AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.2.1.3

Current, resistance and potential difference

Past-paper questions

Tier	**Higher**
Question groups	**17**
Available paper years	**2018–2025**

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.

6.2.1.3 Current, resistance and potential difference

Question 01

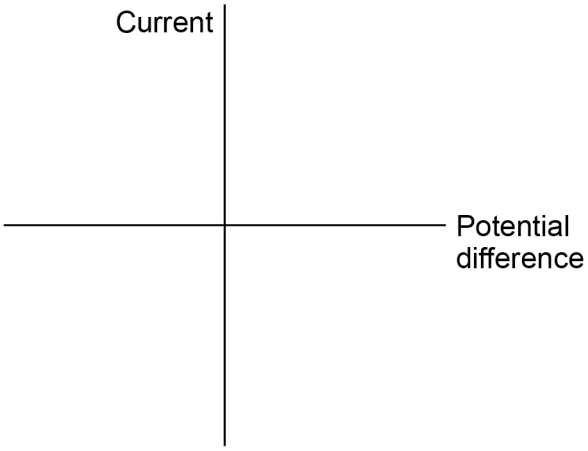
June 2018 | 8464/P/1H | Original Q6

0 6 A student built a circuit using filament lamps.

0 6 . 1 Sketch a current potential difference graph for a filament lamp on **Figure 9**

[2 marks]

Figure 9



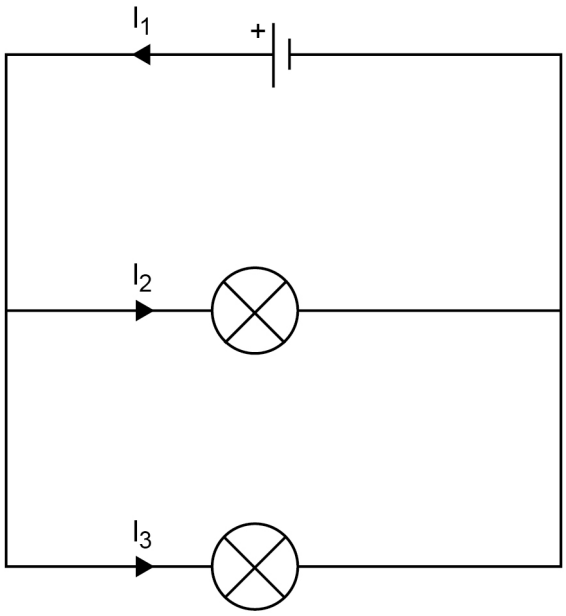
6.2.1.3 Current, resistance and potential difference

Question 01 · continued

June 2018 | 8464/P/1H | Original Q6

Figure 10 shows the circuit with two identical filament lamps.

Figure 10



0 6 . 2 Compare the currents I_1, I_2 and I_3

[2 marks]

Question 6 continues on the next page

6.2.1.3 Current, resistance and potential difference

Question 01 · continued

0 6 . 3 Calculate the charge that flows through the cell in 1 minute.

Each filament lamp has a power of 3 W and a resistance of 12 Ω

Write any equations that you use.

Give the unit.

[6 marks]

Charge = _____

Unit = _____

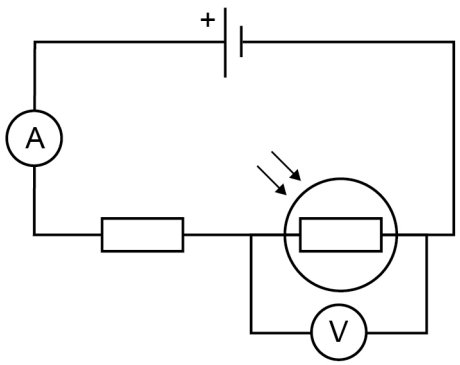
6.2.1.3 Current, resistance and potential difference

Question 01 · continued

0 6 . 4 The student builds a different circuit.

Figure 11 shows the circuit.

Figure 11



Explain how the readings on both meters change when the environmental conditions change.

[6 marks]

6.2.1.3 Current, resistance and potential difference

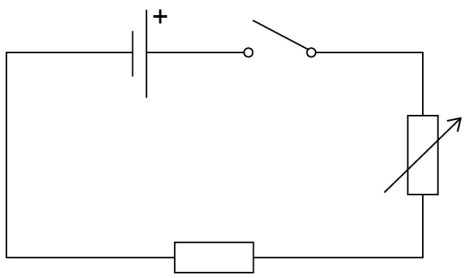
Question 02

June 2019 | 8464/P/1H | Original Q1

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

Figure 1 shows part of the circuit used.

Figure 1



0 1 . 1 The student connected an ammeter and a voltmeter into the circuit.

What is the correct way to connect the ammeter and the voltmeter into the circuit?

[1 mark]

Tick (✓) **one** box.

Ammeter	Voltmeter	
In parallel with the resistor	In series with the resistor	☐
In parallel with the cell	In series with the resistor	☐
In series with the resistor	In parallel with the resistor	☐
In series with the resistor	In parallel with the cell	☐

0 1 . 2 The student increased the resistance of the variable resistor.

How did increasing the resistance affect the current in the circuit?

[1 mark]

6.2.1.3 Current, resistance and potential difference

Question 02 · continued

0 1 . 3 How should the student change the circuit to give negative values for current and potential difference?

[1 mark]

0 1 . 4 Name the type of relationship between current and potential difference for a resistor at constant temperature.

[1 mark]

0 1 . 5 Write the equation which links current, potential difference and resistance.

[1 mark]

0 1 . 6 The current in the resistor was 0.12 A when the potential difference across the resistor was 3.0 V

Calculate the resistance of the resistor.

[3 marks]

Resistance = _____ Ω

8

6.2.1.3 Current, resistance and potential difference

Question 03

June 2019 | 8464/P/1H | Original Q3

0 3 A hybrid car has an electric motor and a petrol engine.

0 3 . 1 Petrol is a non-renewable energy resource.

What is meant by a non-renewable energy resource?

[1 mark]

0 3 . 2 The electric motor in the car is powered by a battery.

To charge the battery, the car is plugged into the mains supply at 230 V

The power used to charge the battery is 6.9 kW

Calculate the current used to charge the battery.

[4 marks]

Current = _____ A

0 3 . 3 Mains electricity is an ac supply.

Explain the difference between direct and alternating potential difference.

[2 marks]

6.2.1.3 Current, resistance and potential difference

Question 03 · continued

0 3 . 4 The cable used to connect the car to the mains electricity supply has a low resistance.

Explain why it is better to use a cable with a low resistance than to use a cable with a high resistance.

[2 marks]

9

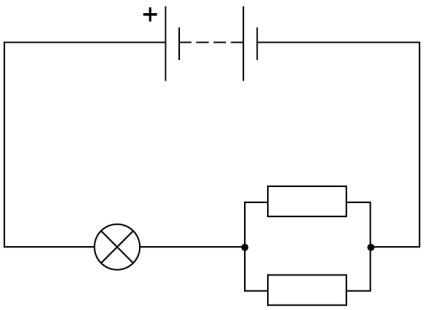
6.2.1.3 Current, resistance and potential difference

Question 04

June 2019 | 8464/P/1H | Original Q4

0 4 **Figure 2** shows a circuit that a student built.

Figure 2



0 4 . 1 The lamp has a resistance of 10 Ω

Each resistor has a resistance of 10 Ω

What is the total resistance of the circuit?

[1 mark]

Tick (✓) **one** box.

Between 20 and 30 Ω ☐

Exactly 20 Ω ☐

Exactly 30 Ω ☐

Less than 20 Ω ☐

0 4 . 2 Explain your answer to Question **04.1**

[2 marks]

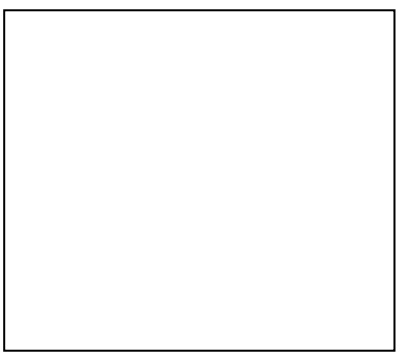
6.2.1.3 Current, resistance and potential difference

Question 04 · continued

The student replaced one of the resistors with a thermistor.

0 4 . 3 Draw the circuit symbol for a thermistor in the box below.

[1 mark]



0 4 . 4 The student increased the temperature of the thermistor.

Explain how the current in the thermistor changed.

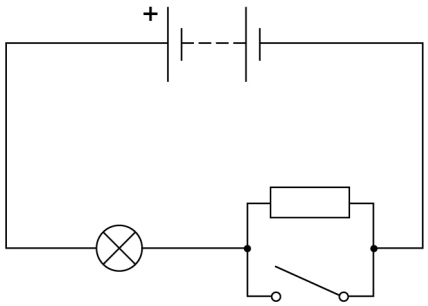
[2 marks]

6.2.1.3 Current, resistance and potential difference

Question 04 · continued

0 4 . 5 **Figure 3** shows another circuit the student built.

Figure 3



Explain how the potential difference across the resistor and the lamp will change when the switch is closed.

