



8464-P-1H-QP3-Combined Science Trilogy-G-22May25-AM

Biology (The Harvey Grammar School)



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Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE COMBINED SCIENCE: TRILOGY

H

Higher Tier
Physics Paper 1H

Thursday 22 May 2025

Morning

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the Physics Equations Sheet (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



J U N 2 5 8 4 6 4 P

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8464/P/1H

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ANSWER IN THE SPACES PROVIDED**



0 2

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

0	1	.	1
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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

Turn over ►

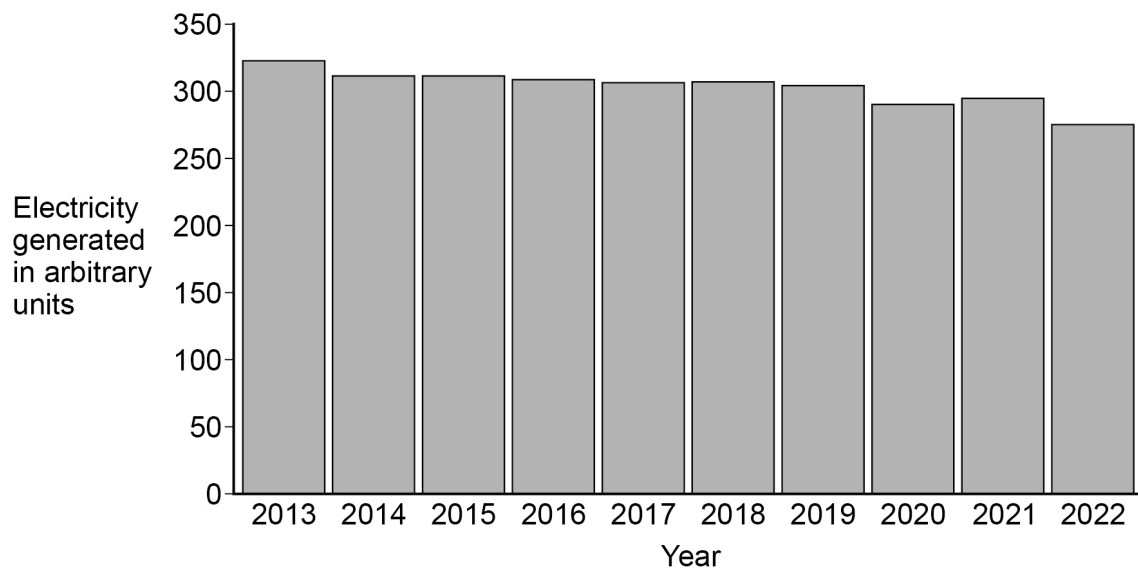


0 3

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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.

☐


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

Turn over for the next question

Turn over ►



0 5

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0 2

A student investigated the specific heat capacity of aluminium.

The student used an electric heater to increase the temperature of an aluminium block.

The student measured the:

- mass of the block
- energy transferred to the block
- temperature change of the block.

Table 1 shows the results.

Table 1

Mass in kilograms	0.75
Energy transferred in joules	13 800
Temperature change in °C	20

0 2 . 1

Calculate the specific heat capacity of aluminium.

Use the Physics Equations Sheet.

[3 marks]

Specific heat capacity = _____ J/kg °C



[6 marks]

Extra space _____

Question 2 continues on the next page

0 2 . 3

Wrapping the aluminium block in insulation makes the value for the specific heat capacity of aluminium more accurate.

Which are **two** reasons why?

[2 marks]

Tick (✓) **two** boxes.

The amount of wasted energy is less.

☐

The energy transferred to the aluminium block is greater.

☐

The insulation heats the aluminium block.

☐

The power of the electric heater increases.

☐

The temperature increase of the aluminium block is greater.

☐

11



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

Turn over ►



0 9

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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]

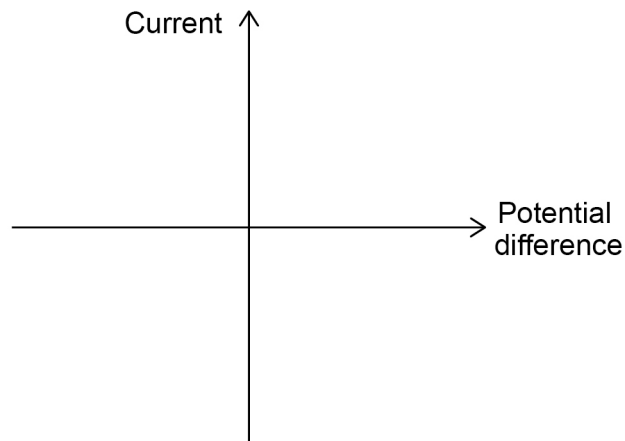
Resistance = _____ Ω



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.

