

Q1. (2018)

0 6

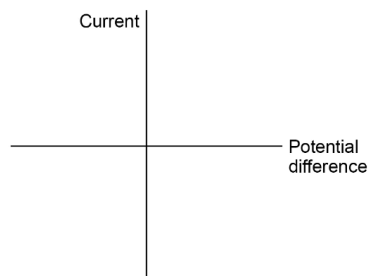
A student built a circuit using filament lamps.

a)

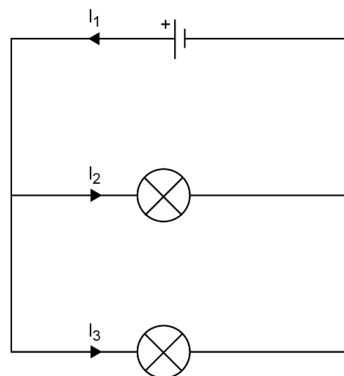
0 6 . 1

Sketch a current potential difference graph for a filament lamp on **Figure 9**

[2 marks]

Figure 9

b)

Figure 10 shows the circuit with two identical filament lamps.**Figure 10**

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 $12\ \Omega$

Write any equations that you use.

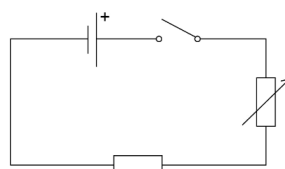
Give the unit.

[6 marks]

Q2. (2019)

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**

a)

- 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	☐

b)

- 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]

c)

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

[1 mark]

d)

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

[1 mark]

e)

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

[1 mark]

f)

- 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]

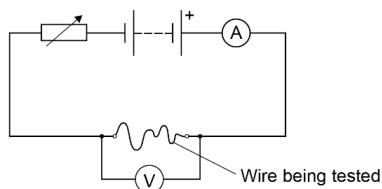
Q3. (2020)

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

a)

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

Figure 2



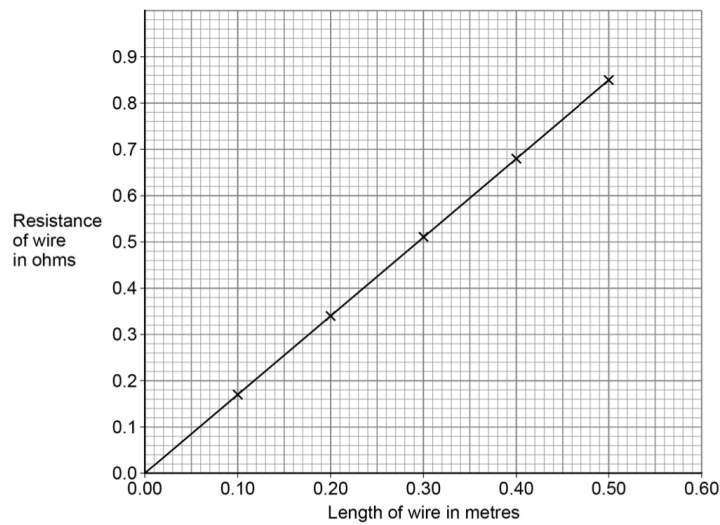
Explain why the student needed to adjust the variable resistor each time she changed the length of the wire.

[3 marks]

b)

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]

