AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier — Physics Paper 1H

Specimen 2018 (set 2) — 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.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- 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.

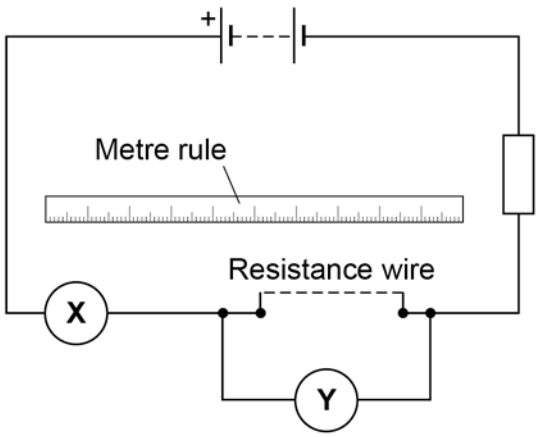
Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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

0 1 A student investigated how length affects resistance of a wire.

Figure 1 shows the circuit the student used.

Figure 1



0 1 . 1 The student took measurements using the meters **X** and **Y**.

Name meters **X** and **Y**.

[2 marks]

Meter **X** _____

Meter **Y** _____

Table 1 shows the results.

Table 1

	Resistance in Ω			
Length in m	**Test 1**	**Test 2**	**Test 3**	**Mean**
0.100	0.66	0.67	0.74	0.69
0.200	1.36	1.40	1.34	1.37
0.300	2.02	2.02	2.03	2.02
0.400	2.77	2.72	2.68	2.72
0.500	3.37	3.35	3.40	3.37
0.600	4.03	4.02	3.96	4.00

0 1 . 2 For which length of wire are the readings of resistance the most precise?

Give the reason for your answer.

[2 marks]

Length = _____ m

Reason _____

_____

0 1 . 3 Why did the student do three tests and calculate a mean?

[1 mark]

_____

_____

Question 1 continues on the next page

Turn over ►

0 1 . 4 Write the equation that links current, potential difference, and resistance.

[1 mark]

0 1 . 5 The potential difference across a piece of wire is 2.1 V

The current in the wire is 0.30 A

Calculate the resistance of the wire.

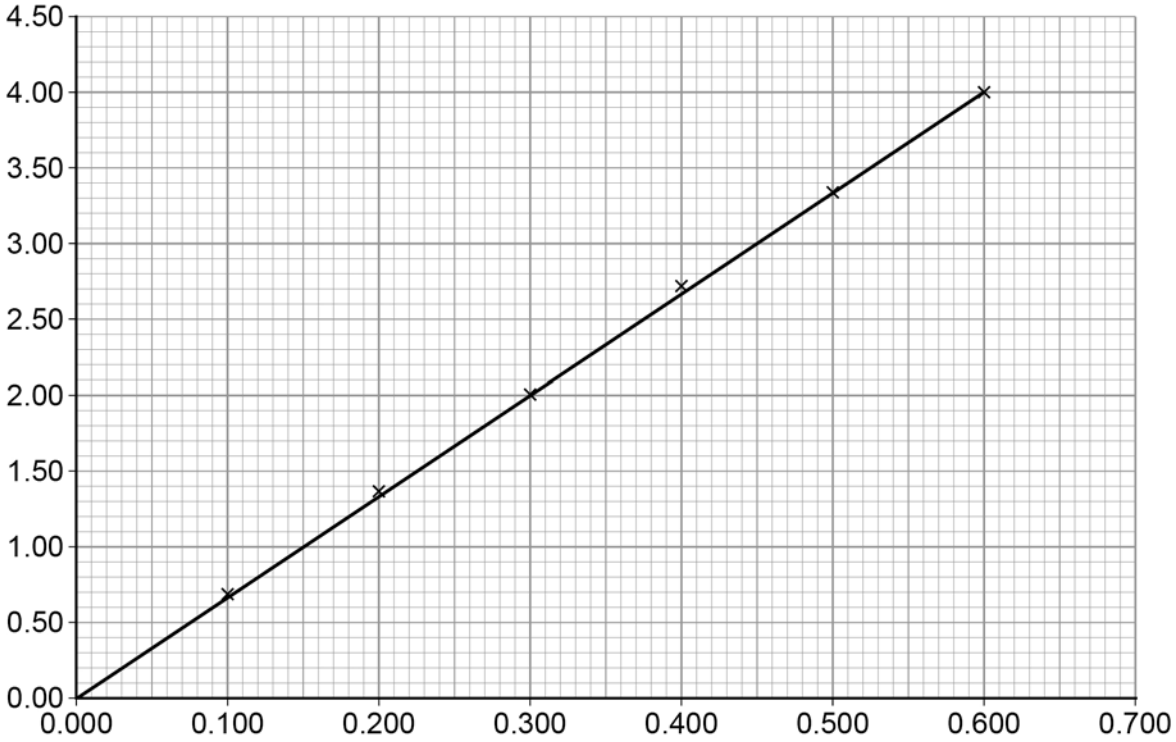
Write any equation that you use.

