AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.1.1.4

Power

Past-paper questions

Tier	**Higher**
Question groups	**19**
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.

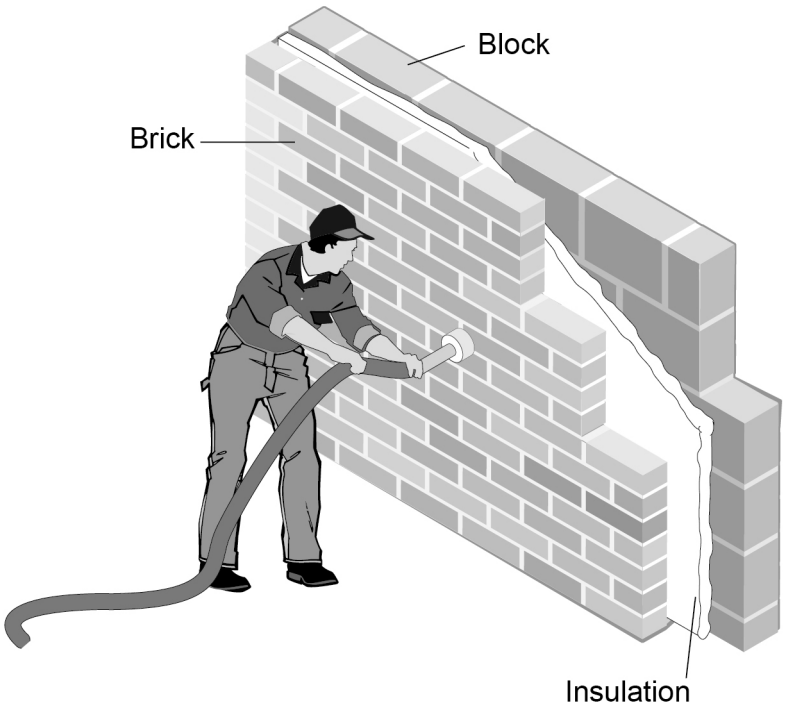
6.1.1.4 Power

Question 01

June 2018 | 8464/P/1H | Original Q5

0 5 **Figure 7** shows cavity wall insulation being installed in the wall of a house.

Figure 7



0 5 . 1 Explain how the wall reduces unwanted energy transfers.

[3 marks]

Question 5 continues on the next page

Question 01 · continued

0 5 . 2 The cavity insulation was tested.

- The heating inside the house was switched off.
- The temperature inside the house was measured every 20 minutes for 2 hours.

Table 4 shows the results.

Table 4

Time in minutes	Temperature in °C
0	25.0
20	20.8
40	17.4
60	14.5
80	12.1
100	10.0
120	8.4

Determine the temperature inside the house after 30 minutes.

[2 marks]

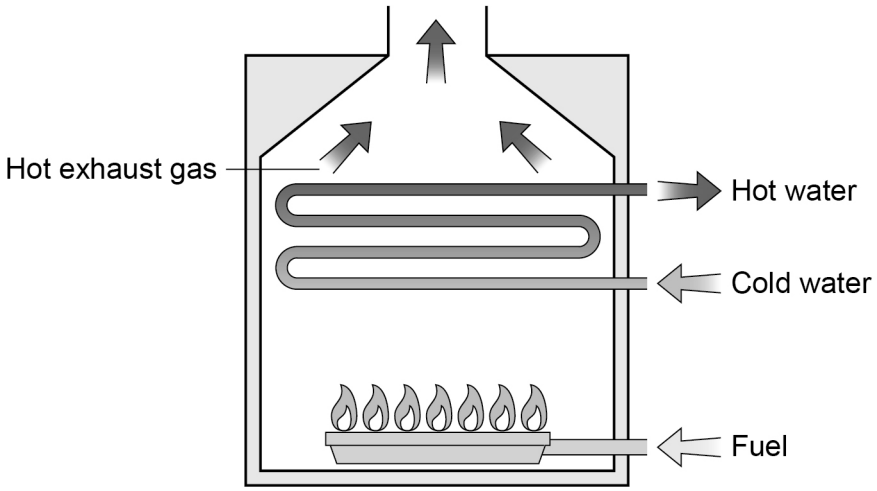
Temperature = _____ °C

6.1.1.4 Power

Question 01 · continued

0 5 . 3 **Figure 8** shows the gas boiler used to heat the house.

Figure 8



Describe how different energy stores are changed by the boiler.

[3 marks]

0 5 . 4 To heat the house, the boiler transfers 15 MJ of energy in 10 minutes.

Calculate the power of the boiler.

Write any equation that you use.

[4 marks]

Power = _____ W

12

6.1.1.4 Power

Question 02

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]

6.1.1.4 Power

Question 02 · 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

6.1.1.4 Power

Question 03

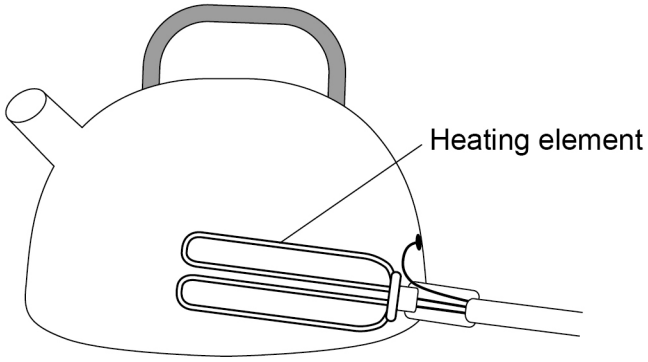
June 2019 | 8464/P/1H | Original Q5

0 5 A student investigated how the mass of water in an electric kettle affected the time taken for the water to reach boiling point.

The kettle switched off when the water reached boiling point.

Figure 4 shows the kettle.

Figure 4



0 5 . 1 The heating element of the kettle was connected to the mains supply.

Explain why the temperature of the heating element increased.

[2 marks]

0 5 . 2 Give **one** variable that the student should have controlled.

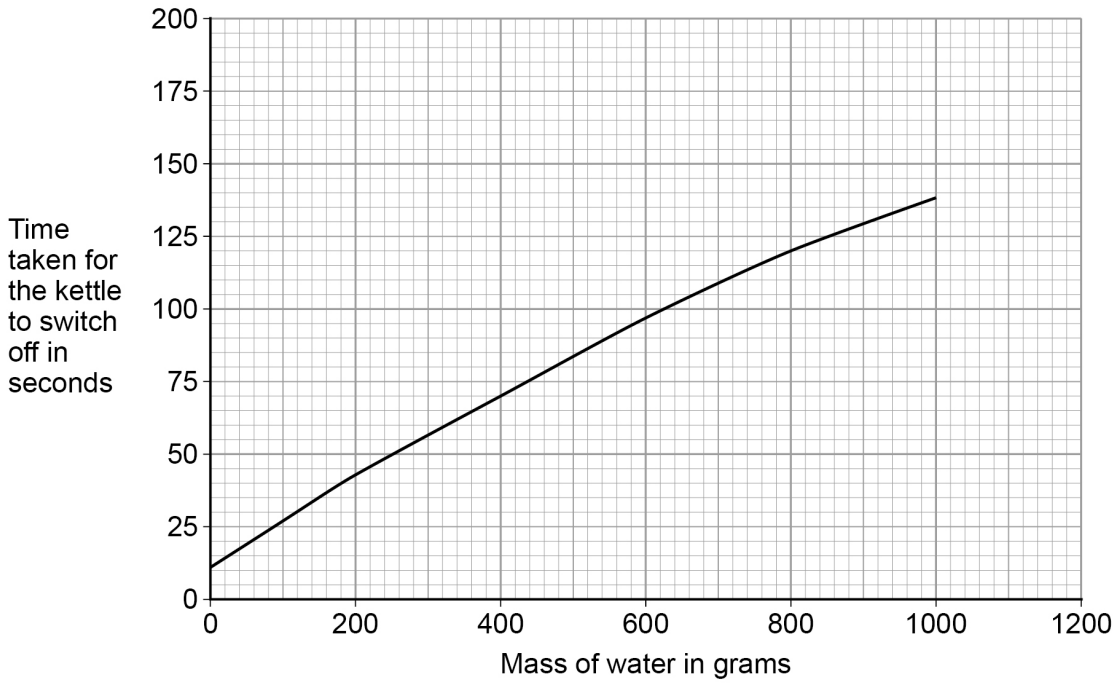
[1 mark]

6.1.1.4 Power

Question 03 · continued

Figure 5 shows how the mass of water in the kettle affected the time taken for the kettle to switch off.

Figure 5



0 5 . 3 Suggest why the line on **Figure 5** does **not** go through the origin.

[1 mark]

0 5 . 4 Suggest why the results give a non-linear pattern.