[4 marks]

The resistor _____

_____

_____

_____

The lamp _____

_____

_____

_____

10

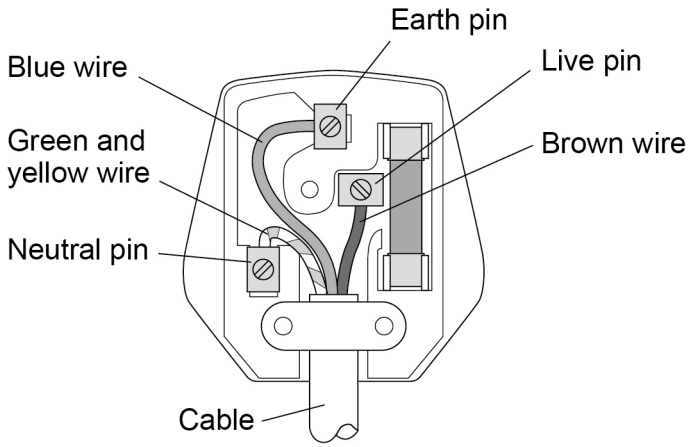
6.2.1.3 Current, resistance and potential difference

Question 05

November 2020 | 8464/P/1H | Original Q1

0 1 **Figure 1** shows the inside of a plug.

Figure 1



0 1 . 1 The plug is **not** wired correctly.

What should be done to connect the wires in the plug correctly?

[1 mark]

Question 05 · continued

The correctly wired plug and cable connects a washing machine to the mains electricity supply.

0 1 . 2 Give the potential difference and frequency of the mains electricity supply in the UK.

[2 marks]

The potential difference is _____ V

The frequency is _____ Hz

0 1 . 3 The washing machine is switched on.

What is the potential difference between the neutral wire and the earth wire?

[1 mark]

Potential difference = _____ V

0 1 . 4 The plug has a fuse.

Draw the circuit symbol for a fuse in the space below.

[1 mark]

Question 1 continues on the next page

Question 05 · continued

The washing machine has a metal case.

A fault causes the live wire to make an electrical connection with the metal case of the washing machine.

0 1 . 5 The earth wire is **not** connected to the metal case of the washing machine.

Explain why it would not be safe for a person to touch the metal case.

[2 marks]

0 1 . 6 The earth wire is now connected to the metal case of the washing machine.

Explain why it would now be safe for a person to touch the metal case, even if the live wire touches the metal case.

[2 marks]

9

6.2.1.3 Current, resistance and potential difference

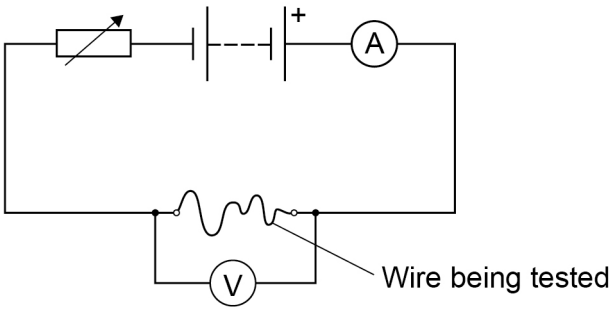
Question 06

November 2020 | 8464/P/1H | Original Q3

0 3 A student investigated how the resistance of a piece of wire varies with its length.

0 3 . 1 **Figure 2** shows the circuit used.

Figure 2



Explain why the student needed to adjust the variable resistor each time she changed the length of the wire.

[3 marks]

Question 3 continues on the next page

Question 06 · continued

0 3 . 2 The student recorded three measurements of the potential difference across a 0.10 m length of wire.

Table 1 shows the results.

Table 1

Length in m	Potential difference in V			
	1	2	3	Mean
0.10	**X**	0.18	0.15	0.17

Calculate **X** in **Table 1**.

[2 marks]

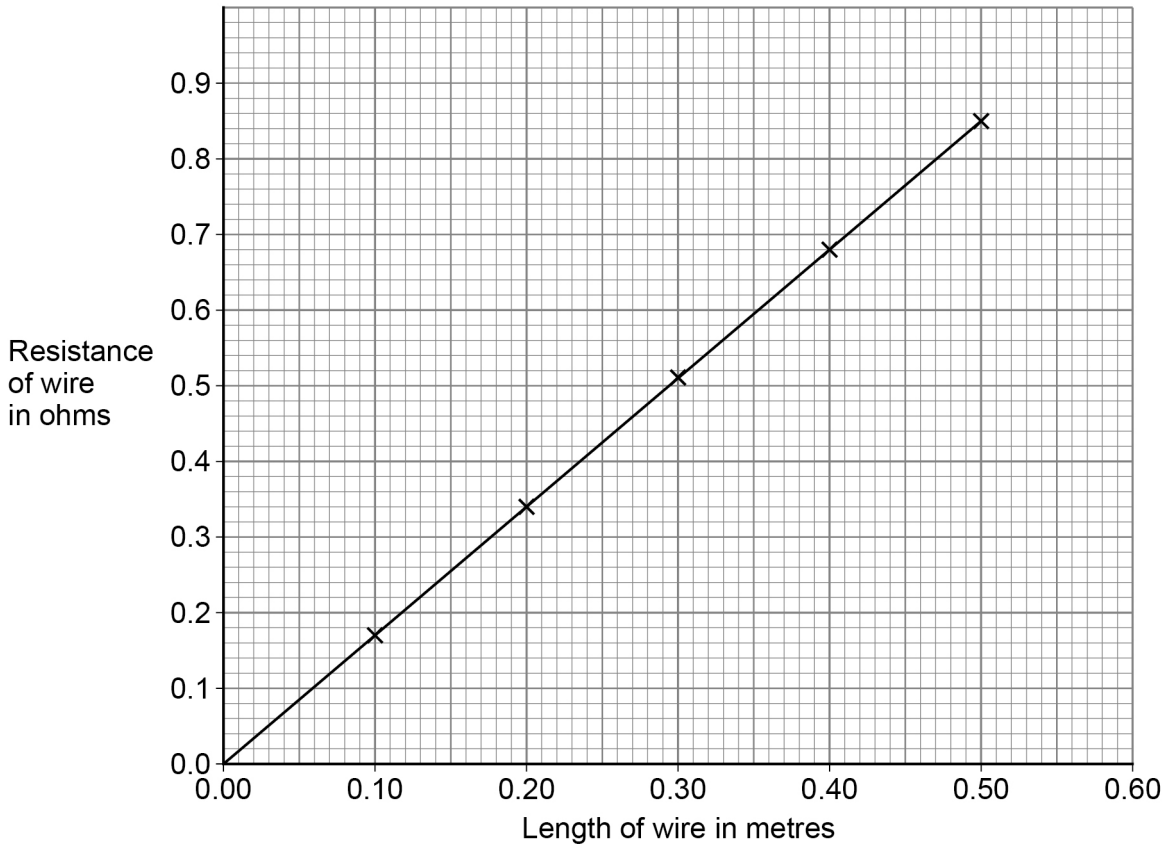
X = _____ V

6.2.1.3 Current, resistance and potential difference

Question 06 · continued

0 3 . 3 **Figure 3** shows the results for five different lengths of the wire.

Figure 3



Describe the relationship between the length of the wire and the resistance of the wire.

[2 marks]

