

Q1. (2018)

0 2

Figure 3 shows a mobile phone being recharged by a portable power source.

Figure 3



0 2 . 2

The power source provides a current of 1.86 A at a potential difference of 3.90 V

Calculate the power of the power source.

Use the equation:

power = potential difference  $\times$  current

Choose the correct unit from the box.

[3 marks]

|   |   |   |
|---|---|---|
| C | J | W |
|---|---|---|

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Power = \_\_\_\_\_

Unit \_\_\_\_\_

Q2. (2018)

0 2 . 3 A student needs a new power source.

Figure 4 shows three different sized power sources.

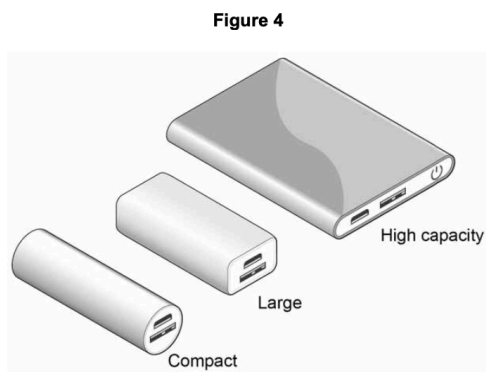


Table 1 gives data about the different power sources.

**Table 1**

| Power source  | Number of charges | Mass in grams |
|---------------|-------------------|---------------|
| Compact       | 1                 | 100           |
| Large         | 5                 | 200           |
| High capacity | 10                | 600           |

The student chose the large power source.

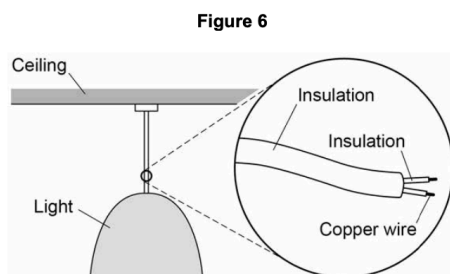
Suggest why the student chose the large power source.

[4 marks]

Q3. (2018)

0 4 Some ceiling lights in the home are connected to the mains by a two-core cable.

Figure 6 shows a ceiling light.



0 4 . 1 Suggest why some ceiling lights do **not** have an earth wire.

[2 marks]

Q4. (2018)

Some fuses have a thin piece of copper that melts if the current is too large.

0 4 . 5 Draw the circuit symbol for a fuse.

[1 mark]

Q5. (2019)

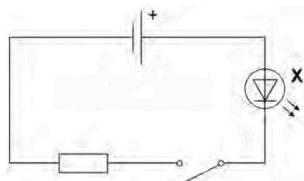
0 1

A designer made some shoes that have lights in them.

Each shoe has a switch which closes when a person puts their foot on the floor.

Figure 1 shows the circuit.

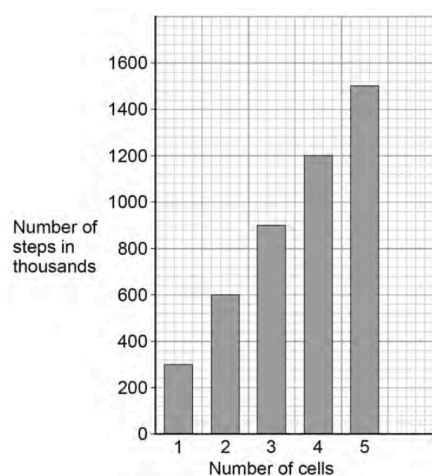
Figure 1



The designer tested how the number of cells affected the number of steps that could be taken before the lights stopped working.

Figure 2 shows the results.

Figure 2



a)

0 1 5

When the potential difference across the resistor was 0.80 V, the current in the resistor was 0.020 A

Calculate the power dissipated by the resistor.

Use the equation:

$$\text{power} = \text{potential difference} \times \text{current}$$

[2 marks]

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Power = \_\_\_\_\_ W

b)

0 1 6

Which other equation can be used to calculate the power dissipated by a resistor?

[1 mark]

Tick (✓) **one** box.