[3 marks]

Resistance = _____ Ω

Figure 2 shows a graph of the results.

Figure 2



0 1 . 6 What is the label for each axis of the graph?

[2 marks]

x-axis _____

y-axis _____

0 1 . 7 What conclusion can be made from the graph in **Figure 2**?

[1 mark]

_____

_____

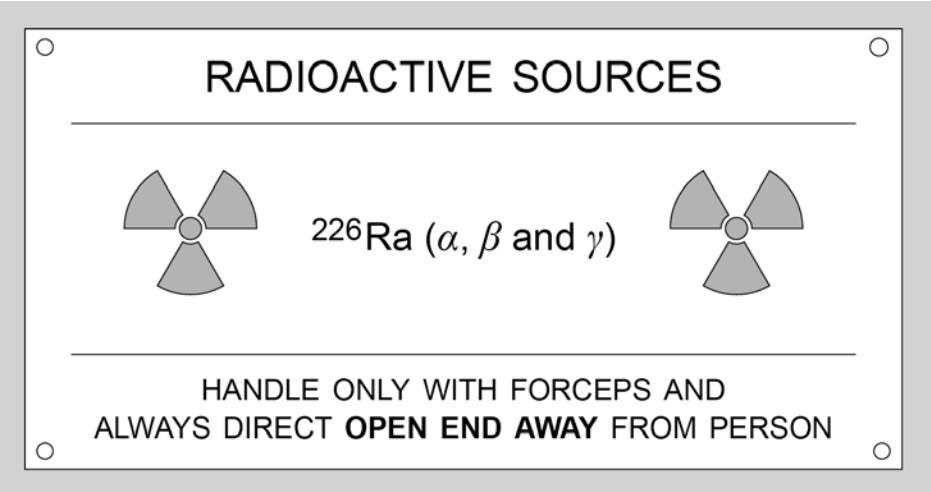
12

Turn over ►

0 2 **Figure 3** shows the label from a box containing radium-226.

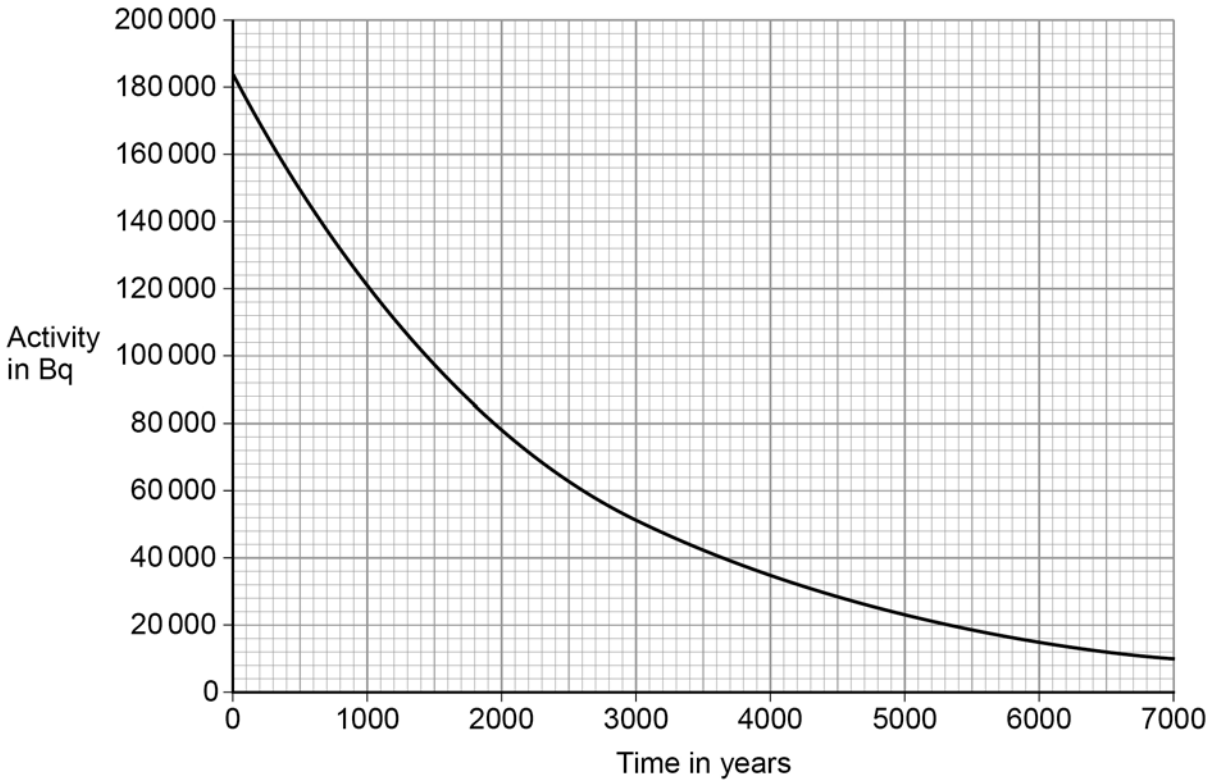
Radium-226 emits α, β and γ radiation.