Question 3 continues on the next page

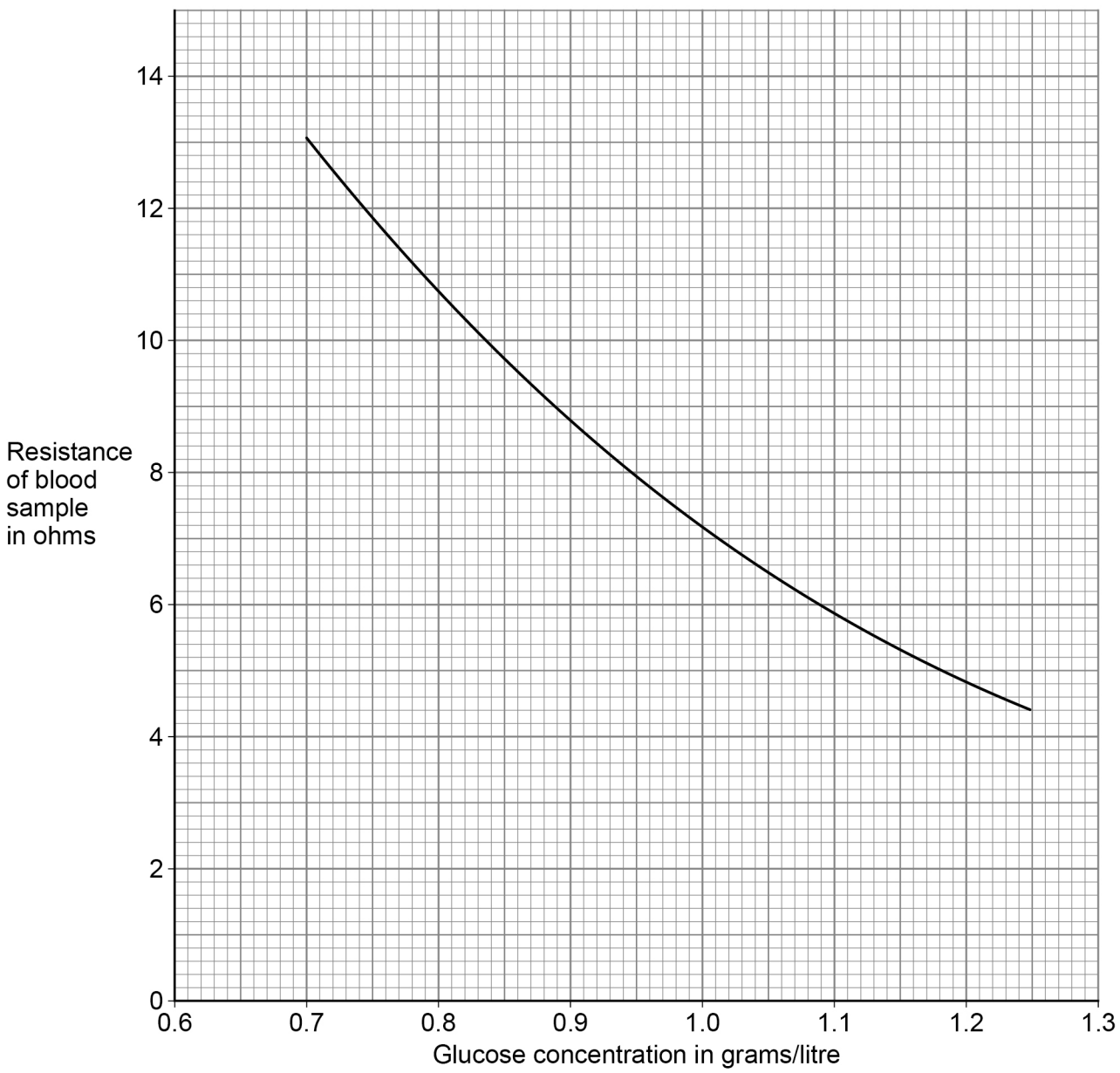
Question 06 · continued

A glucometer uses the resistance of a blood sample to calculate the glucose concentration in a person's blood.

A blood sample is put into a small tube, which is put inside the glucometer. The blood then acts like a resistance wire.

Figure 4 shows the relationship between the resistance of a blood sample and the glucose concentration.

Figure 4



6.2.1.3 Current, resistance and potential difference

Question 06 · continued

0 3 . 4 The glucometer applies a potential difference of 0.90 volts across a blood sample.

The glucose concentration of the blood sample is 0.98 grams/litre.

Determine the current in the blood sample.

[4 marks]

Current = _____ A

0 3 . 5 A new tube is used each time a blood sample is tested.

Explain why valid results are only obtained if each tube is identical.

[2 marks]

13

6.2.1.3 Current, resistance and potential difference

Question 07

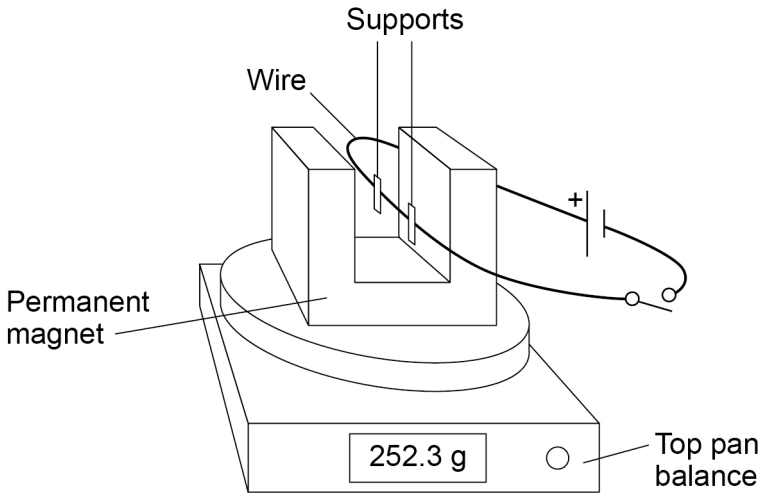
November 2020 | 8464/P/2H | Original Q7

0 7 A student clamped a wire between the poles of a permanent magnet.

The student investigated how the force on the wire varied with the current in the wire.

Figure 13 shows the equipment used.

Figure 13



The top pan balance was used to determine the force on the wire.

0 7 . 1 When the switch was closed the reading on the top pan balance increased.

Explain why the increased reading showed that there was an upward force on the wire.

[2 marks]

6.2.1.3 Current, resistance and potential difference

Question 07 · continued

0 7 . 2 **Table 3** shows the readings on the top pan balance with the switch open and with the switch closed.

Table 3

Switch	Mass in grams
Open	252.3
Closed	254.8

Explain how the values in **Table 3** can be used to determine the size of the force on the wire.

[2 marks]

Question 7 continues on the next page

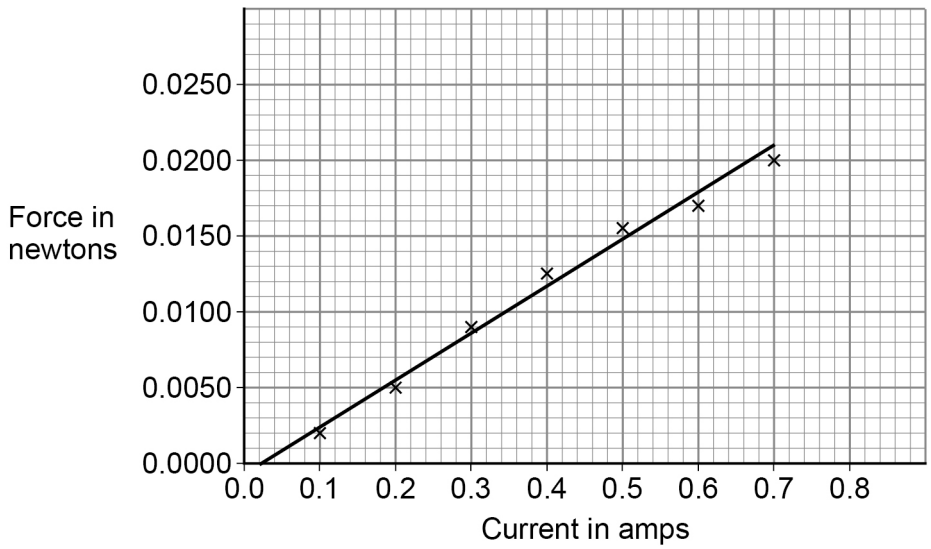
6.2.1.3 Current, resistance and potential difference

Question 07 · continued

0 7 . 3 The student varied the current in the wire and calculated the force acting on the wire.

Figure 14 shows the results.

Figure 14



The length of the wire in the magnetic field was 0.125 m

Determine the magnetic flux density.

[4 marks]

Magnetic flux density = _____ T

8

6.2.1.3 Current, resistance and potential difference

Question 08

0 1 **Figure 1** shows a mobile phone with its battery removed.

Figure 1



A student measured the potential difference across the battery and then put the battery into the phone.

0 1 . 1 What is the equation linking current (I), potential difference (V) and resistance (R)?

[1 mark]

Tick (✓) **one** box.

- $I = V R$ ☐
- $R = I V$ ☐
- $V = I R$ ☐
- $V = I^2 R$ ☐

Question 1 continues on the next page

6.2.1.3 Current, resistance and potential difference

Question 08 · continued

0 1 . 2 The current in the electronic circuit in the mobile phone was 0.12 A.

The potential difference across the battery was 3.9 V.

Calculate the resistance of the electronic circuit in the mobile phone.

[3 marks]

Resistance = _____ Ω

6.2.1.3 Current, resistance and potential difference

Question 08 · continued

0 1 . 3 Write down the equation which links energy (E), power (P) and time (t).

[1 mark]

0 1 . 4 The battery was fully charged when it was put into the mobile phone.

The battery discharged when the mobile phone was switched on.

The average power output of the battery as it discharged was 0.46 watts.

The time taken to fully discharge the battery was 2500 minutes.

Calculate the energy transferred by the battery.

[3 marks]

Energy transferred = _____ J

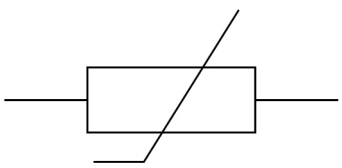
Question 1 continues on the next page

Question 08 · continued

The mobile phone includes a sensor to monitor the temperature of the battery.

Figure 2 shows the circuit symbol for a component used in the sensor.

Figure 2



0 1 . 5 What component does the circuit symbol shown in **Figure 2** represent?

[1 mark]

0 1 . 6 The temperature of the component in **Figure 2** increases.

The potential difference across the component remains constant.

Explain what happens to the current in the component.

[2 marks]

11

6.2.1.3 Current, resistance and potential difference

Question 09

November 2021 | 8464/P/1H | Original Q2

0 2 A radioactive source emits alpha, beta and gamma radiation.

0 2 . 1 An alpha particle is the same as a helium nucleus.

How many times bigger is the radius of a helium atom than the radius of an alpha particle?

[1 mark]

Tick (✓) **one** box.

- Less than 100 times bigger ☐
- Exactly 5000 times bigger ☐
- More than 10 000 times bigger ☐

0 2 . 2 Alpha particles can ionise atoms in the air.

What happens to an atom when it is ionised by an alpha particle?

[2 marks]

Tick (✓) **two** boxes.

