1 mark)

(ii) Complete the sentence.

When a current flows to an uncharged capacitor, ... is stored and the potential difference across the capacitor ..... .

(2 marks)

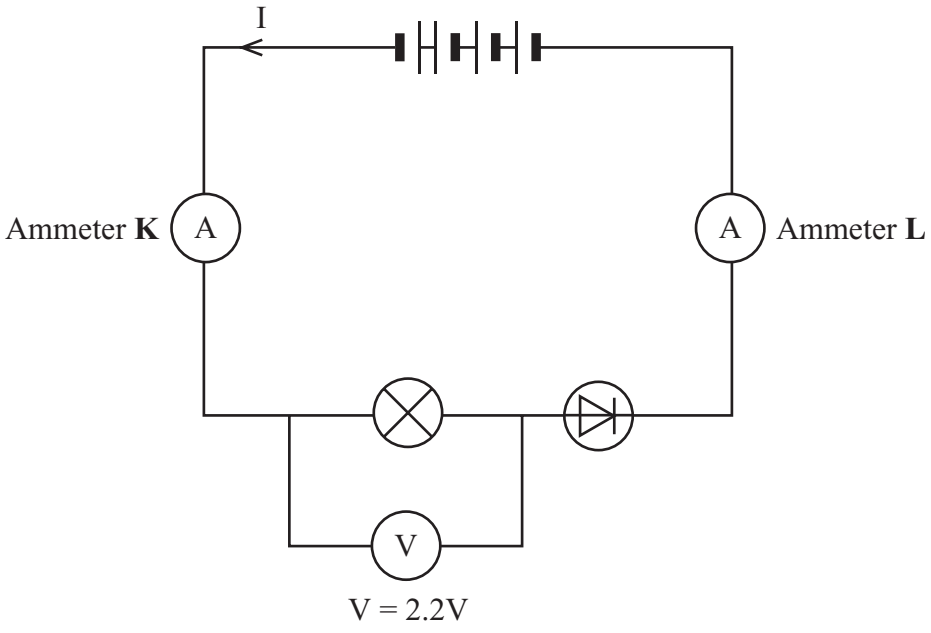
12

4.2.1.4 Resistors

Question 09

June 2006 | 3451 | Original Q12 | Legacy

12 The diagram shows how a student joined several components, including a 6-volt lamp and four identical 1.5 volt cells, in a circuit.



(a) The reading on ammeter **K** is 0.05 A.

What is the reading on ammeter **L**?

.....

(1 mark)

(b) The student expected the lamp in the diagram to be much brighter and the reading on the voltmeter to be 6 volts.

(i) Give **two** reasons why the reading on the voltmeter is much less than 6 volts. The voltmeter is working correctly.

1.....

.....

2.....

.....

(2 marks)

Question 09 · continued

BLANK

(ii) The student decides that the lamp is dim because the diode is connected the wrong way round. When the student reverses the connections to the diode the lamp goes out.

Explain why.

.....

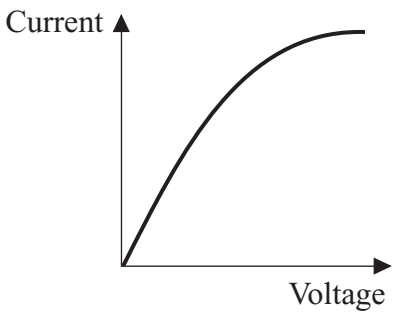
.....

.....

.....

(2 marks)

(c) The graph shows how the current through a filament lamp changes as the voltage (potential difference) across it changes.



Explain why the graph is not a straight line.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

.....

(4 marks)

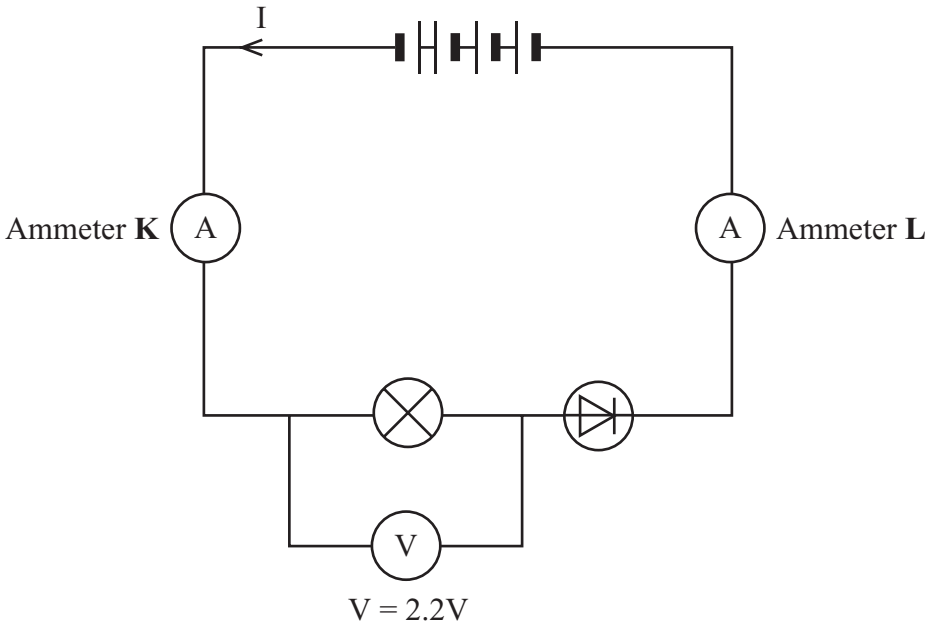
9

4.2.1.4 Resistors

Question 10

June 2006 | 3462 | Original Q10 | Legacy

10 The diagram shows how a student joined several components, including a 6-volt lamp and four identical 1.5 volt cells, in a circuit.



(a) The reading on ammeter **K** is 0.05 A.

What is the reading on ammeter **L**?

.....

(1 mark)

(b) The student expected the lamp in the diagram to be much brighter and the reading on the voltmeter to be 6 volts.

(i) Give **two** reasons why the reading on the voltmeter is much less than 6 volts. The voltmeter is working correctly.

1.....

.....

2.....

.....

(2 marks)

Question 10 · continued

BLANK

(ii) The student decides that the lamp is dim because the diode is connected the wrong way round. When the student reverses the connections to the diode the lamp goes out.

Explain why.

.....

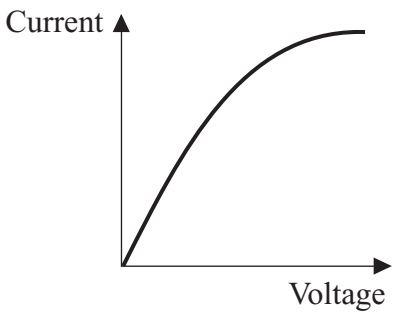
.....

.....

.....

(2 marks)

(c) The graph shows how the current through a filament lamp changes as the voltage (potential difference) across it changes.



Explain why the graph is not a straight line.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

.....

(4 marks)

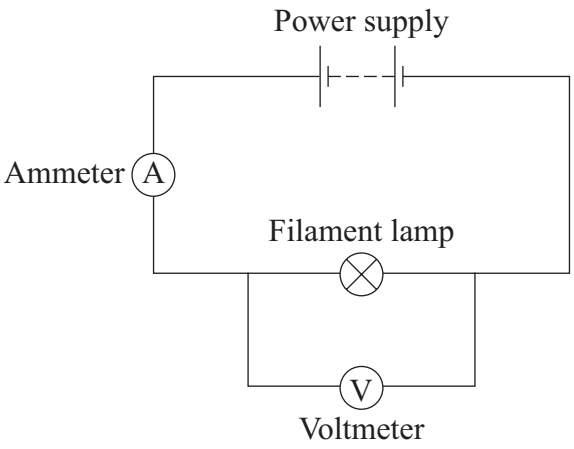
9

4.2.1.4 Resistors

Question 11

January 2009 | PHY2F | Original Q4 | Legacy

4 (a) The diagram shows the circuit used by a student to measure the power of a filament lamp.



Name a component connected in parallel with the filament lamp.

.....

(1 mark)

4 (b) By adding another component to the circuit, the student is able to obtain a range of ammeter and voltmeter readings.

Ammeter reading in amps	Voltmeter reading in volts
0.10	1.0
0.15	2.0
0.20	4.0
0.25	7.0
0.30	11.0

4.2.1.4 Resistors

Question 11 · continued

for mark

4 (b) (i) Which **one** of the following components did the student add to the circuit?

Draw a ring around your answer.

fuse **switch** **variable resistor**

(1 mark)

4 (b) (ii) What is the range of ammeter readings taken by the student?

from ..... amps to ..... amps

(1 mark)

4 (b) (iii) Use the data in the table and the equation in the box to calculate the **maximum** power of the filament lamp.

power (watt, W)	=	current (ampere, A)	×	potential difference (volt, V)

Show clearly how you work out your answer.

.....

.....

Power = ... W

(3 marks)

4 (c) Complete the following sentence by drawing a ring around the correct line in the box.

As the temperature of a filament lamp increases, its resistance

increases
remains constant
decreases

.

(1 mark)

7

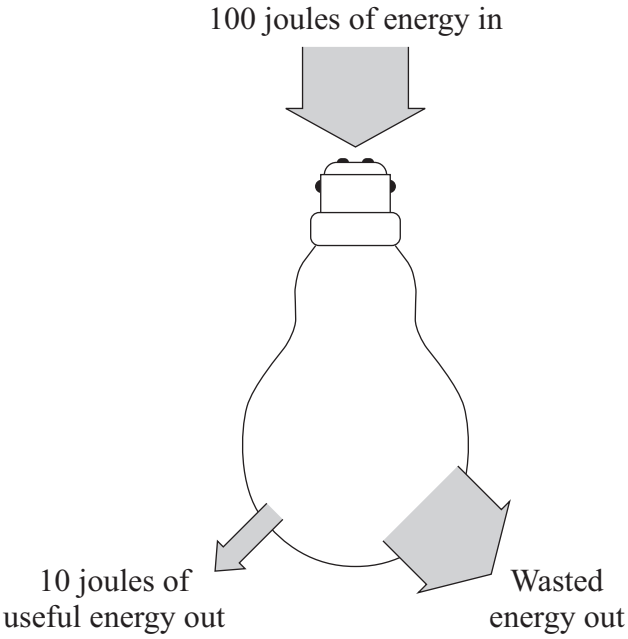
4.2.1.4 Resistors

Question 12

March 2009 | PHY1AP | Original Q7 | Legacy

QUESTION SEVEN

The diagram shows a tungsten filament lamp and the energy used by the lamp in one second.



7A How many joules of energy are wasted each second?

1 10

2 80

3 90

4 100

7B What type of wasted energy is produced by the lamp?

1 electrical

2 heat

3 light

4 sound

4.2.1.4 Resistors

Question 12 · continued

7C What happens to the wasted energy?

1 It is transformed into useful energy.

2 It is destroyed.

3 It spreads out and becomes easier to use.

4 It spreads out and becomes more difficult to use.

7D What is the efficiency of the lamp?

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

1 0.1

2 0.8

3 0.9

4 1.0

4.2.1.4 Resistors

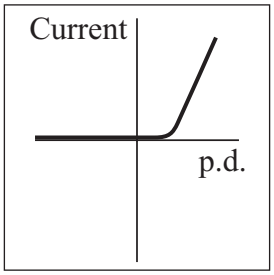
Question 13

June 2009 | PHY2F | Original Q1 | Legacy

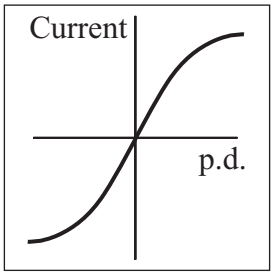
1 (a) The graphs, **A**, **B** and **C**, show how the current through a component varies with the potential difference (p.d.) across the component.

Draw a line to link each graph to the correct component.
Draw only **three** lines.

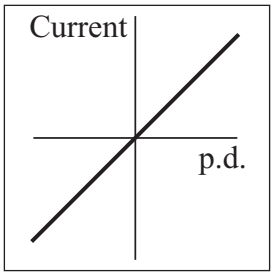
A



B

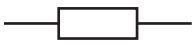


C



Component

A resistor at constant temperature



A filament lamp



A diode



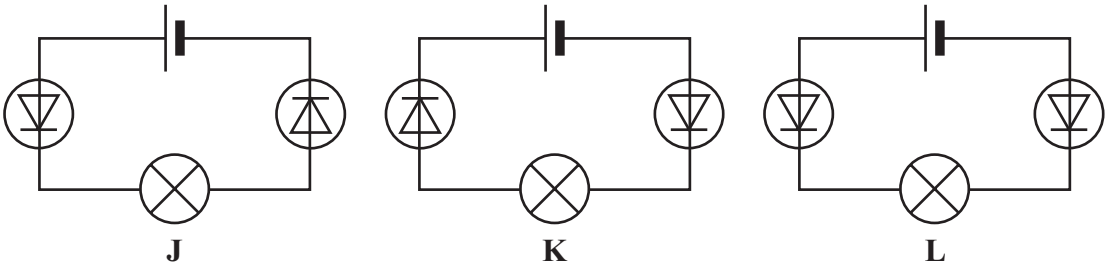
(2 marks)

4.2.1.4 Resistors

Question 13 · continued

for mark

1 (b) Each of the circuits, **J**, **K** and **L**, include two diodes.



