

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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# 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

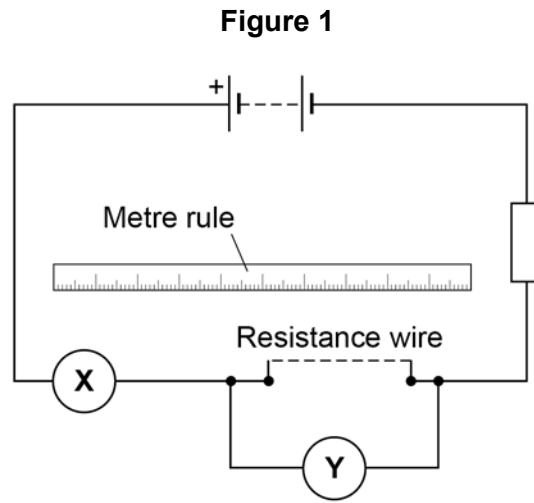
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
<b>TOTAL</b>	

0 1

A student investigated how length affects resistance of a wire.

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



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

Length in m	Resistance in $\Omega$			
	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]**

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**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]**

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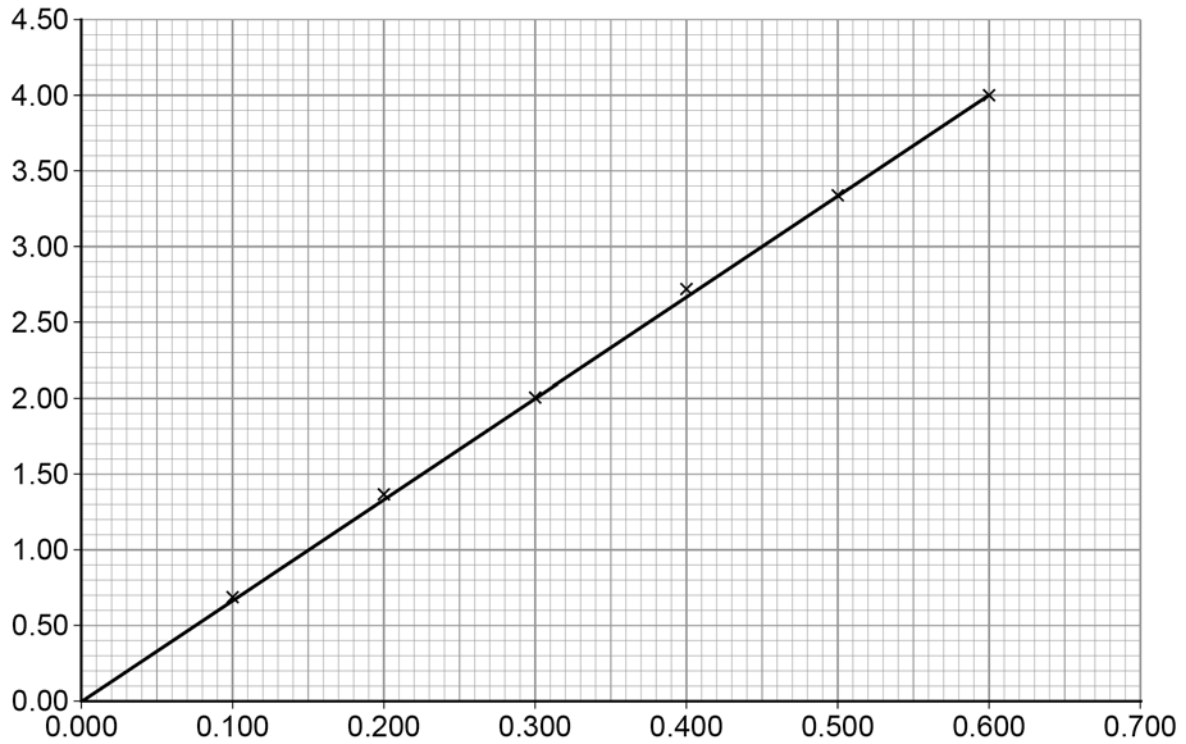
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Resistance = \_\_\_\_\_  $\Omega$

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]

