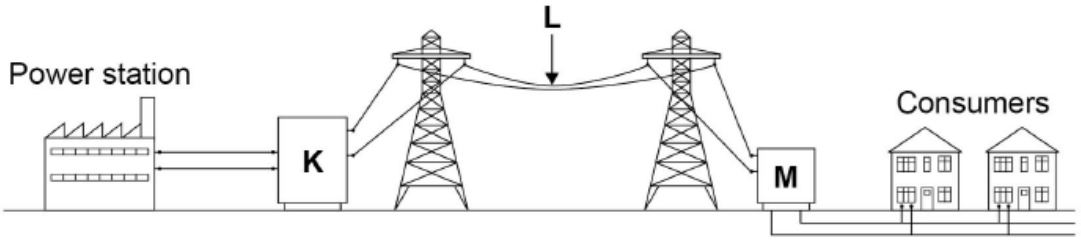
AQA - Electricity – GCSE Physics

1. May/2020/Paper_1F/No.1

0 1 **Figure 1** shows how the National Grid connects power stations to consumers.

Figure 1



0 1 . 1 Name the parts of the National Grid labelled K, L and M.

[3 marks]

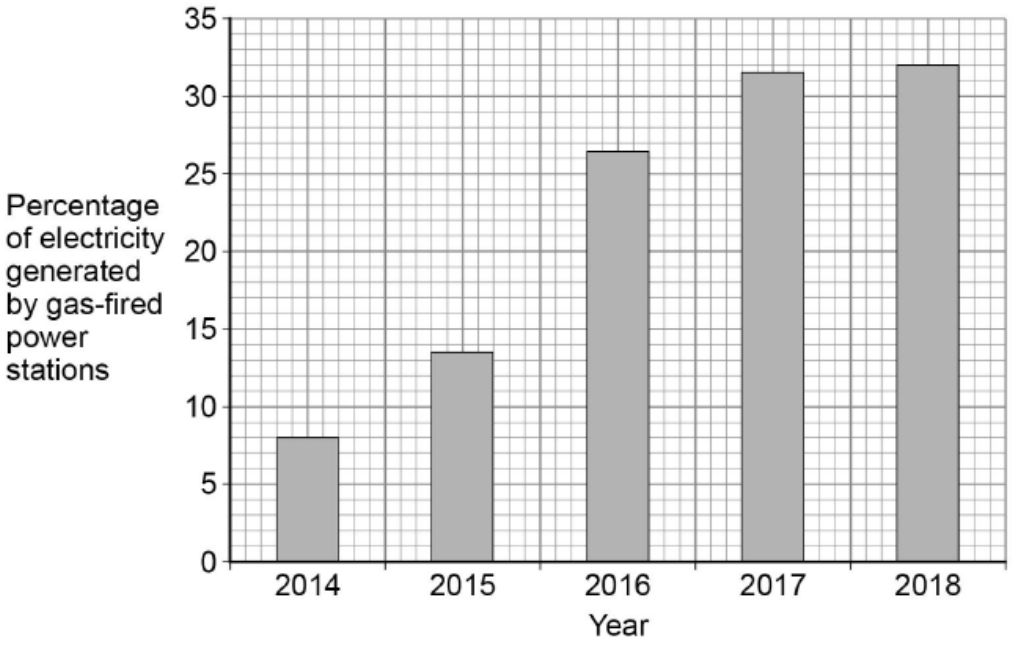
K = _____

L = _____

M = _____

Figure 2 shows how the percentage of electricity generated by gas-fired power stations changed in the UK over 5 years.

Figure 2



0 1 . 2 Calculate how many times greater the percentage of electricity generated by gas-fired power stations was in 2018 than in 2014.

[2 marks]

Number of times greater = _____

0 1 . 3 Explain **one** environmental effect of generating electricity using a gas-fired power station.

[2 marks]

0 1 . 4 The UK government wants more electricity to be generated using renewable energy resources.

What is a renewable energy resource?

[1 mark]