[1 mark]

Question 5 continues on the next page

6.1.1.4 Power

Question 03 · continued

0 5 . 5 The power of the kettle was 2.6 kW

The kettle took 120 seconds to heat 0.80 kg of water from 18 °C to 100 °C

Calculate the specific heat capacity of water using this information.

Give your answer to 2 significant figures.

[6 marks]

Specific heat capacity = _____ J/kg °C

11

6.1.1.4 Power

Question 04

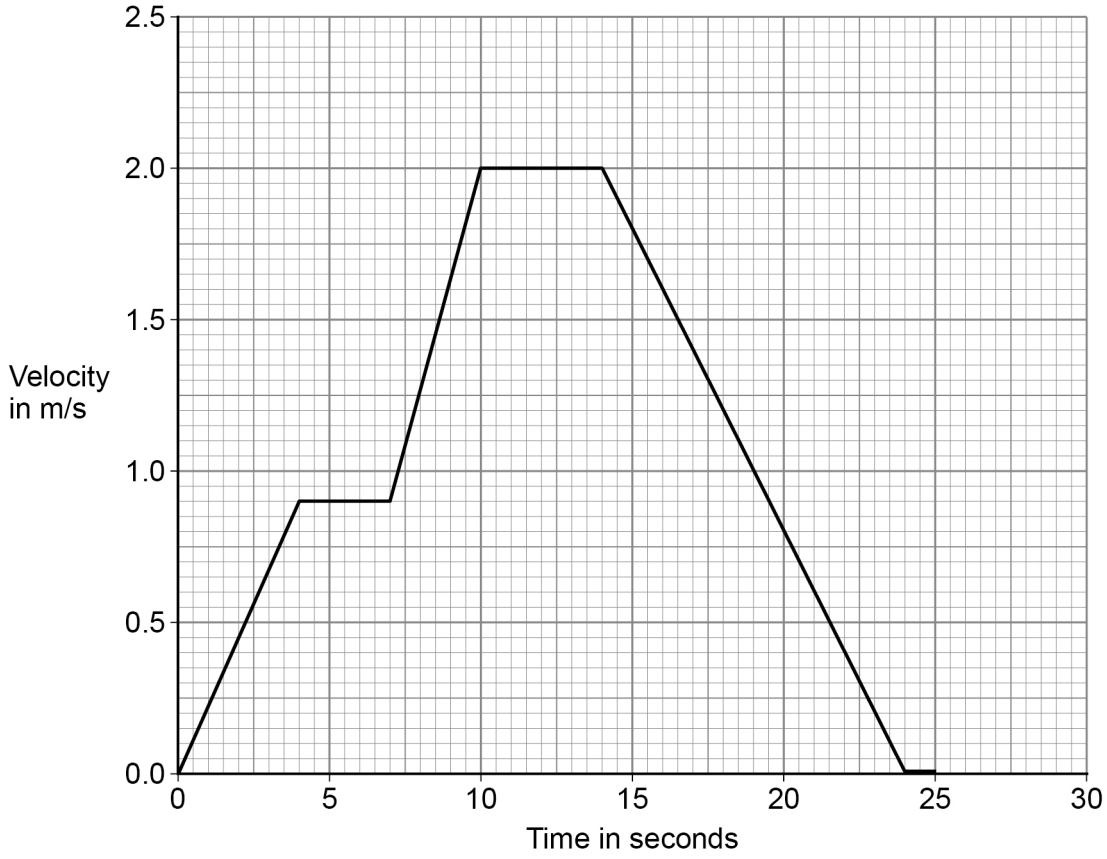
0 1 **Figure 1** shows a runner using a smart watch and a mobile phone to monitor her run.

Figure 1



Figure 2 is a velocity–time graph for part of the runner's warm-up.

Figure 2



6.1.1.4 Power

Question 04 · continued

0 1 . 1 Determine the total time for which the velocity of the runner was increasing.

[2 marks]

Time = _____ s

0 1 . 2 Determine the deceleration of the runner.

[2 marks]

Deceleration = _____ m/s^2

Question 1 continues on the next page

6.1.1.4 Power

Question 04 · continued

The smart watch and mobile phone are connected to each other by a system called Bluetooth.

Bluetooth is wireless and uses electromagnetic waves for communication.

0 1 . 3 Suggest why the phone and watch being connected by a wireless system is an advantage when running.

[1 mark]

0 1 . 4 Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

0 1 . 5 The electromagnetic waves have a frequency of 2 400 000 000 Hz

The speed of electromagnetic waves is 300 000 000 m/s

Calculate the wavelength of the electromagnetic waves.

[3 marks]

Wavelength = _____ m

6.1.1.4 Power

Question 04 · continued

0 1 . 6 **Table 1** shows some information about four types of Bluetooth.

Table 1

Type	Power in milliwatts	Range in metres
1	100	100
2	2.50	10.0
3	1.00	1.00
4	0.50	0.50

Mobile phones use type **2** Bluetooth to communicate with other devices.

Suggest **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

11

6.1.1.4 Power

Question 05

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

6.1.1.4 Power

Question 05 · 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

6.1.1.4 Power

Question 05 · 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

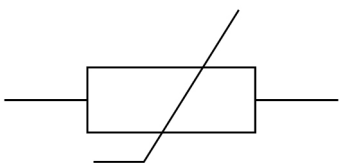
6.1.1.4 Power

Question 05 · 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

6.1.1.4 Power

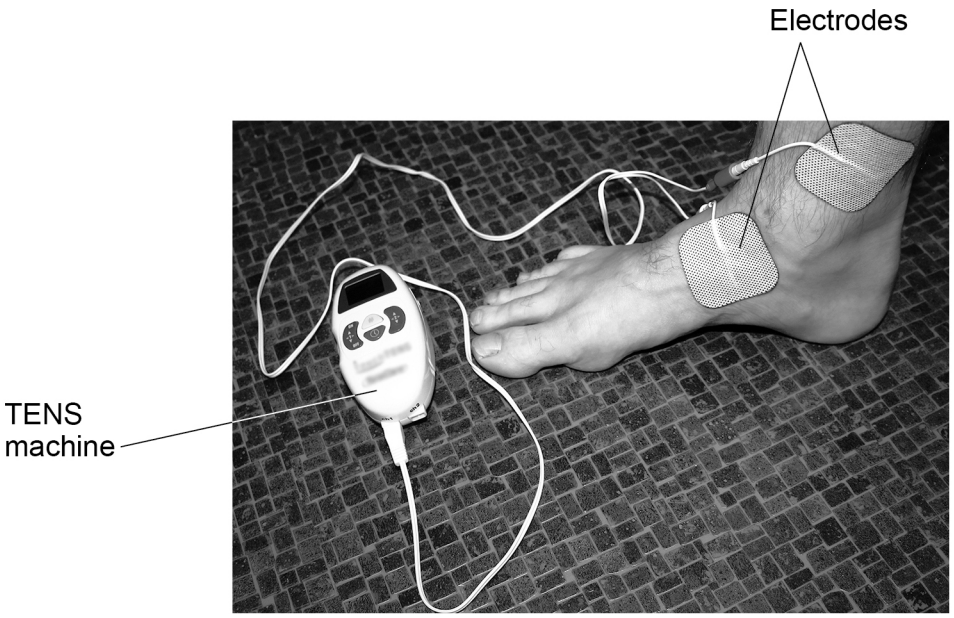
Question 06

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.

