AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier — Physics Paper 1F

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	
6	
7	
TOTAL	

0 1 Water exists as ice, water or steam.

0 1 . 1 Complete the sentences.

Choose the answers from the box.

[2 marks]

ice	**steam**	**water**

The particles are arranged in a regular pattern in _____ .

The particles are close together but not in a pattern in _____ .

The particles move quickly in all directions in _____ .

0 1 . 2 Which will have the most internal energy?

[1 mark]

Tick **one** box.

1 kg of ice ☐

1 kg of steam ☐

1 kg of water ☐

0 1 . 3 Which will have the lowest density?

[1 mark]

Tick **one** box.

Ice ☐

Steam ☐

Water ☐

Figure 1 shows an iceberg floating in the sea.

Figure 1

0 1 . 4 The iceberg has a mass of 11 200 kg

The volume of the iceberg is 12.0 m^3

Calculate the density of the iceberg.

Use the equation:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

[2 marks]

Density = _____ kg/m^3

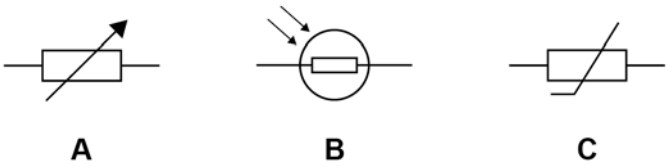
0 1 . 5 Explain why the iceberg will melt.

[2 marks]

8

0 2 **Figure 2** shows the circuit symbol for three different components.

Figure 2



0 2 . 1 Which component is a variable resistor?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

0 2 . 2 Which component is a thermistor?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

0 2 . 3 In which component will the resistance decrease when the temperature increases?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

0 2 . 3 In which component will the resistance decrease when the light intensity increases?

[1 mark]

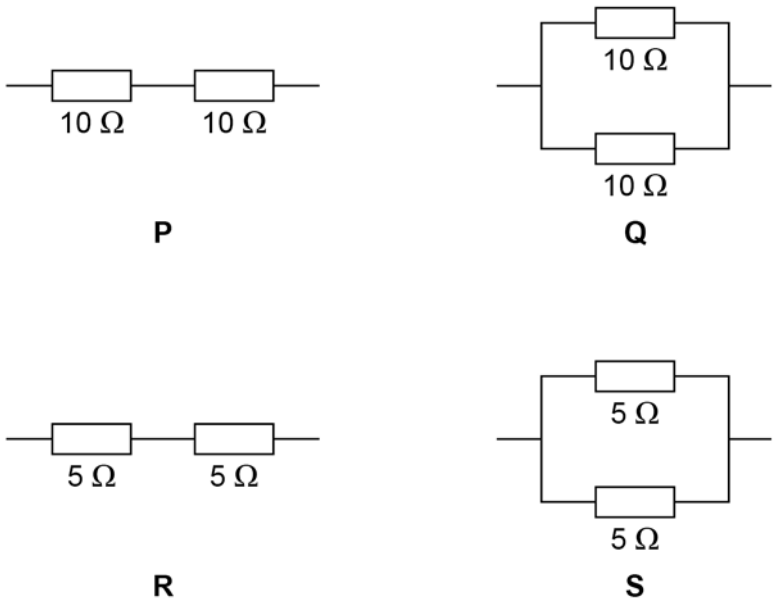
Tick **one** box.

A ☐ **B** ☐ **C** ☐

Question 2 continues on the next page

Figure 3 shows four different arrangements of resistors.

Figure 3



0 2 . 5 Two of the arrangements are in series and two are in parallel.

Describe the different between a series and a parallel arrangement.

[2 marks]

0 2 . 6 Which arrangement has a resistance of 10 Ω?

[1 mark]

Tick **one** box.

P ☐ **Q** ☐ **R** ☐ **S** ☐

0 2 . 7 Which arrangement has the highest resistance?

[1 mark]

Tick **one** box.

P ☐ **Q** ☐ **R** ☐ **S** ☐

0 2 . 8 A student connects a resistor to a cell for 60 seconds.

The current through the resistor is 0.97 A

Calculate the charge flow.

Use the equation:

charge flow = current × time

Give your answer to 2 significant figures.