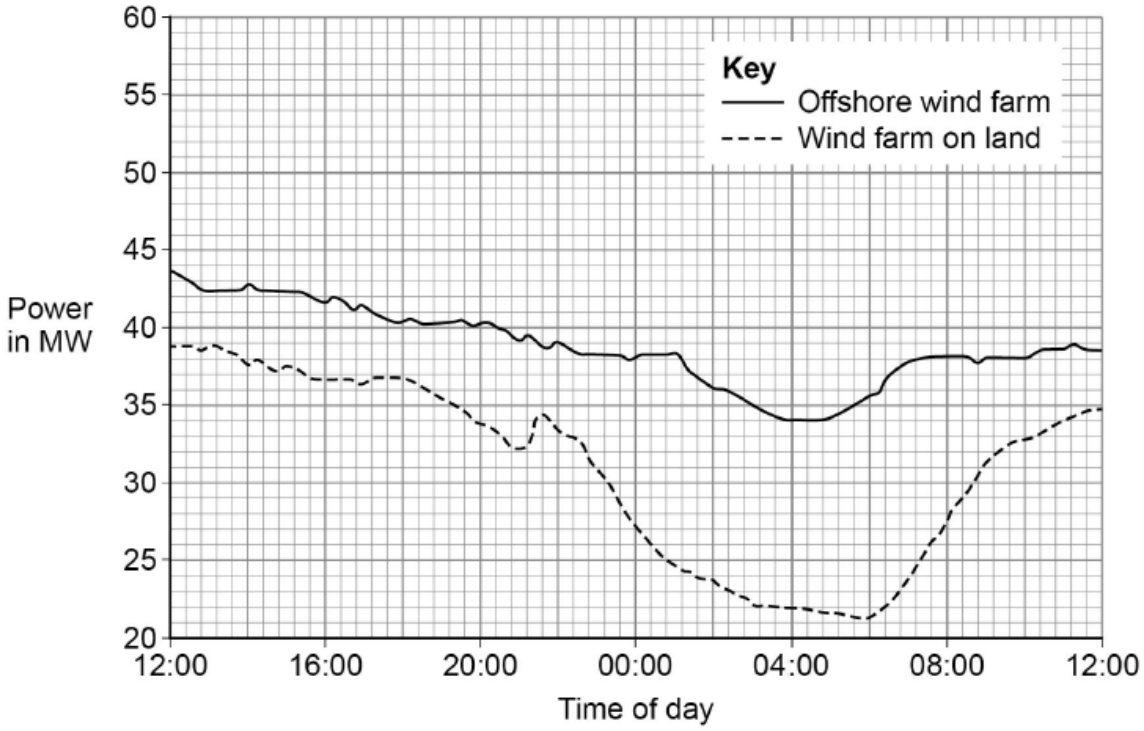
Tick (✓) **one** box.

- An energy resource that can be burned ☐
- An energy resource that can be recycled ☐
- An energy resource that can be replenished quickly ☐
- An energy resource that can be reused ☐

0 1 . 5 An offshore wind farm is a group of wind turbines that are placed out at sea.

Figure 3 shows the power output of an offshore wind farm compared with a wind farm on land for a 24-hour period.

Figure 3



Give **two** advantages of the offshore wind farm compared with the wind farm on land.

Use information from **Figure 3**.

[2 marks]

1 _____

_____

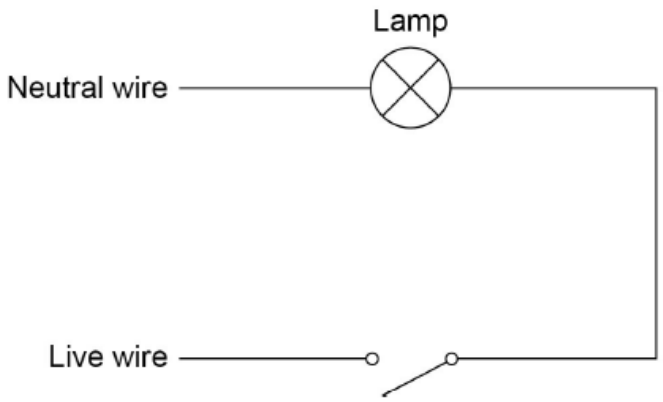
2 _____

_____

2. May/2020/Paper_1F/No.3

0 3 **Figure 5** shows part of a lighting circuit in a house.

Figure 5



0 3 . 1 What is the frequency of the ac mains electricity supply in the UK?

[1 mark]

Tick (✓) **one** box.

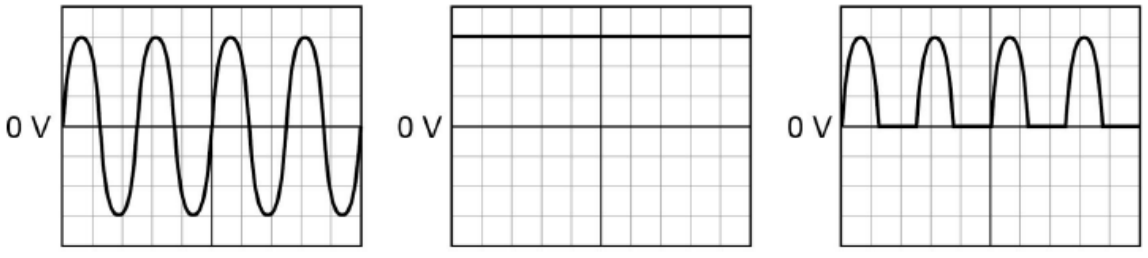
20 Hz ☐ 50 Hz ☐ 60 Hz ☐ 100 Hz ☐

0 3 . 2 The mains electricity supply has an alternating potential difference.