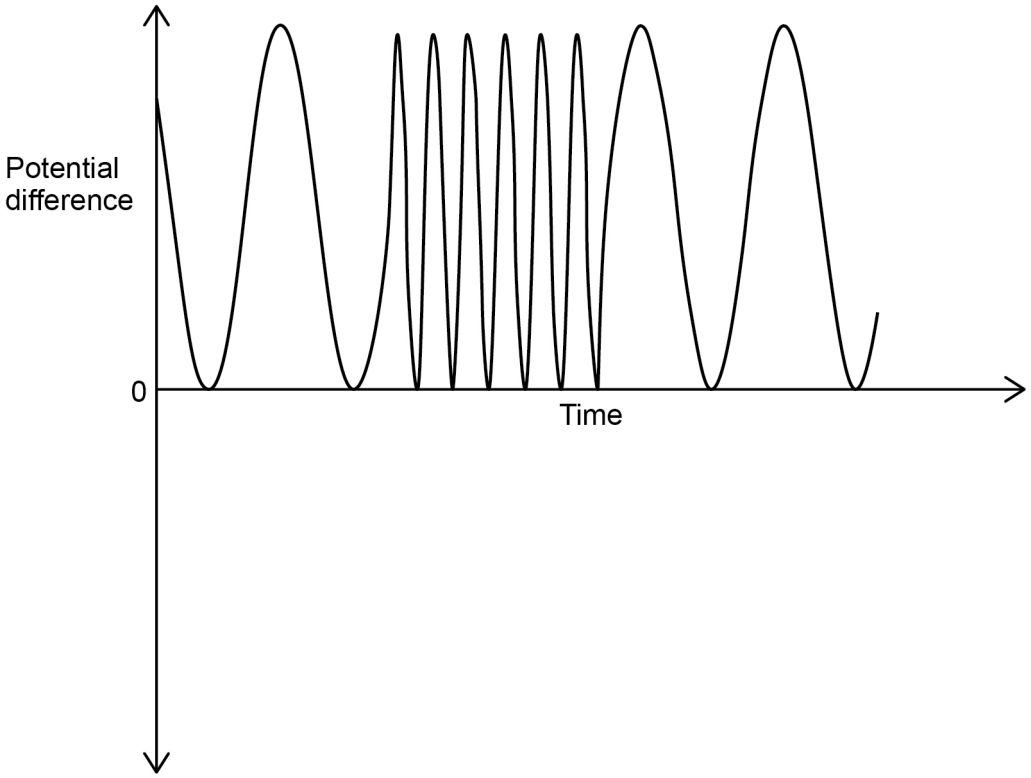
[4 marks]

Maximum current = _____ A

Question 06 · 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.

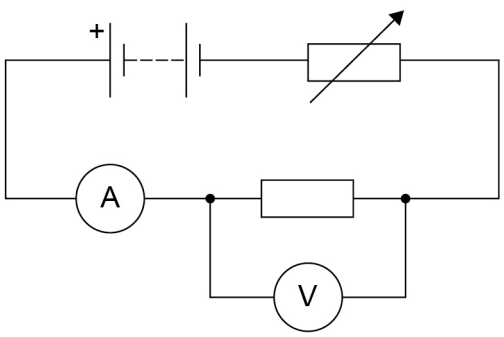
How does **Figure 9** show that the student was **not** correct?

[1 mark]

Question 5 continues on the next page

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

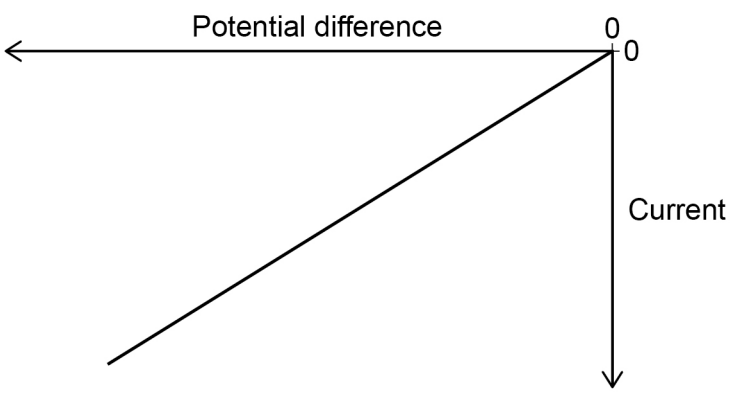
Figure 10



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?

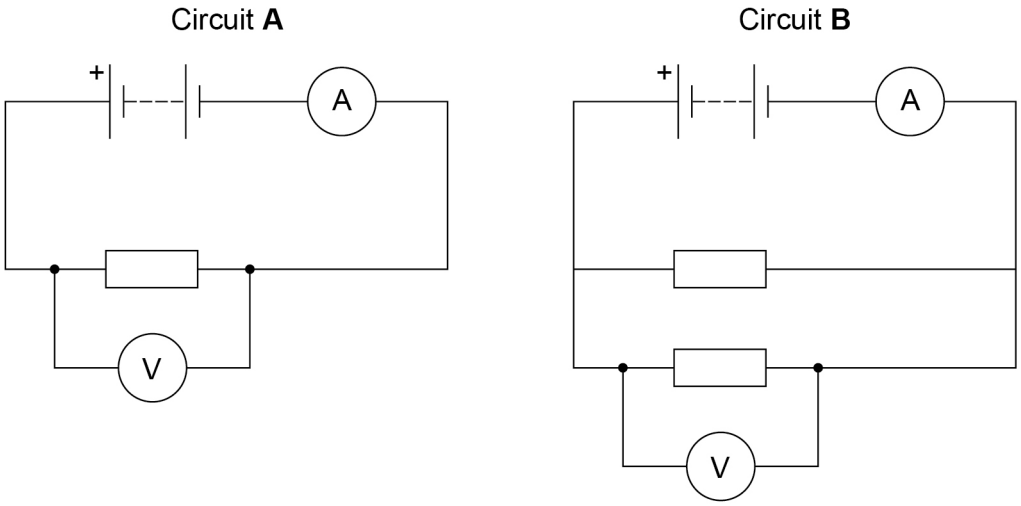
[1 mark]

6.1.1.4 Power

Question 06 · 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

6.1.1.4 Power

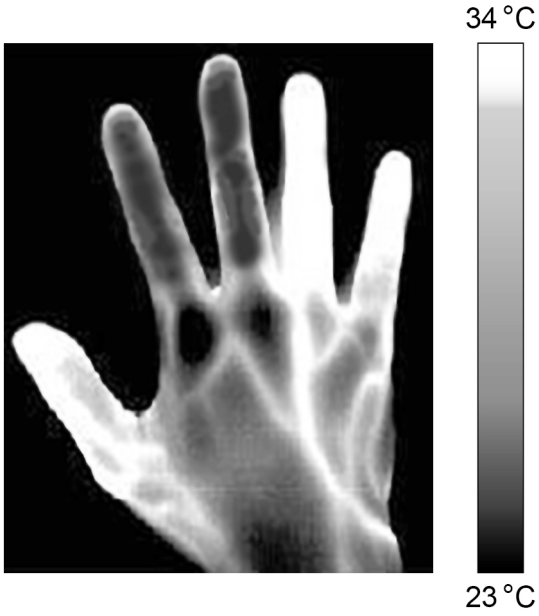
Question 07

November 2021 | 8464/P/2H | Original Q5

0 5 Different parts of the electromagnetic spectrum are used in medical imaging.

Figure 8 shows an image of a person's hand taken with an infrared camera.

Figure 8



0 5 . 1 Explain why the infrared camera is able to show that parts of the hand are at different temperatures.

[2 marks]

Question 5 continues on the next page

6.1.1.4 Power

Question 07 · continued

0 5 . 2 Infrared has a range of wavelengths from 700 nm to 1 mm.

Which part of the electromagnetic spectrum would have waves with a wavelength of 6.5×10^{-7} m?

[1 mark]

Tick (✓) **one** box.

- Infrared ☐
- Microwaves ☐
- Radio waves ☐
- Visible light ☐

6.1.1.4 Power

Question 07 · continued

0 5 . 3 **Figure 9** shows X-rays and gamma rays being used for medical imaging.

Figure 9

X-rays **Gamma rays**



To use X-rays for medical imaging, a machine produces a very brief burst of X-rays.

To use gamma rays for medical imaging, a radioactive isotope is injected into the patient's blood. The isotope is circulated around the body in the blood. The isotope emits gamma rays.

Compare the potential risks to a patient of using X-rays and gamma rays for medical imaging.

[4 marks]

Question 5 continues on the next page

6.1.1.4 Power

Question 07 · continued

X-rays are produced by colliding high-energy electrons into a metal target.

The electrons have high energy because they are accelerated to high speeds.

Only a small proportion of the kinetic energy of an electron is converted into an X-ray when it collides with the metal target.

0 5 . 4 An electron is accelerated through a distance of 15 mm.

The work done on the electron is 1.2×10^{-13} J.

Calculate the force on the electron.

[3 marks]

Force = _____ N

0 5 . 5 The metal target is made from tungsten.

Tungsten has the highest melting point of any metal.

Explain why using tungsten as the metal target enables the X-ray machine to be more powerful.