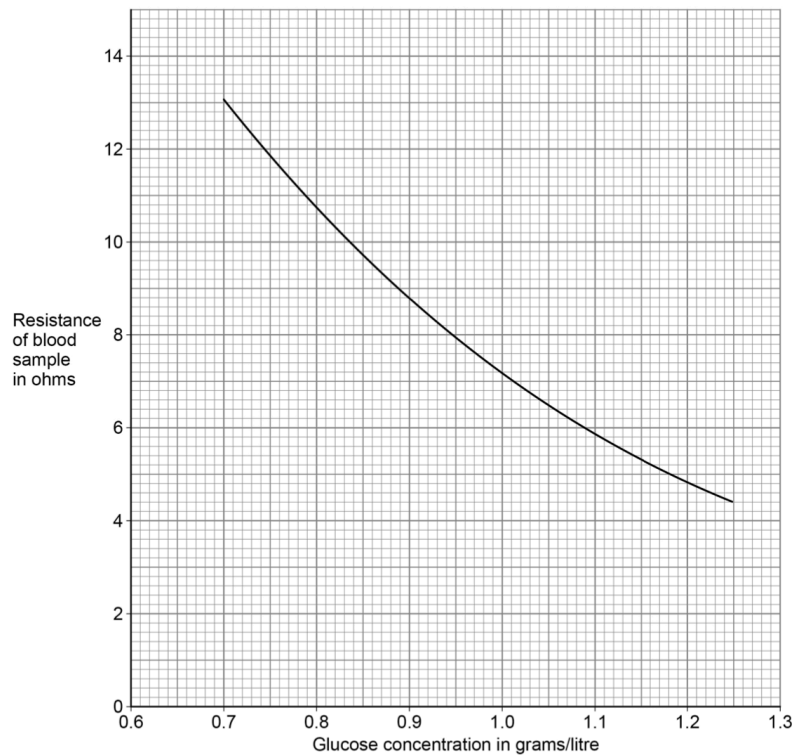
Q4. (2020)

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



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]

Q5. (2021)

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.

a)

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

Tick (✓) **one** box.

$I = V R$ ☐

$R = I V$ ☐

$V = I R$ ☐

$V = I^2 R$ ☐

b)

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.

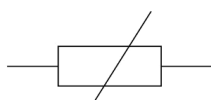
[3 marks]

Q6. (2021)

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



a)

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

[1 mark]

b)

0 1 . 6

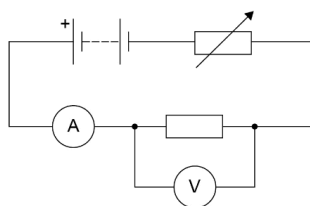
The temperature of the component in **Figure 2** increases.

The potential difference across the component remains constant.

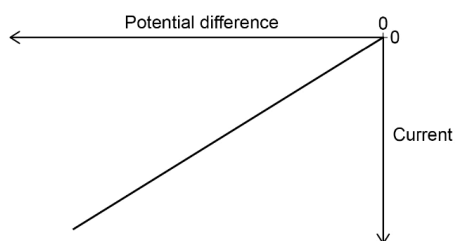
Explain what happens to the current in the component.

[2 marks]

Q7. (2021)

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**

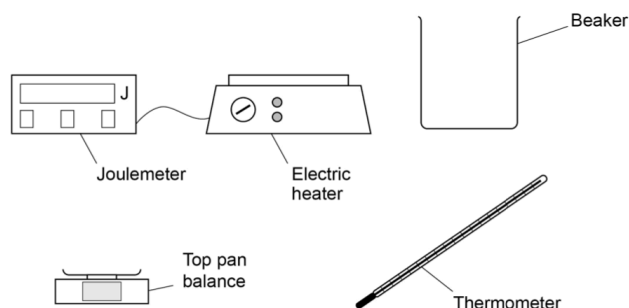
0 5 . 3

What relationship does **Figure 11** show?**[1 mark]**

Q8. (2022)

0 2

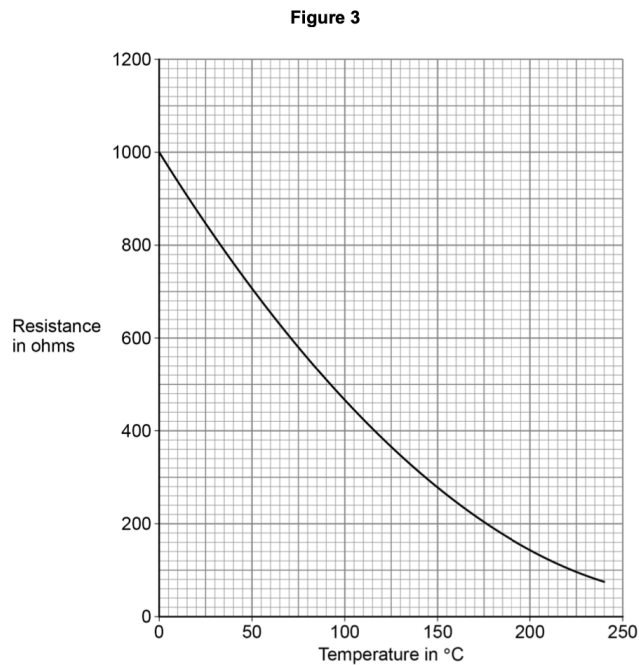
A student made measurements to determine the specific heat capacity of vegetable oil.