Which diagram shows an alternating potential difference?

[1 mark]

Tick (✓) **one** box.



☐ ☐ ☐

0 3 . 3 The potential difference across the lamp is 230 V.

The current in the lamp is 0.020 A.

Calculate the power output of the lamp.

Use the equation:

power = potential difference × current

[2 marks]

Power = _____ W

0 3 . 4 The potential difference across the lamp is 230 V.

Calculate the energy transferred by the lamp when 180 C of charge flows through the lamp.

Use the equation:

energy transferred = charge flow × potential difference

[2 marks]

Energy transferred = _____ J

0 3 . 5 An electrician needs to replace the light switch in **Figure 5**.

Describe the possible hazard and the risk to the electrician of changing the light switch.

[2 marks]

Hazard _____

Risk _____

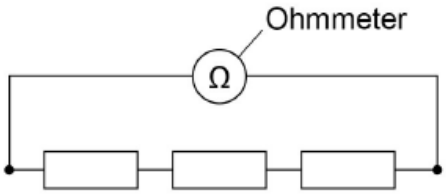
3. May/2020/Paper_1F/No.4

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 ☐

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

[1 mark]

Tick (✓) **one** box.

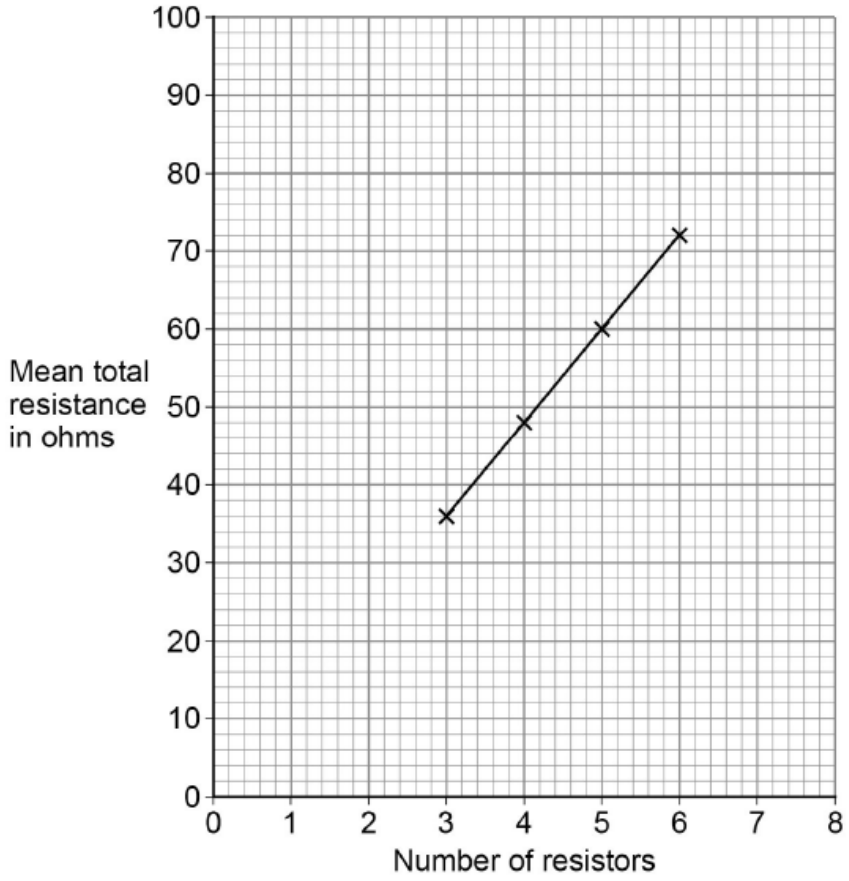
The measurements are accurate. ☐

The measurements are grouped closely together. ☐

The measurements are reproducible. ☐

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. ☐

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 _____ .

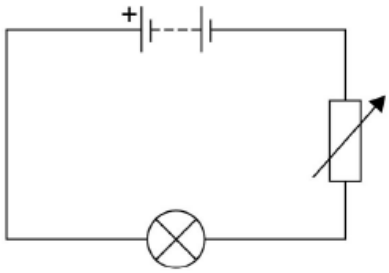
When the number of resistors increases, the current in the circuit _____ .