- A neutron in the atom becomes a proton. ☐
- The atom becomes a positive ion. ☐
- The atom gains a neutron. ☐
- The atom gains a proton. ☐
- The atom loses an electron. ☐

Question 2 continues on the next page

6.2.1.3 Current, resistance and potential difference

Question 09 · continued

0 2 . 3 A spark detector is a device that can be used to detect alpha radiation.

A spark detector works by alpha particles ionising atoms in the air near a wire mesh.

A large potential difference creates a spark when the air near the wire mesh is ionised.

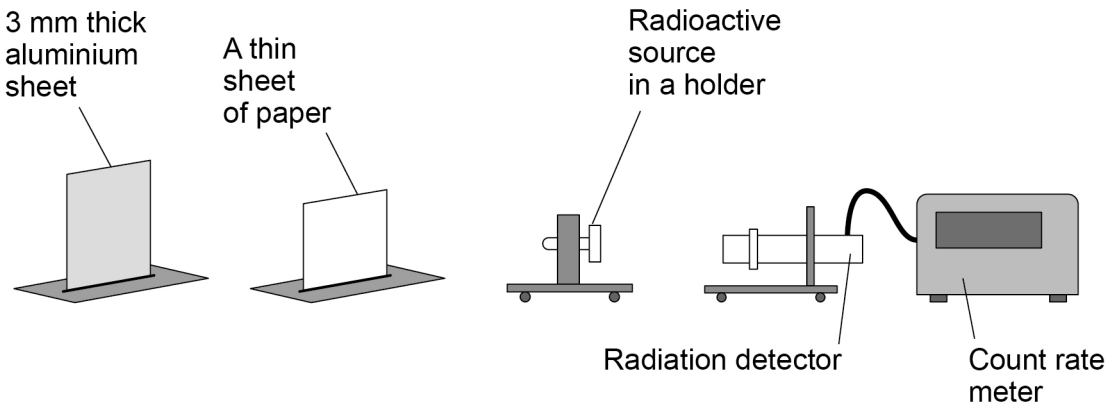
Suggest why a spark detector **cannot** detect beta radiation.

[1 mark]

0 2 . 4 A teacher wants to demonstrate that the radioactive source emits alpha, beta and gamma radiation.

Figure 3 shows the equipment the teacher has.

Figure 3



Describe a method the teacher could use.

[6 marks]

10

6.2.1.3 Current, resistance and potential difference

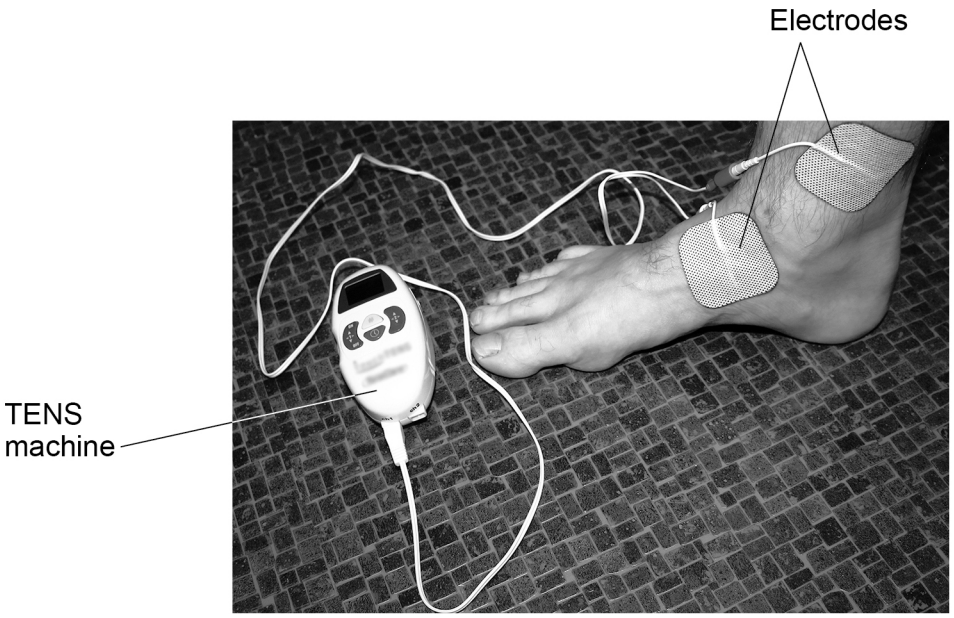
Question 10

November 2021 | 8464/P/1H | Original Q5

0 5 A TENS machine uses an electrical current to relieve pain.

Figure 8 shows the electrodes of a TENS machine connected across an ankle.

Figure 8



0 5 . 1 The maximum power of the TENS machine is 240 mW.

The potential difference across the battery in the TENS machine is 2.5 V.

Calculate the maximum current from the battery.

[4 marks]

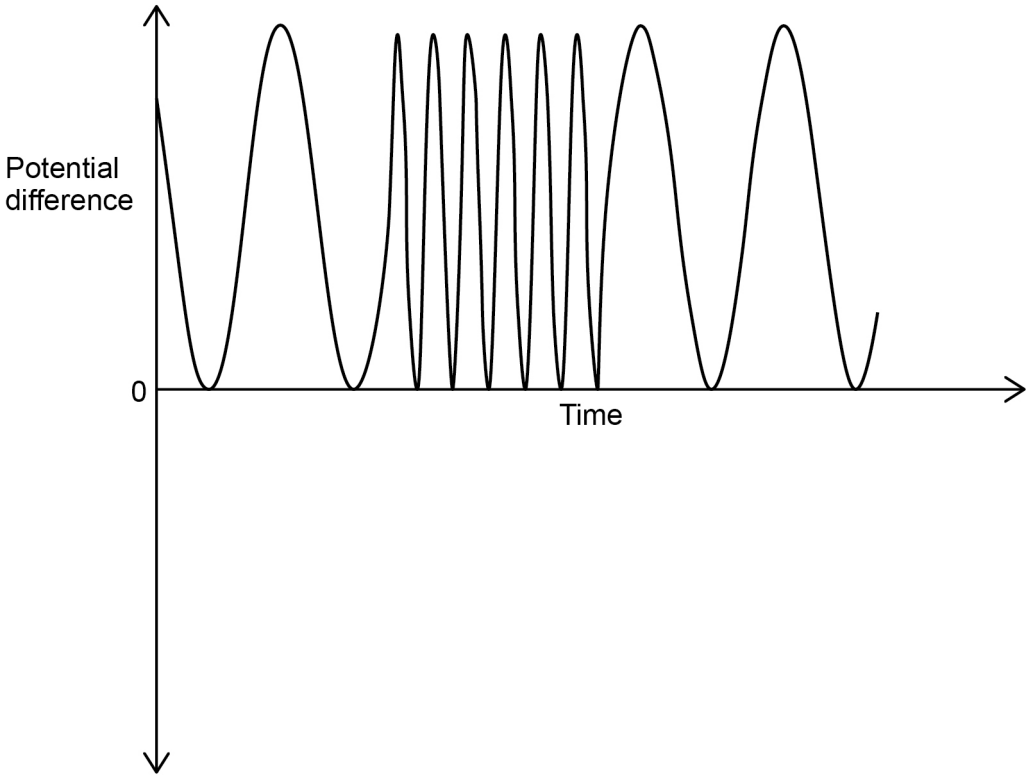
Maximum current = _____ A

6.2.1.3 Current, resistance and potential difference

Question 10 · continued

0 5 . 2 **Figure 9** is a sketch graph showing how the potential difference across the electrodes varies with time.

Figure 9



A student concluded that there was an alternating potential difference across the electrodes.

How does **Figure 9** show that the student was **not** correct?

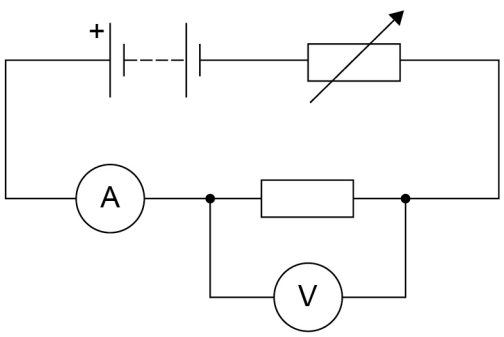
[1 mark]

Question 5 continues on the next page

Question 10 · continued

Figure 10 shows a circuit the student built using the battery from the TENS machine.

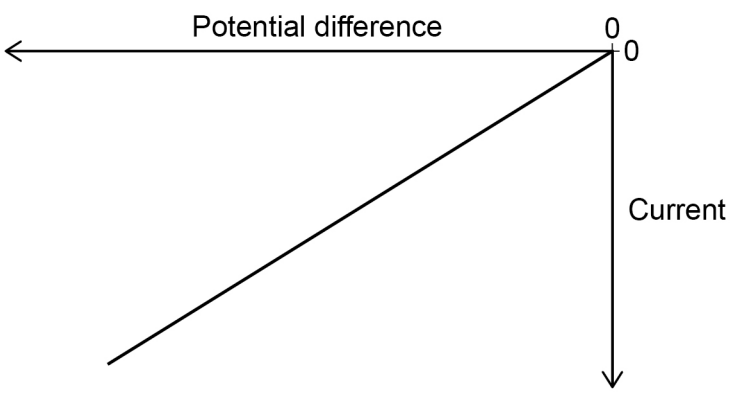
Figure 10



The student recorded how the current in the resistor varied with the potential difference across the resistor.

