AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Physics Paper 1F

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.

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

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.

Do not write outside the box

0 1 There are different isotopes of the element lead.

0 1 . 1 What is the difference between the atoms of different isotopes of lead?

[1 mark]

Tick (✓) **one** box.

The number of electrons ☐

The number of neutrons ☐

The number of protons ☐

0 1 . 2 The isotope lead-210 is radioactive.

What is meant by 'lead-210 is radioactive'?

[1 mark]

Tick (✓) **one** box.

Lead-210 forms many different compounds. ☐

Lead-210 has unstable nuclei. ☐

Lead-210 melts at a low temperature. ☐

Do not write outside the box

0 1 . 3 The isotope lead-210 emits beta radiation.

What is beta radiation?

[1 mark]

Tick (✓) **one** box.

Electromagnetic radiation emitted from nuclei ☐

High speed electrons ejected from nuclei ☐

Particles that consist of two neutrons and two protons ☐

Question 1 continues on the next page

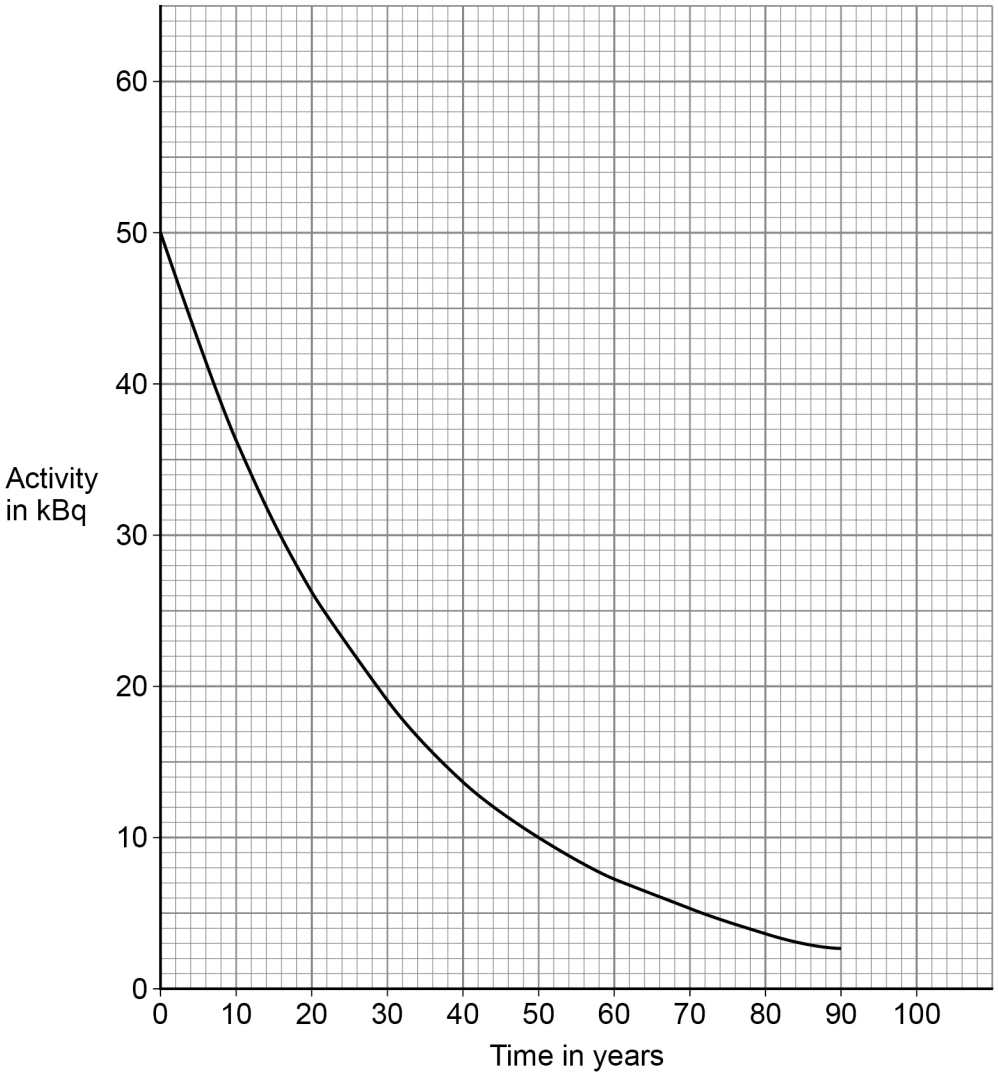
Do not write outside the box

The paint in an old painting contains the isotope lead-210.