In which **one** of the circuits, **J**, **K** or **L**, would the filament lamp be on?

.....

(1 mark)

3

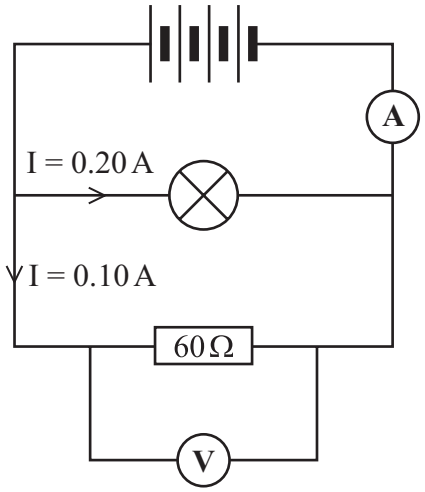
Turn over for the next question

4.2.1.4 Resistors

Question 14

June 2009 | PHY2F | Original Q4 | Legacy

4 A circuit was set up as shown in the diagram.



4 (a) Each cell provides a potential difference of 1.5 volts.

4 (a) (i) What is the total potential difference provided by the four cells in the circuit?

.....

Total potential difference = ... volts
(1 mark)

4 (a) (ii) What will be the reading on the voltmeter?

.....
(1 mark)

4 (b) The current through the lamp is 0.20 amps.
The current through the resistor is 0.10 amps.

What is the reading on the ammeter?

.....

Reading on ammeter = ... amps
(1 mark)

4.2.1.4 Resistors

Question 14 · continued

for mark

4 (c) Use a phrase from the box to complete the following sentence.

greater than	**equal to**	**smaller than**

The resistance of the lamp is ..... 60 Ω.

Give a reason for your answer.

.....

.....

(2 marks)

5

Turn over for the next question

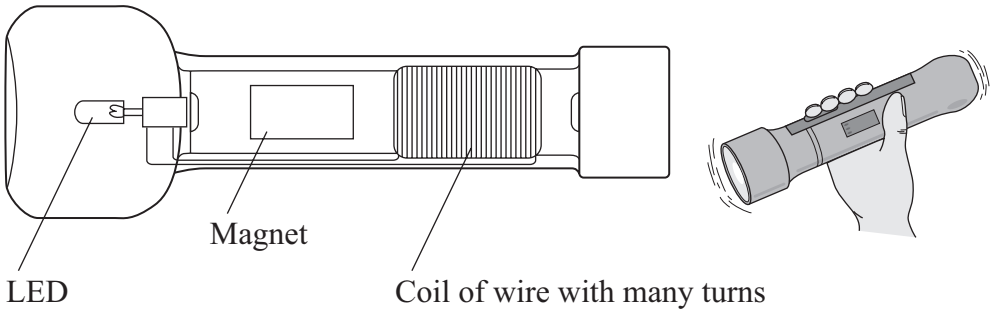
4.2.1.4 Resistors

Question 15

June 2009 | PHY3F | Original Q8 | Legacy

8 The diagram shows some parts of a torch which works without batteries.
The coil is part of a complete circuit with the LED (light-emitting diode).

You have to shake the torch for a short time and then it is ready to use.



8 (a) Arrange the letters, **A**, **B**, **C**, **D** and **E**, in the correct order to explain how shaking the torch produces an electric current.

A An electric current is induced in the circuit.

B The magnetic field cuts through the coil.

C The magnet moves in and out of the coil.

D A potential difference (p.d.) is induced across the ends of the coil.

E The torch is shaken to and fro.

The first letter has been done for you.

E				

(2 marks)

8 (b) Give **two** changes which you would make to the design of the torch to increase the size of the induced potential difference.

1 .....

.....

2 .....

.....

(2 marks)

4.2.1.4 Resistors

Question 15 · continued

for mark

8 (c) A few minutes after shaking, the LED gets dimmer and then stops giving out light.

A student tests the torch. She shakes it for a period of time. Then she switches it on and times how long the light lasts.

These are her results.

Period of time torch is shaken measured in seconds	How long the light lasts measured in seconds
30	168
60	312
90	420
120	546
150	654

8 (c) (i) What conclusion can the student come to on the basis of these results?

.....

.....

(1 mark)

8 (c) (ii) The student's friend says that the results are **not** reliable. Her friend is correct.

Give **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

(2 marks)

7

4.2.1.4 Resistors

Question 16

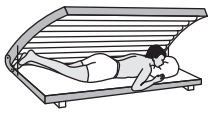
January 2010 | PHY1F | Original Q1 | Legacy

1 (a) The diagram shows the electromagnetic spectrum.
The pictures show four devices that use electromagnetic waves. Each device uses a different type of electromagnetic wave.

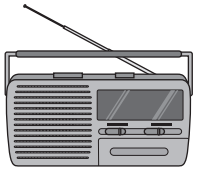
Draw a line from each device to the type of electromagnetic wave that it uses.
One has been done for you.

Gamma rays	X-rays	Ultraviolet rays	Visible light	Infra red rays	Microwaves	Radio waves

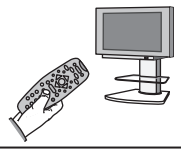
Sunbed



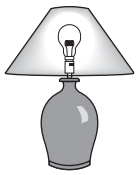
Radio



TV remote control



Filament lamp



(3 marks)

1 (b) A headline from a recent newspaper article is shown below.



1 (b) (i) What serious health problem may be caused by using a sunbed too much?

.....

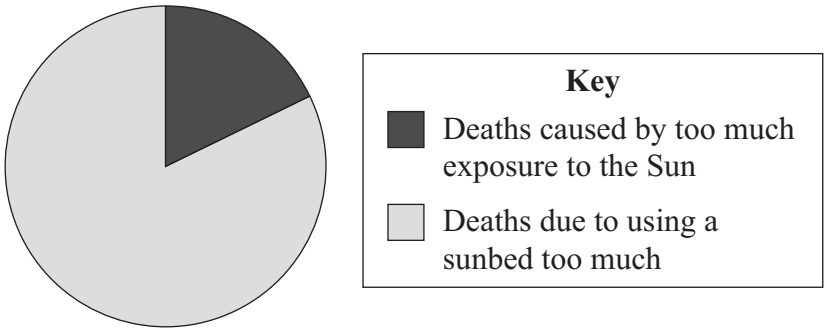
(1 mark)

4.2.1.4 Resistors

Question 16 · continued

for mark

1 (b) (ii) The pie chart compares the number of deaths in Britain each year, which may have been caused by using sunbeds too much, with those which may have been caused by too much exposure to the Sun.



It is difficult for a doctor to be certain that a person has died because of using a sunbed too much.

Suggest why.

.....

.....

(1 mark)

1 (b) (iii) A spokesperson for a leading cancer charity said:

> 'We want people, especially young people, to know the possible dangers of using a sunbed.'

Why is it important that you know the possible dangers of using a sunbed?

.....

.....

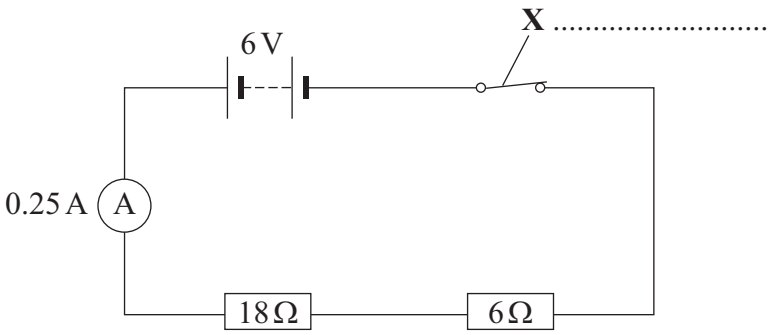
(1 mark)

6

4.2.1.4 Resistors

Question 17

1 A circuit diagram is shown below.



1 (a) Use a word from the box to label component **X**.

fuse	**switch**	**thermistor**

(1 mark)

1 (b) Calculate the total resistance of the two resistors in the circuit.

.....

Total resistance = ... Ω

(1 mark)

1 (c) The reading on the ammeter is 0.25 A.

The current through the 6 Ω resistor will be:

bigger than 0.25 A **equal to 0.25 A** **smaller than 0.25 A**

Draw a ring around your answer.

(1 mark)

1 (d) The 6 V battery is made by correctly joining several 1.5 V cells in series.

Calculate the number of cells needed to make the battery.

.....

Number of cells = ...

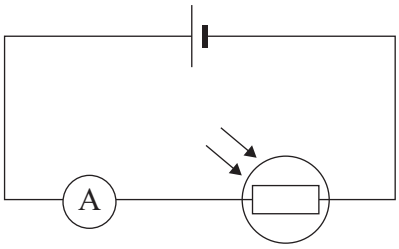
(1 mark)

4

4.2.1.4 Resistors

Question 18

5 The diagram shows a simple circuit.



5 (a) The circuit includes an LDR.

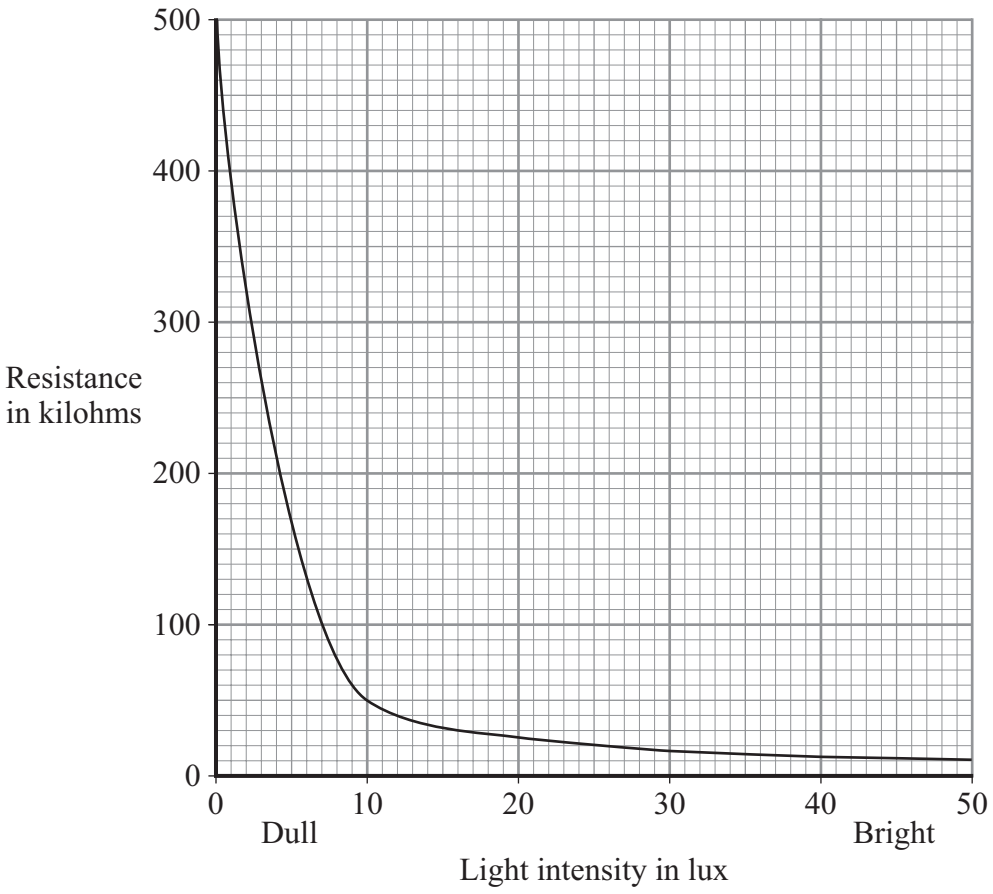
What do the letters LDR stand for?

Draw a ring around your answer.

Light-dependable resistor **light-dependent resistor** **light-direct resistor**

(1 mark)

5 (b) The graph shows how the resistance of an LDR changes with light intensity.



4.2.1.4 Resistors

Question 18 · continued

for mark

Describe in detail how the resistance of the LDR changes as the light intensity increases from 0 to 50 lux.

.....

.....

.....

.....

.....

.....

(3 marks)

5 (c) (i) Complete the following sentence by drawing a ring around the correct line in the box.

A decrease in the light intensity of light on the LDR will [decrease / not change / increase] the reading on the ammeter.

(1 mark)

5 (c) (ii) Give a reason for your answer to part (c)(i).

.....

.....

(1 mark)

5 (d) An LDR can be used to switch a circuit on and off automatically.

In which **one** of the following would an LDR be used?