Figure 11 shows a sketch graph of the results.

Figure 11



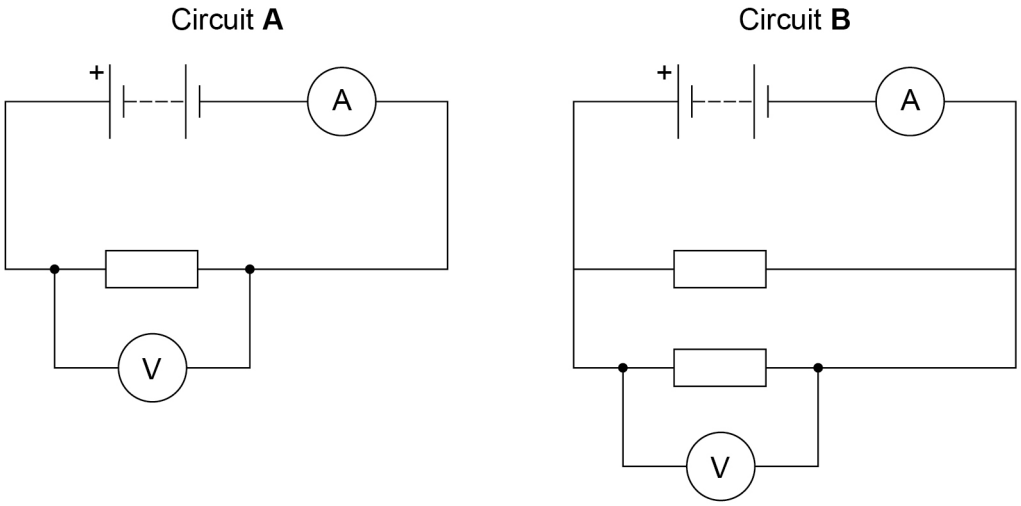
0 5 . 3 What relationship does **Figure 11** show?

[1 mark]

Question 10 · continued

0 5 . 4 **Figure 12** shows two more circuits that the student built using the battery from the TENS machine.

Figure 12



The resistors all have the same resistance.

Compare the readings on the voltmeter and ammeter in circuit **A** and circuit **B**.

[3 marks]

Voltmeter _____

_____

_____

Ammeter _____

_____

_____

9

6.2.1.3 Current, resistance and potential difference

Question 11

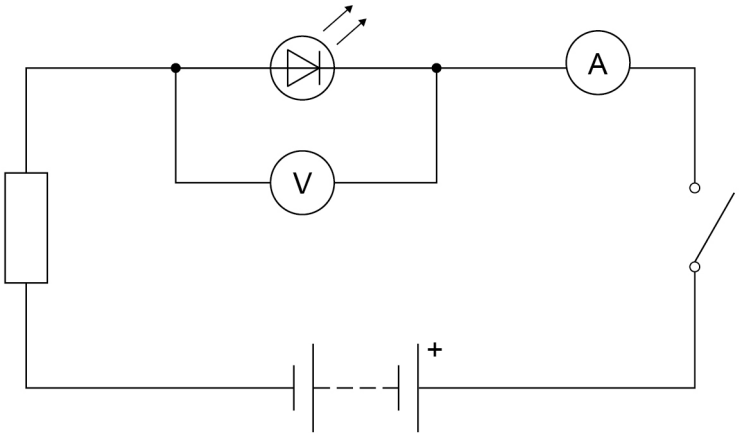
June 2022 | 8464/P/1H | Original Q5

0 5 The camera in a mobile phone uses an LED to provide light when taking a photograph.

A student investigated how the potential difference across an LED varies with the current in it.

Figure 9 shows the circuit used.

Figure 9



0 5 . 1 The student closed the switch. The voltmeter gave a reading of 5.0 V

The ammeter gave a reading of 0 mA

The LED did not emit any light.

Explain how the student should have changed the circuit to make the LED emit light.

[2 marks]

6.2.1.3 Current, resistance and potential difference

Question 11 · continued

0 5 . 2 The student changed the circuit so that the LED emitted light.

The current in the circuit was 290 mA

The power of the LED was 0.98 W

Calculate the potential difference across the LED.

Use the Physics Equations Sheet.

Give your answer to 2 significant figures.

[5 marks]

Potential difference (2 significant figures) = _____ V

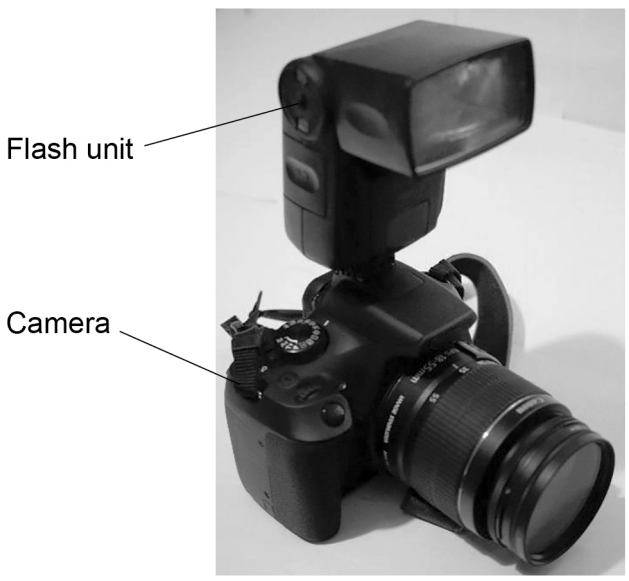
Question 5 continues on the next page

Question 11 · continued

A traditional camera uses a flash unit to provide light.

Figure 10 shows a flash unit on a traditional camera.

Figure 10



0 5 . 3 The flash unit emits light from xenon gas in a fluorescent tube.

What happens when a xenon atom emits light?

[1 mark]

Tick (✓) **one** box.

- Electrons in the atom fall to a lower energy level. ☐
- Electrons in the atom move to a higher energy level. ☐
- Electrons leave the atom, causing ionisation. ☐
- Electrons transfer to the atom from the electrical circuit. ☐

6.2.1.3 Current, resistance and potential difference

Question 11 · continued

0 5 . 4 When the flash unit is used there is a mean potential difference of 200 V across the fluorescent tube.

The flash of light lasts for 2.8×10^{-4} s

1.4 J of energy is transferred.

Calculate the mean current.

Use the Physics Equations Sheet.

[6 marks]

Mean current = _____ A

14

6.2.1.3 Current, resistance and potential difference

Question 12

June 2023 | 8464/P/1H | Original Q2

0 2 Body analysis scales use the electrical resistance of a person's legs to estimate the percentage of water in the person's body.

Figure 3 shows body analysis scales.

Figure 3



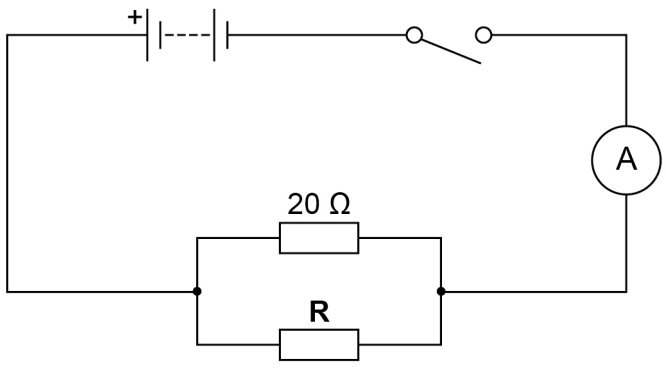
The person's legs contain both solid tissue and water.

A student used resistors to model the solid tissue and water.

The student connected a 20 Ω resistor in parallel with a resistor, **R**.

Figure 4 shows the circuit diagram.

Figure 4



0 2 . 1 To determine the total resistance of both resistors, a voltmeter must be connected into the circuit.

Complete **Figure 4** to show where the voltmeter should be connected.

[1 mark]

6.2.1.3 Current, resistance and potential difference

Question 12 · continued

0 2 . 2 The student calculated the total resistance of the two resistors.

The student's answer was 26 Ω.

Explain why the student's answer **cannot** be correct.

[2 marks]

0 2 . 3 Write down the equation that links current (I), resistance (R) and potential difference (V).

[1 mark]

Use the Physics Equations Sheet to answer questions **02.3** and **02.4**.

0 2 . 4 When the total resistance of the resistors was 7.5 Ω the current in the circuit was 480 mA.

Calculate the potential difference across the two resistors.

[3 marks]

Potential difference = _____ V

6.2.1.3 Current, resistance and potential difference

Question 12 · continued

The student investigated how the resistance of **R** affected the total resistance of the circuit.

Table 1 shows the results.