Figure 2 shows the equipment used.**Figure 2**

In a deep fryer, vegetable oil is heated by an electric heating element. Food is then cooked in the hot vegetable oil.

The deep fryer contains an electrical component to monitor the temperature of the vegetable oil.

Figure 3 shows how the resistance of this electrical component changes with temperature.



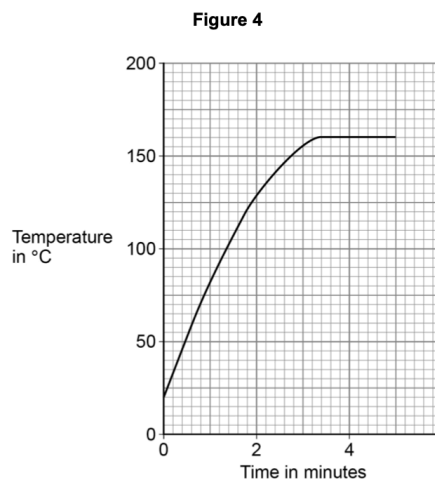
a)

0 2 . 5 What electrical component is used to monitor the temperature of the vegetable oil? **[1 mark]**

b)

0 2 . 6 The electric heating element in the deep fryer automatically switches off when the vegetable oil reaches a certain temperature.

Figure 4 shows how the temperature of the vegetable oil changed after the deep fryer was switched on.



Determine the resistance of the electrical component when the electric heating element automatically switched off.

Use **Figure 3** and **Figure 4**.

[2 marks]

Q9. (2022)

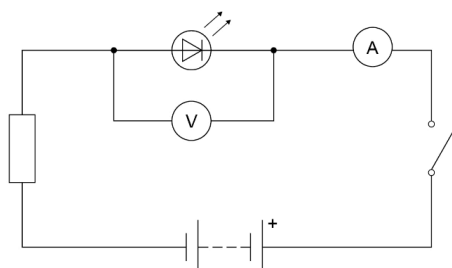
0 5

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]

Q10. (2022)

A traditional camera uses a flash unit to provide light.

Figure 10 shows a flash unit on a traditional camera.

Figure 10



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]

Q11. (2023)

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



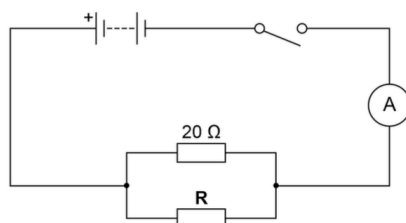
The person's legs contain both solid tissue and water.

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

The student connected a $20\ \Omega$ resistor in parallel with a resistor, R .

Figure 4 shows the circuit diagram.

Figure 4



a)

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]

b)

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

0 2 . 3

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

[1 mark]

c)

0 2 . 4

When the total resistance of the resistors was $7.5\ \Omega$ the current in the circuit was 480 mA.

Calculate the potential difference across the two resistors.

[3 marks]

d)

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

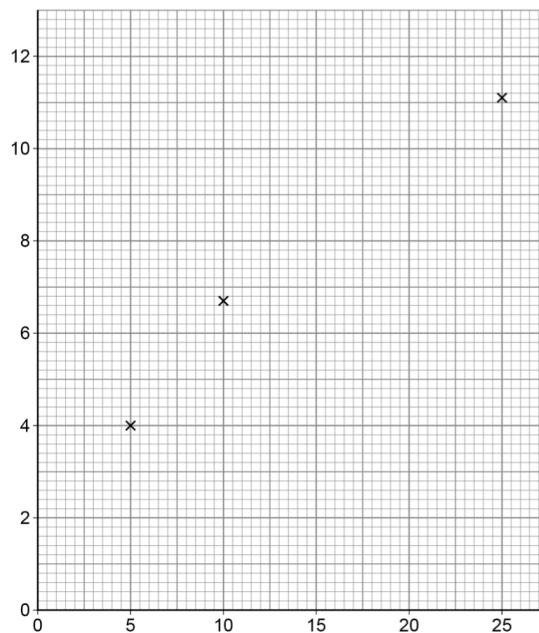
Table 1 shows the results.