Put a tick (✓) in the box next to your answer.

a circuit to switch on central heating when it gets cold ☐

a circuit to switch on security lighting when it gets dark ☐

a circuit to switch on a water sprinkler when the soil in a greenhouse is dry ☐

(1 mark)

7

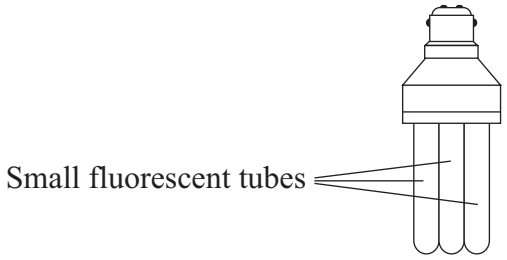
4.2.1.4 Resistors

Question 19

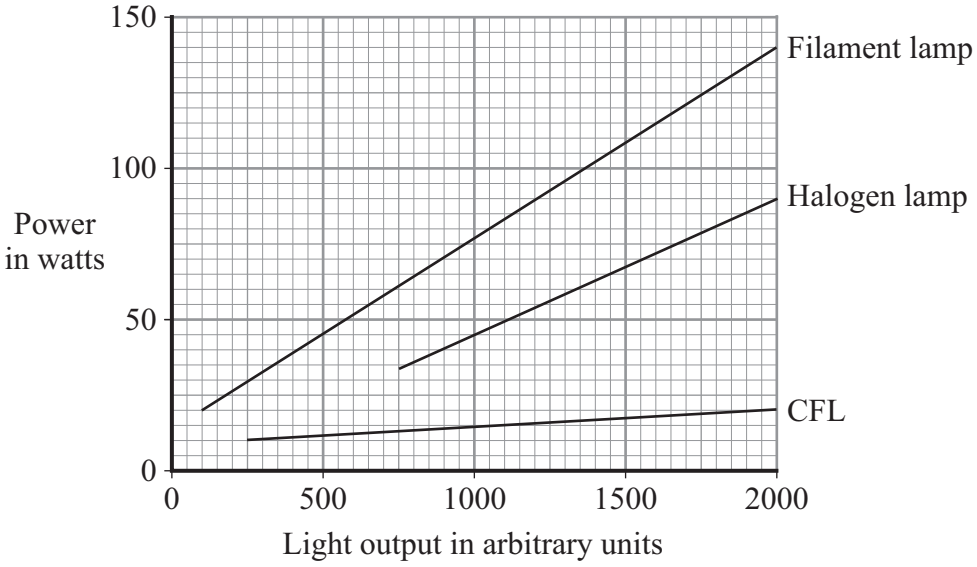
March 2010 | PHY1AP | Original Q9 | Legacy

QUESTION NINE

The diagram shows a compact fluorescent lamp (CFL).



The graph shows the electrical power of a CFL compared with a filament lamp and a halogen lamp.



9A How much power does a halogen lamp need in order to give an output of 1000 units of light?

1 40 watts

2 45 watts

3 50 watts

4 55 watts

4.2.1.4 Resistors

9B How many more watts of power would a filament lamp need, compared with a halogen lamp, to produce 2000 units of light?

1 40

2 50

3 70

4 120

9C What happens to the extra energy that the filament lamp uses compared with the halogen lamp?

The extra energy . . .

1 is stored in the filament of the lamp.

2 is transferred as heat to the surroundings.

3 is used to produce a chemical reaction in the lamp.

4 returns to the electricity supply.

9D In some countries, governments are making it compulsory to use CFLs rather than filament lamps.

What is the reason for this?

1 CFLs are more powerful than filament lamps.

2 CFLs can give out much more light than filament lamps.

3 CFLs can heat the room as well as light it.

4 CFLs save energy because they are more efficient.

END OF TEST

4.2.1.4 Resistors

Question 20

June 2010 | PHY1AP | Original Q9 | Legacy

QUESTION NINE

The UK government has decided that filament lamps must be replaced by energy-saving lamps. Some people want to continue using filament lamps. Below are some of the arguments for using each type of lamp.

Filament lamps	Energy-saving lamps
• Filament lamps cost only 42 p; energy-saving lamps are more expensive. • Filament lamps reach full brightness almost immediately; energy-saving lamps take a long time to warm up. • The extra heat given out from a filament lamp helps to warm the room.	• An 11 watt energy-saving lamp gives as much light as a 60 watt filament lamp. • Energy-saving lamps produce very little waste energy; filament lamps have an efficiency of only 0.1. • Energy-saving lamps are cheaper to use. • Energy-saving lamps last about 7 times longer than filament lamps.

9A Filament lamps are less efficient than energy-saving lamps.

This means that they . . .

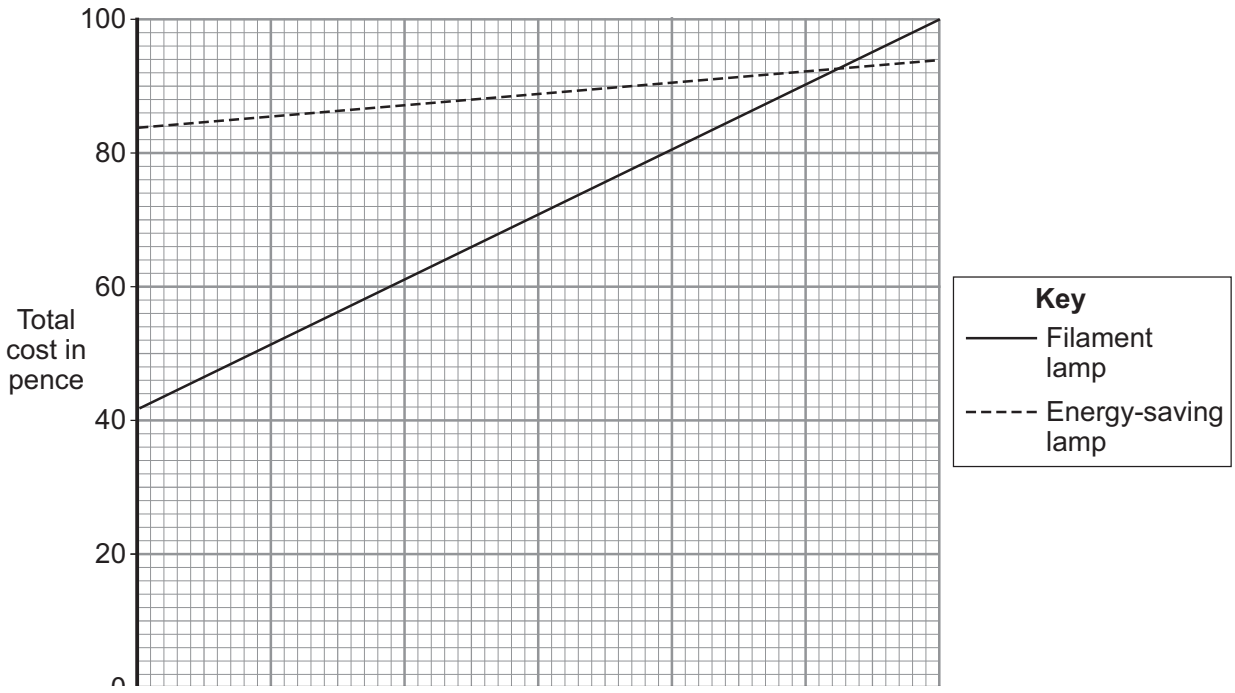
1 cost less.

2 do not last as long.

3 have a larger input power for the same light output.

4 reach full brightness straight away.

The graph shows the total cost of buying and using each type of lamp.



4.2.1.4 Resistors

9B The graph shows that the cost of buying an energy-saving lamp compared with buying a filament lamp is . . .

1 half as much.

2 twice as much.

3 the same.

4 four times as much.

9C An energy-saving lamp becomes more economical than a filament lamp after . . .

1 86 hours of use.

2 93 hours of use.

3 103 hours of use.

4 105 hours of use.

9D Supporters of filament lamps believe that the 'waste' heat from each lamp is used to heat their houses. They believe that this saves on their heating costs. They say that the total energy used to **light and heat** their houses would not be reduced by using energy-saving lamps.

To find out if they are correct, it is necessary to compare the costs . . .

1 in a small house using filament lamps and in a large house using energy-saving lamps.

2 in a small house using energy-saving lamps and in a large house using filament lamps.

3 using two identical houses with filament lamps in one and energy-saving lamps in the other.

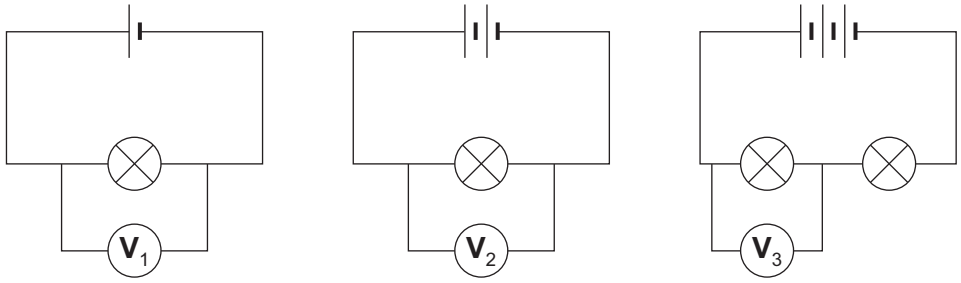
4 using some filament lamps and some energy-saving lamps in the same house.

END OF TEST

4.2.1.4 Resistors

Question 21

2 (a) The lamps in the circuits drawn below are all identical.
Each of the cells has a potential difference of 1.5 volts.



2 (a) (i) What is the potential difference across the 3 cells that are joined in series?

.....

Potential difference = ... V
(1 mark)

2 (a) (ii) What will be the reading on the voltmeter labelled V_3?

Voltmeter reading V_3 = ... V
(1 mark)

2 (a) (iii) Which voltmeter, V_1, V_2 or V_3, will give the highest reading?

Draw a ring around your answer.

V_1 V_2 V_3

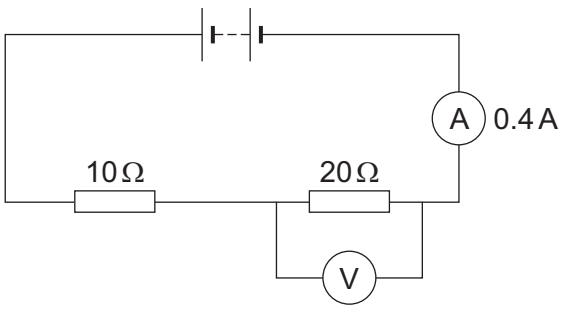
(1 mark)

Question 2 continues on the next page

4.2.1.4 Resistors

Question 21 · continued

2 (b) The diagram below shows a simple circuit.



2 (b) (i) Calculate the total resistance of the two resistors in the circuit.

.....

Total resistance = ... Ω

(1 mark)

2 (b) (ii) Use the equation in the box to calculate the reading on the voltmeter.

potential difference = current × resistance

Show clearly how you work out your answer.

.....

.....

Voltmeter reading = ... V

(2 marks)

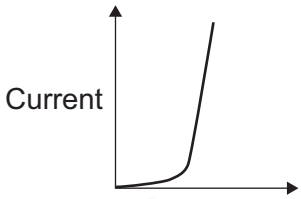
4.2.1.4 Resistors

Question 21 · continued

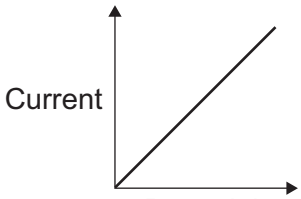
2 (b) (iii) The current through a resistor at constant temperature changes when the potential difference across the resistor changes.

Which **one** of the graphs, **X**, **Y** or **Z**, shows how the current changes?

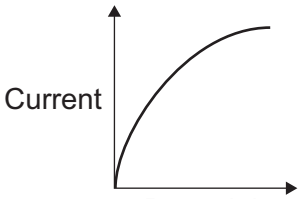
Write your answer, **X**, **Y** or **Z**, in the box.



X



Y



Z

Graph ☐

(1 mark)

7

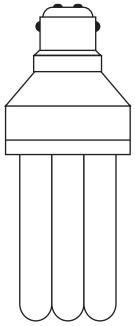
4.2.1.4 Resistors

Question 22

March 2011 | PHY1AP | Original Q5 | Legacy

QUESTION FIVE

The diagram shows a compact fluorescent lamp (CFL).



Match words, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the sentences.

A economical

B efficient

C environmental

D ethical

Compared with a filament lamp, a CFL transforms less electrical energy to produce the same amount of light energy each second. This makes the CFL more . . . **1** . . . .

Over time, CFLs cost less to buy and use, making them more . . . **2** . . . than filament lamps.

CFLs contain mercury and their disposal causes . . . **3** . . . problems.

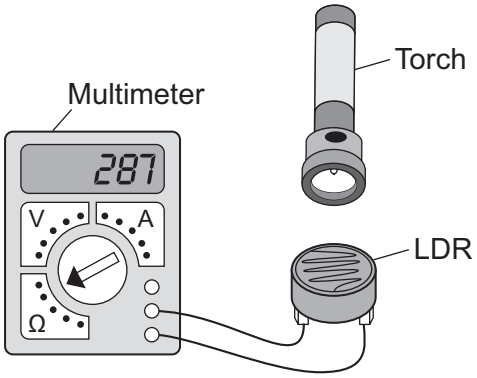
Society must decide whether or not it is . . . **4** . . . to use CFLs even if there is a possible hazard to health.

4.2.1.4 Resistors

Question 23

June 2012 | PH2FP | Original Q4 | Legacy

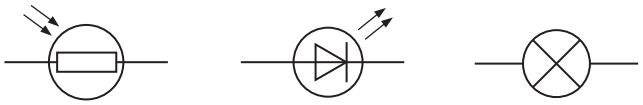
4 A student used the apparatus below to find out how the resistance of a light-dependent resistor (LDR) depends on light intensity.