4. May/2020/Paper_1F/No.8

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



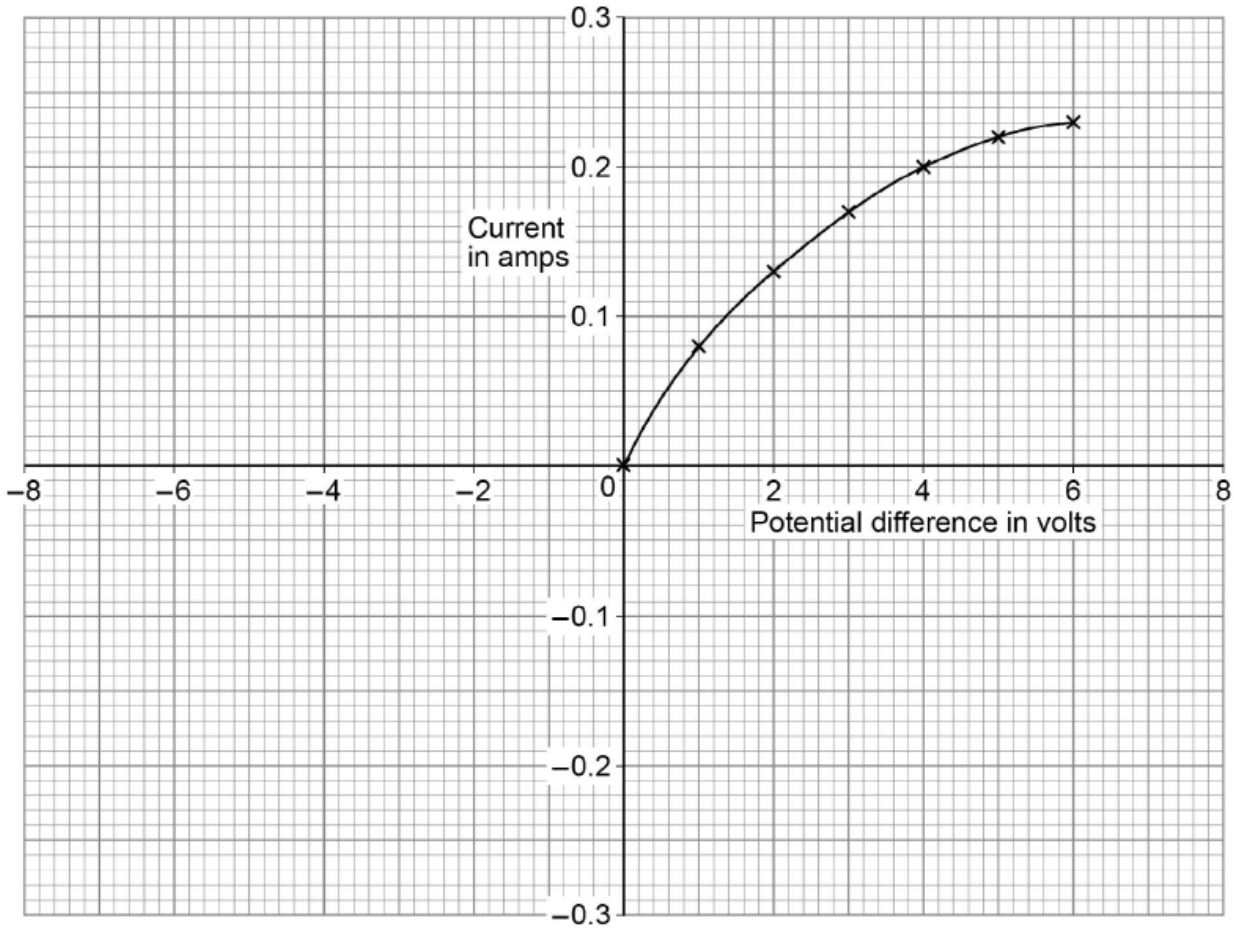
0 8 . 1 Complete **Figure 11** by adding an ammeter and a voltmeter.

Use the correct circuit symbols.

[3 marks]

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]

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]

5. May/2020/Paper_1F/No.9

0 9 **Figure 13** shows an LED torch.

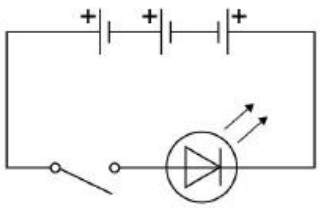
Figure 13

0 9 . 1 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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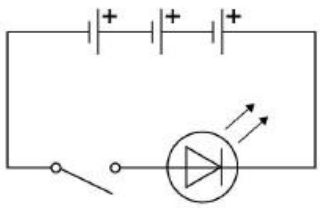

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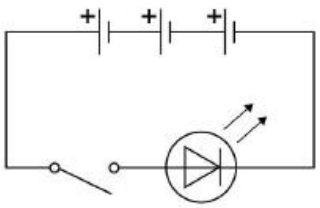


☐

0 9 . 2 Write down the equation which links charge flow (Q), current (I) and time (t).