Figure 3



0 2 . 1 **Figure 4** shows how the activity of the radium-226 will change.

Figure 4



Determine the half-life of radium-226.

Show your working on **Figure 4**.

[2 marks]

Half-life = _____ years

Question 2 continues on the next page

Turn over ►

0 2 . 2 Radium-226 was discovered by Marie Curie in 1898.

The notebooks she used were contaminated with radium-226 and are still hazardous.

Explain why the notebooks are still hazardous.

[2 marks]

0 2 . 3 Explain how the properties of α, β and γ radiation affect the level of the hazard at different distances.

[6 marks]

10

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 3 Some street lamps contain sodium.

Figure 5 shows two isotopes of sodium.

Figure 5

$^{23}_{11}Na$ $^{24}_{11}Na$

0 3 . 1 What are isotopes?

[2 marks]

0 3 . 2 How many protons and neutrons are in a nucleus of $^{23}_{11}Na$?

[2 marks]

Number of protons = _____

Number of neutrons = _____

0 3 . 3 The sodium atoms emit light.

What would cause light to be emitted from a sodium atom?

[1 mark]

Tick **one** box.

Electrons being emitted from the nucleus. ☐

Electrons falling to a lower energy level. ☐

Electrons leaving the atom when it is ionised. ☐

Electrons moving to a higher energy level. ☐

0 3 . 4 In a street lamp, solid sodium is melted and vaporised.

Describe how the arrangement of the sodium atoms changes as the sodium goes from solid to liquid to gas.

[4 marks]

Question 3 continues on the next page

Table 2 shows the power ratings of some types of sodium lamp.

Table 2

Type of sodium lamp	Power in Watts
A	35
B	50
C	70
D	100
E	150

0 3 . 5 Some main roads are lit by type **E** sodium lamps.

Calculate the energy transferred by one type **E** sodium lamp in 1 hour.

[3 marks]

Energy transferred = _____ J

0 3 . 6 Many housing estates are lit by type **A** sodium lamps.

Suggest **two** advantages of using type **A** sodium lamps on housing estates.

[2 marks]

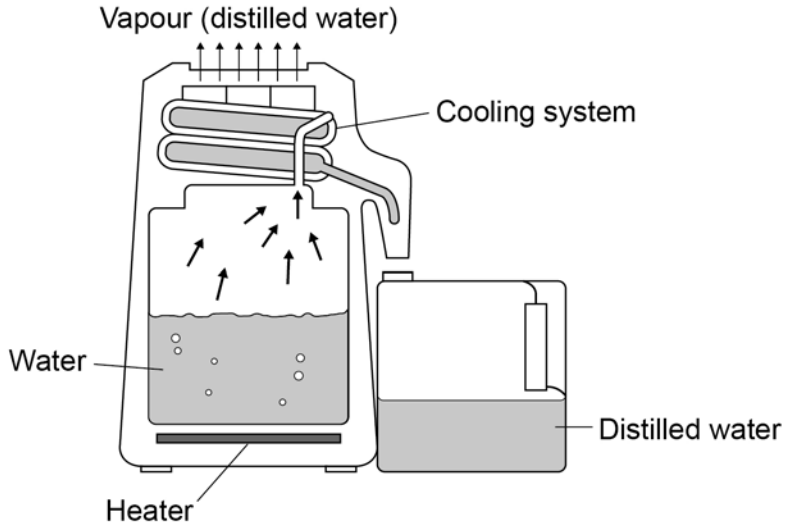
1 _____

2 _____

14

0 4 **Figure 6** shows a water distiller which is used to purify water.

