

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE COMBINED SCIENCE: TRILOGY

H

Higher Tier
Physics Paper 1H

Wednesday 23 May 2018

Afternoon

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.

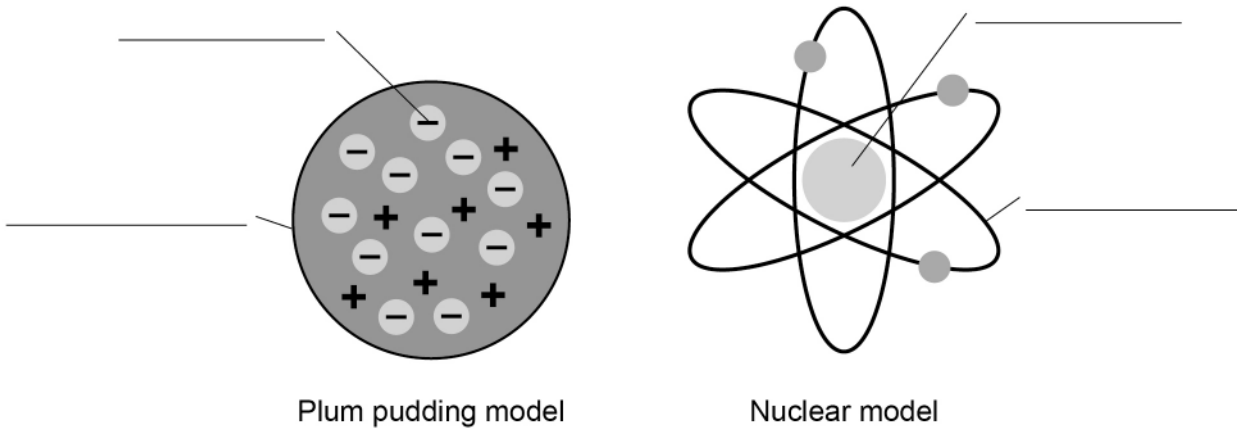
For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	



0 1

Figure 1 shows two models of the atom.

Figure 1



0 1 . 1

Write the labels on **Figure 1**

Choose the answers from the box.

[4 marks]

atom	electron	nucleus
neutron	orbit	proton

0 1 . 2

Explain why the total positive charge in every atom of an element is always the same.

[2 marks]



0 1 . 3

The results from the alpha particle scattering experiment led to the nuclear model.

Alpha particles were fired at a thin film of gold at a speed of 7% of the speed of light.

Determine the speed of the alpha particles.

Speed of light = 300 000 000 m/s

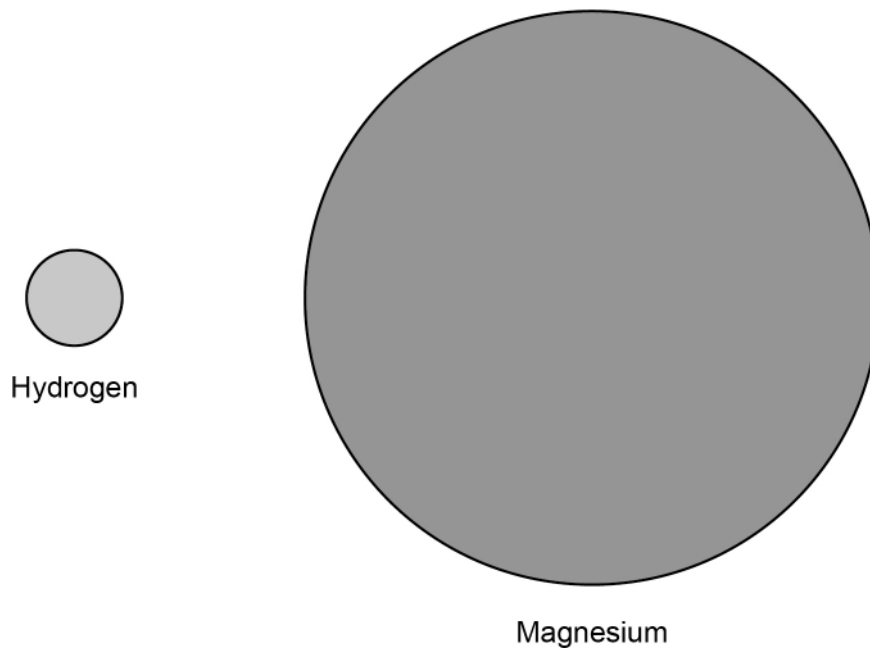
[2 marks]