[1 mark]

0 9 . 3 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

0 9 . 4 When replaced, the cells were put into the torch the wrong way around.

Explain why the torch did not work.

[2 marks]

0 9 . 5 Write down the equation which links efficiency, total power input and useful power output.

[1 mark]

0 9 . 6 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]

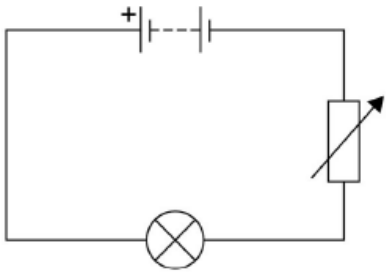
Useful power output = _____ W

6. May/2020/Paper_1H/No.1

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

Figure 1 shows part of the circuit used.

Figure 1



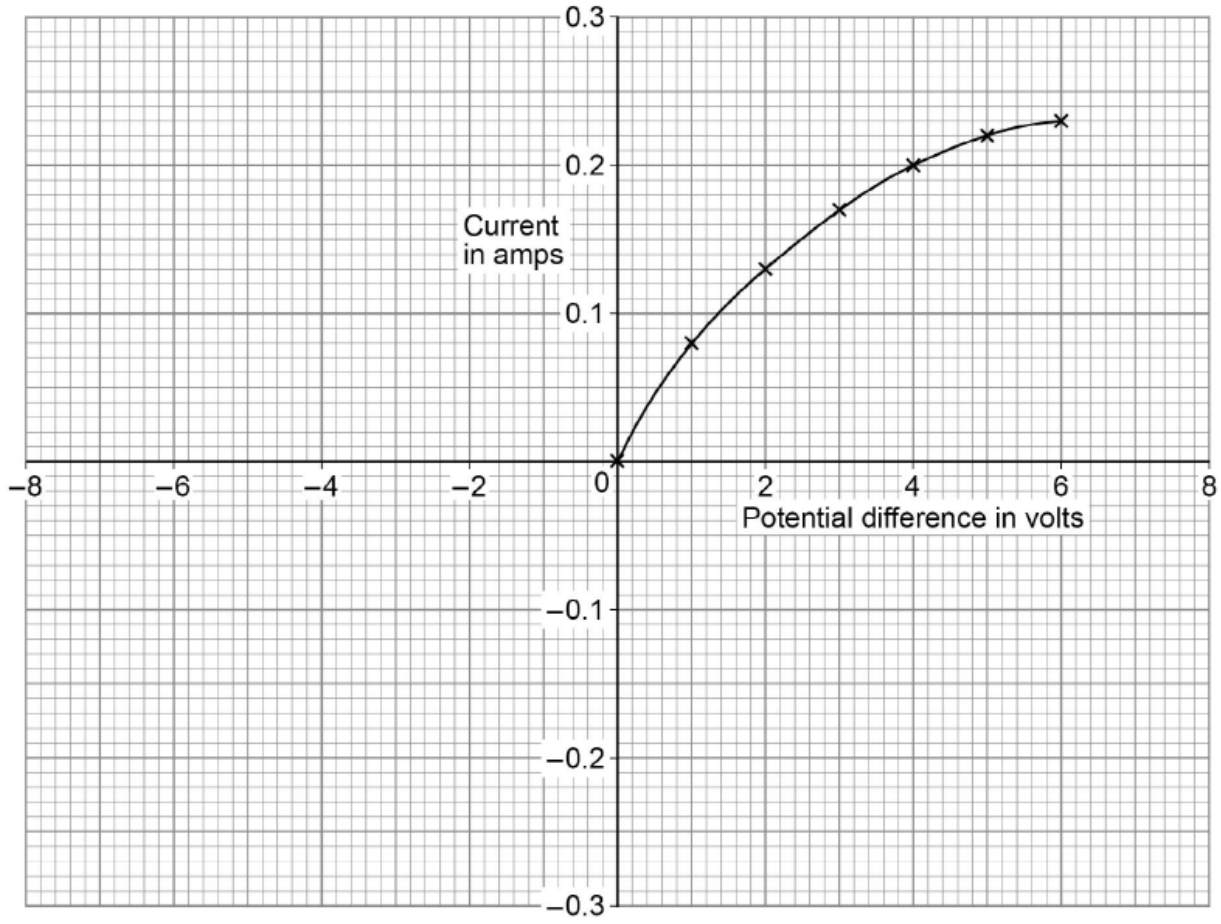
0 1 . 1 Complete **Figure 1** by adding an ammeter and a voltmeter.

Use the correct circuit symbols.

[3 marks]

Figure 2 shows some of the results.

Figure 2



0 1 . 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 2** to show the relationship between the negative values of current and potential difference.