\_\_\_\_\_  
\_\_\_\_\_

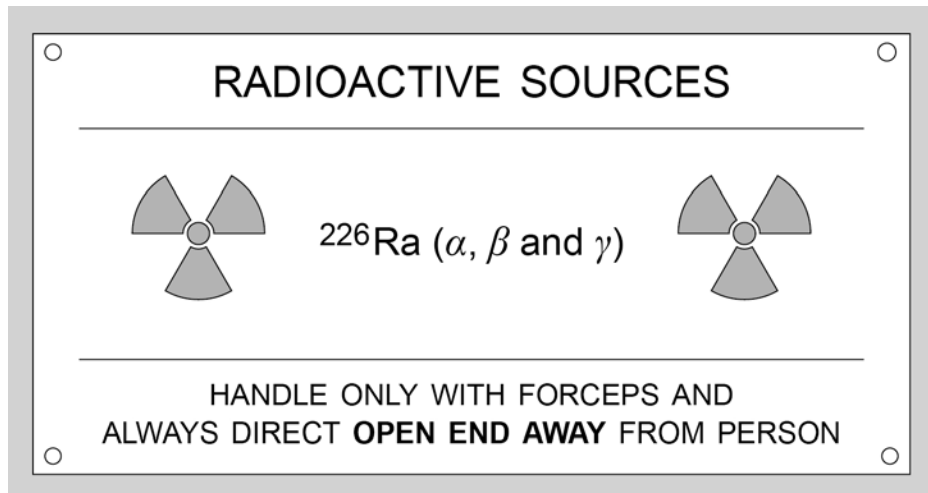
Turn over ►

0 2

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

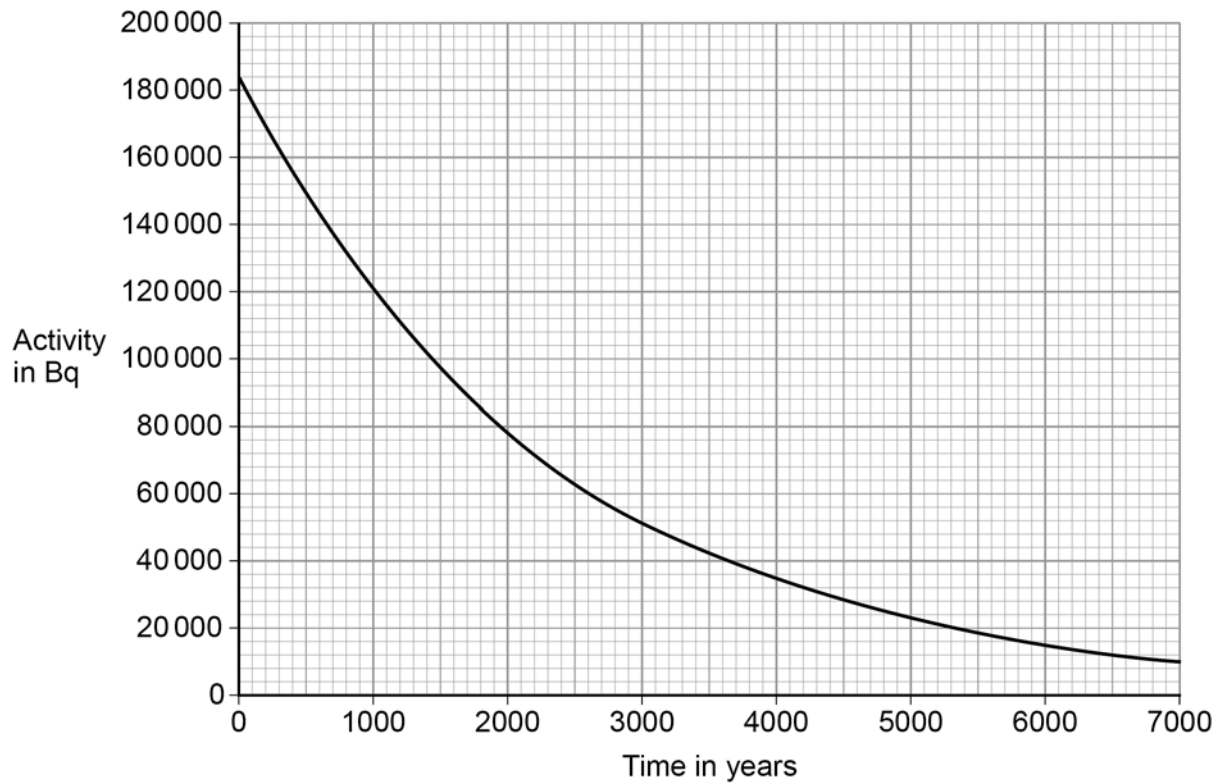
Radium-226 emits  $\alpha$ ,  $\beta$  and  $\gamma$  radiation.