Table 1

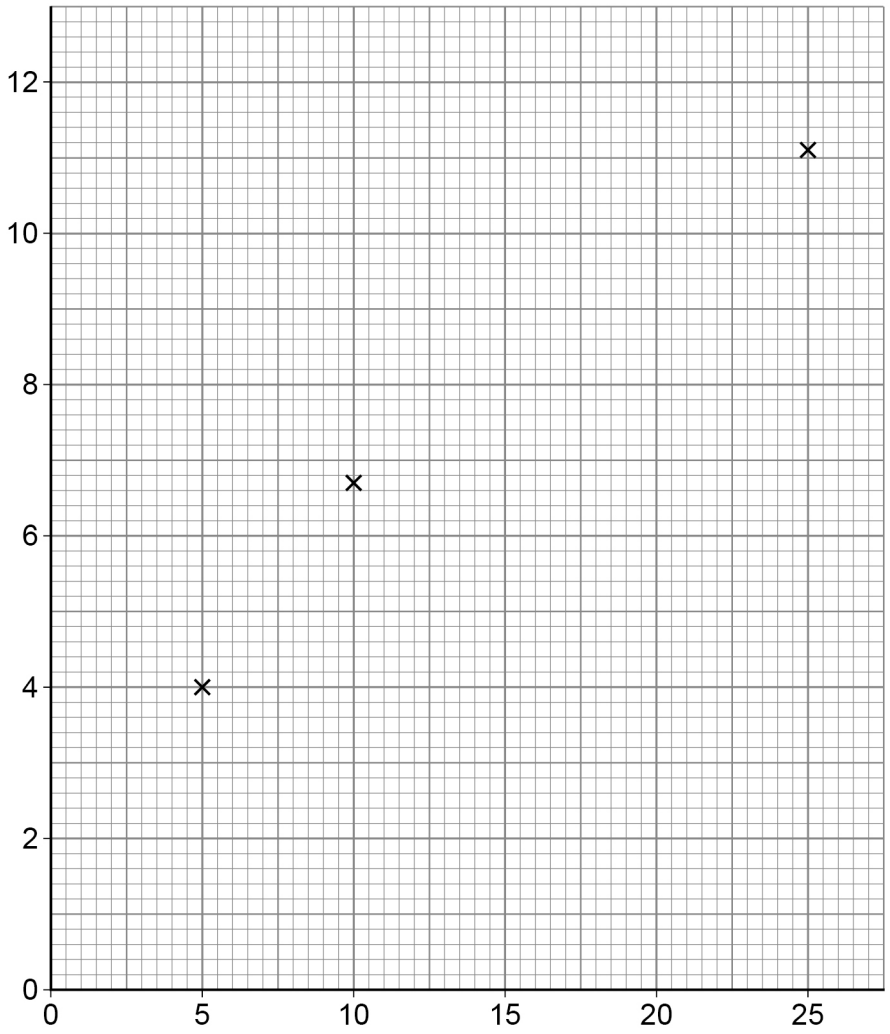
Resistance of R in ohms	Total resistance of the circuit in ohms
5.0	4.0
10.0	6.7
15.0	8.6
20.0	10.0
25.0	11.1

Some of the results are plotted in **Figure 5**.

6.2.1.3 Current, resistance and potential difference

Question 12 · continued

Figure 5



0 2 . 5 Complete **Figure 5**.

You should:

- label both axes
- plot the two remaining values from **Table 1**
- draw the line of best fit.

[3 marks]

0 2 . 6 What resistance of **R** would give a total resistance of 4.4 Ω?

Use **Figure 5**.

[1 mark]

Resistance of **R** = _____ Ω

Question 12 · continued

The body analysis scales initially show a reading of 0.0 kg.

When the student steps onto the scales the reading is 64.8 kg.

The student steps off the scales and then immediately steps back on.

The scales now show a reading of 64.1 kg.

0 2 . 7 Complete the sentence.

[1 mark]

The difference between the two values given by the scales is due

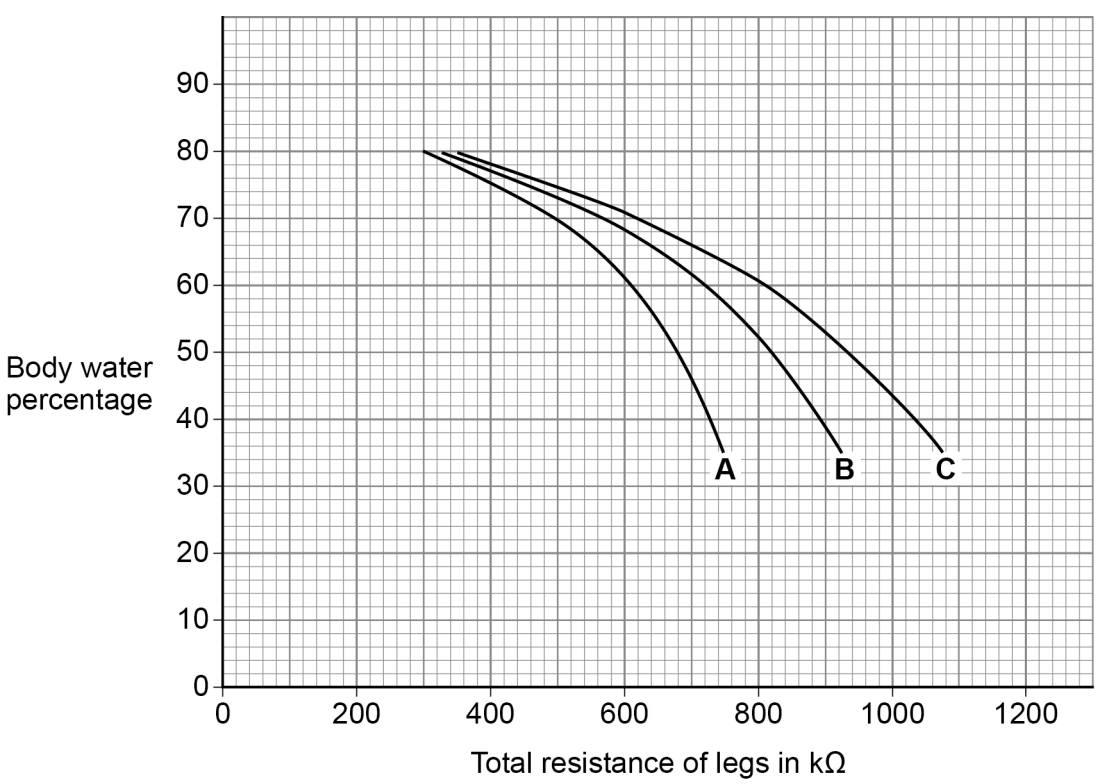
to a _____ error.

0 2 . 8 The height of the student is programmed into the scales.

The scales place the student into a category, **A**, **B** or **C**, based on height and mass.

Figure 6 shows how the scales use the category and the total resistance of the legs to determine the body water percentage.

Figure 6



6.2.1.3 Current, resistance and potential difference

Question 12 · continued

The total resistance of the student's legs is 600 kΩ. A healthy body water percentage is between 45% and 65%.

The different measurements of the mass of the student mean that the student could be in either category **A** or category **B**.

Evaluate if the student has a healthy body water percentage.

[3 marks]

15

Turn over for the next question

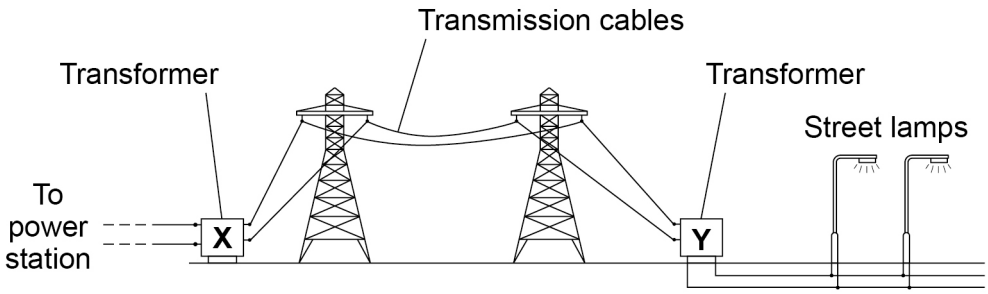
6.2.1.3 Current, resistance and potential difference

Question 13

June 2023 | 8464/P/1H | Original Q3

0 3 **Figure 7** shows how the National Grid transfers energy from a power station to some street lamps.

Figure 7



0 3 . 1 Explain how transformer **X** increases the efficiency of the National Grid.

[3 marks]

Question 13 · continued

0 3 . 2 The potential difference across the primary coil in transformer **Y** is 400 000 V.

The potential difference across the secondary coil is 11 000 V.

The current in the primary coil is 660 A.

Calculate the current in the secondary coil of transformer **Y**.

Use the Physics Equations Sheet.

[3 marks]

Current in the secondary coil = _____ A

0 3 . 3 Why is the current in each street lamp less than the current in the secondary coil in transformer **Y**?

[1 mark]

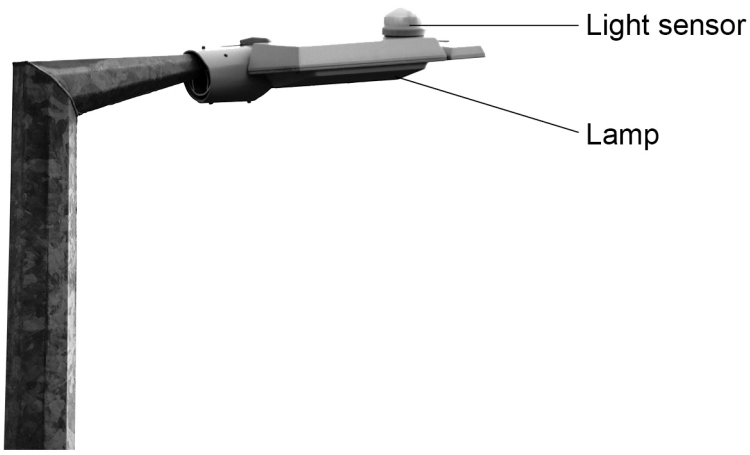
Tick (✓) **one** box.

