Q1.(2018)

Draw a diagram to show how 1.5 V cells should be connected together to give a potential difference of 4.5 V.

Use the correct circuit symbol for a cell.

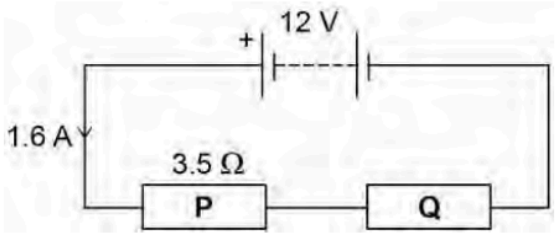
[2 marks]

Q2. (2018)

a)

A student built the circuit shown in **Figure 3**.

Figure 3



Calculate the total resistance of the circuit in **Figure 3**.

Use the equation:

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

[2 marks]

Total resistance = _____ Ω

b)

The resistance of **P** is 3.5 Ω.

Calculate the resistance of **Q**.

[1 mark]

Resistance of **Q** = _____ Ω

c)

The student connects the two resistors in **Figure 3** in parallel.

What happens to the total resistance of the circuit?

Tick **one** box.

[1 mark]

- It decreases ☐
- It increases ☐
- It does not change ☐

Give a reason for your answer.

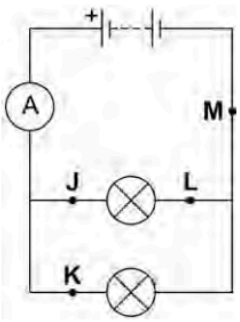
[1 mark]

Q3. (2019)

a)

Figure 9 shows a circuit diagram.

Figure 9



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** ☐

b)

Draw the circuit symbol for a switch in the box below.

[1 mark]

☐

c)

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

d)

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:

$$\text{energy transferred} = \text{charge flow} \times \text{potential difference}$$

[2 marks]

Energy transferred = _____ J

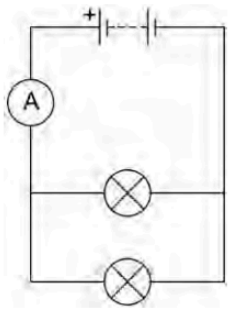
e)

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

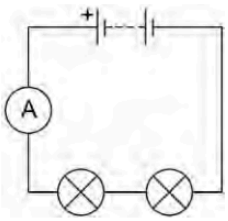
The components used in each circuit were identical.

Figure 10

Circuit X



Circuit Y



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. ☐

f)

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. ☐

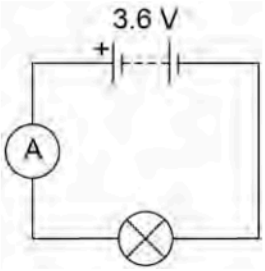
The total resistance of **Y** is less. ☐

The total resistance is the same. ☐

g)

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

Figure 11



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

[1 mark]

_____

h)

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

Q4.(2020)

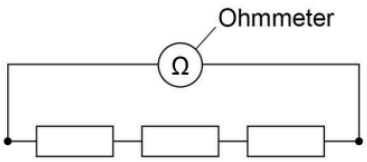
a)

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

Calculate the mean resistance of 1 resistor.

[2 marks]

Resistance = _____ Ω

b)

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 ☐

c)

How do the results show that the student's measurements were precise?