Power = (current)<sup>2</sup> × resistance

☐

Power =  $\frac{\text{current}}{(\text{resistance})^2}$

☐

Power = current × (resistance)<sup>2</sup>

☐

c)

0 1 . 7 What happens to the temperature of the resistor when there is a current in it? [1 mark]

Q7. (2019)

0 5 Figure 7 shows a toaster.

Figure 7



The toaster is connected to the mains supply using a three-core cable.

a)

0 5 . 1 What is the function of the earth wire inside the cable? [1 mark]

Tick (✓) **one** box.

To carry the current from the supply to the toaster

☐

To complete the circuit in the toaster

☐

To melt if a fault occurs inside the toaster

☐

To stop the metal case of the toaster becoming live if a fault occurs

☐

b)

0 5 . 2 Complete the sentences. [3 marks]

Choose answers from the box.

|      |       |        |       |        |
|------|-------|--------|-------|--------|
| blue | brown | orange | white | yellow |
|------|-------|--------|-------|--------|

The insulation around the earth wire is green and \_\_\_\_\_.

The insulation around the live wire is \_\_\_\_\_.

The insulation around the neutral wire is \_\_\_\_\_.

c)

0 5 . 3 The toaster is switched on for 120 seconds.

The power of the toaster is 850 watts.

Calculate the energy transferred by the toaster.

Use the equation:

$$\text{energy transferred} = \text{power} \times \text{time}$$

[2 marks]

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Energy transferred = \_\_\_\_\_ J

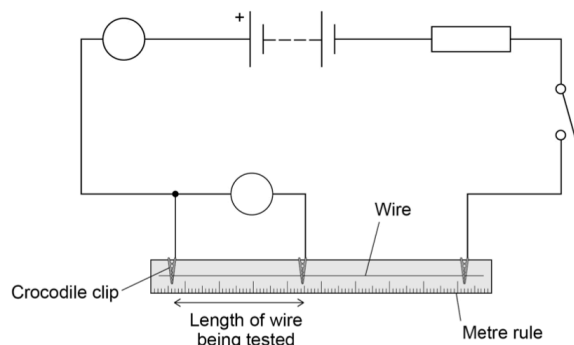
Q8. (2020)

0 1

A student investigated how the resistance of a wire varies with the length of the wire.

Figure 1 shows the circuit used.

Figure 1



The length of the wire was increased to 60 cm

The current in the wire was 0.50 A

The mean potential difference across the wire was 0.32 V

0 1 . 6

Calculate the power dissipated in the 60 cm length of wire.

Use the equation:

$$\text{power} = \text{potential difference} \times \text{current}$$

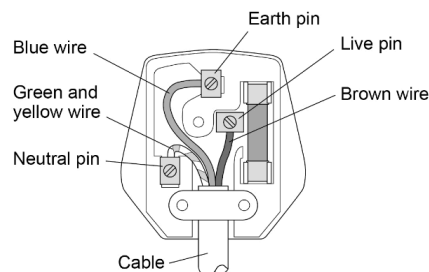
[2 marks]

## Q9. (2020)

0 5

Figure 5 shows the inside of a plug.

Figure 5



a)

0 5 . 1

The plug is **not** wired correctly.

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

[1 mark]

b)

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

0 5 . 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

c)

0 5 . 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

d)

0 5 . 4 The plug has a fuse.

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

[1 mark]

e)

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 5 . 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]

f)

0 5 . 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]

### Q10. (2021)

A manufacturer investigated the maximum current value of some filament lamps.

0 3 . 5 When the potential difference across a filament lamp was 0.75 V, the current in the filament lamp was 0.16 A.

Calculate the power of the filament lamp.

Use the equation:

$$\text{power} = \text{potential difference} \times \text{current}$$

[2 marks]

### Q11. (2021)

0 5 Figure 9 shows a mobile phone with its battery removed.

Figure 9



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

a)

0 5 . 3 Write down the equation which links energy ( $E$ ), power ( $P$ ) and time ( $t$ ).

[1 mark]

b)

- 0 5 . 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.

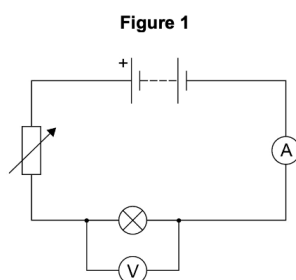
Calculate the energy transferred by the battery.