The resistance of the LDR was measured directly using a multimeter.

4 (a) (i) Which **one** of the following is the correct circuit symbol for a LDR?

Draw a ring around your answer.



(1 mark)

4 (a) (ii) Name **one** factor that will affect the intensity of the light hitting the LDR.

.....

.....

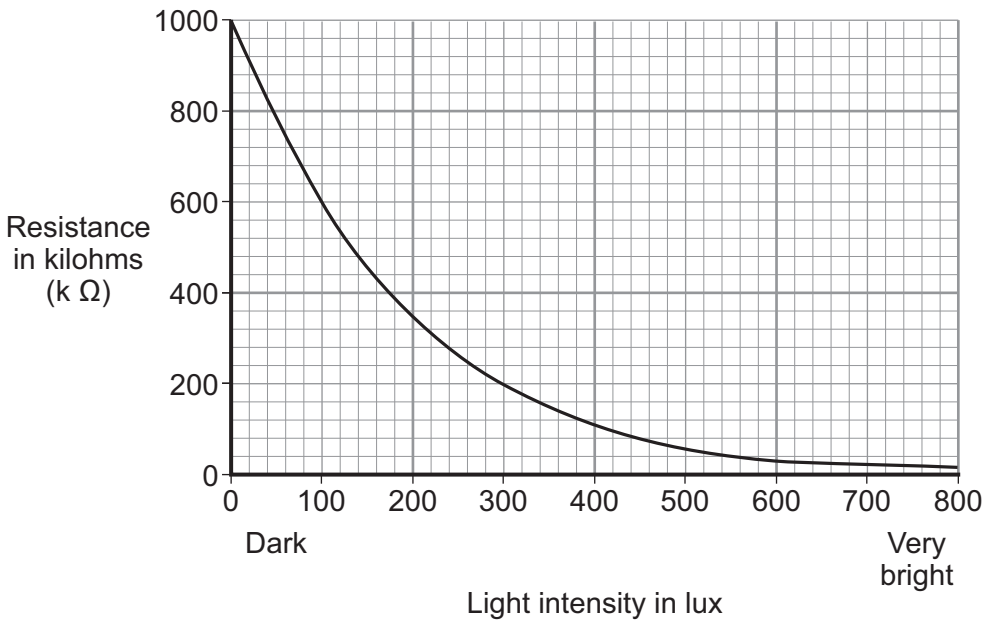
(1 mark)

Question 4 continues on the next page

4.2.1.4 Resistors

Question 23 · continued

4 (b) The manufacturer of the LDR provides data for the LDR in the form of a graph.



Describe how the resistance of the LDR changes when the light intensity increases from 100 lux to 300 lux.

.....

.....

.....

(2 marks)

4.2.1.4 Resistors

Question 23 · continued

4 (c) The student only obtained three results. These are given in the table.

Light intensity	Resistance in kilohms
Dark	750
Bright	100
Very bright	1

4 (c) (i) The student could **not** use the results to draw a line graph.
Why not?

.....

.....

(1 mark)

4 (c) (ii) Do the student's results agree with the data the manufacturer provided?

Draw a ring around your answer. YES NO

Give a reason for your answer.

.....

.....

.....

(1 mark)

4 (d) Which **one** of the following circuits probably includes a LDR?

Tick (✓) **one** box.

A circuit that automatically switches outside lights on when it gets dark. ☐

A circuit that automatically switches central heating on and off. ☐

A circuit that automatically turns lights off when no one is in the room. ☐

(1 mark)

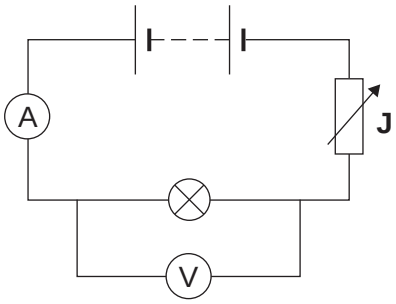
7

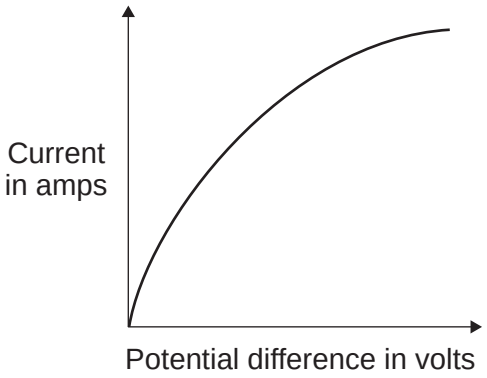
4.2.1.4 Resistors

Question 24

June 2013 | PH2FP | Original Q8 | Legacy

8 (a) The diagram shows the circuit used to obtain the data needed to plot the current–potential difference graph for a filament bulb.





8 (a) (i) Why is the component labelled '**J**' included in the circuit?

.....

.....

(1 mark)

8 (a) (ii) The resistance of the bulb increases as the potential difference across the bulb increases. Why?

.....

.....

(1 mark)

8 (a) (iii) The bulb is at full brightness when the potential difference across the bulb is 12 V. The current through the bulb is then 3 A.

Calculate the power of the bulb when it is at full brightness and give the unit.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Power = ...

(3 marks)

4.2.1.4 Resistors

Question 24 · continued

8 (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The table gives data about two types of light bulb people may use in their homes.

Type of light bulb	Energy efficiency	Cost of one light bulb	Average lifetime in hours
Halogen	10%	£1.95	2 000
Light Emitting Diode (LED)	32%	£11.70	36 000

Both types of light bulb produce the same amount of light.

Evaluate, in terms of cost and energy efficiency, the use of the two types of light bulb.

To gain full marks you must compare both types of light bulb and conclude which light bulb would be the best to use.

.....

.....

.....

.....

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.....

.....

.....

.....

(6 marks)

11

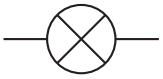
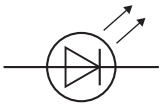
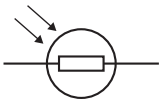
4.2.1.4 Resistors

Question 25

June 2014 | PH2FP | Original Q3 | Legacy

3 (a) Draw **one** line from each circuit symbol to its correct name.

[3 marks]

Circuit symbol	Name
	Diode
	Light-dependent resistor (LDR)
	Lamp
	Light-emitting diode (LED)

4.2.1.4 Resistors

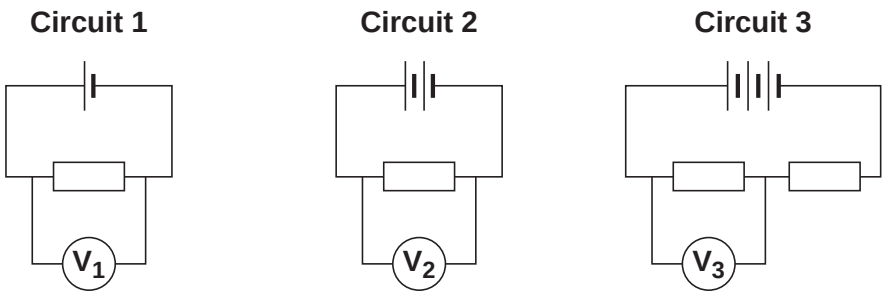
Question 25 · continued

3 (b) **Figure 5** shows three circuits.

The resistors in the circuits are identical.

Each of the cells has a potential difference of 1.5 volts.

Figure 5



3 (b) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

half	twice	the same as

The resistance of **circuit 1** is ..... the resistance of **circuit 3**.

3 (b) (ii) Calculate the reading on voltmeter V_2.

[1 mark]

.....

Voltmeter reading V_2 = ... V

3 (b) (iii) Which voltmeter, V_1, V_2 or V_3, will give the lowest reading?

Draw a ring around the correct answer.

[1 mark]

V_1 V_2 V_3

Question 3 continues on the next page

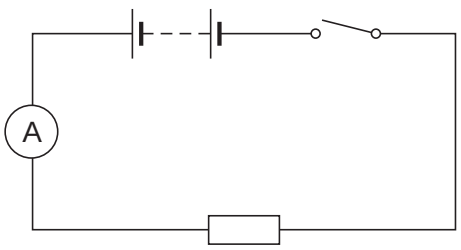
4.2.1.4 Resistors

Question 25 · continued

3 (c) A student wanted to find out how the number of resistors affects the current in a series circuit.

Figure 6 shows the circuit used by the student.

Figure 6



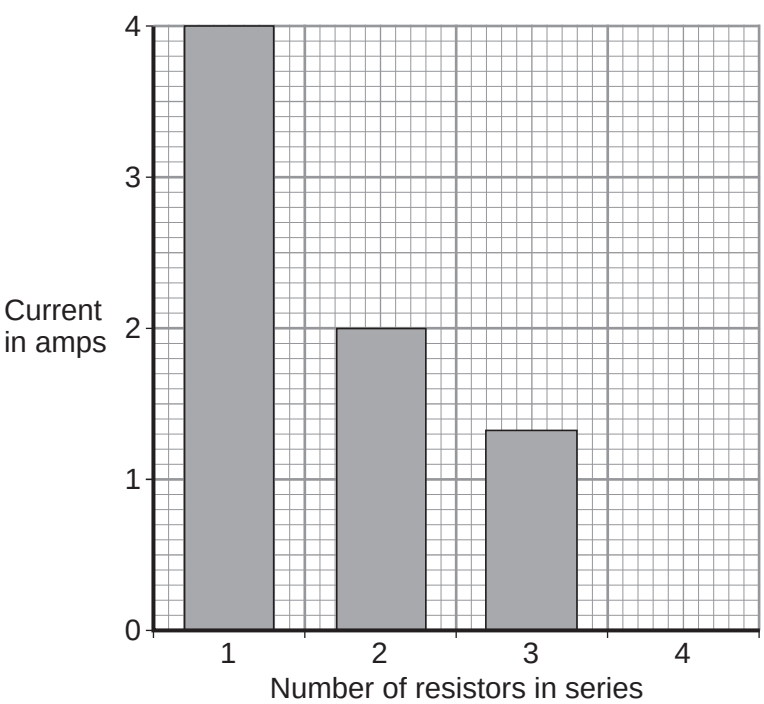
The student started with one resistor and then added more identical resistors to the circuit.

Each time a resistor was added, the student closed the switch and took the ammeter reading.

The student used a total of 4 resistors.

Figure 7 shows three of the results obtained by the student.

Figure 7



4.2.1.4 Resistors

Question 25 · continued

3 (c) (i) To get valid results, the student kept one variable the same throughout the experiment.

Which variable did the student keep the same?

[1 mark]

.....

3 (c) (ii) The bar chart in **Figure 7** is not complete. The result using 4 resistors is not shown.

Complete the bar chart to show the current in the circuit when 4 resistors were used.

[2 marks]

3 (c) (iii) What conclusion should the student make from the bar chart?

[1 mark]

.....

.....

10

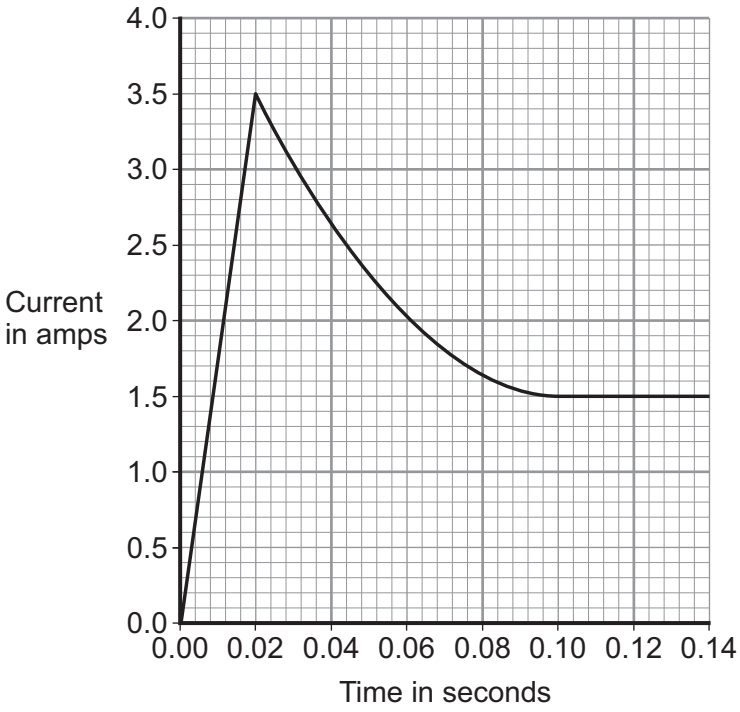
4.2.1.4 Resistors

Question 26

June 2015 | PH2FP | Original Q1 | Legacy

1 **Figure 1** shows how the current through a filament bulb changes after the bulb is switched on.

Figure 1



1 (a) What happens to the current through the bulb in the first 0.02 seconds after the bulb is switched on?

[1 mark]

.....

1 (b) Between 0.02 seconds and 0.08 seconds the current through the bulb decreases.

1 (b) (i) What, if anything, happens to the **resistance** of the bulb between 0.02 seconds and 0.08 seconds?