Figure 6



The distiller boils water and then condenses most of the water vapour back to water.

0 4 . 1 The water distiller is filled with 5.0 kg of water at 20 °C

The specific heat capacity of water = 4 200 J/Kg °C

Calculate the energy needed to raise the temperature of the water to 100 °C

Use the Physics Equations Sheet.

[3 marks]

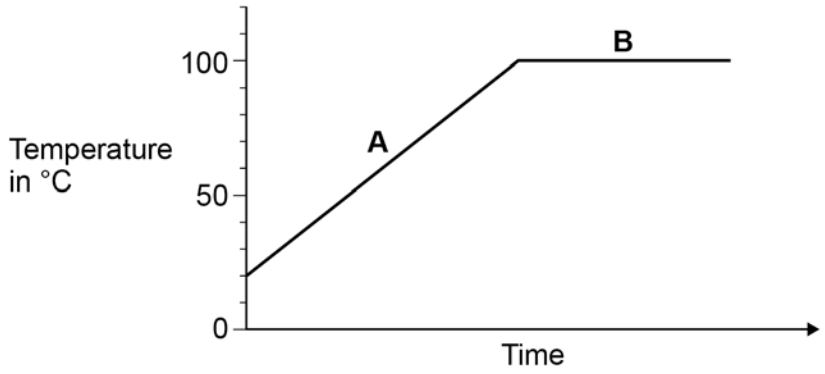
Energy = _____ J

Question 4 continues on the next page

Turn over ►

Figure 7 shows how the temperature of the water in the distiller changes with time.

Figure 7



0 4 . 2 Energy is transferred to the water at a constant rate.

Explain why the graph is a different shape in parts **A** and **B**.

[3 marks]

0 4 . 3 When the water drops to a low level, the heater automatically switches off.

Explain what problem would be caused if the heater did **not** automatically switch off.

[3 marks]

0 4 . 4 The distiller is connected to the mains by a three-core cable.

The wires are covered by different coloured insulation.

What colour is the insulation covering each of the wires?

[2 marks]

Live wire _____

Neutral wire _____

Earth wire _____

Question 4 continues on the next page

0 4 . 5 Which statement gives the purpose of the earth wire?

[1 mark]

Tick **one** box.

It carries an alternating potential difference. ☐

It melts if the current in the circuit is too high. ☐

It provides a connection to complete the circuit. ☐

It stops the casing of the appliance becoming live. ☐

0 4 . 6 The heating element has a power of 2.5 kW

The resistance of the heating element is 17 Ω

Calculate the current in the heating element.

Give your answer to 2 significant figures.

Write any equations that you use.

[5 marks]

Current = _____ A

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Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 5 On 7th June 2017 more than 50% of the electricity generated in the UK was from renewable sources.

0 5 . 1 Suggest **two** environmental conditions in the UK on 7th June 2017.

[2 marks]

1 _____

_____

2 _____

_____

0 5 . 2 At midday 35.4 GW of electricity was generated.

20.8% of this was provided by gas-fired power plants.

Calculate the energy per second that was provided by gas-fired power stations.

[3 marks]

_____

_____

_____

Energy per second = _____ J

0 5 . 3 Some of the electricity generated was from low-carbon sources.

Low-carbon sources emit very little carbon dioxide.

Name **one** non-renewable resource that is a low-carbon source.

[1 mark]

_____

0 5 . 4 In the UK, electricity is delivered to consumers by the National Grid.

Explain the main features of the National Grid.

[6 marks]

Question 5 continues on the next page

0 5 . 5 The National Grid supplied a house with 18 000 000 J of energy in 1 hour.

What was the average current supplied to the house during that hour?

Write any equations that you use.

[5 marks]

Current = _____ A

17

END OF QUESTIONS