**[3 marks]**

### Q12. (2022)

- 0 1** A student investigated how the potential difference across a filament lamp affects the current in the lamp.

**Figure 1** shows the circuit the student used.



- 0 1 . 5** Calculate the power of the lamp when the potential difference across the lamp was 4.8 V

The current in the lamp was 0.75 A

Use the equation:

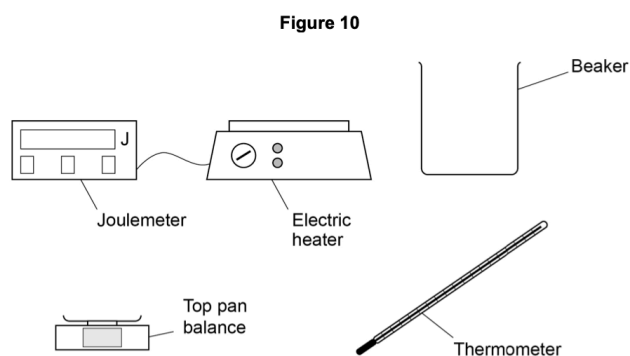
$$\text{power} = \text{potential difference} \times \text{current}$$

**[2 marks]**

### Q13. (2022)

- 0 6** A student made measurements to determine the specific heat capacity of vegetable oil.

**Figure 10** shows the equipment used.



A different student did not have a joulemeter and calculated the energy transferred by the electric heater.

Use the Physics Equations Sheet to answer questions **06.3** and **06.4**.

a)

- 0 6 . 3** Write down the equation linking energy transferred ( $E$ ), power ( $P$ ) and time ( $t$ ).

**[1 mark]**

b)

0 6 . 4 The electric heater had a power output of 50 watts.

Calculate the time taken for the electric element to transfer 4750 joules of energy to the vegetable oil.

[3 marks]

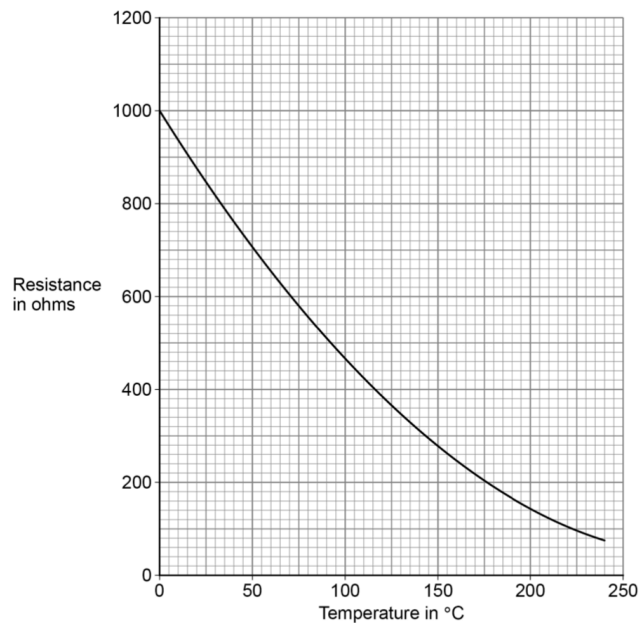
Q14. (2022)

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 11** shows how the resistance of this electrical component changes with temperature.

**Figure 11**



a)

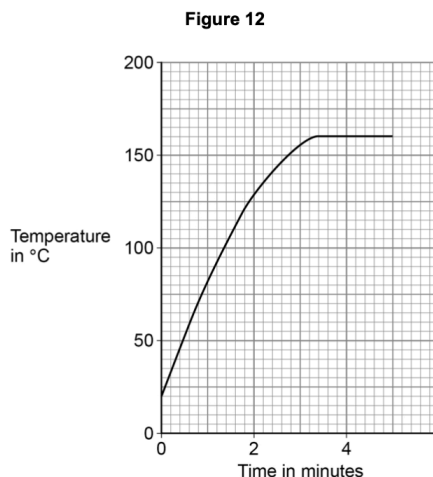
0 6 . 5 What electrical component is used to monitor the temperature of the vegetable oil?