[2 marks]

0 1 . 3 Write down the equation which links current (I), potential difference (V) and resistance (R).

[1 mark]

0 1 . 4 Determine the resistance of the filament lamp when the potential difference across it is 1.0 V.

Use data from **Figure 2**.

[4 marks]

Resistance = _____ Ω

0 1 . 5 A second student did the same investigation. The ammeter used had a zero error.

What is meant by a zero error?

[1 mark]

7. May/2020/Paper_1H/No.2

0 2 **Figure 3** shows an LED torch.

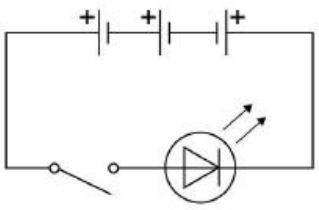
Figure 3

0 2 . 1 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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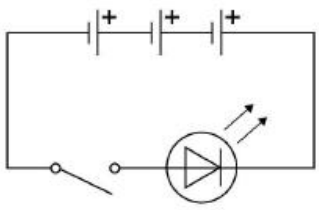

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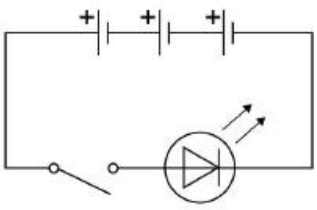


☐

0 2 . 2 Write down the equation which links charge flow (Q), current (I) and time (t).

[1 mark]

0 2 . 3 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

0 2 . 4 When replaced, the cells were put into the torch the wrong way around.

Explain why the torch did not work.

[2 marks]

0 2 . 5 Write down the equation which links efficiency, total power input and useful power output.

[1 mark]

0 2 . 6 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

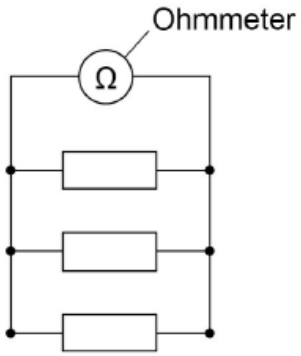
8. May/2020/Paper_1H/No.8

0 8 A student investigated how the total resistance of identical resistors connected in parallel varied with the number of resistors.

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

Figure 11 shows the student's circuit with 3 resistors.

Figure 11



The student repeated each reading of resistance three times.

Table 1 shows some of the results for 3 resistors in parallel.

Table 1

Number of resistors	Total resistance in ohms			
	Reading 1	Reading 2	Reading 3	Mean
3	15.8	15.3	**X**	15.7

0 8 . 1 Calculate value **X** in **Table 1**.

[2 marks]

X = _____ Ω

0 8 . 2 The student thought that taking a fourth reading would improve the precision of the results.

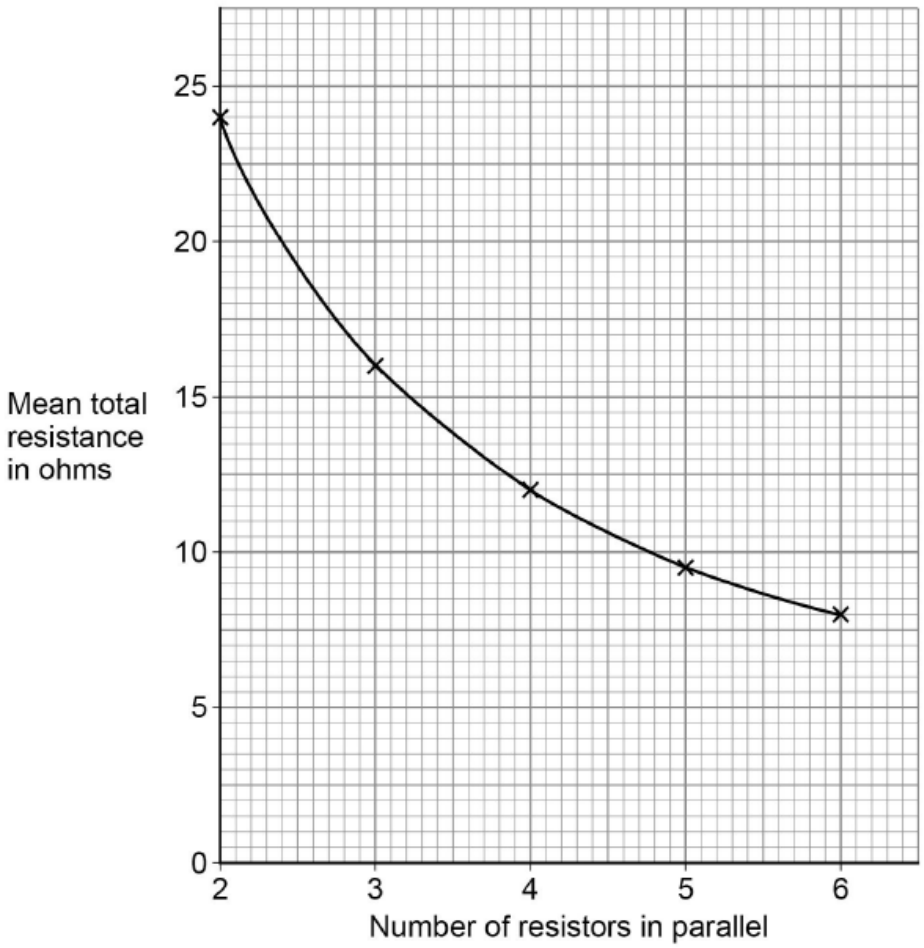
The fourth reading was 16.2 Ω.