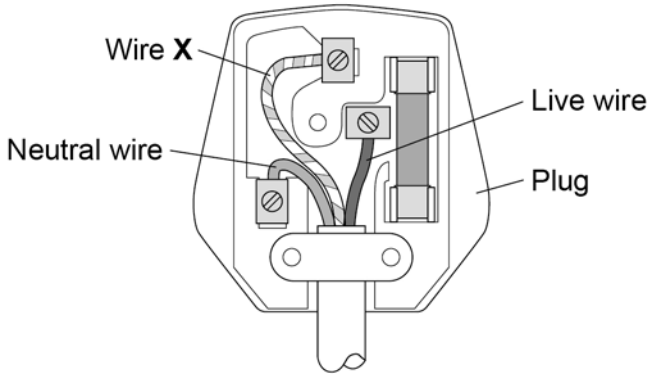
[3 marks]

Charge flow = _____ C

11

0 3 **Figure 4** shows a three pin plug connected to the cable of a metal toaster.

Figure 4



0 3 . 1 Name wire **X**.

[1 mark]

0 3 . 2 What does wire **X** do?

[1 mark]

Tick **one** box.

It provides extra energy to the toaster when needed. ☐

It completes the circuit in the toaster. ☐

It can prevent an electric shock from the toaster. ☐

It supplies the current to the toaster. ☐

0 3 . 3 The toaster is plugged in to the mains electricity supply.

What is the potential difference between the live and neutral wires?

[1 mark]

Tick **one** box.

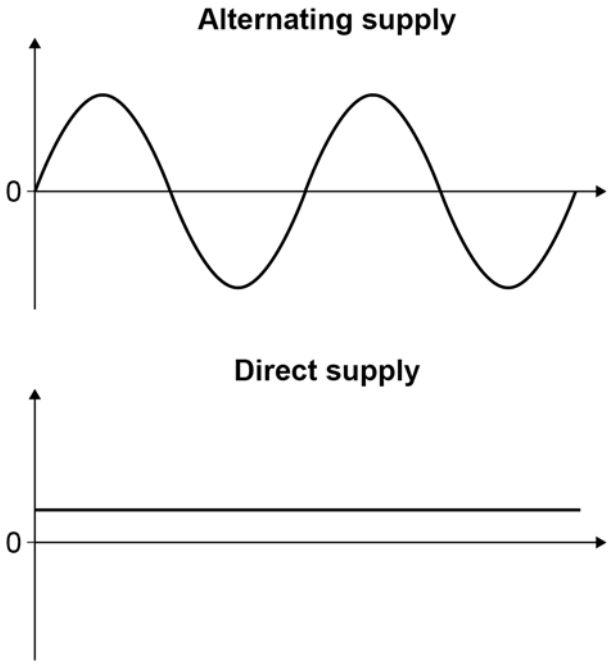
0 V ☐ 120 V ☐ 230 V ☐ 460 V ☐

0 3 . 4 Mains electricity is an alternating supply.

A battery is a direct supply.

Figure 5 shows an alternating supply and a direct supply.

Figure 5



Give **two** differences between the alternating supply and the direct supply.

[2 marks]