The lead-210 in the paint can be used to estimate the age of the painting.

Figure 1 shows how the activity of the lead-210 in the paint changes with time.

Figure 1



0 1 . 4 What was the initial activity of the lead-210 in the paint?

Use **Figure 1**.

[1 mark]

Activity = _____ kBq

Do not write outside the box

0 1 . 5 Calculate the activity of the lead-210 in the paint after one half-life.

[1 mark]

Activity = _____ kBq

0 1 . 6 What was the estimated age of the painting when the activity was 10 kBq?

Use **Figure 1**.

[1 mark]

Age = _____ years

The paint also contains other radioactive substances.

0 1 . 7 A scientist removed the other radioactive substances before measuring the activity.

The activity would be greater if the other radioactive substances were **not** removed.

How would the estimate of the age of the painting be different if the activity was greater?

Use **Figure 1**.

[1 mark]

Tick (✓) **one** box.

The estimated age would be lower ☐

The estimated age would be the same ☐

The estimated age would be greater ☐

Do not write outside the box

The other radioactive substances in the paint emit different types of radiation.

0 1 . 8 Complete the sentence.

Choose the answer from the box.

[1 mark]

alpha	**beta**	**gamma**

The type of radiation with the greatest range in air is _____.

0 1 . 9 Complete the sentence.

Choose the answer from the box.

[1 mark]

alpha	**beta**	**gamma**

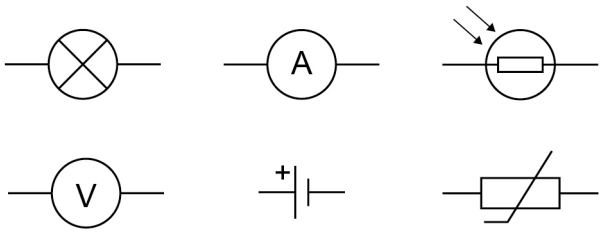
The type of radiation that is the least penetrating is _____.

9

Do not write outside the box

0 2 **Figure 2** shows circuit symbols for some electrical components.

Figure 2



A student connects a circuit to measure the current in a filament lamp.

The student uses:

- an ammeter
- a cell
- a filament lamp.

0 2 . 1 Draw a circuit diagram for a circuit the student could use to measure the current in a filament lamp.

You should use **three** of the circuit symbols from **Figure 2**.

[3 marks]

Turn over ►

Do not write outside the box

0 2 . 2 Which component is the source of energy for the circuit?

[1 mark]

Tick (✓) **one** box.

Ammeter ☐

Cell ☐

Filament lamp ☐

0 2 . 3 There is a current of 1.5 A in the filament lamp for a time of 30 s.

Calculate the charge flow in the filament lamp.

Use the equation:

charge flow = current × time

[2 marks]

Charge flow = _____ C

Do not write outside the box

0 2 . 4 The current in the filament lamp is 1.5 A when the potential difference across the filament lamp is 12 V.

Calculate the resistance of the filament lamp.

Use the equation:

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

Choose the unit from the box.

[3 marks]

Ω	**°C**	**W**

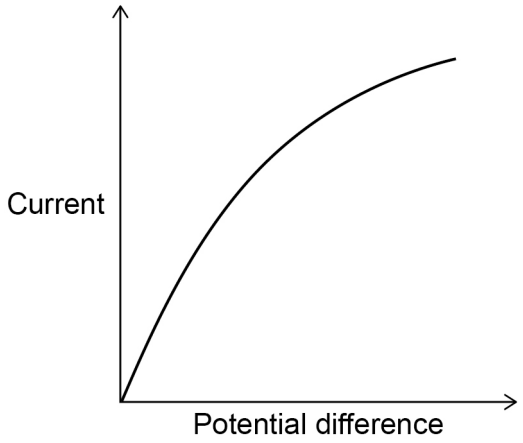
Resistance = _____ Unit _____

Question 2 continues on the next page

Do not write outside the box

Figure 3 shows how the current varies with potential difference for the filament lamp.

Figure 3



0 2 . 5 Describe the relationship between potential difference and current for the filament lamp.

[2 marks]

0 2 . 6 As the current in the filament lamp increases, the temperature of the filament lamp increases.

What happens to the resistance of the filament lamp as the temperature increases?

[1 mark]

Do not write outside the box

0 2 . 7 In most homes, filament lamps have been replaced with LED bulbs.

Table 1 shows information about a filament lamp and an LED bulb.

Table 1

	Input power in watts	Brightness in arbitrary units
Filament lamp	40	800
LED bulb	8	800

Explain the advantages of using LED bulbs instead of filament lamps.