[1 mark]

Draw a ring around the correct answer.

decreases **does not change** **increases**

4.2.1.4 Resistors

Question 26 · continued

1 (b) (ii) What, if anything, happens to the **temperature** of the bulb between 0.02 seconds and 0.08 seconds?

[1 mark]

Draw a ring around the correct answer.

decreases **does not change** **increases**

1 (c) The bulb is connected to a 12 V power supply.

Calculate the power of the bulb when the current through the bulb is 1.5 A.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

Choose the unit from the list below.

coulomb **joule** **watt**

.....

.....

Power = ... unit .....

6

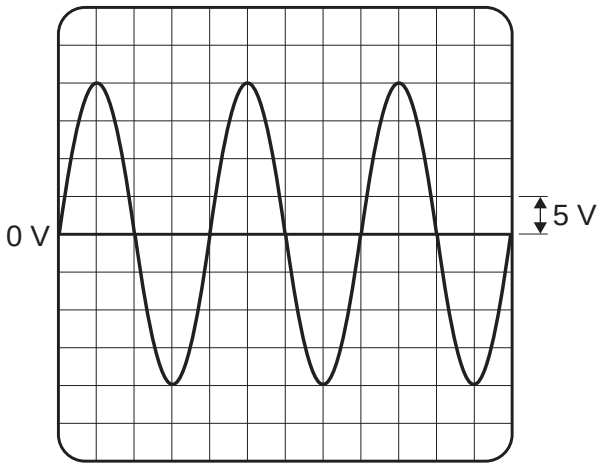
4.2.1.4 Resistors

Question 27

June 2016 | PH2FP | Original Q2 | Legacy

2 (a) **Figure 2** shows the oscilloscope trace an alternating current (a.c.) electricity supply produces.

Figure 2



One vertical division on the oscilloscope screen represents 5 volts.

Calculate the peak potential difference of the electricity supply.

[1 mark]

Peak potential difference = _____ V

2 (b) Use the correct answer from the box to complete the sentence.

[1 mark]

40	**50**	**60**

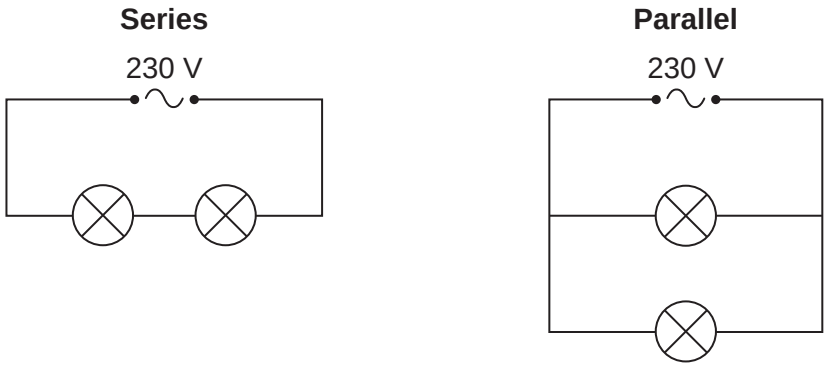
In the UK, the frequency of the a.c. mains electricity supply is _____ hertz.

4.2.1.4 Resistors

Question 27 · continued

2 (c) **Figure 3** shows how two lamps may be connected in series or in parallel to the 230 volt mains electricity supply.

Figure 3



2 (c) (i) Calculate the potential difference across each lamp when the lamps are connected in **series**.
The lamps are identical.

[1 mark]

Potential difference when in series = _____ V

2 (c) (ii) What is the potential difference across each lamp when the lamps are connected in **parallel**?

[1 mark]

Tick (✓) **one** box.

115 V ☐ 230 V ☐ 460 V ☐

2 (c) (iii) Give **one** advantage of connecting the lamps in parallel instead of in series.

[1 mark]

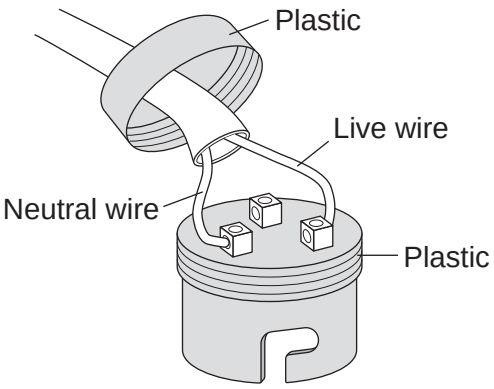
Question 2 continues on the next page

4.2.1.4 Resistors

Question 27 · continued

2 (d) **Figure 4** shows the light fitting used to connect a filament light bulb to the mains electricity supply.

Figure 4



The light fitting does **not** have an earth wire connected.

Explain why the light fitting is safe to use.

[2 marks]

2 (e) A fuse can be used to protect an electrical circuit.

Name a different device that can also be used to protect an electrical circuit.

[1 mark]

8

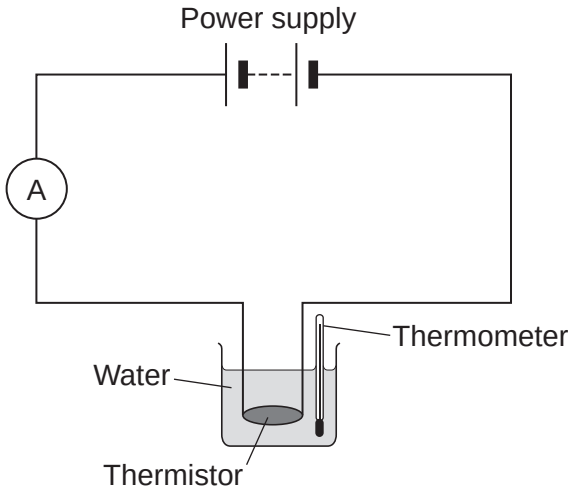
4.2.1.4 Resistors

Question 28

June 2016 | PH2FP | Original Q7 | Legacy

7 **Figure 10** shows the apparatus used to investigate how the current through a thermistor depends on the temperature of the thermistor.

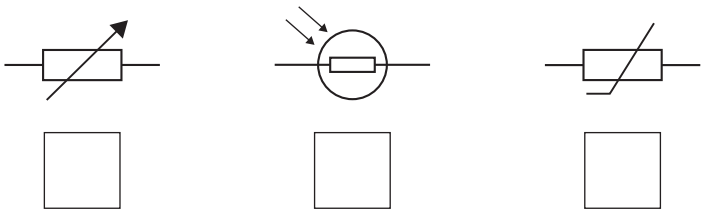
Figure 10



7 (a) Which **one** of the following is the correct circuit symbol for a thermistor?

[1 mark]

Tick (✓) **one** box.



Question 7 continues on the next page

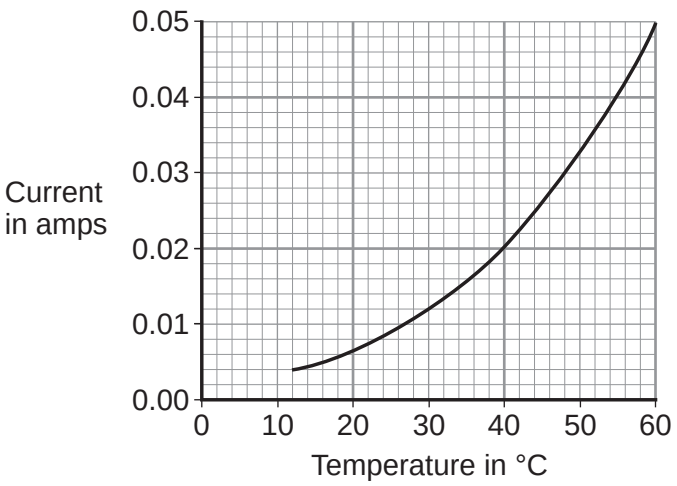
4.2.1.4 Resistors

Question 28 · continued

7 (b) To get a range of results, hot water at 60 °C was poured into the beaker.
The temperature of the water and current through the thermistor were then recorded as the water cooled.

The results of the investigation are shown in **Figure 11**.

Figure 11



7 (b) (i) Suggest **one** way the investigation could have been changed to give a wider range of temperatures.

[1 mark]

_____

_____

7 (b) (ii) Describe how the current through the thermistor depends on the temperature of the thermistor.

[1 mark]

_____

_____

7 (b) (iii) Use **Figure 11** to determine the current through the thermistor at 40 °C.

[1 mark]

Current at 40 °C = _____ A

4.2.1.4 Resistors

Question 28 · continued

7 (b) (iv) At 40 °C the thermistor has a resistance of 250 Ω.

Use your answer to part **(b)(iii)** and the resistance of the thermistor to calculate the potential difference across the thermistor.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

_____

_____

Potential difference = _____ V

7 (b) (v) The potential difference across the thermistor stays the same all through the investigation.

What conclusion can be made from the results in **Figure 11** about the resistance of the thermistor as the temperature of the thermistor **decreases**?

[1 mark]

Tick (✓) **one** box.

the resistance increases ☐

the resistance does not change ☐

the resistance decreases ☐

7

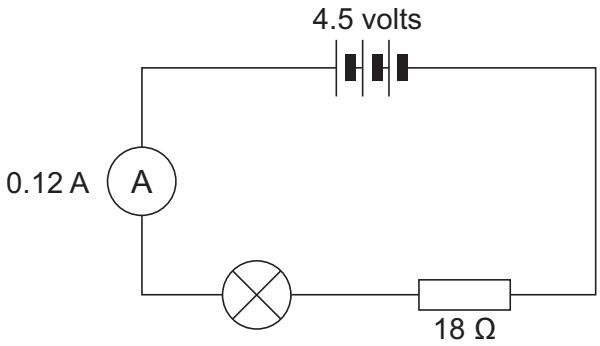
4.2.1.4 Resistors

Question 29

June 2017 | PH2FP | Original Q3 | Legacy

3 **Figure 4** shows a lamp and an 18 Ω resistor connected in a series circuit.

Figure 4



3 (a) (i) Calculate the potential difference (***V***) across the 18 Ω resistor.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

Potential difference (***V***) = _____ volts

3 (a) (ii) How would you calculate the potential difference across the lamp?

[1 mark]

Tick (✓) **one** box.

4.5 – ***V*** ☐

4.5 + ***V*** ☐

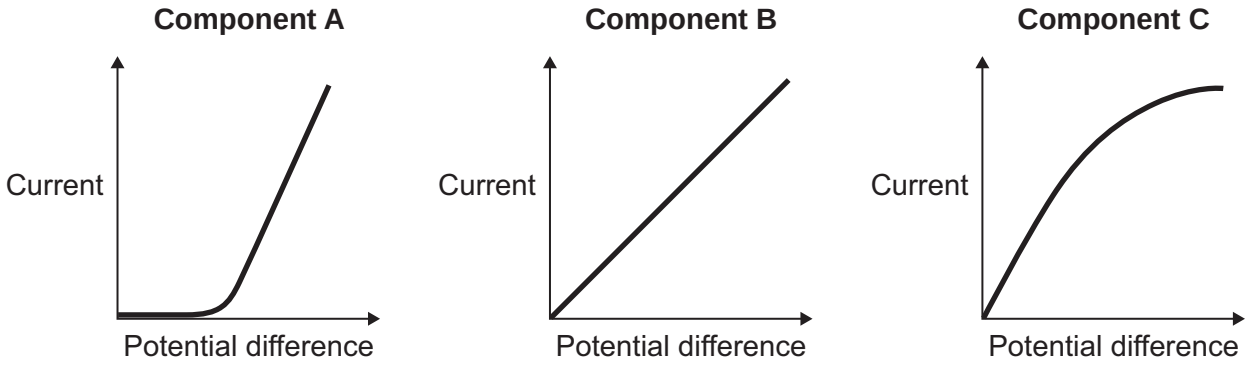
$\frac{4.5}{V}$ ☐

4.2.1.4 Resistors

Question 29 · continued

3 (b) **Figure 5** shows the current-potential difference graphs for three electrical components, **A**, **B** and **C**.

Figure 5



3 (b) (i) Which component, **A**, **B** or **C** is a lamp?

[1 mark]

3 (b) (ii) Which component, **A**, **B** or **C** is a diode?

[1 mark]

5

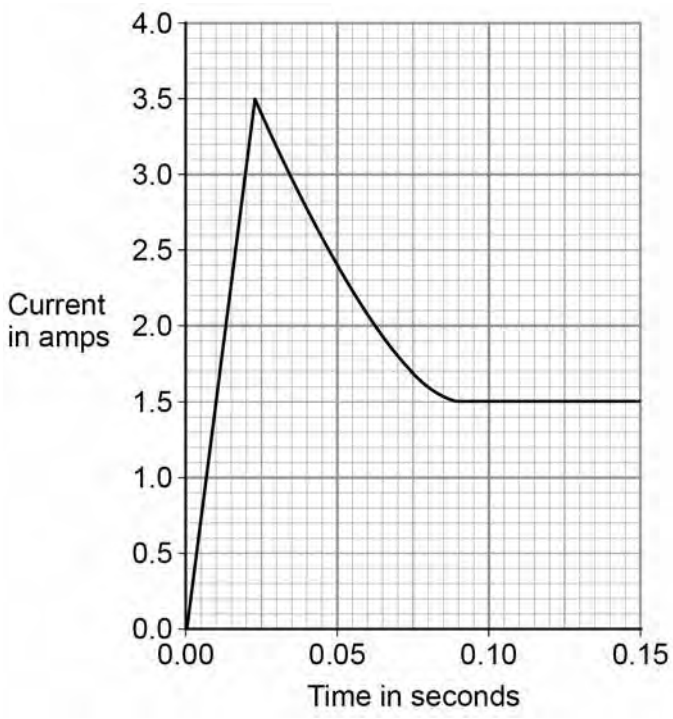
4.2.1.4 Resistors

Question 30

June 2018 | 8463/1F | Original Q2

0 2 **Figure 2** shows how the current through a filament lamp changes after the lamp is switched on.