- Current is used up in the cables between **Y** and each street lamp. ☐
- Some of the current is dissipated to the surroundings. ☐
- The cables between **Y** and the street lamps have electrical resistance. ☐
- The street lamps are connected in parallel. ☐

Question 13 · continued

0 3 . 4 **Figure 8** shows the top of a street lamp.

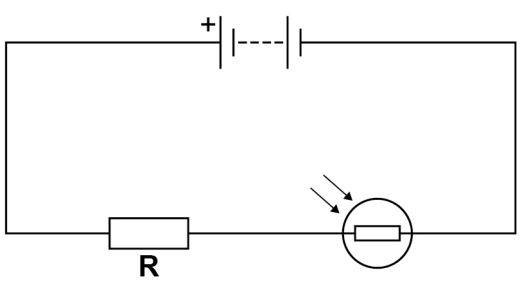
Figure 8



The light sensor detects if it is day or night.

Figure 9 shows part of the circuit in the light sensor.

Figure 9



Explain what happens to the potential difference across resistor **R** as the light intensity decreases.

[3 marks]

6.2.1.3 Current, resistance and potential difference

Question 13 · continued

0 3 . 5 When the current in resistor **R** is 20 mA, the power transferred by resistor **R** is 6.0 W.

Calculate the resistance of resistor **R**.

Use the Physics Equations Sheet.

[4 marks]

Resistance = _____ Ω

14

6.2.1.3 Current, resistance and potential difference

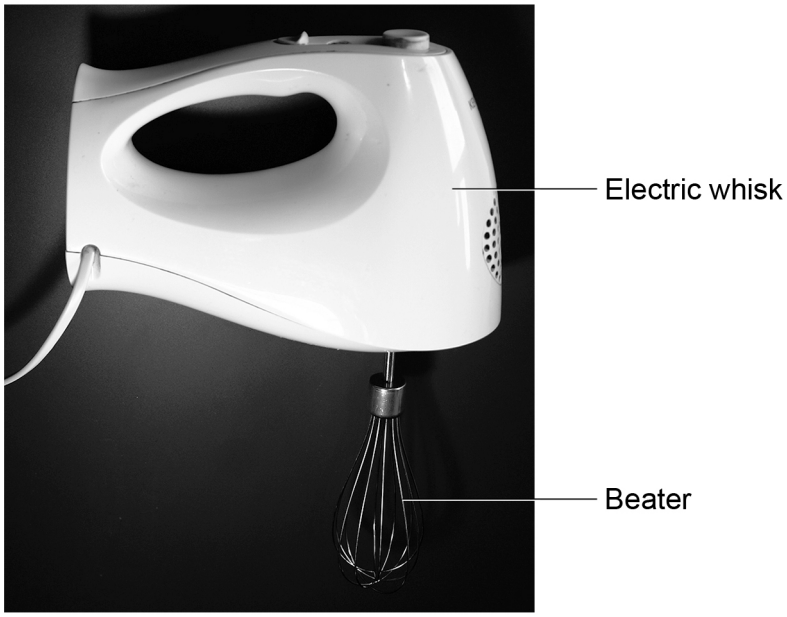
Question 14

June 2024 | 8464/P/1H | Original Q1

0 1 **Figure 1** shows an electric whisk that plugs into the mains electricity supply.

The whisk can mix food by spinning a beater.

Figure 1



0 1 . 1 Give **two** energy stores that increase when the whisk is switched on.

[2 marks]

1 _____

_____

2 _____

_____

6.2.1.3 Current, resistance and potential difference

Question 14 · continued

Use the Physics Equations Sheet to answer questions **01.2** and **01.3**.

0 1 . 2 Work is done by the whisk when it is used to mix food.

Write down the equation that links power (*P*), time (*t*) and work done (*W*).

[1 mark]

0 1 . 3 The power output of the whisk is 92 W.

Calculate the time for the whisk to do 23 000 J of work.

[3 marks]

Time = _____ s

Question 1 continues on the next page

Question 14 · continued

Use the Physics Equations Sheet to answer questions **01.4** and **01.5**.

0 1 . 4 Which equation links current (I), power (P) and resistance (R)?

[1 mark]

Tick (✓) **one** box.

$P = \frac{I}{R^2}$ ☐

$P = I R^2$ ☐

$P = \frac{I^2}{R}$ ☐

$P = I^2 R$ ☐

0 1 . 5 The current in the whisk is 500 mA.

The resistance of the whisk is 640 Ω.

Calculate the power of the whisk.

[3 marks]

Power = _____ W

6.2.1.3 Current, resistance and potential difference

Question 14 · continued

The whisk has several settings that allow the beater to spin at different speeds.

A faster beater speed needs a greater power input from the mains electricity supply.

0 1 . 6 What is the potential difference between the live wire and neutral wire in the mains electricity supply?

[1 mark]

_____ V

0 1 . 7 Changing the beater speed does **not** change the potential difference between the live wire and neutral wire.

The power input to the whisk changes because the current in the whisk changes.

Complete the sentence.

[1 mark]

When the beater speed increases, the current in the whisk increases because the resistance of the whisk _____.

12

6.2.1.3 Current, resistance and potential difference

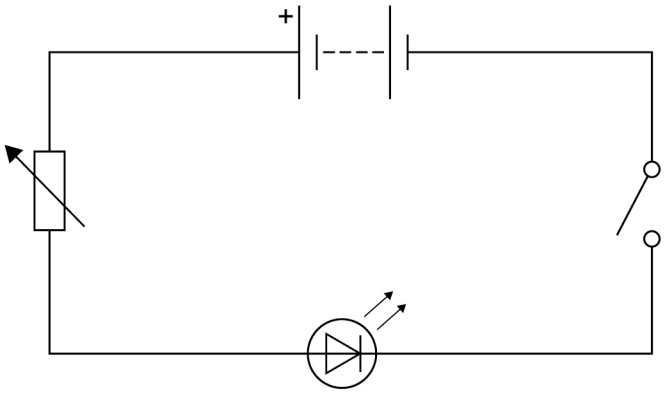
Question 15

June 2024 | 8464/P/1H | Original Q3

0 3 A student investigated how the current in a red LED varies with the potential difference across the LED.

Figure 3 shows an incomplete diagram of the circuit used.

Figure 3



0 3 . 1 Complete **Figure 3** to show how the student should have connected a voltmeter and an ammeter into the circuit.

Use the correct circuit symbols.

[2 marks]

Question 15 · continued

0 3 . 2 The potential difference across the battery was +2.6 V.

The student varied the potential difference across the LED between –2.6 V and +2.6 V.

Describe how the student should have adjusted the circuit to vary the potential difference across this range.

[2 marks]

Question 3 continues on the next page

Question 15 · continued

0 3 . 3 **Table 1** shows the results when the potential difference across the LED had positive values.

Table 1

Potential difference in volts	0.0	1.0	1.8	2.0	2.2	2.4	2.6
Current in milliamps	0	0	0	5	19	41	69

Figure 4 shows a graph of current against potential difference.

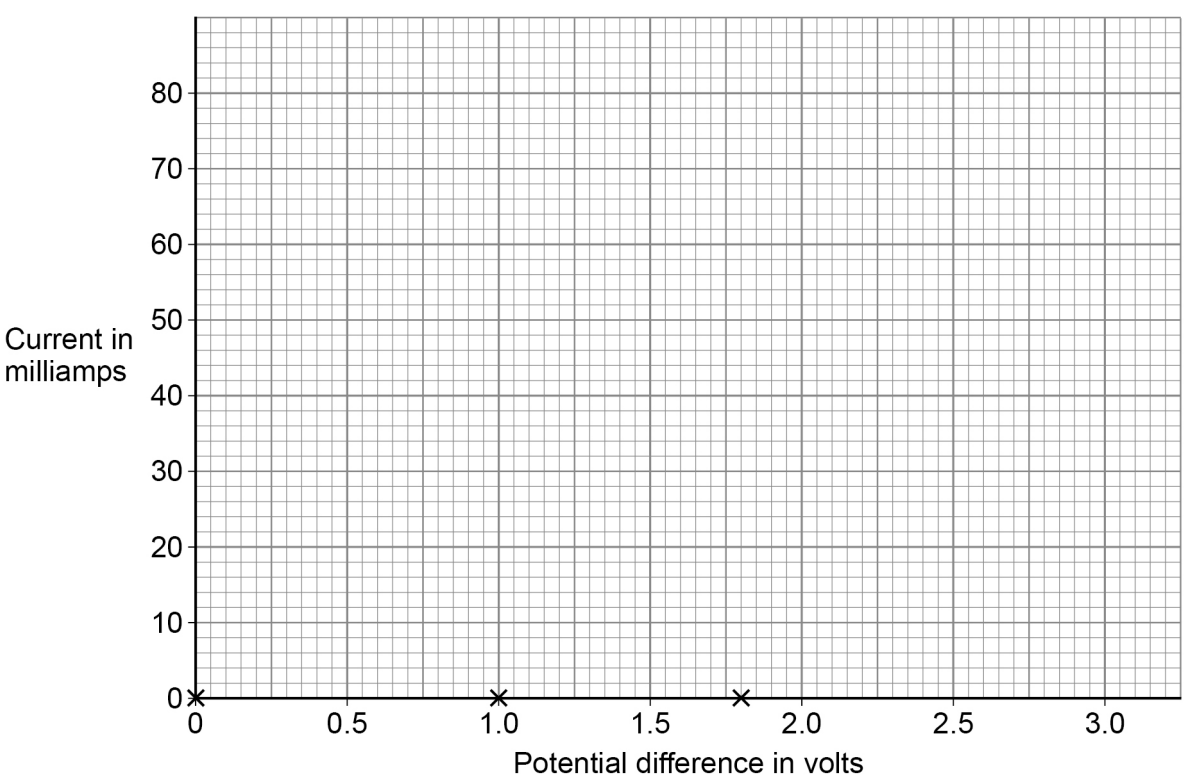
Complete **Figure 4**.