You should include a calculation in your answer.

[4 marks]

Extra space

16

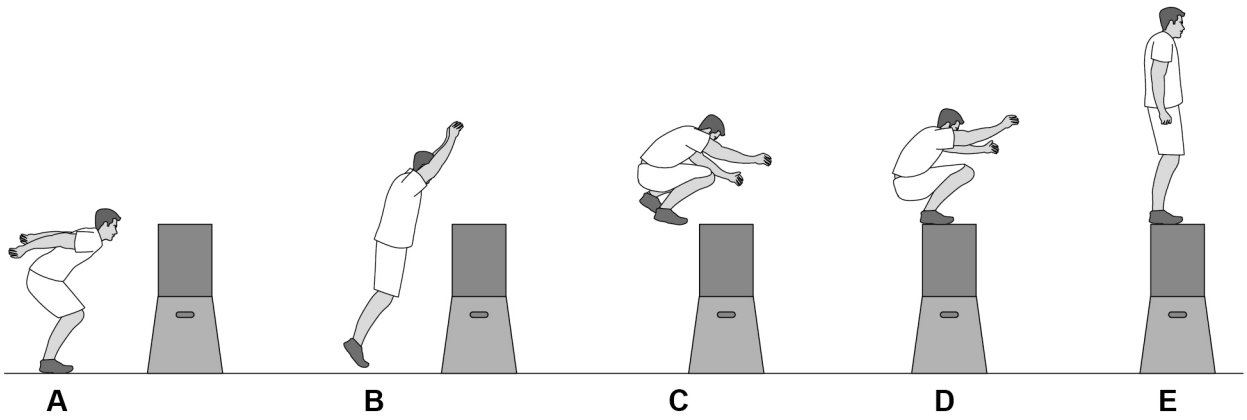
Turn over for the next question

Do not write outside the box

0 3 A person performs a 'vertical box jump'.

Figure 4 shows five different stages, **A**, **B**, **C**, **D** and **E**, of the jump.

Figure 4



0 3 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

A	**B**	**C**	**D**	**E**

The person has the least gravitational potential energy at stage _____.

The person has the greatest kinetic energy at stage _____.

Do not write outside the box

0 3 . 2 The person in **Figure 4** has a mass of 60 kg.

The person leaves the ground with a speed of 5.5 m/s.

Calculate the kinetic energy of the person.

Use the equation:

$$\text{kinetic energy} = 0.5 \times \text{mass} \times (\text{speed})^2$$

[2 marks]

Kinetic energy = _____ J

0 3 . 3 The person has a mass of 60 kg.

The height of the jump is 1.5 m.

gravitational field strength = 9.8 N/kg

Calculate the gravitational potential energy of the person at a height of 1.5 m.

Use the equation:

gravitational potential energy = mass × gravitational field strength × height

[2 marks]

Gravitational potential energy = _____ J

Question 3 continues on the next page

Do not write outside the box

0 3 . 4 The person jumps onto a box higher than the one in **Figure 4**, on page 12.

To jump onto a higher box, the person's speed when leaving the ground is different.

Explain how the speed is different when jumping onto a higher box.

You should answer in terms of gravitational potential energy and kinetic energy.

[3 marks]

0 3 . 5 Suggest **one** reason why a person is more likely to be injured when falling off a higher box.

[1 mark]

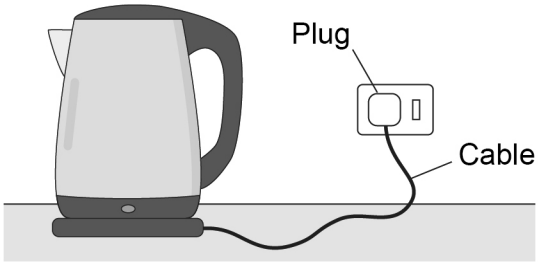
10

Do not write outside the box

0 4 **Figure 5** shows a plastic kettle.

The kettle is connected to the mains electricity supply.

Figure 5



0 4 . 1 What is the frequency of the UK mains electricity supply?

[1 mark]

Tick (✓) **one** box.

25 Hz ☐

50 Hz ☐

75 Hz ☐

100 Hz ☐

Question 4 continues on the next page

Do not write outside the box

0 4 . 2 The cable that connects the kettle to the plug contains two insulated wires.

Draw **one** line from each wire to the colour of the insulation on the wire.

[2 marks]

Wire	Colour of insulation
Live	Blue
Neutral	Brown
	Green and yellow stripes

Use the Physics Equations Sheet to answer questions **04.3** and **04.4**.