1 _____

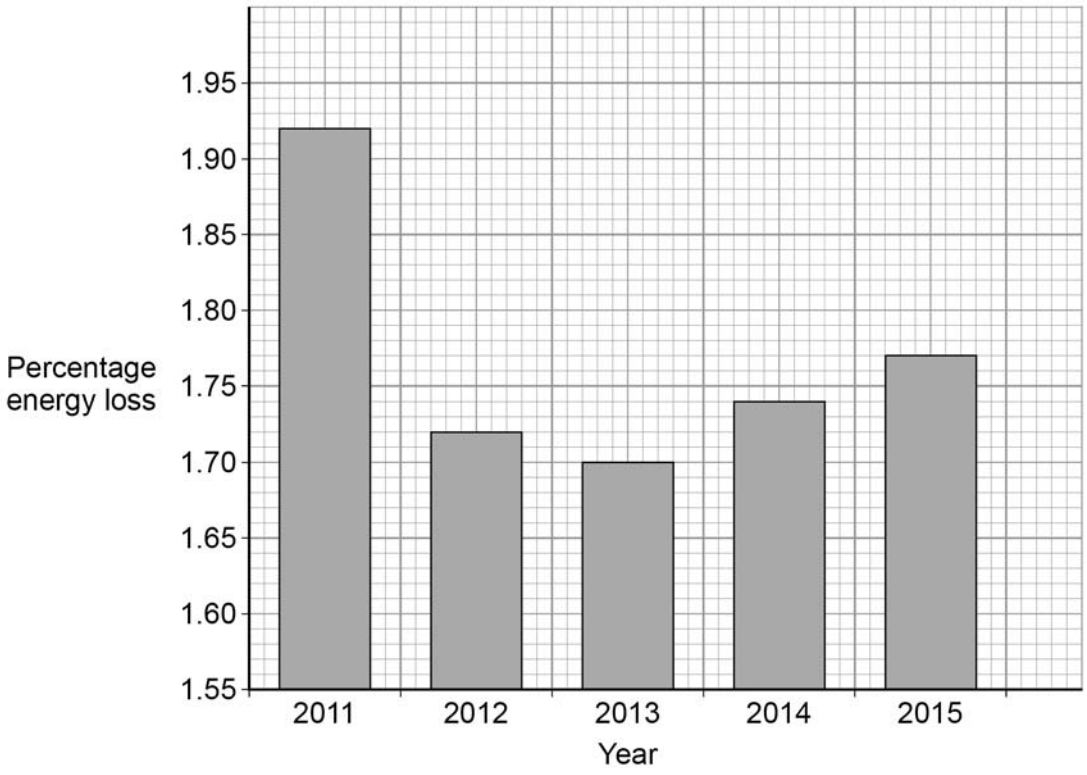
2 _____

Turn over ►

Energy is transferred to homes by the National Grid.

Figure 6 shows the percentage energy losses over the National Grid for different years.

Figure 6



0 3 . 5 Describe the changes in percentage energy loss.

[2 marks]

0 3 . 6 Calculate the mean percentage energy loss per year in **Figure 6**.

[3 marks]

Mean energy loss per year = _____ %

10

Turn over for the next question

0 4 **Figure 7** shows a student making potato soup.

Figure 7

0 4 . 1 The student places 0.5 kg of potato into a pan of water.

During cooking, the temperature of the potato increases from 20 °C to 100 °C

The specific heat capacity of the potato is 3400 J/kg °C

Calculate the change in thermal energy of the potato.

Use the equation:

change in thermal energy = mass × specific heat capacity × temperature change

[3 marks]

Change in thermal energy = _____ J

0 4 . 2 Why is the energy supplied by the cooker greater than that calculated in Question **04.1**?

[1 mark]

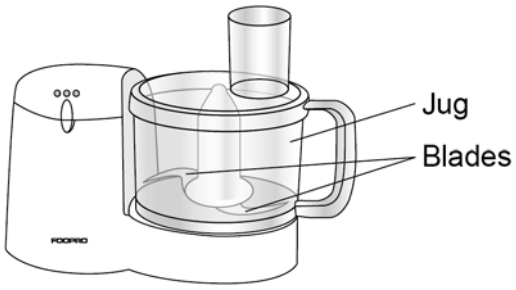
0 4 . 3 Suggest **one** way that the student could reduce the time to heat the potato to 100 °C

[1 mark]

Question 4 continues on the next page

Figure 8 shows a food processor.

Figure 8



0 4 . 4 The student places the cooked potato into the jug of the food processor.

The food processor contains a motor that spins blades to chop the potato.

The total power input to the motor is 500 W

The useful power output from the motor is 300 W

Calculate the efficiency of the motor in the food processor.

Use the equation :

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

[2 marks]

Efficiency = _____

0 4 . 5 The jug is made of plastic with a low thermal conductivity.

Explain why this is an advantage.

[2 marks]

_____

_____

_____

_____

9

Turn over for the next question

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 5 **Figure 9** shows a girl riding a self-balancing scooter.

Figure 9

0 5 . 1 The scooter has an electric motor powered by a battery.

During the ride the battery transfers 15 000 C of charge.

The potential difference across the battery is 36 V

Calculate the energy transferred by the battery.

Use the equation:

energy transferred = charge flow × potential difference

Give your answer in kJ

[3 marks]

Energy transferred = _____ kJ

Question 5 continues on the next page

Turn over ►

Table 1 gives data for two scooters with different motors.

Both motors have the same efficiency.

Table 1

	Power of motor in W	**Mass in kg**
Scooter A	500	10.5
Scooter B	700	14.0

0 5 . 2 Explain why scooter **B** has a higher maximum speed.

[2 marks]

0 5 . 3 Both scooters can be ridden for 20 minutes before the battery needs recharging.

Compare the amount of chemical energy stored in the batteries of each scooter.

[1 mark]

0 5 . 4 Write the equation that links energy transferred, power and time.

[1 mark]

0 5 . 5 Calculate the energy transferred by the motor in scooter **B** in 20 minutes.

[3 marks]

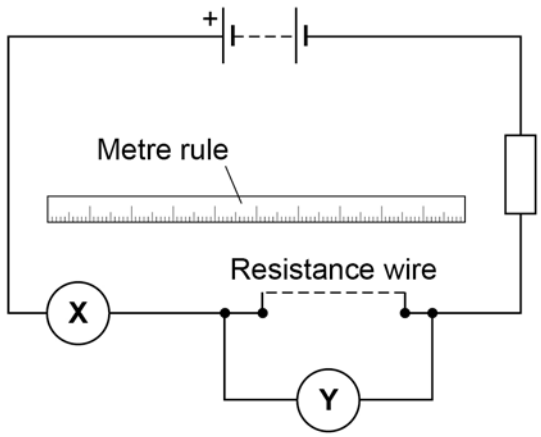
Energy transferred = _____ J

10

0 6 A student investigated how length affects resistance of a wire.