Figure 2



0 2 . 1 The normal current through the filament lamp is 1.5 A.

For how many seconds is the current through the filament lamp greater than 1.5 A?

Tick **one** box.

[1 mark]

- 0.01 s ☐
- 0.08 s ☐
- 0.09 s ☐
- 0.14 s ☐

4.2.1.4 Resistors

Question 30 · continued

0 2 . 2 Why might the filament inside a lamp melt when the lamp is first switched on?

[1 mark]

0 2 . 3 The lamp is connected to a 24 V power supply. The current through the lamp is 1.5 A.

Calculate the power of the lamp.

Use the equation:

power = potential difference × current

[2 marks]

Power = _____ W

0 2 . 4 LED lamps are much more efficient than filament lamps.

What does this statement mean?

Tick **one** box.

[1 mark]

- LED lamps have a similar power output to filament lamps. ☐
- LED lamps waste a smaller proportion of the input energy than filament lamps. ☐
- LED lamps have a higher power input than filament lamps. ☐
- LED lamps waste a larger proportion of the input energy than filament lamps. ☐

5

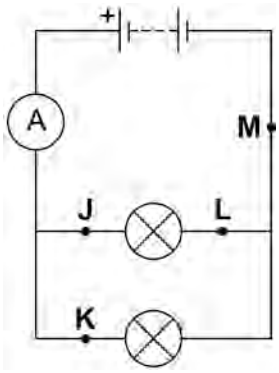
4.2.1.4 Resistors

Question 31

June 2019 | 8463/1F | Original Q7

0 7 **Figure 9** shows a circuit diagram.

Figure 9



0 7 . 1 In which position could a switch be placed so that both lamps can be switched on or off at the same time?

[1 mark]

Tick (✓) **one** box.

J ☐ **K** ☐ **L** ☐ **M** ☐

0 7 . 2 Draw the circuit symbol for a switch in the box below.

[1 mark]

4.2.1.4 Resistors

Question 31 · continued

0 7 . 3 In 30 seconds, 24 coulombs of charge flow through the battery.

Calculate the current in the battery.

Use the equation:

$$\text{current} = \frac{\text{charge flow}}{\text{time}}$$

[2 marks]

Current = _____ A

0 7 . 4 There is a potential difference of 3.6 V across the battery.

Calculate the energy transferred by the battery when 60 coulombs of charge flows through the battery.

Use the equation:

energy transferred = charge flow × potential difference

[2 marks]

Energy transferred = _____ J

Question 7 continues on the next page

4.2.1.4 Resistors

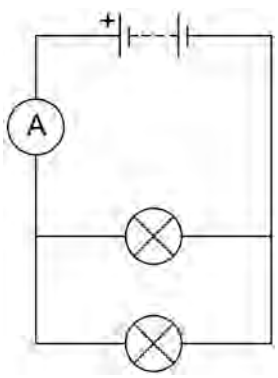
Question 31 · continued

A student built **Circuit X** and **Circuit Y** shown in **Figure 10**.

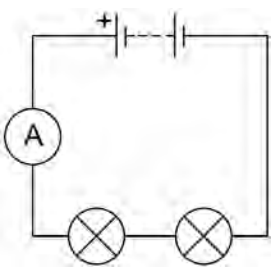
The components used in each circuit were identical.

Figure 10

Circuit X



Circuit Y



0 7 . 5 How would the reading on the ammeter in **Circuit Y** compare to the reading on the ammeter in **Circuit X**?

[1 mark]

Tick (✓) **one** box.

The reading in **Y** would be higher. ☐

The reading in **Y** would be lower. ☐

The readings would be the same. ☐

0 7 . 6 How does the total resistance of **Circuit Y** compare with the total resistance of **Circuit X**?

[1 mark]

Tick (✓) **one** box.

The total resistance of **Y** is greater. ☐

The total resistance of **Y** is less. ☐

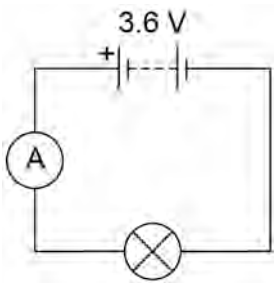
The total resistance is the same. ☐

4.2.1.4 Resistors

Question 31 · continued

The student built another circuit which is shown in **Figure 11**.

Figure 11



0 7 . 7 Write down the equation which links current, potential difference and resistance.

[1 mark]

0 7 . 8 There is a potential difference of 3.6 V across the lamp in **Figure 11**.

The current through the lamp is 0.80 A

Calculate the resistance of the lamp.

[3 marks]

Resistance = _____ Ω

12

4.2.1.4 Resistors

Question 32

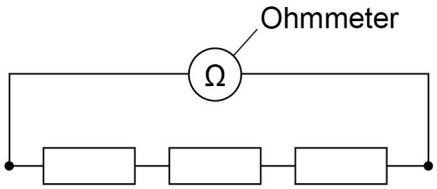
November 2020 | 8463/1F | Original Q4

0 4 A student investigated how the total resistance of identical resistors connected in series varied with the number of resistors.

The student used an ohmmeter to measure the total resistance of the resistors.

Figure 6 shows the student's circuit with 3 resistors.

Figure 6



The student repeated each reading of resistance three times.

Table 1 shows the student's results for 3 resistors in series.

Table 1

Number of resistors	Total resistance in Ω			
	Reading 1	Reading 2	Reading 3	Mean
3	35.9	36.0	36.1	36.0

0 4 . 1 Calculate the mean resistance of 1 resistor.

[2 marks]

Resistance = _____ Ω

0 4 . 2 What was the resolution of the ohmmeter the student used?

Tick (✓) **one** box.

[1 mark]

0.1 Ω ☐ 0.2 Ω ☐ 1.1 Ω ☐ 36.0 Ω ☐

4.2.1.4 Resistors

Question 32 · continued

0 4 . 3 How do the results show that the student's measurements were precise?

[1 mark]

Tick (✓) **one** box.

- The measurements are accurate. ☐
- The measurements are grouped closely together. ☐
- The measurements are reproducible. ☐

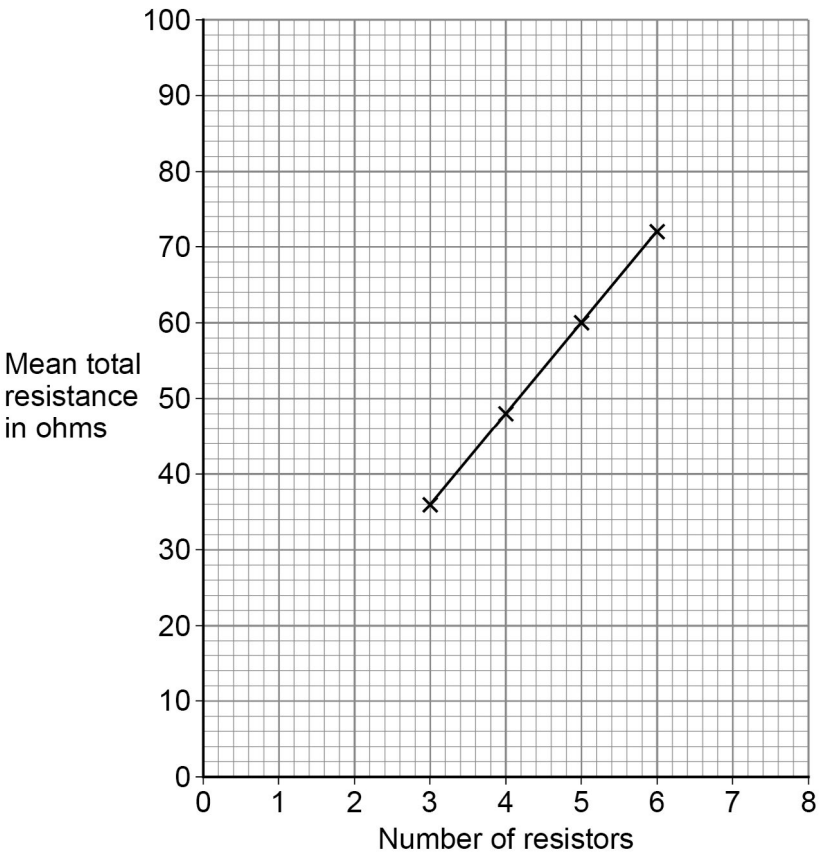
Question 4 continues on the next page

4.2.1.4 Resistors

Question 32 · continued

Figure 7 shows the results.

Figure 7



0 4 . 4 How do the results show that the total resistance is directly proportional to the number of resistors?

[1 mark]

Tick (✓) **one** box.

The results give a line with a positive gradient. ☐

The results give a straight line that would go through the origin. ☐

The results show a linear relationship. ☐

4.2.1.4 Resistors

Question 32 · continued

0 4 . 5 Predict the mean total resistance of 7 resistors.

Use **Figure 7**.

[1 mark]

Mean total resistance of 7 resistors = _____ Ω

0 4 . 6 Some resistors are connected in series with a battery.

When more resistors are added in series, the total resistance increases.

Complete the sentences.

Choose answers from the box.

Each answer may be used once, more than once or not at all.

[2 marks]

decreases	**increases**	**remains the same**

When the number of resistors increases, the potential difference across each resistor _____ .

When the number of resistors increases, the current in the circuit _____ .

8

4.2.1.4 Resistors

Question 33

November 2020 | 8463/1F | Original Q7

0 7 A student heated water in an electric kettle.

0 7 . 1 Water has a high specific heat capacity.

Complete the sentence.

Choose answers from the box.

[2 marks]

°C	**J**	**kg**	**s**	**W**

The specific heat capacity of a substance is the energy needed to raise the

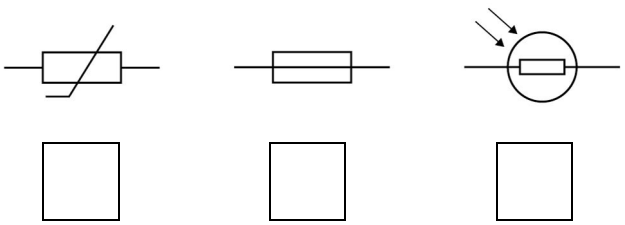
temperature of 1 _____ of the substance by 1 _____.

0 7 . 2 The kettle circuit contains a thermistor which is used to switch the kettle off when the water reaches 100 °C.

What is the correct symbol for a thermistor?

[1 mark]

Tick (✓) **one** box.



4.2.1.4 Resistors

Question 33 · continued

0 7 . 3 The resistance of the heating element in the kettle is 15 Ω.

The current in the heating element is 12 A.

Calculate the power of the heating element.

Use the equation:

$$\text{power} = (\text{current})^2 \times \text{resistance}$$

[2 marks]

Power = _____ W

Question 7 continues on the next page

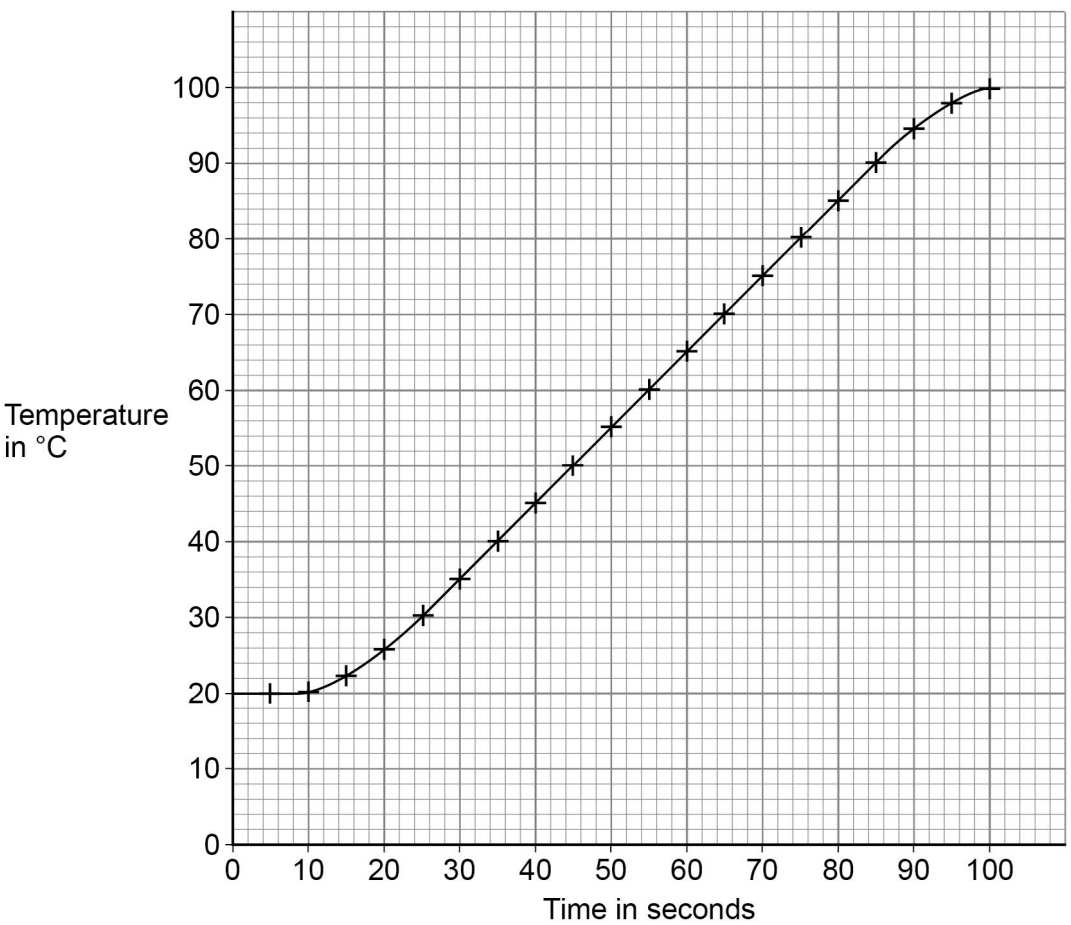
4.2.1.4 Resistors

Question 33 · continued

The student investigated how quickly the kettle could increase the temperature of 0.50 kg of water.