[3 marks]

13

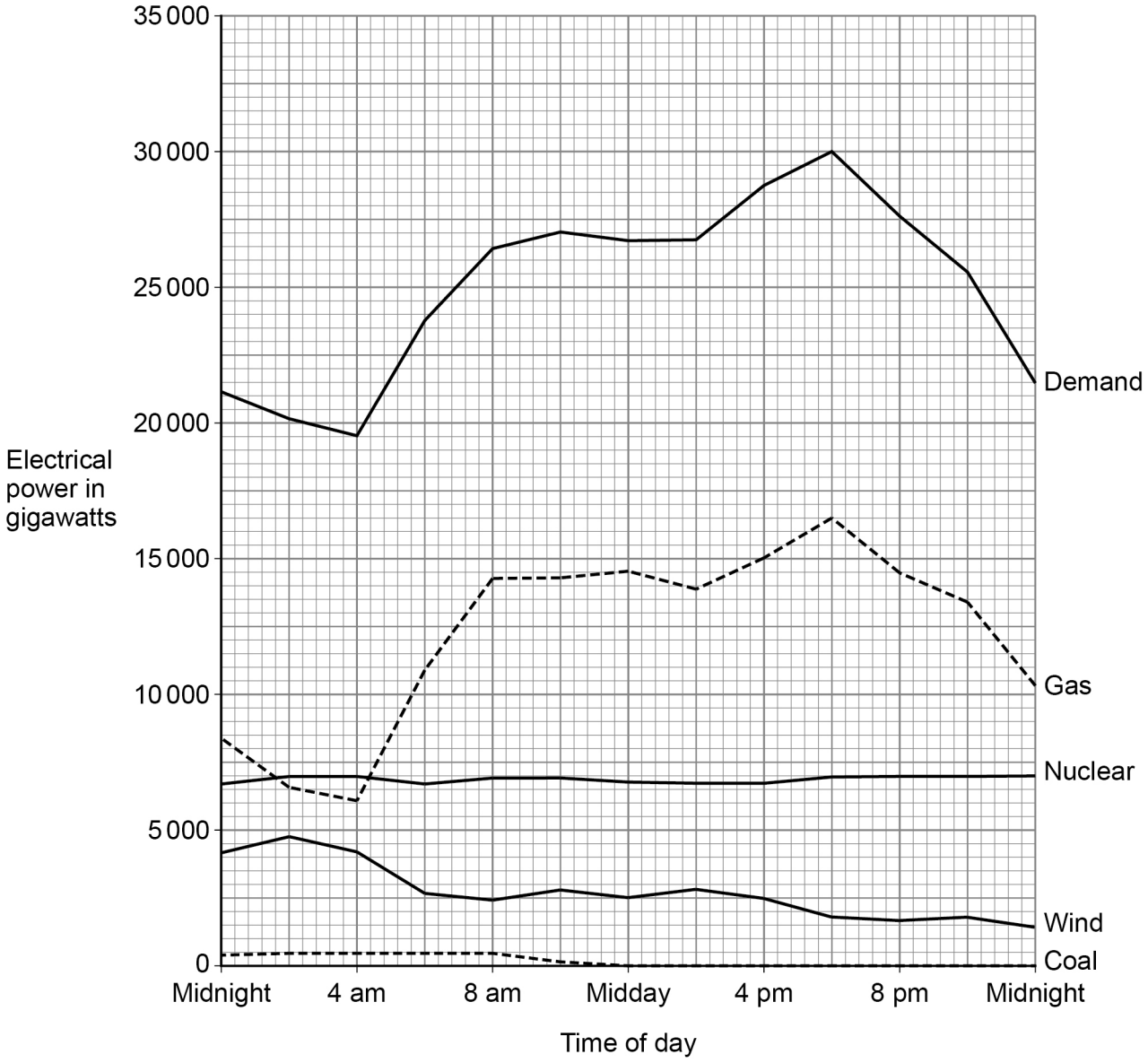
6.1.1.4 Power

Question 08

June 2022 | 8464/P/1H | Original Q1

0 1 **Figure 1** shows some of the energy resources used to meet the demand for electrical power in the UK on one day in 2020.

Figure 1



6.1.1.4 Power

Question 08 · continued

0 1 . 1 The maximum demand for electrical power on that day was at 6 pm.

Determine the percentage of the maximum demand for electrical power that was generated using gas.

[3 marks]

Percentage = _____ %

0 1 . 2 The UK government wants to reduce carbon emissions as much as possible.

Which energy resources need to be used less to achieve this?

[1 mark]

Tick (✓) **one** box.

- Coal and gas ☐
- Gas and nuclear ☐
- Wind and coal ☐
- Wind and nuclear ☐

Question 1 continues on the next page

6.1.1.4 Power

Question 08 · continued

A network of transformers and transmission cables transfers electrical power from power stations to consumers.

0 1 . 3 What is this network called?

[1 mark]

0 1 . 4 Explain how using step-up transformers makes the network efficient.

[3 marks]

8

6.1.1.4 Power

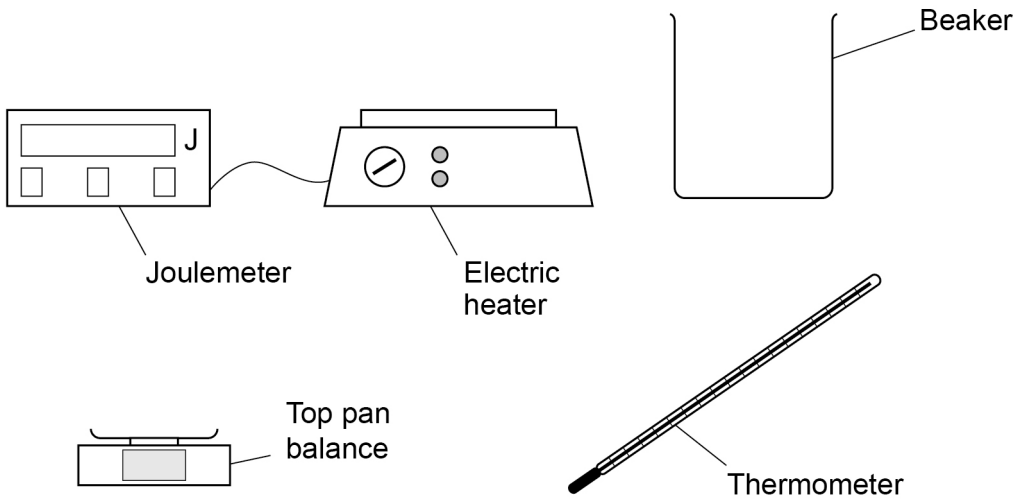
Question 09

June 2022 | 8464/P/1H | Original Q2

0 2 A student made measurements to determine the specific heat capacity of vegetable oil.

Figure 2 shows the equipment used.

Figure 2



0 2 . 1 Describe how the student could use the equipment shown in **Figure 2** to determine the specific heat capacity of vegetable oil.

[6 marks]

6.1.1.4 Power

Question 09 · continued

0 2 . 2 Give **one** risk when using the equipment in **Figure 2**.

[1 mark]

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 **02.3** and **02.4**.

0 2 . 3 Write down the equation linking energy transferred (*E*), power (*P*) and time (*t*).

[1 mark]

0 2 . 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]

Time taken = _____ s

Question 2 continues on the next page

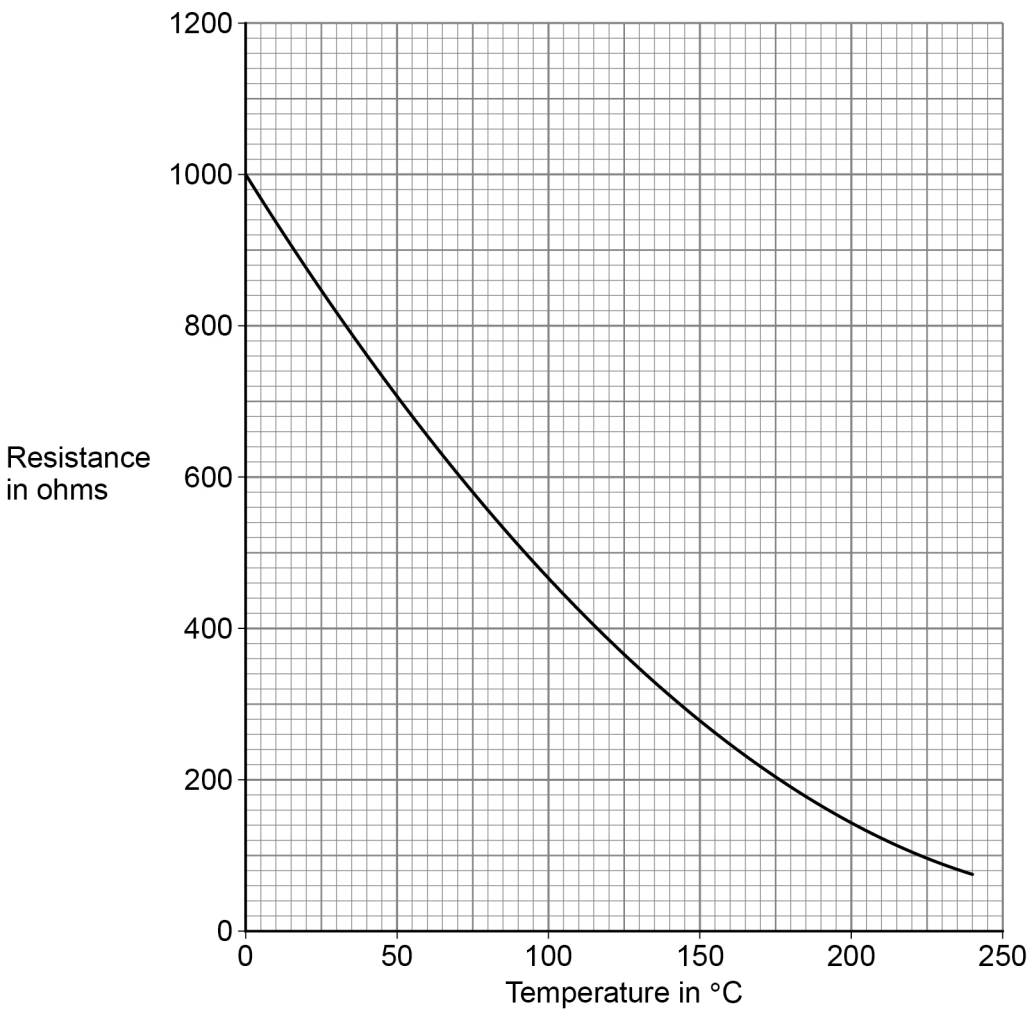
Question 09 · continued

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.