0 4 . 3 Write down the equation that links current (I), potential difference (V) and power (P).

[1 mark]

Do not write outside the box

0 4 . 4 The power of the heating element in the kettle is 2100 W.

The potential difference across the heating element is 230 V.

Calculate the current in the heating element.

Give your answer to 2 significant figures.

[4 marks]

Current (2 significant figures) = _____ A

0 4 . 5 The kettle is designed to switch off when the water reaches boiling point.

Before the kettle switches off, 0.0080 kg of water changes state.

The energy transferred to change the state of the water is 18 000 J.

Calculate the specific latent heat of vaporisation of the water.

Use the Physics Equations Sheet.

[3 marks]

Specific latent heat of vaporisation = _____ J/kg

Turn over ►

Do not write outside the box

0 4 . 6 A different kettle is used to heat some water.

The useful output energy transferred to the water is 75 600 J.

The total input energy transferred by the kettle is 84 000 J.

Calculate the efficiency of the kettle.

Use the equation:

$$\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$$

[2 marks]

Efficiency = _____

0 4 . 7 Explain **one** advantage of electrical appliances having a high efficiency.

[2 marks]

15

Do not write outside the box

0 5 Fossil fuels are burned in car engines and in power stations.

0 5 . 1 Describe how different energy stores change in a car engine when a fossil fuel is burned.

[2 marks]

0 5 . 2 Some car engines burn a fuel that is produced using plants.

Name a fuel produced using plants.

[1 mark]

0 5 . 3 Some cars do **not** contain an engine that burns a fuel.

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

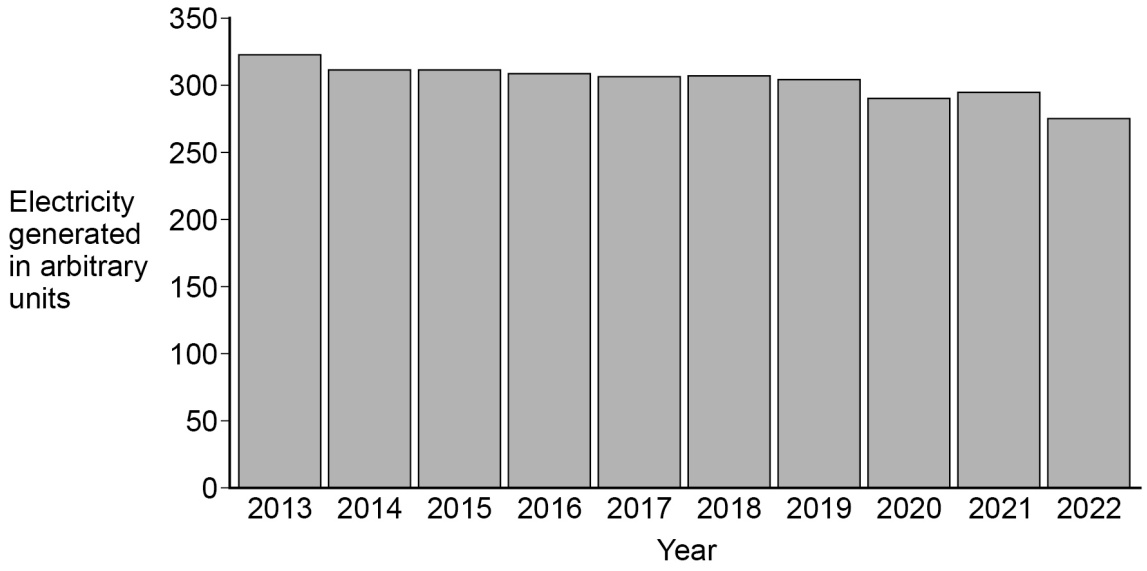
[1 mark]

Question 5 continues on the next page

Do not write outside the box

Figure 6 shows how the total amount of electricity generated in the UK has changed with time.

Figure 6



0 5 . 4 The proportion of electricity that is generated using renewable energy resources has increased since the year 2013.

Which conclusion is correct?

Use **Figure 6**.

[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. ☐

Do not write outside the box

0 5 . 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 5 . 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

Do not write outside the box

0 6 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 2 shows the results.

Table 2

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

0 6 . 1 Calculate the specific heat capacity of aluminium.

Use the Physics Equations Sheet.

[3 marks]

Specific heat capacity = _____ J/kg °C

Do not write outside the box

0 6 . 2 Describe a method the student could have used to obtain the results in **Table 2**.

[6 marks]

Extra space

Question 6 continues on the next page

Do not write outside the box

0 6 . 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

END OF QUESTIONS

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....
	.....