Figure 10 shows the circuit the student used.

Figure 10



0 6 . 1 The student took measurements using the meters **X** and **Y**.

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

[2 marks]

Meter **X** _____

Meter **Y** _____

Table 2 shows the results.

Table 2

	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 6 . 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 6 . 3 Why did the student do three tests and calculate a mean?

[1 mark]

_____

_____

Question 6 continues on the next page

Turn over ►

0 6 . 4 Write the equation that links current, potential difference, and resistance.

[1 mark]

0 6 . 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.

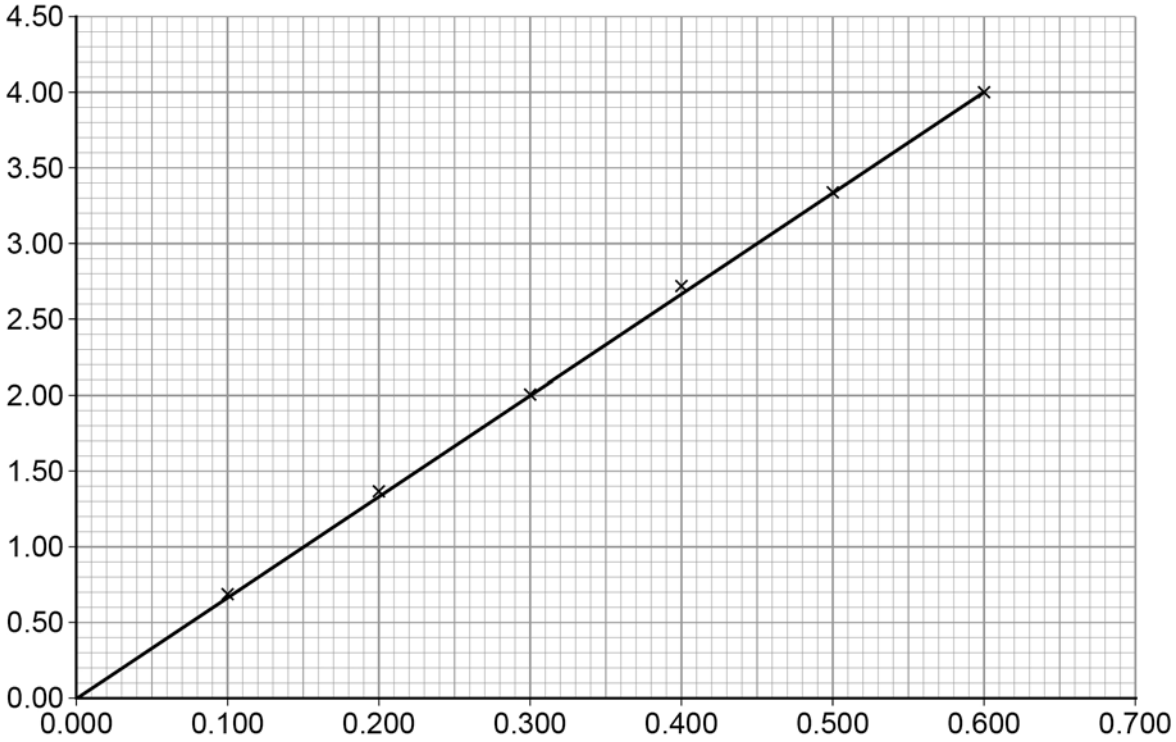
Write any equation that you use.

[3 marks]

Resistance = _____ Ω

Figure 11 shows a graph of the results.

Figure 11



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

[2 marks]

x-axis _____

y-axis _____

0 6 . 7 What conclusion can be made from the graph in **Figure 11**?