Figure 3



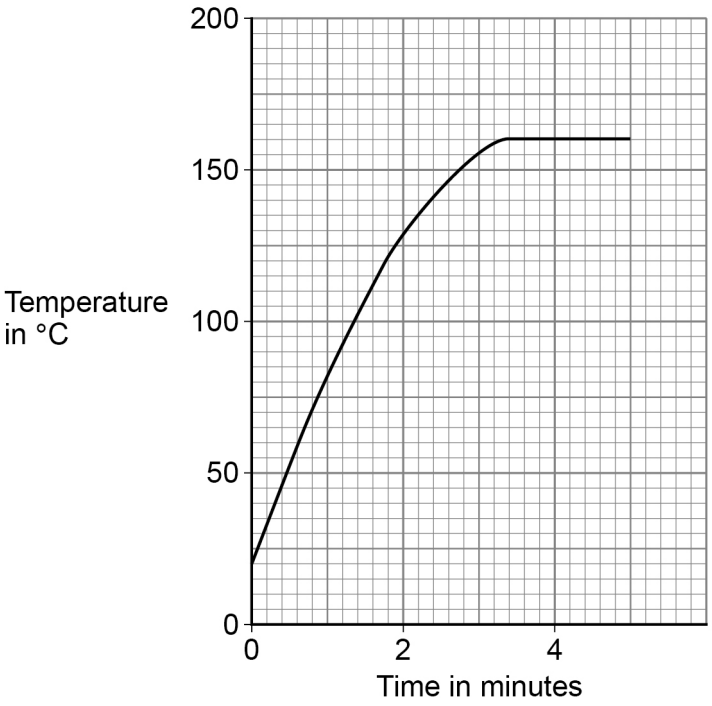
0 2 . 5 What electrical component is used to monitor the temperature of the vegetable oil?

[1 mark]

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.

Figure 4



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

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

[2 marks]

Resistance = _____ Ω

Question 2 continues on the next page

6.1.1.4 Power

Question 09 · continued

0 2 . 7 Some chips were put in the deep fryer.

In the deep fryer, water in the chips underwent a physical change and became steam.

Why is this a physical change?

[1 mark]

Tick (✓) **one** box.

All water can change to steam. ☐

No chemicals are involved when water changes to steam. ☐

The change from water to steam can be detected visually. ☐

The water will recover its original properties if the steam is cooled ☐

15

6.1.1.4 Power

Question 10

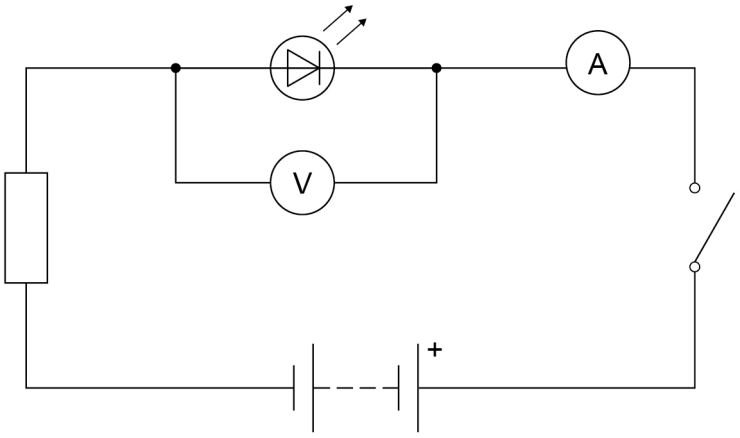
June 2022 | 8464/P/1H | Original Q5

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]

6.1.1.4 Power

Question 10 · 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

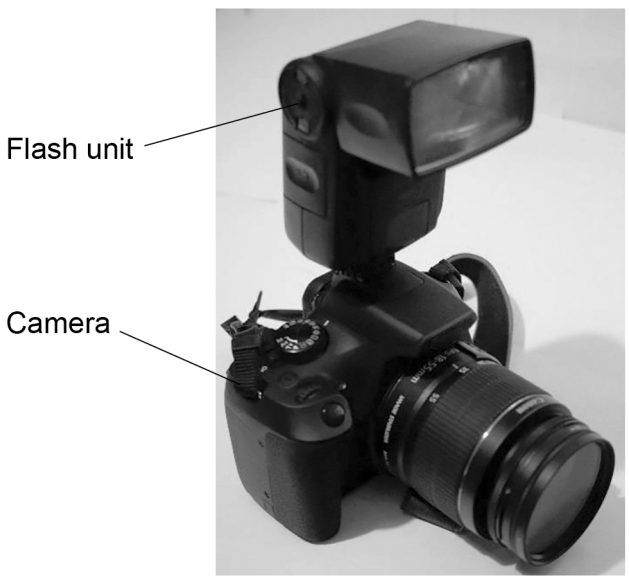
Question 5 continues on the next page

Question 10 · 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. ☐

6.1.1.4 Power

Question 10 · 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

6.1.1.4 Power

Question 11

June 2023 | 8464/P/1H | Original Q1

0 1 Wind power and solar power are both renewable energy resources used to generate electricity for the National Grid.

0 1 . 1 Which of the following is also a renewable energy resource?

[1 mark]

Tick (✓) **one** box.

- Geothermal ☐
- Natural gas ☐
- Nuclear fuel ☐

0 1 . 2 The energy transferred by the National Grid in one second was 36 gigajoules (GJ).

Which of the following is the same as 36 gigajoules?

[1 mark]

Tick (✓) **one** box.

- 36×10^3 J ☐
- 36×10^6 J ☐
- 36×10^9 J ☐
- 36×10^{12} J ☐

Question 1 continues on the next page

Question 11 · continued

0 1 . 3 **Figure 1** shows how the mean power output from solar and wind energy resources in the UK varied between 2014 and 2019.