You should:

- plot the remaining points from **Table 1**
- draw a line of best fit.

[3 marks]

Figure 4



Question 15 · continued

0 3 . 4 Explain what happens to the current in the LED when the potential difference across the LED is negative.

[2 marks]

0 3 . 5 A second student did the investigation using a blue LED.

The results for both the red LED and the blue LED showed the same pattern.

What conclusion can be made about the investigation?

[1 mark]

Tick (✓) **one** box.

The investigation is repeatable. ☐

The investigation is reproducible. ☐

The results were accurate. ☐

Question 3 continues on the next page

6.2.1.3 Current, resistance and potential difference

Question 15 · continued

0 3 . 6 The relationship between current and potential difference for an LED is non-linear.

Which of the following always shows a linear relationship between current and potential difference?

[1 mark]

Tick (✓) **one** box.

Filament lamp ☐

LDR ☐

Resistor at constant temperature ☐

Thermistor ☐

11

6.2.1.3 Current, resistance and potential difference

Question 16

June 2025 | 8464/P/1H | Original Q3

0 3 A student investigated the resistance of a resistor.

0 3 . 1 The student used:

- the resistor
- a cell
- a switch
- an ammeter
- a voltmeter.

Draw a circuit diagram for a circuit the student could use to measure the resistance of the resistor.

[3 marks]

Question 3 continues on the next page

Question 16 · continued

The student:

- added a variable resistor to the circuit
- used the variable resistor to change the readings on the ammeter and the voltmeter
- recorded several different pairs of readings from the ammeter and the voltmeter.

0 3 . 2 When the reading on the ammeter was 450 mA, the reading on the voltmeter was 2.7 V.

Calculate the resistance of the resistor.

Use the Physics Equations Sheet.

[4 marks]

Resistance = _____ Ω

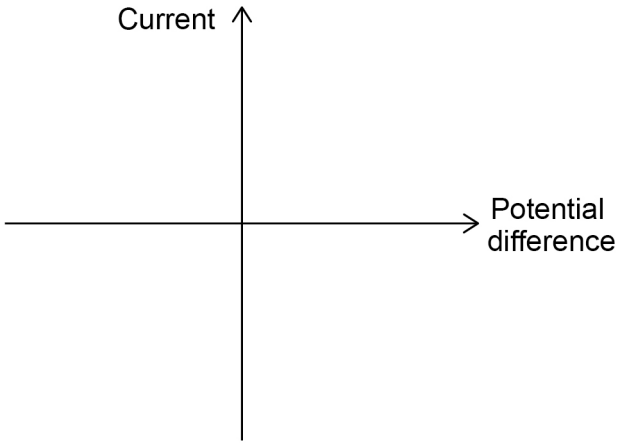
Question 16 · continued

0 3 . 3 The student plotted a graph of current against potential difference for the fixed resistor.

Complete **Figure 2** to show a sketch graph for a fixed resistor at a constant temperature.

[1 mark]

Figure 2

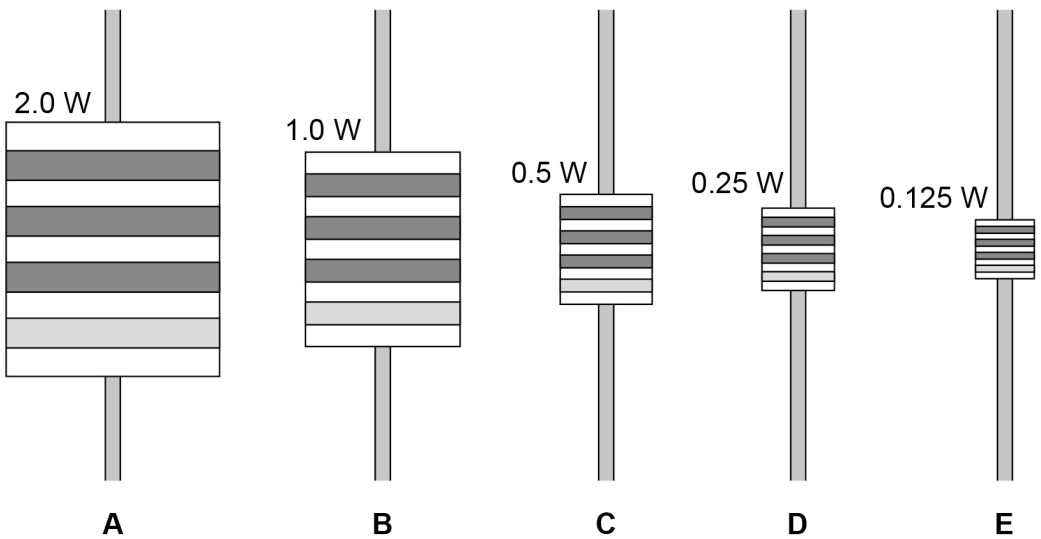


Question 3 continues on the next page

Question 16 · continued

0 3 . 4 **Figure 3** shows five resistors with the same resistance but different power ratings.

Figure 3



The power rating of a resistor is the maximum energy the resistor can transfer each second without overheating.

Each resistor has a resistance of 2.2 kΩ.

Determine which resistors in **Figure 3** are suitable to be used in a circuit that has a maximum current of 0.012 A.

Use the Physics Equations Sheet.

[4 marks]

Suitable resistors _____

12

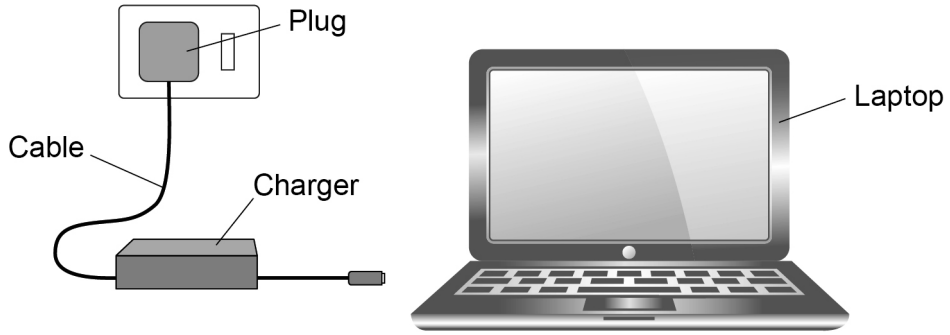
6.2.1.3 Current, resistance and potential difference

Question 17

June 2025 | 8464/P/1H | Original Q5

0 5 **Figure 5** shows a laptop computer, and a charger plugged into the mains supply.

Figure 5



0 5 . 1 Give the potential difference and frequency of the UK mains electricity supply.

[2 marks]

Potential difference _____ V

Frequency _____ Hz

0 5 . 2 The cable that connects the charger to the plug contains **two** wires that have coloured insulation.

The cable does **not** contain an earth wire.

Name each wire in the cable.

Give the colour of the insulation covering each wire.

[2 marks]

Name of wire _____ Colour of insulation _____

Name of wire _____ Colour of insulation _____

6.2.1.3 Current, resistance and potential difference

Question 17 · continued

0 5 . 3 The input to the charger is an alternating potential difference.

The output from the charger is a direct potential difference.

Describe the difference between an alternating potential difference and a direct potential difference.

[2 marks]

Question 5 continues on the next page

6.2.1.3 Current, resistance and potential difference

Question 17 · continued

A student is using the laptop computer.

The student notices that the battery has no stored energy.

The student quickly plugs the charger into the laptop and continues to use the laptop.

0 5 . 4 The laptop charger provides a constant power to the laptop.

The laptop takes longer to charge when the student uses the laptop than when the laptop is not used.

Explain why.

[2 marks]

6.2.1.3 Current, resistance and potential difference

Question 17 · continued

0 5 . 5 The potential difference across the laptop circuit is 15 V.

The average current in the laptop circuit when it is being used is 4.8 A.

The laptop charger provides a constant power of 97 W.

The maximum energy that the battery can store is 225 kJ.

Calculate the time taken to fully charge the battery from zero when the laptop is used continuously.

Use the Physics Equations Sheet.

Give your answer in hours.

[6 marks]

Time = _____ hours

14