Figure 10 shows the results of the investigation.

Figure 10



4.2.1.4 Resistors

Question 33 · continued

0 7 . 4 The temperature of the water did **not** start to increase until 10 seconds after the kettle was switched on.

What is the reason for this?

[1 mark]

Tick (✓) **one** box.

- Energy is transferred from the surroundings to the kettle. ☐
- The charge flows slowly through the kettle circuit. ☐
- The heating element in the kettle takes time to heat up. ☐
- The power output of the kettle increases slowly. ☐

0 7 . 5 Describe a method the student could have used to obtain the results shown in **Figure 10**.

[6 marks]

Question 7 continues on the next page

4.2.1.4 Resistors

Question 33 · continued

0 7 . 6 The mass of water in the kettle was 0.50 kg.

The temperature of the water increased from 20 °C to 100 °C.

specific heat capacity of water = 4200 J/kg °C

Calculate the energy transferred to the water.

Use the Physics Equations Sheet.

[3 marks]

Energy = _____ J

0 7 . 7 The water in the kettle boiled for a short time before the kettle switched off.

During this time 5.0 g of water changed to steam.

specific latent heat of vaporisation of water = 2 260 000 J/kg

Calculate the energy transferred to change the water to steam.

Use the Physics Equations Sheet.

[3 marks]

Energy = _____ J

18

4.2.1.4 Resistors

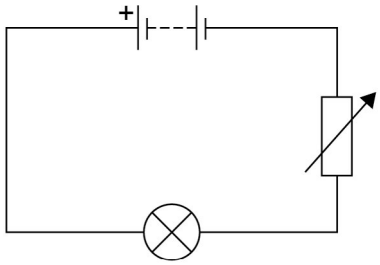
Question 34

November 2020 | 8463/1F | Original Q8

0 8 A student investigated how the current in a filament lamp varied with the potential difference across the filament lamp.

Figure 11 shows part of the circuit used.

Figure 11



0 8 . 1 Complete **Figure 11** by adding an ammeter and a voltmeter.

Use the correct circuit symbols.

[3 marks]

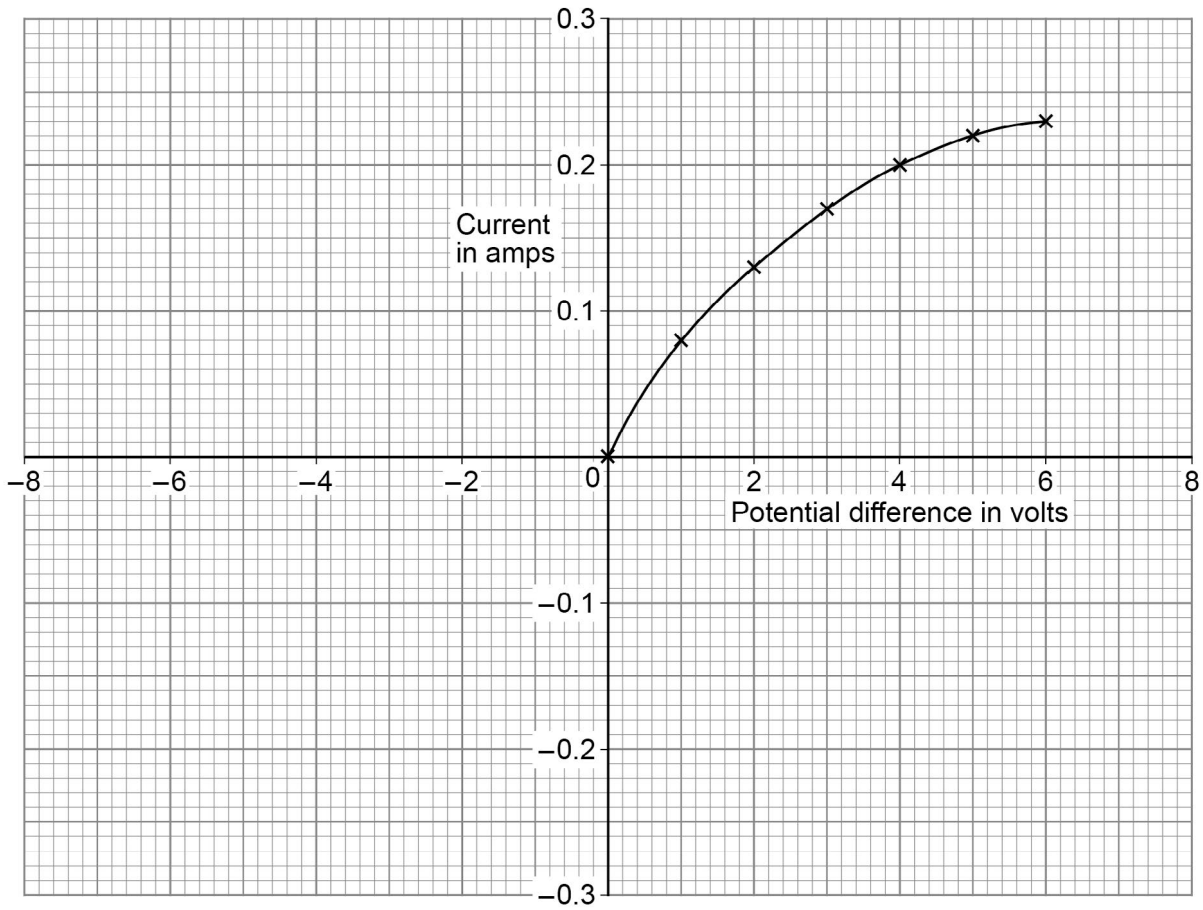
Question 8 continues on the next page

4.2.1.4 Resistors

Question 34 · continued

Figure 12 shows some of the results.

Figure 12



0 8 . 2 The student reversed the connections to the power supply and obtained negative values for the current and potential difference.

Draw a line on **Figure 12** to show the relationship between the negative values of current and potential difference.

[2 marks]

4.2.1.4 Resistors

Question 34 · continued

0 8 . 3 Write down the equation which links current (I), potential difference (V) and resistance (R).

[1 mark]

0 8 . 4 Determine the resistance of the filament lamp when the potential difference across it is 1.0 V.

Use data from **Figure 12**.

[4 marks]

Resistance = _____ Ω

0 8 . 5 A second student did the same investigation. The ammeter used had a zero error.

What is meant by a zero error?

[1 mark]

11

4.2.1.4 Resistors

Question 35

November 2021 | 8463/1F | Original Q4

0 4 A student investigated how the current in a circuit varied with the number of lamps connected in parallel in the circuit.

Figure 4 shows the circuit with three identical lamps connected in parallel.

Figure 4

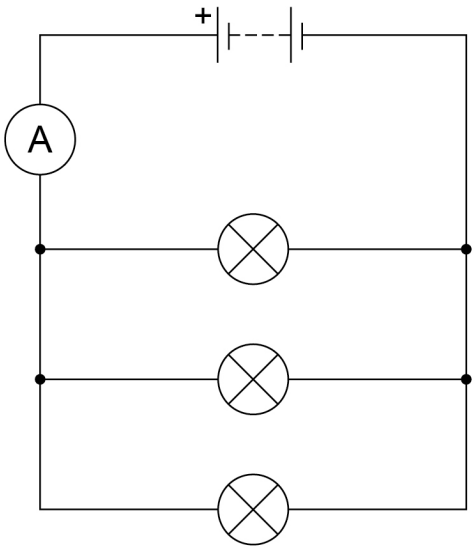
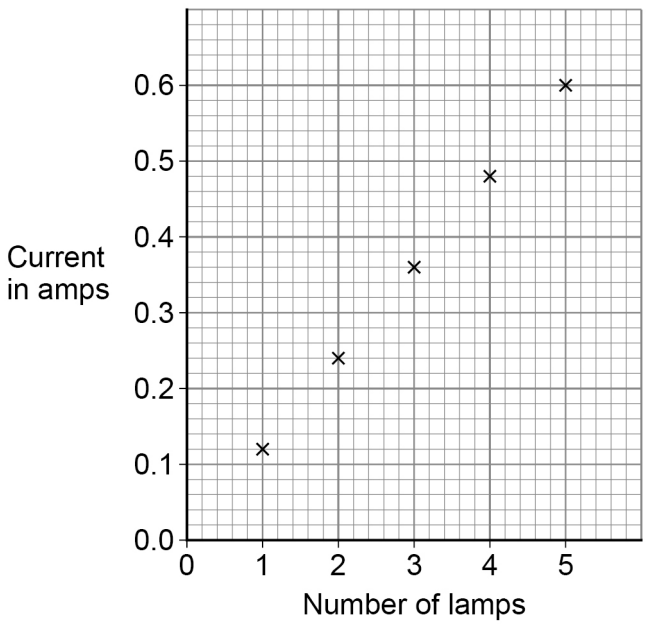


Figure 5 shows the results.

Figure 5



4.2.1.4 Resistors

Question 35 · continued

0 4 . 1 Complete the sentences.

Choose answers from the box.

Each answer can be used once, more than once or not at all.

decreased	**stayed the same**	**increased**

[3 marks]

As the number of lamps increased, the current _____.

As the number of lamps increased, the total resistance of the circuit _____.

As the number of lamps increased, the potential difference across the battery _____.

0 4 . 2 When there were three lamps in the circuit the ammeter reading kept changing between 0.35 A and 0.36 A.

What type of error would this lead to?

[1 mark]

Tick (✓) **one** box.

Random error ☐

Systematic error ☐

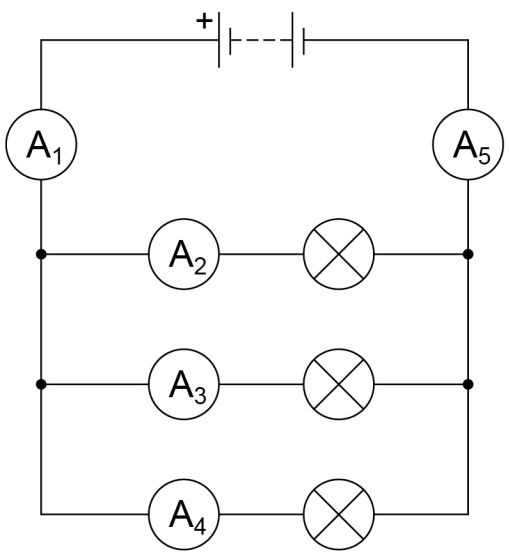
Zero error ☐

Question 4 continues on the next page

Question 35 · continued

Figure 6 shows a circuit with five ammeters and three identical lamps.

Figure 6



0 4 . 3 Complete **Table 2** to show the readings on ammeters A_2 and A_5.

[2 marks]

Table 2

Ammeter	**A_1**	**A_2**	**A_3**	**A_4**	**A_5**
Current in amps	0.36		0.12	0.12	

4.2.1.4 Resistors

Question 35 · continued

0 4 . 4 The resistance of one lamp is 15 Ω.

The current in the lamp is 0.12 A.

Calculate the power output of the lamp.