Figure 1

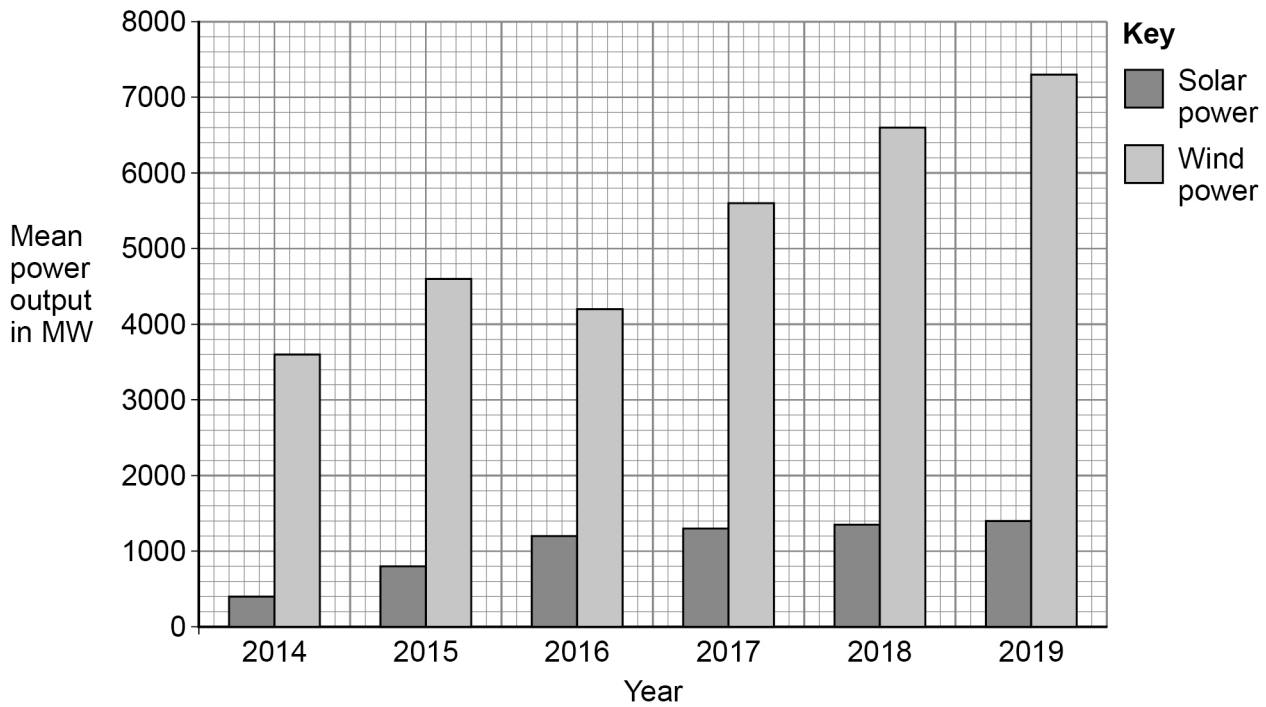
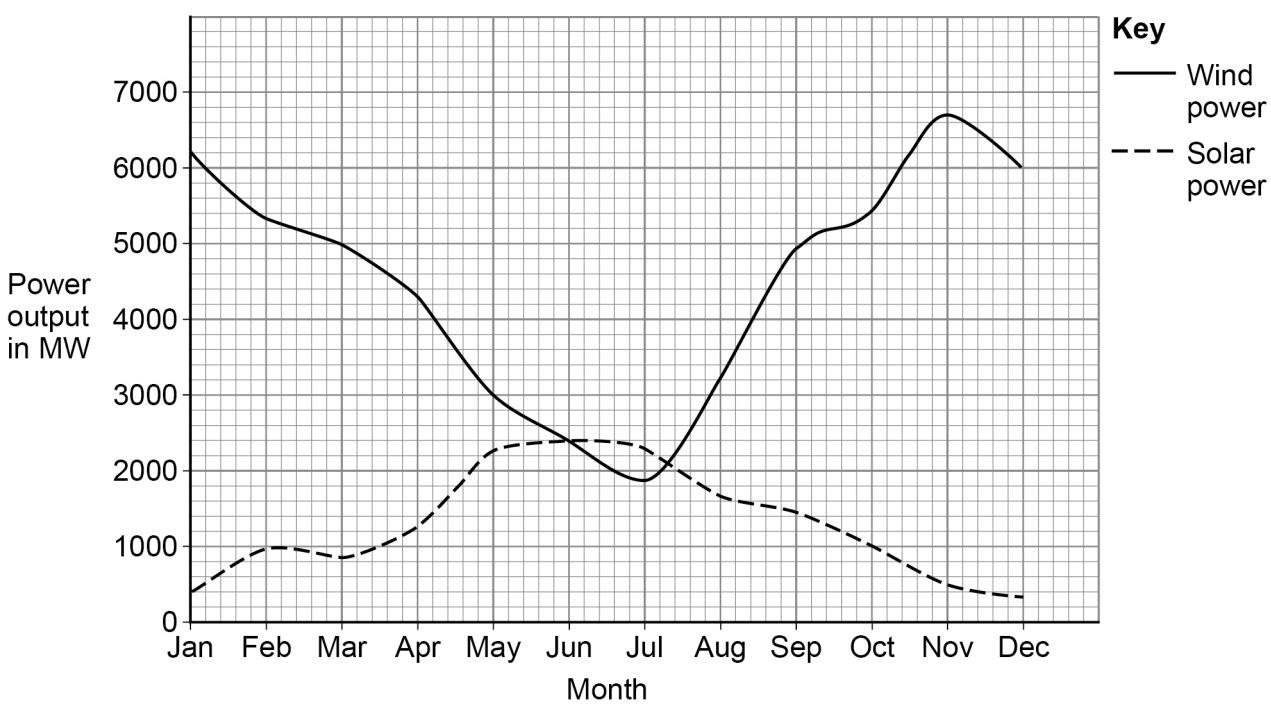


Figure 2 shows how the power output from solar and wind energy resources varies in a typical year.

Figure 2



6.1.1.4 Power

Question 11 · continued

Explain the changes in power output from solar and wind energy resources between 2014 and 2019.

You should include an explanation of the change in power output during a typical year.

[6 marks]

8

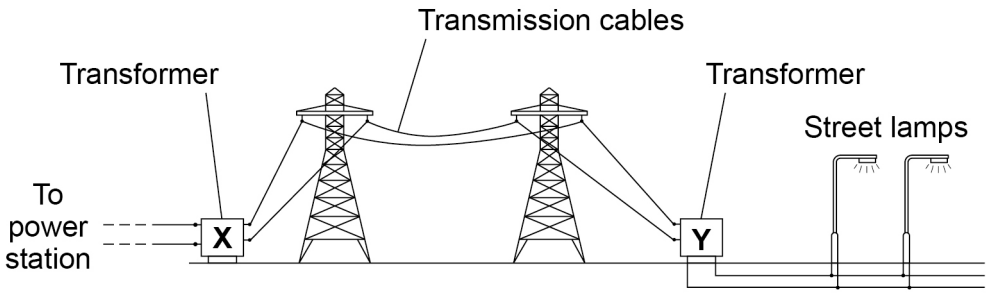
6.1.1.4 Power

Question 12

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 12 · 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]

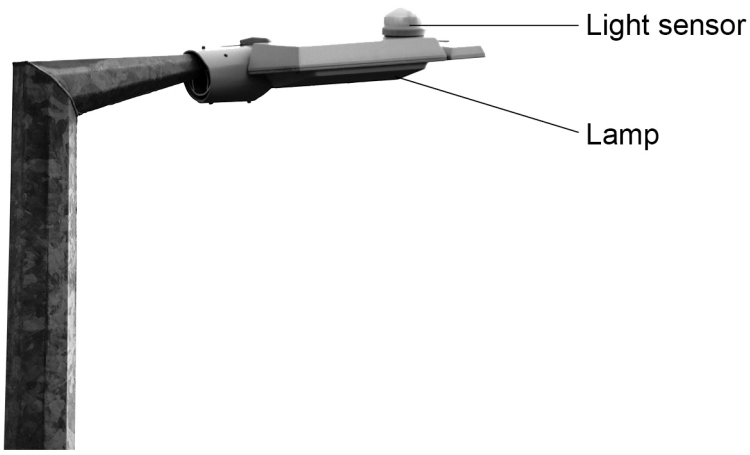
Tick (✓) **one** box.

- 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 12 · continued

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

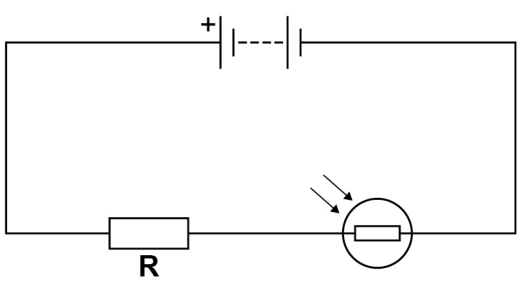
Figure 8



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]

6.1.1.4 Power

Question 12 · 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

6.1.1.4 Power

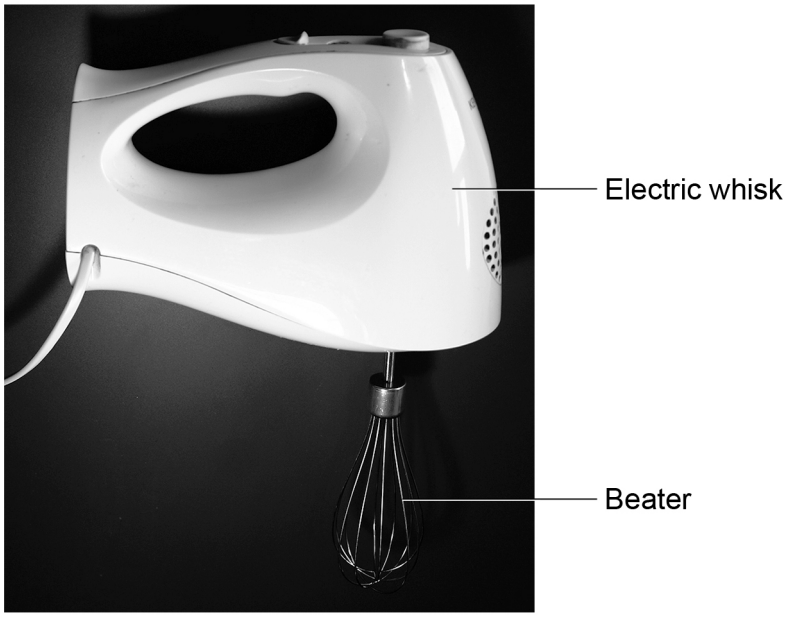
Question 13

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 _____

_____

6.1.1.4 Power

Question 13 · 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

6.1.1.4 Power

Question 13 · 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

6.1.1.4 Power

Question 13 · 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

6.1.1.4 Power

Question 14

June 2024 | 8464/P/1H | Original Q4

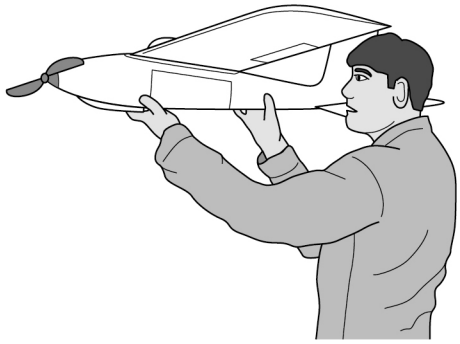
0 4 A drone is a miniature aircraft that has a remote control.