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**.

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]

e)

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

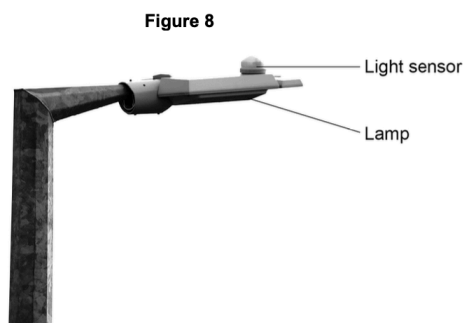
Use **Figure 5**.

[1 mark]

Resistance of **R** = _____ Ω

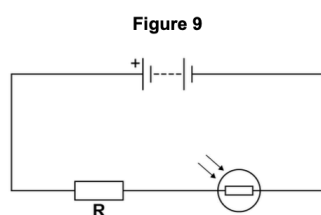
Q12. (2023)

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



The light sensor detects if it is day or night.

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



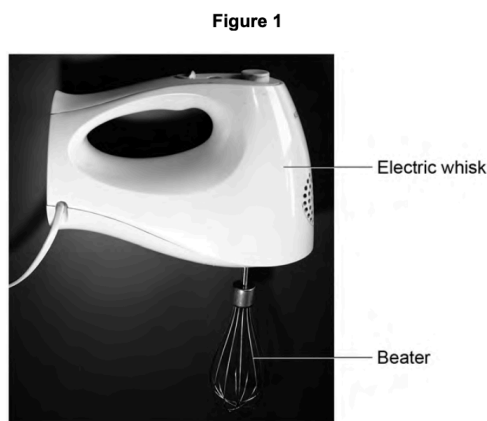
Explain what happens to the potential difference across resistor **R** as the light intensity decreases.

[3 marks]

Q13. (2024)

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

The whisk can mix food by spinning a beater.



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 . 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 _____.

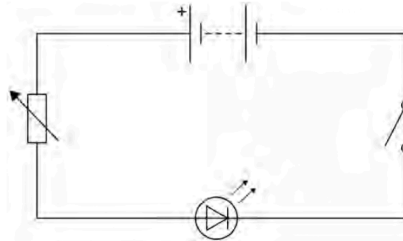
Q14. (2024)

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



a)

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.

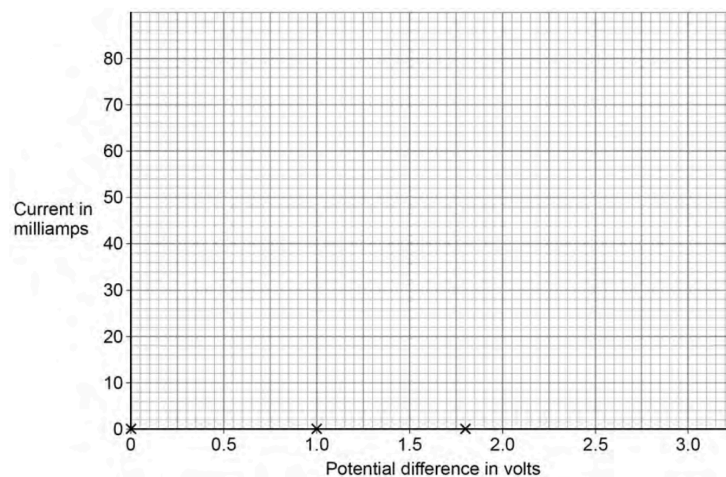
Complete Figure 4.

You should:

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

[3 marks]

Figure 4



b)

0 3 . 4

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

[2 marks]

c)

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

☐