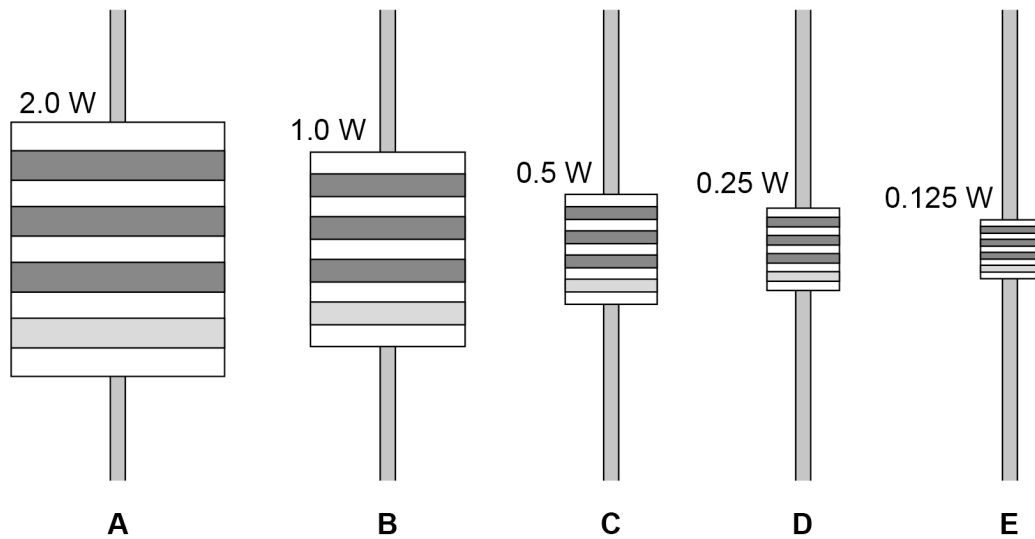
[1 mark]**Figure 2**

Question 3 continues on the next page

Turn over ►

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 $2.2 \text{ k}\Omega$.

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 _____



0 4

Three types of radiation emitted by unstable nuclei are:

- alpha particle
- beta particle
- gamma ray.

0 4 . 1

Describe each type of radiation.

[3 marks]

Alpha particle _____

Beta particle _____

Gamma ray _____

0 4 . 2

The radioactive isotope gold-198 (Au) decays to mercury (Hg) by emitting beta radiation.

Complete the nuclear equation for the decay of gold-198.

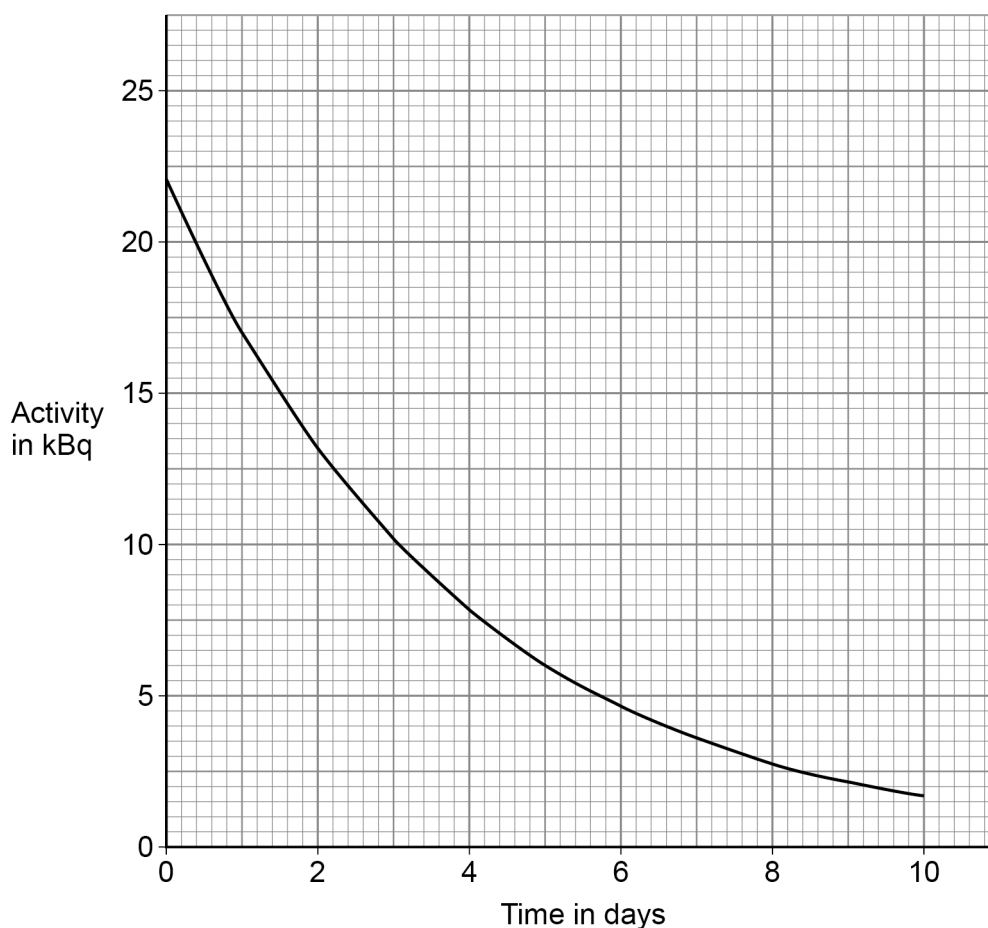
[2 marks]**Question 4 continues on the next page****Turn over ►**

Gold-198 is used in the treatment of cancer.