[1 mark]

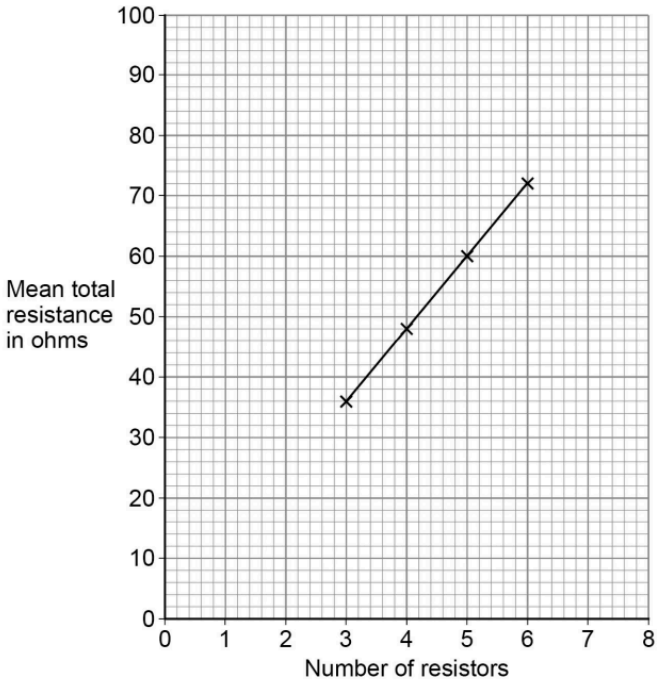
Tick (✓) **one** box.

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

Q4.d)(2020)

Figure 7 shows the results.

Figure 7



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. ☐

e)

Predict the mean total resistance of 7 resistors.

Use **Figure 7**.

[1 mark]

Mean total resistance of 7 resistors = _____ Ω

f)

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 _____ .

Q5.(2020)
a)

Figure 13 shows an LED torch.

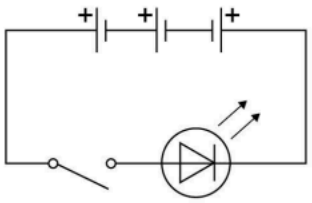
Figure 13

The torch contains one LED, one switch and three cells.

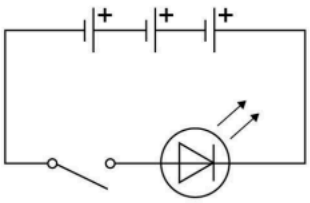
Which diagram shows the correct circuit for the torch?

[1 mark]

Tick (✓) **one** box.



☐



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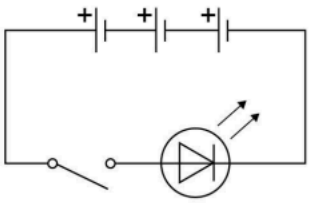


☐

b)

Write down the equation which links charge flow (Q), current (I) and time (t).

[1 mark]

c)

The torch worked for 14 400 seconds before the cells needed replacing.

The current in the LED was 50 mA.

Calculate the total charge flow through the cells.

[3 marks]

Total charge flow = _____ C

d)

When replaced, the cells were put into the torch the wrong way around.

Explain why the torch did not work.

[2 marks]

e)

Write down the equation which links efficiency, total power input and useful power output.

[1 mark]

f)

The total power input to the LED was 0.24 W.

The efficiency of the LED was 0.75

Calculate the useful power output of the LED.

[3 marks]

Useful power output = _____ W

Q6.(2021)