An inventor designed a battery powered drone.

The inventor tested what would happen if the battery runs out of charge during a flight.

Figure 5 shows the inventor about to launch the drone.

Figure 5



0 4 . 1 After the drone was launched, it moved at a constant speed and gained height.

The thermal stores of energy of the drone increased.

Describe **two** other changes to the energy stores of the drone as it moved at a constant speed and gained height.

[2 marks]

1 _____

_____

2 _____

_____

Question 4 continues on the next page

6.1.1.4 Power

Question 14 · continued

When the drone reached a height of 840 m the motor was switched off.

The motor was switched back on after a short time, when the drone had fallen to a lower height above the ground.

The change in gravitational potential energy of the drone during the fall to this lower height was 3920 J.

The mass of the drone is 2.5 kg.

gravitational field strength = 9.8 N/kg

0 4 . 2 Calculate the height above the ground of the drone when the motor was switched back on.

Use the Physics Equations Sheet.

[4 marks]

Height above ground = _____ m

6.1.1.4 Power

Question 14 · continued

0 4 . 3 When the motor was switched off, the kinetic energy of the drone was 150 J.

Calculate the maximum possible speed of the drone when the motor was switched back on.

Use the Physics Equations Sheet.

Give your answer in km/s.

[5 marks]

Maximum possible speed of drone = _____ km/s

11

6.1.1.4 Power

Question 15

June 2024 | 8464/P/1H | Original Q6

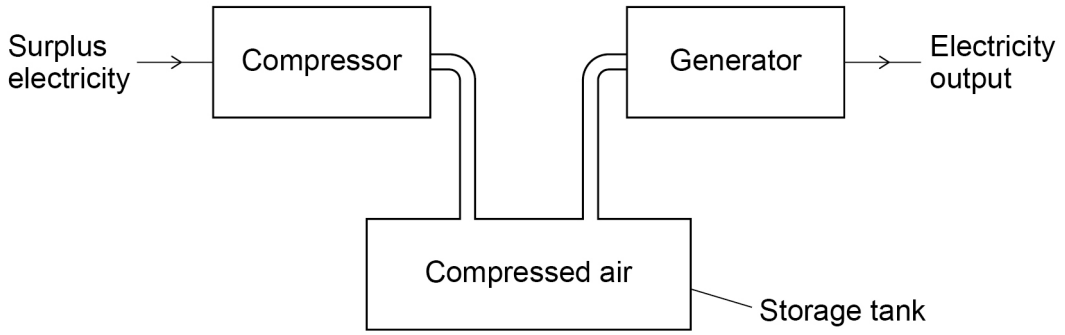
0 6 Energy can be stored using a Compressed Air Energy Storage (CAES) system.

When more electricity is generated than is needed, a CAES system uses the surplus electricity to compress air in a storage tank.

When there is a greater demand for electricity, the CAES system releases the compressed air to generate electricity.

Figure 7 shows a diagram of the CAES system.

Figure 7



0 6 . 1 The CAES system has two processes:

- compressing air to store energy. This process has an efficiency of 0.72
- releasing the air to generate electricity. This process has an efficiency of 0.86

Calculate the efficiency of the CAES system.

Give your answer to 2 significant figures.

[3 marks]

Efficiency of the CAES system (2 significant figures) = _____

6.1.1.4 Power

Question 15 · continued

The generator works when forces from the compressed air cause a turbine to rotate.

When particles of air collide with the turbine they transfer energy to the turbine.

In warm weather the temperature of the compressed air increases, increasing the pressure inside the storage tank.

0 6 . 2 Explain how the motion of the particles in warmer air causes an increase in the power transferred to the turbine.

[4 marks]

Question 6 continues on the next page

6.1.1.4 Power

Question 15 · continued

0 6 . 3 The volume of the storage tank is 5.0×10^5 m^3.

The density of the compressed air is 48 kg/m^3.

specific heat capacity of air = 1100 J/kg °C

The temperature of the compressed air increases from 12 °C to 27 °C.

Calculate the energy transferred to the compressed air in the storage tank.

Use the Physics Equations Sheet.

Give your answer in standard form.

[6 marks]

Energy transferred (in standard form) = _____ J

6.1.1.4 Power

Question 15 · continued

0 6 . 4 The UK government wants the amount of carbon dioxide released into the atmosphere to be reduced.

Explain why efficient energy storage is important in reducing the amount of carbon dioxide released when generating electricity.

[4 marks]

17

6.1.1.4 Power

Question 16

June 2025 | 8464/P/1H | Original Q1

0 1 Fossil fuels are burned in car engines and in power stations.

0 1 . 1 Describe how different energy stores change in a car engine when a fossil fuel is burned.

[2 marks]

0 1 . 2 Some car engines burn a fuel that is produced using plants.

Name a fuel produced using plants.

[1 mark]

0 1 . 3 Some cars do **not** contain an engine that burns a fuel.

Suggest how cars that do **not** burn a fuel are powered.

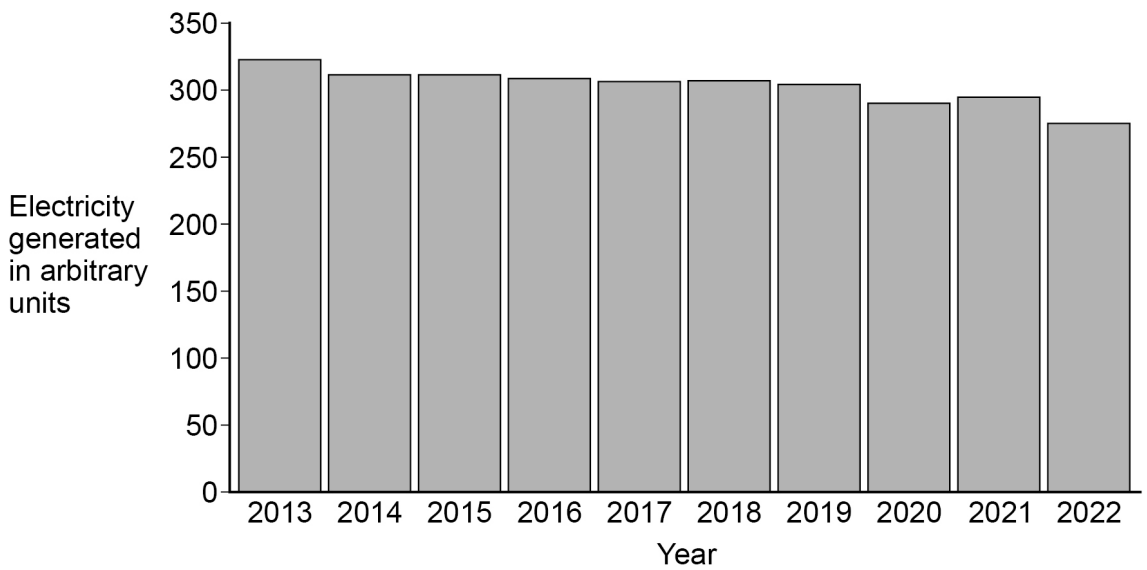
[1 mark]

Question 1 continues on the next page

Question 16 · continued

Figure 1 shows how the total amount of electricity generated in the UK has changed with time.

Figure 1



0 1 . 4 The proportion of electricity that is generated using renewable energy resources has increased since the year 2013.

Which conclusion is correct?

Use **Figure 1**.

[1 mark]

Tick (✓) **one** box.