**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]**

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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]

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0 2 . 3 Explain how the properties of  $\alpha$ ,  $\beta$  and  $\gamma$  radiation affect the level of the hazard at different distances.

[6 marks]

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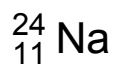
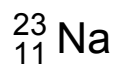
**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**

**Turn over ►**

**0 3**

Some street lamps contain sodium.

**Figure 5** shows two isotopes of sodium.**Figure 5****0 3 . 1**

What are isotopes?

**[2 marks]**

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

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Question 3 continues on the next page

Turn over ►

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

**Table 2**

Type of sodium lamp	Power in Watts
<b>A</b>	35
<b>B</b>	50
<b>C</b>	70
<b>D</b>	100
<b>E</b>	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]**

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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]**

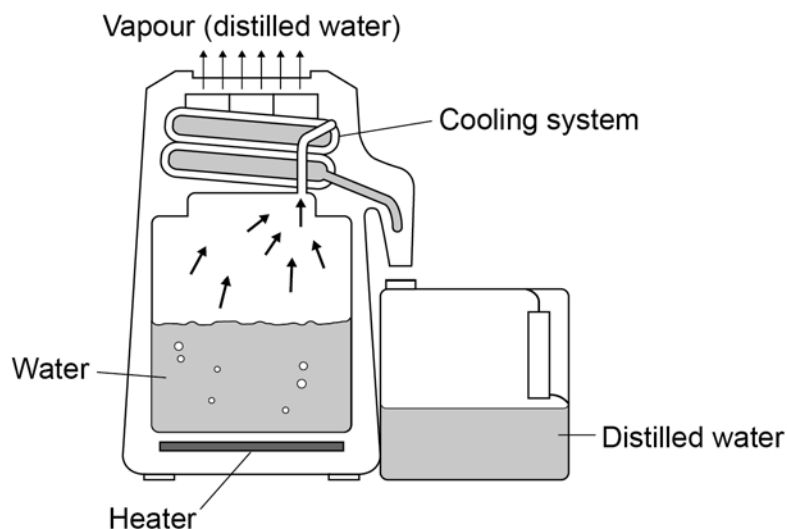
1 \_\_\_\_\_

2 \_\_\_\_\_

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

Write any equation that you use.

[3 marks]

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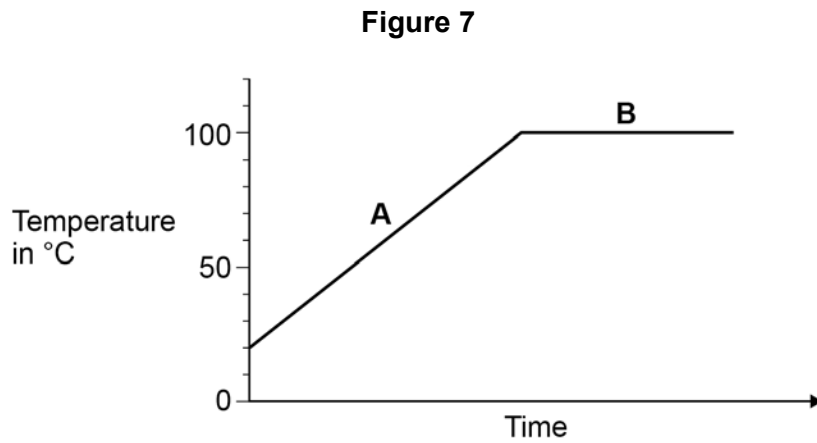
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Energy = \_\_\_\_\_ J

Question 4 continues on the next page

Turn over ►

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



**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]**

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**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]**

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**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**

**Turn over ►**

**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  $17 \Omega$

Calculate the current in the heating element.

Give your answer to 2 significant figures.

Write any equations that you use.

**[5 marks]**

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Current = \_\_\_\_\_ A



**Turn over for the next question**

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ANSWER IN THE SPACES PROVIDED**

**Turn over ►**

**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]**

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**Question 5 continues on the next page**

**Turn over ►**

0	5	.	5
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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]**

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Current = \_\_\_\_\_ A

17
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**END OF QUESTIONS**

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