Explain why the student was wrong.

[2 marks]

Figure 12 shows the results from the investigation.

Figure 12



0 8 . 3 The student concluded that the number of resistors in parallel was inversely proportional to the mean total resistance.

Explain why the student was correct.

Use data from **Figure 12** in your answer.

[3 marks]

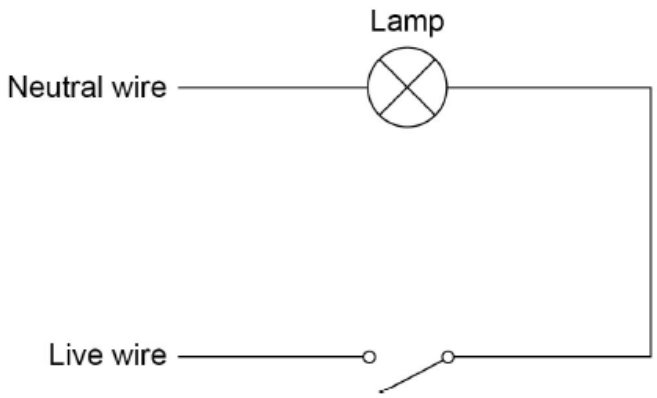
0 8 . 4 Explain why adding resistors in parallel decreases the total resistance.

[2 marks]

9. May/2020/Paper_1H/No.9

0 9 **Figure 13** shows part of a mains electricity lighting circuit in a house.

Figure 13



0 9 . 1 A fault in the switch caused a householder to receive a mild electric shock before a safety device switched the circuit off.

The mean power transfer to the person was 5.75 W.

The potential difference across the person was 230 V.

Calculate the resistance of the person.

[5 marks]

Resistance = _____ Ω

0 9 . 2 An electrician replaced the switch.

The electrician would have received an electric shock unless the circuit was disconnected from the mains supply.

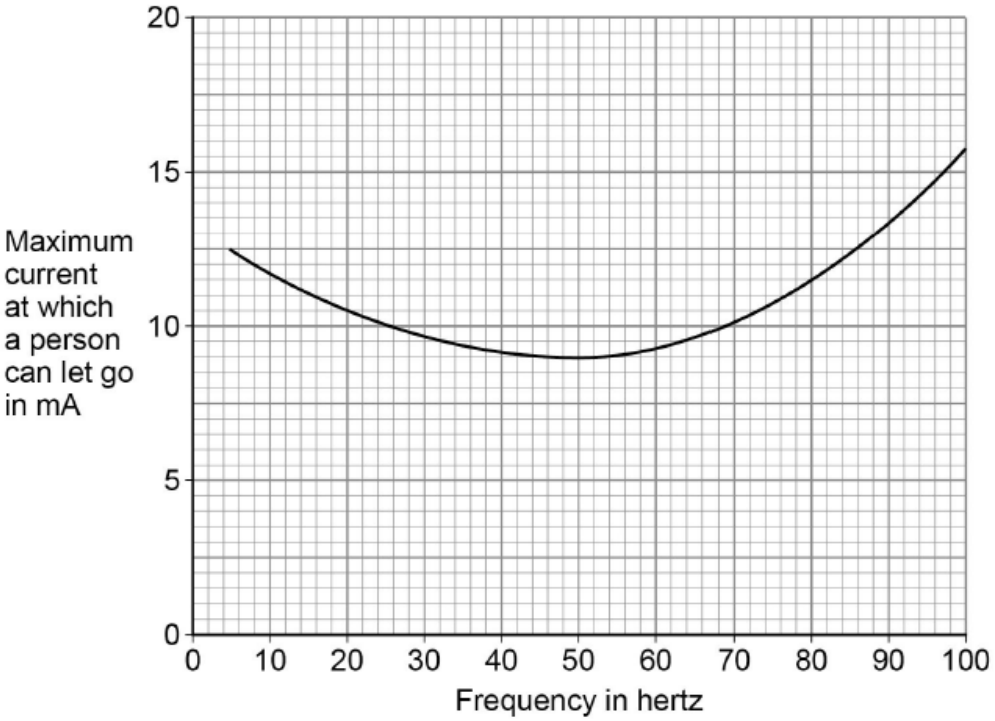
Explain why.