A small sample containing gold-198 is surgically implanted into a patient, very near to the cancer cells.

Figure 4 shows how the activity of the sample changes after it has been implanted.

Figure 4



0 4 . 3 Determine the half-life of gold-198.

[2 marks]

Half-life = _____ days



0 4 . 4

Determine the percentage decrease in the activity at 5 days.

Give your answer to 2 significant figures.

[4 marks]

Percentage decrease (2 significant figures) = _____ %

0 4 . 5

The sample containing gold-198 is implanted very near to the cancer cells.

Give **two** reasons why.**[2 marks]**

1 _____

2 _____

0 4 . 6

After treatment, the sample containing gold-198 is **not** removed from the patient.Suggest why the sample is left in the patient and **not** removed.**[1 mark]**

14

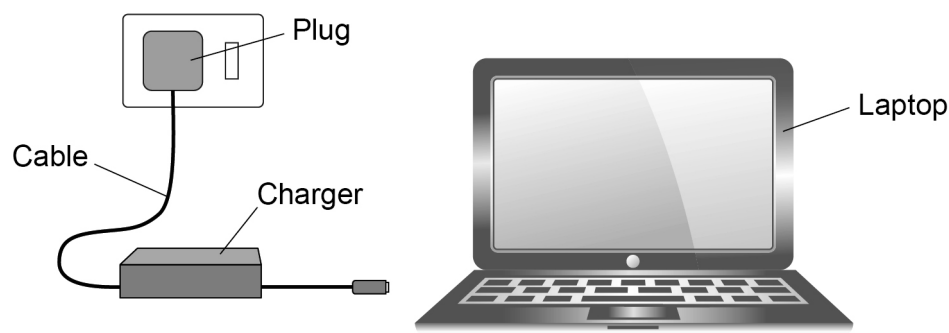
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0 5

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 _____



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

Turn over ►



1 7

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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]



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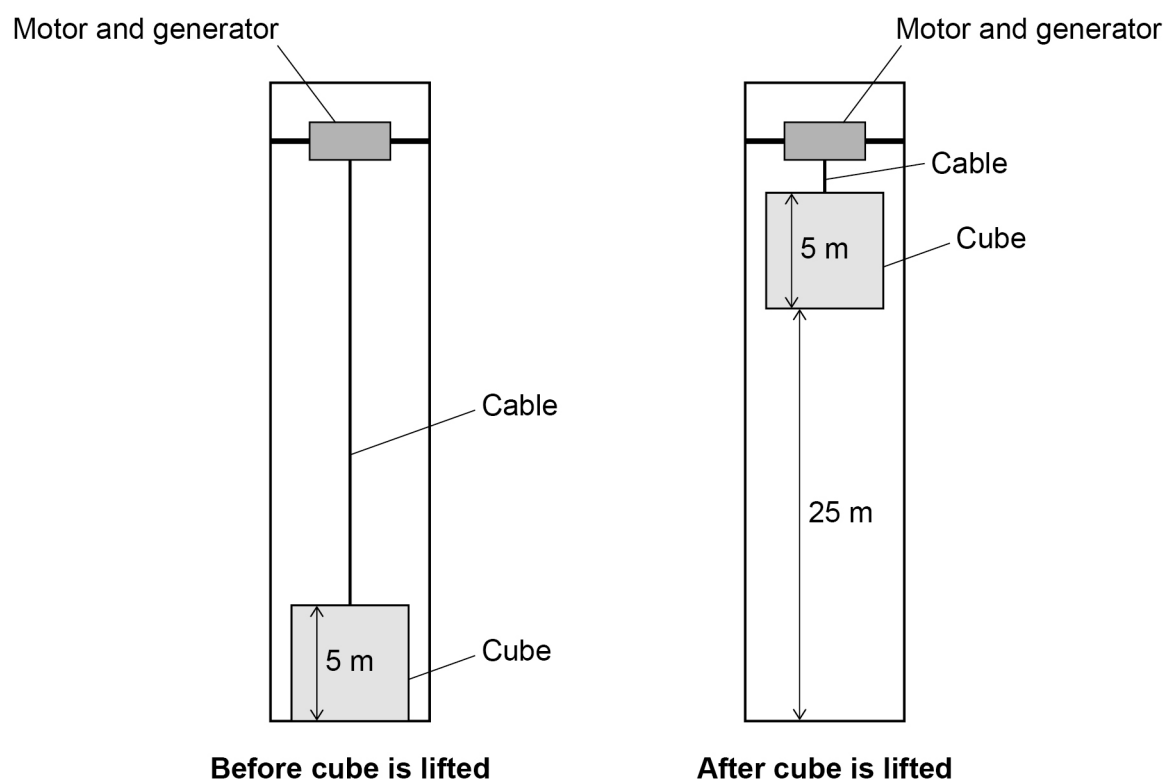
0 6

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



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

Turn over ►



0	6	.	3
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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

END OF QUESTIONS



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2 3

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