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

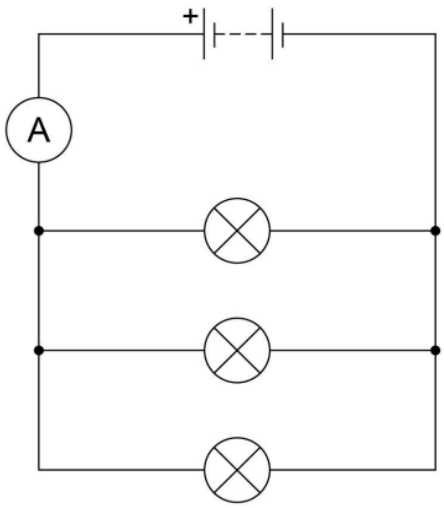
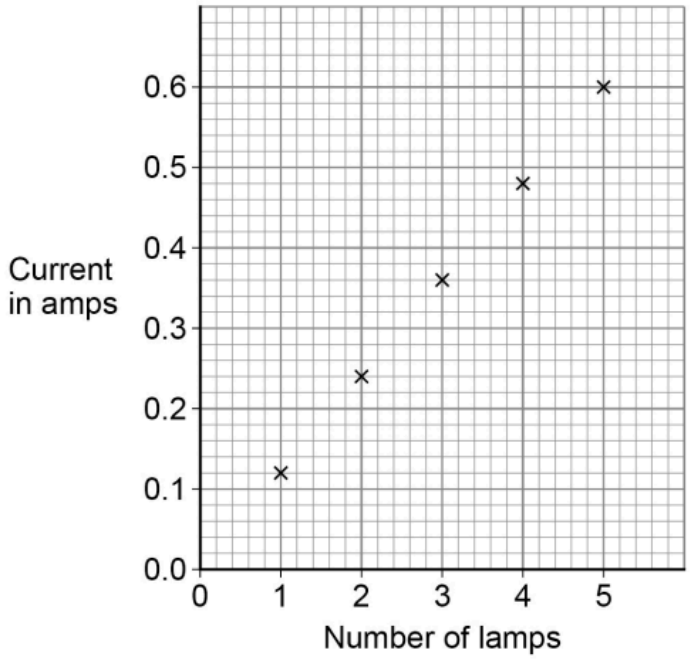


Figure 5 shows the results.

Figure 5



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 _____.

Q7. (2022)

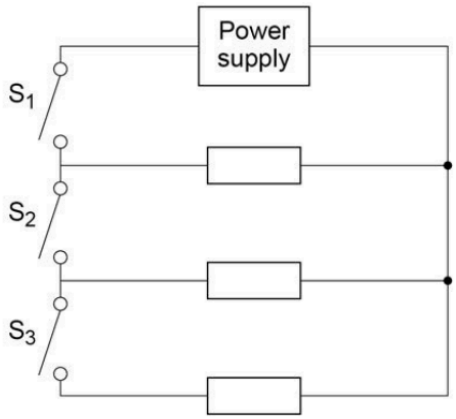
a)

A hair dryer contains three heating elements.

Figure 7 shows the circuit diagram for the heating elements in the hair dryer.

In **Figure 7** the heating elements are represented by resistor symbols.

Figure 7



Complete the sentence.

[1 mark]

The three resistors in **Figure 7** are connected in _____ with the power supply.

b)

Which switch must always be closed for the hair dryer to work?

[1 mark]

Tick (✓) **one** box.

S_1 ☐

S_2 ☐

S_3 ☐

c)

Which switches must be closed for the hair dryer to work at maximum power output?

[1 mark]

Tick (✓) **one** box.

S_1 and S_2 ☐

S_1 and S_3 ☐

S_1, S_2 and S_3 ☐

d)

Write down the equation which links energy transferred (*E*), power (*P*) and time (*t*).

[1 mark]

_____

e)

The heating elements have a maximum power output of 1200 W.

The energy transferred to the heating elements to reach normal operating temperature is 3600 J.

Calculate the time taken for the heating elements to reach normal operating temperature at maximum power output.

[3 marks]

_____

_____

_____

_____

_____

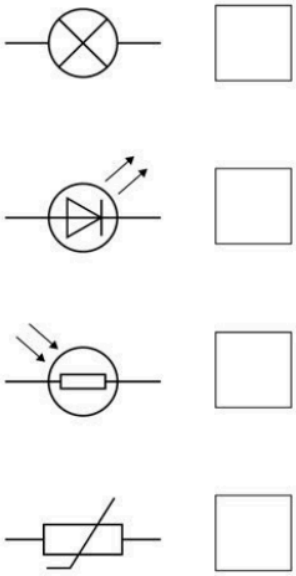
_____

Time = _____ s

f)

The hair dryer has LEDs to indicate the power setting.

What is the circuit symbol for an LED?

[1 mark]

Tick (✓) **one** box.