Use the equation:

$$\text{power} = (\text{current})^2 \times \text{resistance}$$

[2 marks]

Power = _____ W

8

Turn over for the next question

4.2.1.4 Resistors

Question 36

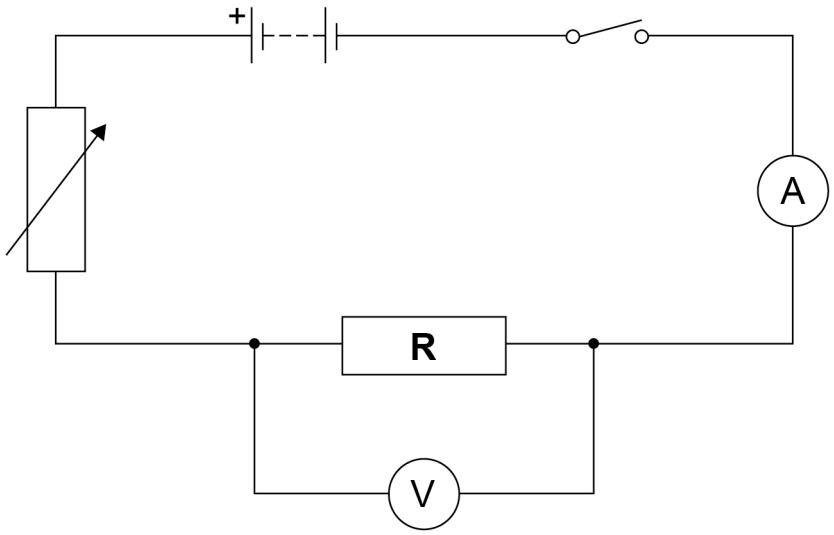
November 2021 | 8463/1F | Original Q11

1 1 Student **A** investigated how the current in resistor **R** at constant temperature varied with the potential difference across the resistor.

Student **A** recorded both positive and negative values of current.

Figure 14 shows the circuit Student **A** used.

Figure 14



1 1 . 1 Describe a method that Student **A** could use for this investigation.

[6 marks]

4.2.1.4 Resistors

Question 36 · continued

11.2 Student **B** repeated the investigation.

During Student **B**'s investigation the temperature of resistor **R** increased.

Explain how the increased temperature of resistor **R** would have affected Student **B**'s results.

[2 marks]

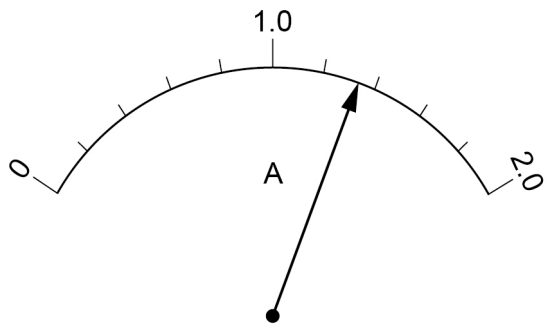
Question 11 continues on the next page

4.2.1.4 Resistors

Question 36 · continued

Figure 15 shows the scale on a moving coil ammeter at one time in the investigation.

Figure 15



1 1 . 3 What is the resolution of the moving coil ammeter?

[1 mark]

Resolution = _____ A

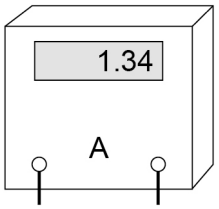
4.2.1.4 Resistors

Question 36 · continued

1 1 . 4 Student **B** replaced the moving coil ammeter with a digital ammeter.

Figure 16 shows the reading on the digital ammeter.

Figure 16



The digital ammeter has a higher resolution than the moving coil ammeter.

Give **one** other reason why it would have been better to use the digital ammeter throughout this investigation.

[1 mark]

10

4.2.1.4 Resistors

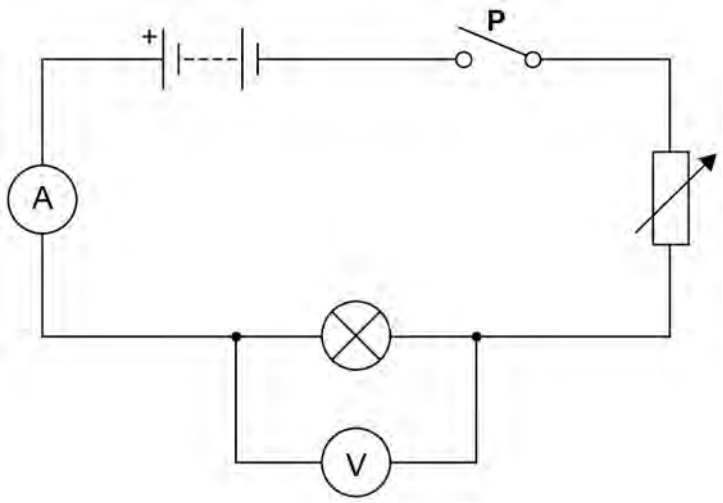
Question 37

June 2023 | 8463/1F | Original Q1

0 1 A student investigated how the current in a filament lamp varies with the potential difference across the lamp.

Figure 1 shows the circuit used.

Figure 1



0 1 . 1 What is component **P**?

[1 mark]

_____

0 1 . 2 Complete the sentences.

Choose answers from the box.

[2 marks]

charge	**current**	**energy**	**potential difference**	**power**

The ammeter in the circuit measures _____ .

The voltmeter in the circuit measures _____ .

4.2.1.4 Resistors

Question 37 · continued

0 1 . 3 How will **increasing** the resistance of the variable resistor in **Figure 1** affect each of the following quantities?

[3 marks]

Tick (✓) **one** box in **each** row.

Quantity	Decreases	Stays the same	Increases
Current in the circuit			
Potential difference across the lamp			
Total resistance of the circuit			

0 1 . 4 A charge flow of 15 coulombs passed through the filament lamp in a time of 60 seconds.

Calculate the current in the lamp.

Use the equation:

$$\text{current} = \frac{\text{charge flow}}{\text{time}}$$

[2 marks]

Current = _____ A

Question 1 continues on the next page

4.2.1.4 Resistors

Question 37 · continued

0 1 . 5 When the current in the filament lamp is 0.12 A, the potential difference across the lamp is 6.0 V.

Calculate the resistance of the filament lamp.

Use the equation:

$$\text{resistance} = \frac{\text{potential difference}}{\text{current}}$$

[2 marks]

Resistance = _____ Ω

4.2.1.4 Resistors

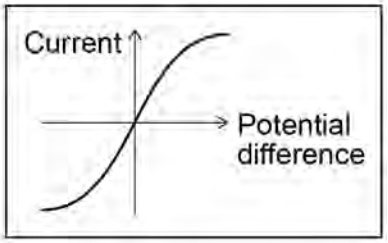
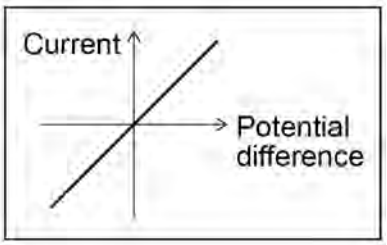
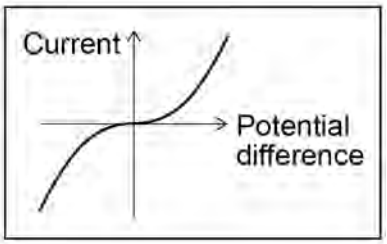
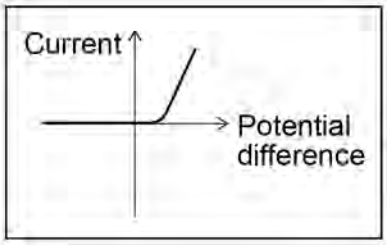
Question 37 · continued

0 1 . 6 The student repeated the investigation after replacing the lamp with a resistor at constant temperature and then a diode.

The student plotted a graph for each component.

Draw **one** line from each component to its graph.

[2 marks]

Component	Graph
Diode	
Filament lamp	
Resistor	
	

4.2.1.4 Resistors

Question 37 · continued

0 1 . 7 **Figure 2** shows an ammeter.

The ammeter is **not** connected to a circuit.

Figure 2



What type of error does the ammeter display?

[1 mark]

Tick (✓) **one** box.

A positive error ☐

A random error ☐

A zero error ☐

13

4.2.1.4 Resistors

Question 38

June 2024 | 8463/1F | Original Q2

0 2 **Figure 4** shows a student putting a coin into a vending machine that sells food.

Figure 4



The vending machine is connected to the mains electricity supply.

0 2 . 1 What is the frequency of the mains electricity supply in the UK?

[1 mark]

Tick (✓) **one** box.

50 hertz ☐

60 hertz ☐

100 hertz ☐

4.2.1.4 Resistors

Question 38 · continued

0 2 . 2 What is the potential difference of the mains electricity supply in the UK?

[1 mark]

Tick (✓) **one** box.

12 volts ☐

230 volts ☐

20 000 volts ☐

The vending machine identifies the value of the coin by measuring the resistance of the coin.

0 2 . 3 The machine applies a potential difference of 0.45 V across the coin.

The current in the coin is 0.75 A.

Calculate the resistance of the coin.

Use the equation:

$$\text{resistance} = \frac{\text{potential difference}}{\text{current}}$$

[2 marks]

Resistance = _____ Ω

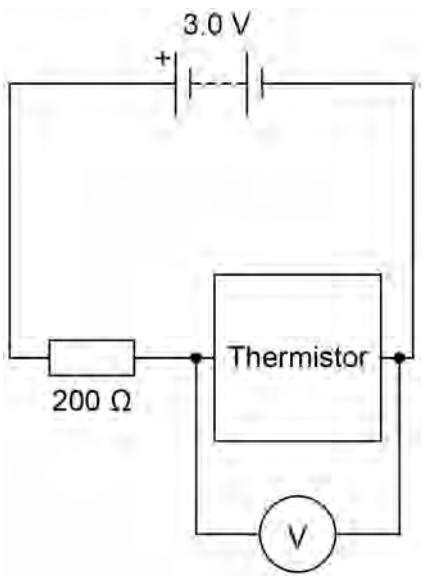
4.2.1.4 Resistors

Question 38 · continued

The temperature inside the vending machine is monitored using an electrical circuit.

Figure 5 shows part of the circuit.

Figure 5

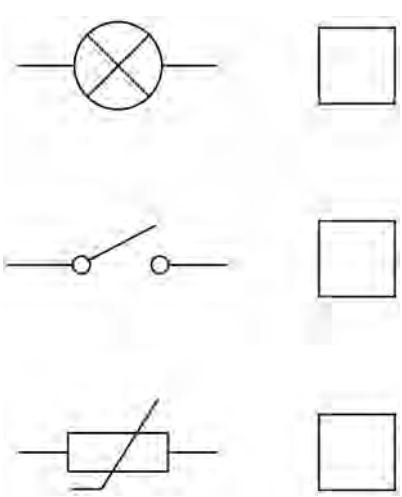


0 2 . 4 The circuit symbol for the thermistor is wrong.

What is the circuit symbol for a thermistor?

[1 mark]

Tick (✓) **one** box.



Question 38 · continued

0 2 . 5 How could the potential difference (pd) across the resistor be calculated?

[1 mark]

Tick (✓) **one** box.

pd across battery – pd across thermistor ☐

pd across battery + pd across thermistor ☐

pd across battery × pd across thermistor ☐

pd across battery ÷ pd across thermistor ☐

0 2 . 6 At one temperature, the thermistor in **Figure 5** has a resistance of 200 Ω.

What is the potential difference across the thermistor at this temperature?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

0.0 V ☐

1.0 V ☐

1.5 V ☐

2.0 V ☐

Reason _____

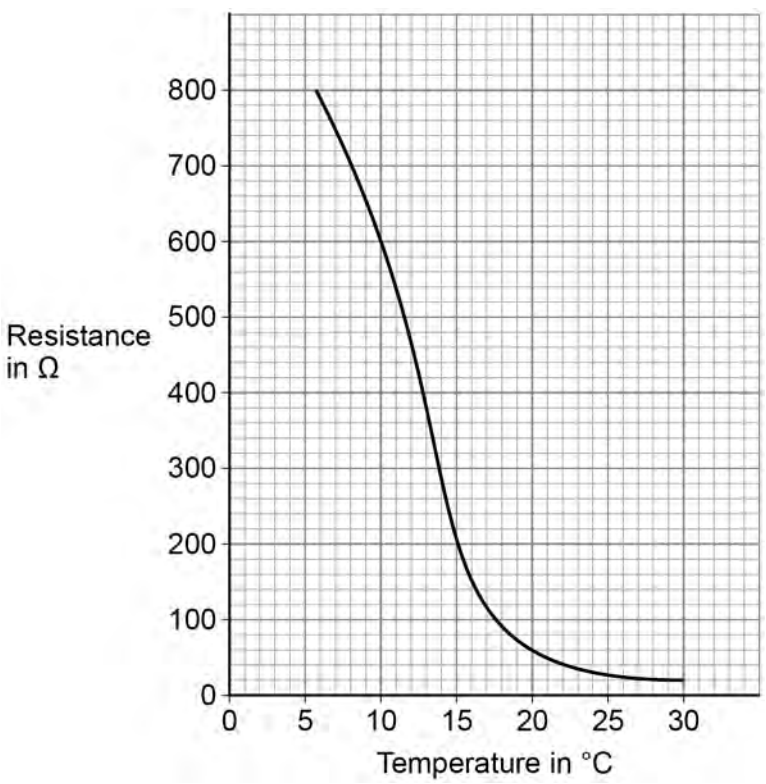
_____

4.2.1.4 Resistors

Question 38 · continued

Figure 6 shows how the resistance of the thermistor varies with temperature.

Figure 6



0 2 . 7 When the temperature of the thermistor is 10 °C, the resistance of the thermistor is 600 Ω.

Calculate the change in resistance when the temperature increased from 10 °C to 15 °C.

[2 marks]

Change in resistance = _____ Ω

10