The amount of fossil fuel that is burned to generate electricity each year has decreased. ☐

The concentration of carbon dioxide in the atmosphere has decreased. ☐

The rate of increase of the mean temperature of the atmosphere has decreased. ☐

6.1.1.4 Power

Question 16 · continued

0 1 . 5 The UK plans to stop burning fossil fuels to generate electricity.

Explain **one** reason why it will take many years before all electricity is generated using renewable resources.

[2 marks]

0 1 . 6 Renewable energy resources can have a negative impact on the environment.

Give **one** negative environmental impact of hydro-electric power and of wind power.

[2 marks]

Hydro-electric power _____

Wind power _____

9

6.1.1.4 Power

Question 17

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

6.1.1.4 Power

Question 17 · 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

6.1.1.4 Power

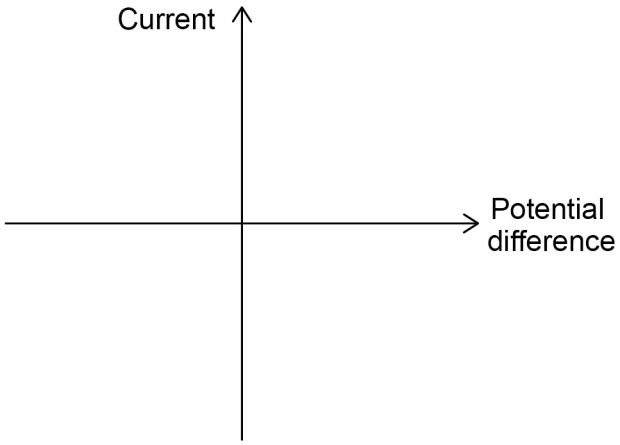
Question 17 · continued

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

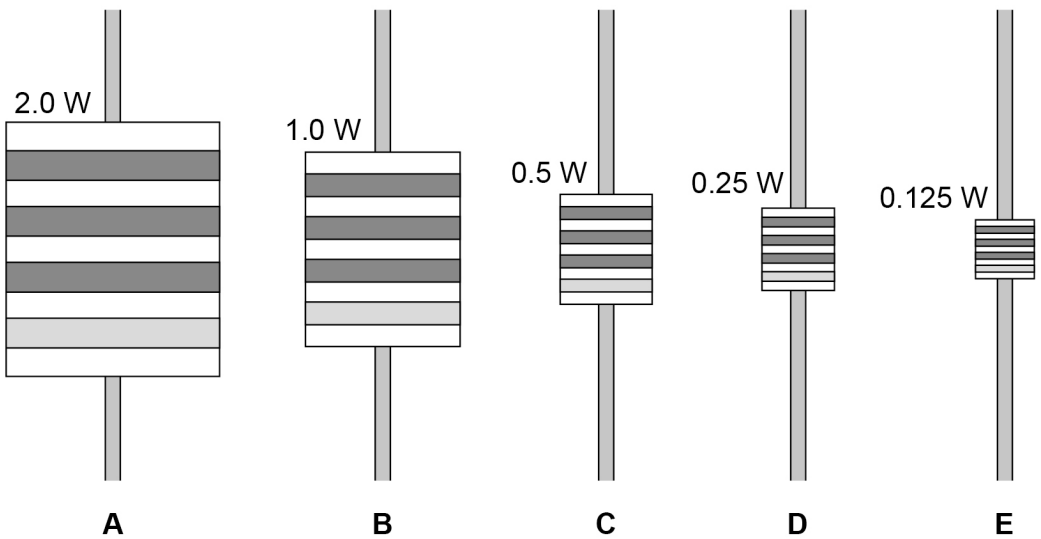


Question 3 continues on the next page

Question 17 · 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

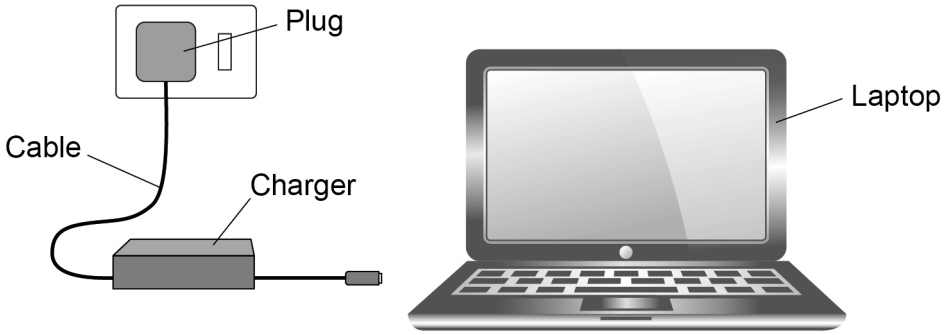
6.1.1.4 Power

Question 18

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 _____

6.1.1.4 Power

Question 18 · 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

6.1.1.4 Power

Question 18 · 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]

6.1.1.4 Power

Question 18 · 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

6.1.1.4 Power

Question 19

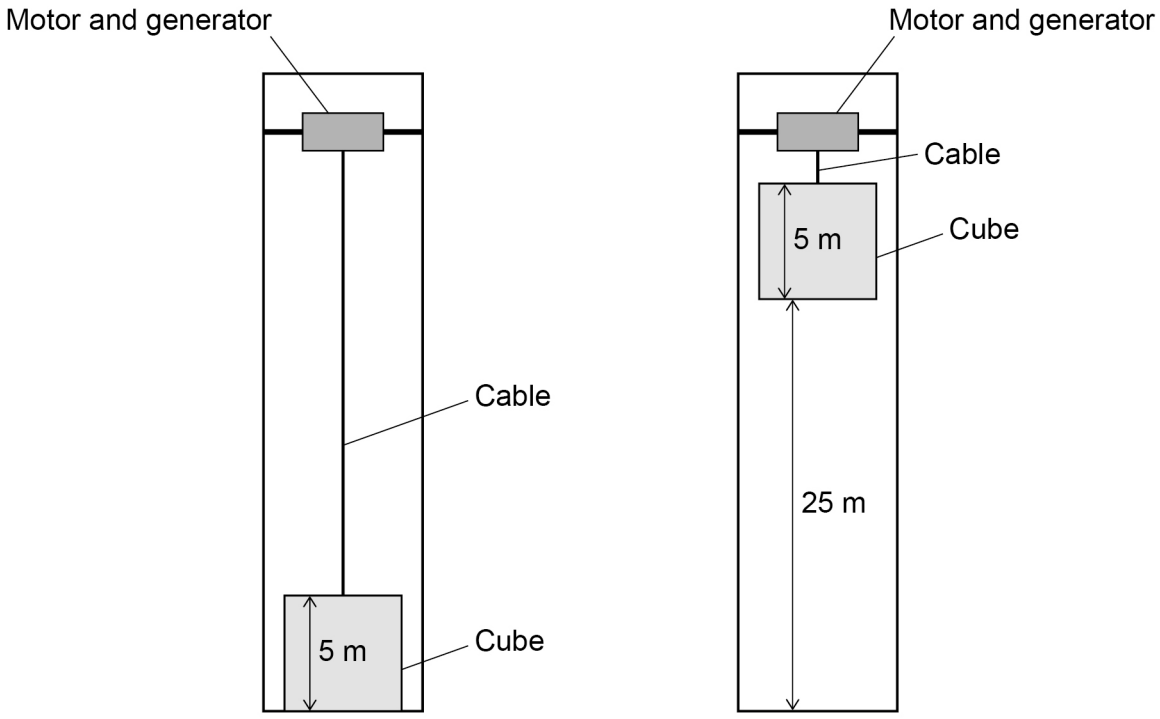
June 2025 | 8464/P/1H | Original Q6

0 6 A system is designed to store excess energy from the National Grid.

- Excess energy from the National Grid powers a motor that lifts a large cube.
- To transfer the energy back to the National Grid, the cube is allowed to fall.
- The falling cube turns a generator which produces electricity.

Figure 6 shows the cube before it is lifted and after it is lifted.

Figure 6



Before cube is lifted **After cube is lifted**

6.1.1.4 Power

Question 19 · continued

0 6 . 1 The cube has a density of 4200 kg/m^3.

Determine the mass of the cube.

Use the Physics Equations Sheet.

[4 marks]

Mass = _____ kg

0 6 . 2 Explain why the cube is made from a material with a high density.

[2 marks]

Question 6 continues on the next page

6.1.1.4 Power

Question 19 · continued

0 6 . 3 The system is designed to store excess energy from the National Grid.

Explain how the efficiency of the system could be determined.

[2 marks]

0 6 . 4 The system in **Figure 6** on page 20 needs to be able to store excess energy as quickly as possible.

Explain **one** change to this system that would allow the same amount of energy to be stored more quickly.

Do **not** refer to efficiency in your answer.

[2 marks]

10