[1 mark]

b)

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

**Figure 12** 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.

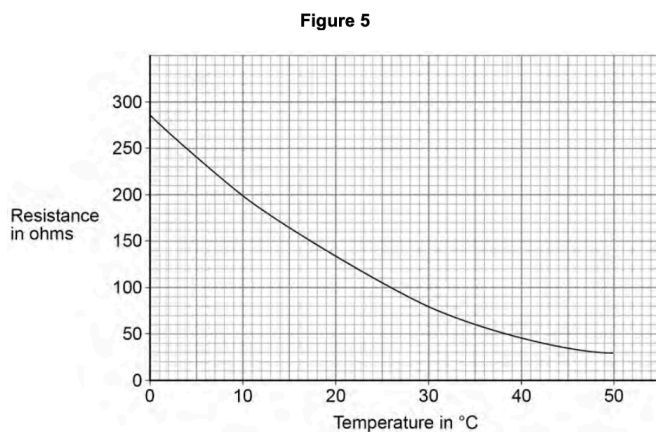
Use **Figure 11** and **Figure 12**.

**[2 marks]**

### Q15. (2023)

- 0 4** A gardener wanted to build an electrical circuit to monitor the temperature in a greenhouse.

**Figure 5** shows how the resistance of the component varies with temperature.



The gardener builds a circuit that switches a heater on when the greenhouse gets too cold.

Use the Physics Equations Sheet to answer questions **04.6** and **04.7**.

a)

- 0 4 . 6** Write down the equation that links current ( $I$ ), potential difference ( $V$ ) and power ( $P$ ). **[1 mark]**

b)

0 4 . 7 The power of the heater is 2900 W.

The potential difference across the heater is 230 V.

Calculate the current in the heater.

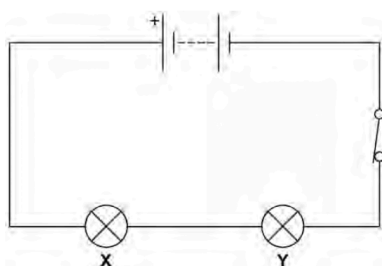
[3 marks]

### Q16. (2024)

0 1

**Figure 1** shows a circuit diagram. The circuit contains a battery and two lamps, X and Y.

**Figure 1**



The current in lamp X is 1.2 A.

The potential difference across lamp X is 1.5 V.

0 1 . 3

Calculate the power of lamp X.

Use the equation:

$$\text{power} = \text{potential difference} \times \text{current}$$

[2 marks]

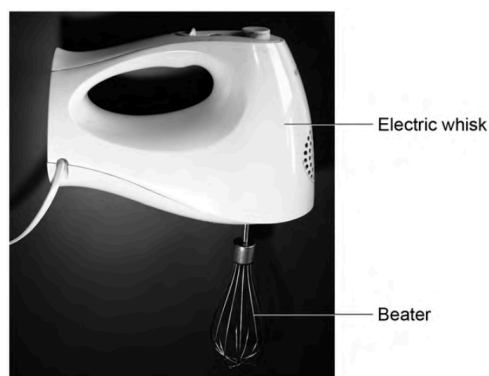
### Q17. (2024)

0 6

**Figure 10** shows an electric whisk that plugs into the mains electricity supply.

The whisk can mix food by spinning a beater.

**Figure 10**



a)

Use the Physics Equations Sheet to answer questions 06.2 and 06.3.

0 6 . 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]

b)

**0 6 . 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]

c)

Use the Physics Equations Sheet to answer questions **06.4** and **06.5**.

**0 6 . 4** Which equation links current ( $I$ ), power ( $P$ ) and resistance ( $R$ )?

[1 mark]

Tick (✓) **one** box.

$$P = \frac{I}{R^2} \quad \square$$

$$P = I R^2 \quad \square$$

$$P = \frac{I^2}{R} \quad \square$$

$$P = I^2 R \quad \square$$

d)

**0 6 . 5** The current in the whisk is 500 mA.

The resistance of the whisk is 640  $\Omega$ .

Calculate the power of the whisk.

[3 marks]

e)

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

[1 mark]

\_\_\_\_\_ V