[3 marks]

0 9 . 3 The current from an electric shock causes a person's muscles to contract. The person cannot let go of the electrical circuit if the current is too high.

Figure 14 shows how the maximum current at which a person can let go depends on the frequency of the electricity supply.

Figure 14



The UK mains frequency is 50 Hz.

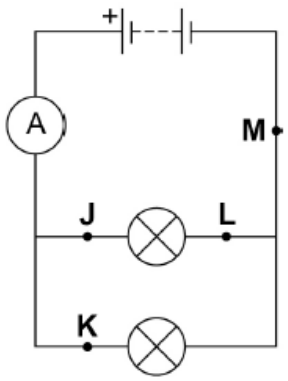
Explain why it would be safer if the UK mains frequency was **not** 50 Hz.

[2 marks]

10. May/2019/Paper_1F/No.7

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]

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:

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

[2 marks]

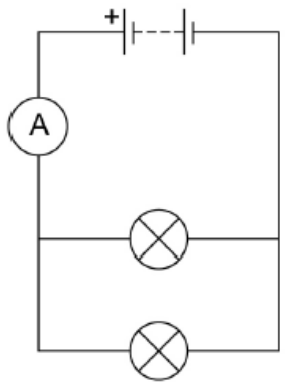
Energy transferred = _____ J

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

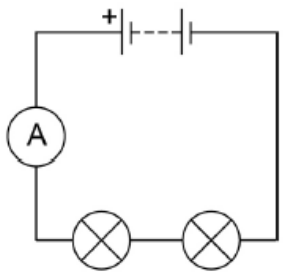
The components used in each circuit were identical.

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.

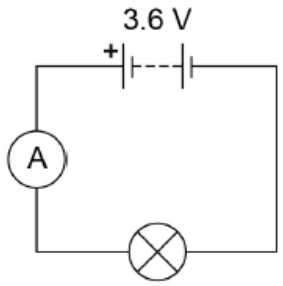
The total resistance of **Y** is greater. ☐

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

The total resistance is the same. ☐

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

11. May/2019/Paper_1H/No.1

0 1 Light bulbs are labelled with a power input.

0 1 . 1 What does power input mean?

[1 mark]

Tick (✓) **one** box.

The charge transferred each second by the bulb. ☐

The current through the bulb. ☐

The energy transferred each second to the bulb. ☐

The potential difference across the bulb. ☐

0 1 . 2 Write down the equation which links current, potential difference and power.

[1 mark]

_____

0 1 . 3 A light bulb has a power input of 40 W

The mains potential difference is 230 V

Calculate the current in the light bulb.

[3 marks]

_____

_____

_____

Current = _____ A

Table 1 shows information about three different light bulbs.

Table 1

Light bulb	Total power input in watts	Useful power output in watts	Efficiency
P	6.0	5.4	0.90
Q	40	2.0	0.05
R	9.0	**X**	0.30

0 1 . 4 Write down the equation which links efficiency, total power input and useful power output.

[1 mark]

0 1 . 5 Calculate the value of **X** in **Table 1**.

[3 marks]

X = _____ W

0 1 . 6 In addition to power input, light bulbs should also be labelled with the rate at which they emit visible light.

Suggest why.

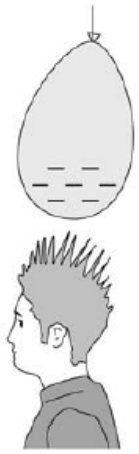
[2 marks]

12. May/2019/Paper_1H/No.10

1 0 **Figure 12** shows a student after rubbing a balloon on his hair.

The balloon and hair have become charged.

Figure 12



1 0 . 1 Describe the force that acts on the student's hair in **Figure 12**.

[2 marks]

1 0 . 2 An earthed conductor was brought near the charged student.
A spark jumped between the conductor and the student.

The potential difference between the conductor and the student was 2.5 kV
The energy transferred by the spark was 0.0050 J

Calculate the charge transferred by the spark.

[3 marks]

Charge = _____ C

1 0 . 3 A defibrillator can transfer a charge to regulate a person's heartbeat.

Figure 13 shows a defibrillator.

Figure 13

When the defibrillator is in use, a potential difference of 4800 V is applied across the person's chest.

A charge of 0.16 coulombs passes through the person's chest in 4.0 ms

Calculate the resistance of the person's chest.

[5 marks]

Resistance = _____ Ω