[1 mark]

_____

_____

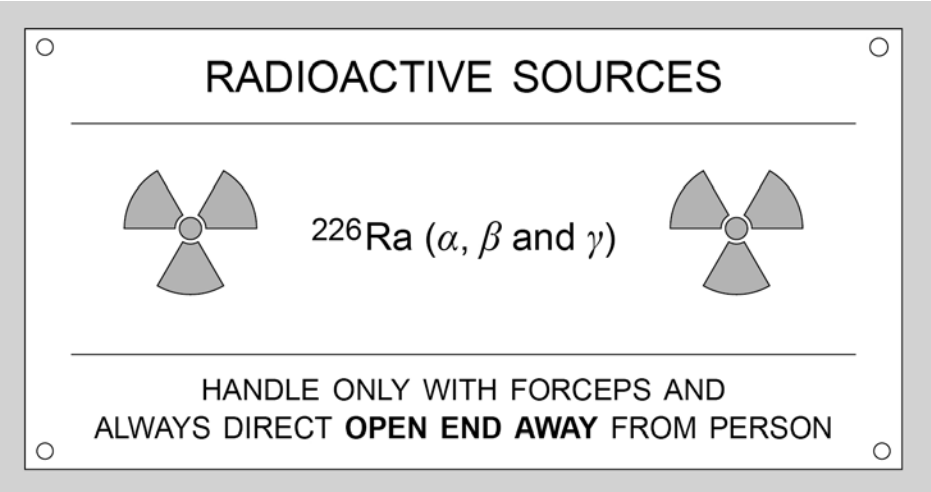
12

Turn over ►

0 7 **Figure 12** shows the label from a box containing radium-226

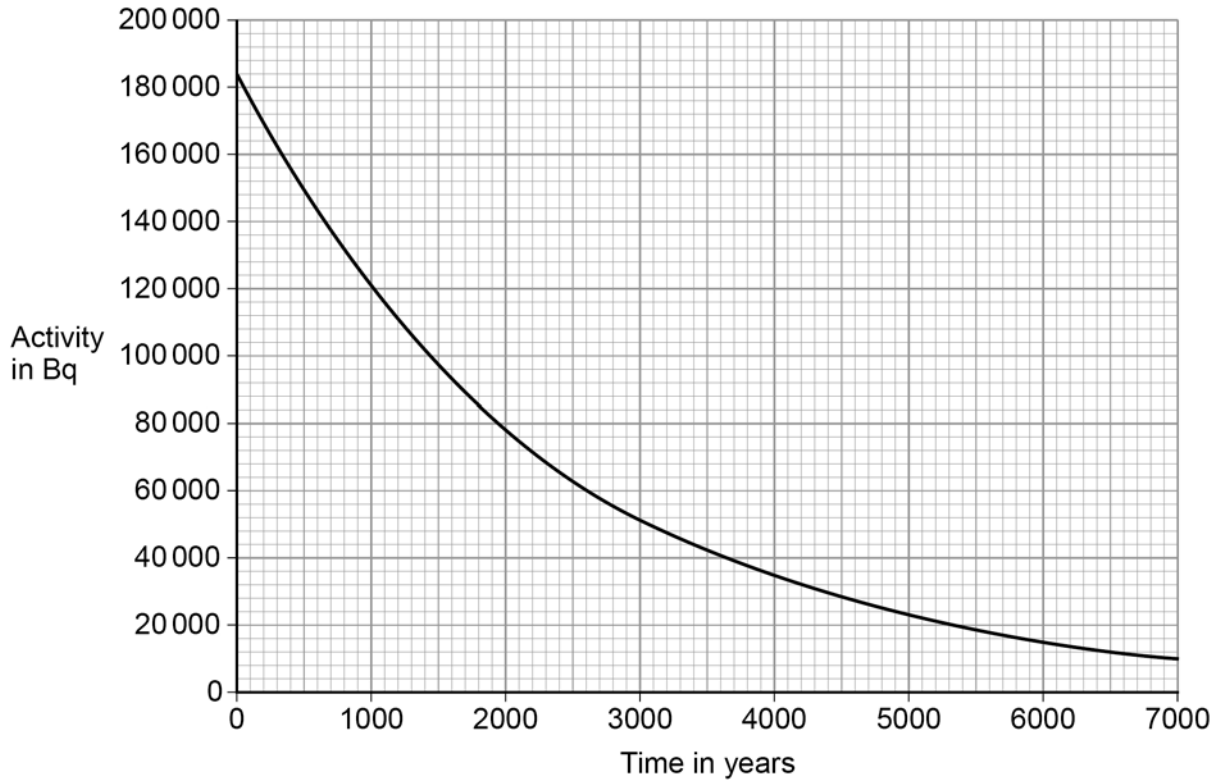
Radium-226 emits α, β and γ radiation.

Figure 12



0 7 . 1 **Figure 13** shows how the activity of the radium-226 will change.

Figure 13



Determine the half-life of radium-226.

Show your working on **Figure 13**.

[2 marks]

Half-life = _____ years

Question 7 continues on the next page

0 7 . 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 7 . 3 Explain how the properties of α, β and γ radiation affect the level of the hazard at different distances.

[6 marks]

END OF QUESTIONS

10