Speed = _____ m/s

0 1 . 4

Figure 2 shows two atoms represented as solid spheres.

Figure 2



A hydrogen atom has a radius of 2.5×10^{-11} m

Determine the radius of a magnesium atom.

Use measurements from **Figure 2**

[2 marks]

Radius = _____ m

10

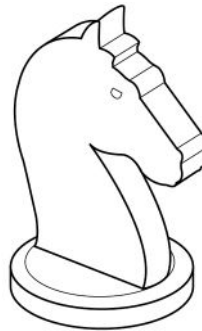
Turn over ►



0 2

A student wanted to determine the density of the irregular shaped object shown in **Figure 3**

Figure 3



0 2 . 1

Plan an experiment that would allow the student to determine the density of the object.

[6 marks]



0 2 . 2

Another student did a similar experiment.

He determined the density of five common plastic materials.

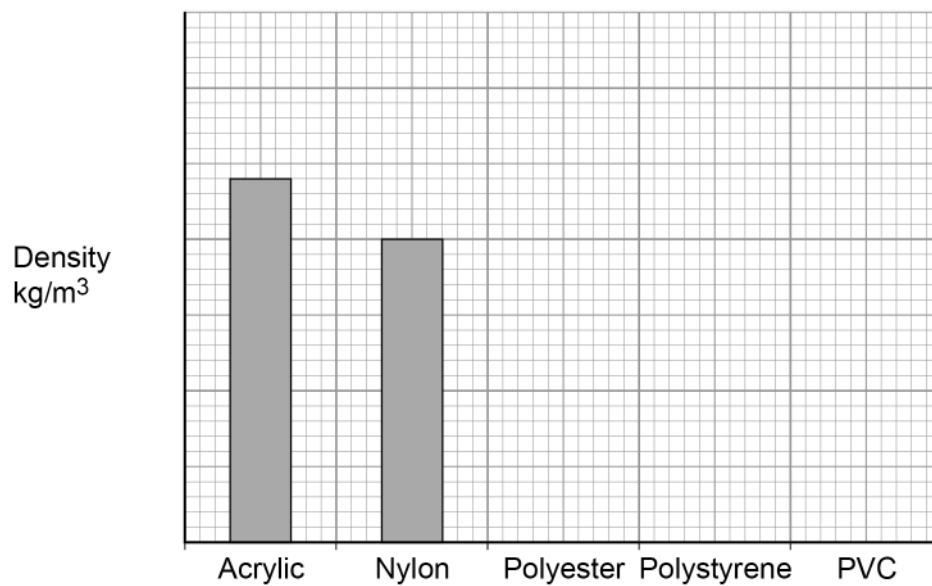
Table 1 shows the results.

Table 1

Plastic material	Density in kg/m^3
Acrylic	1200
Nylon	1000
Polyester	1380
Polystyrene	1040
PVC	1100

Figure 4 shows the results plotted in a bar chart.

Figure 4



Complete **Figure 4**

You should:

- Write the correct scale on the y-axis.
- Draw the bars for polyester, polystyrene and PVC.

[4 marks]

Turn over ►



0 2 . 3 The student is given a piece of a different plastic material.

The student determined the density of the material three times.

Table 2 shows the results.

Table 2

	Density in kg/m^3
1	960
2	1120
3	1040

Determine the uncertainty in the student's results.

[2 marks]

Uncertainty = _____ kg/m^3

12

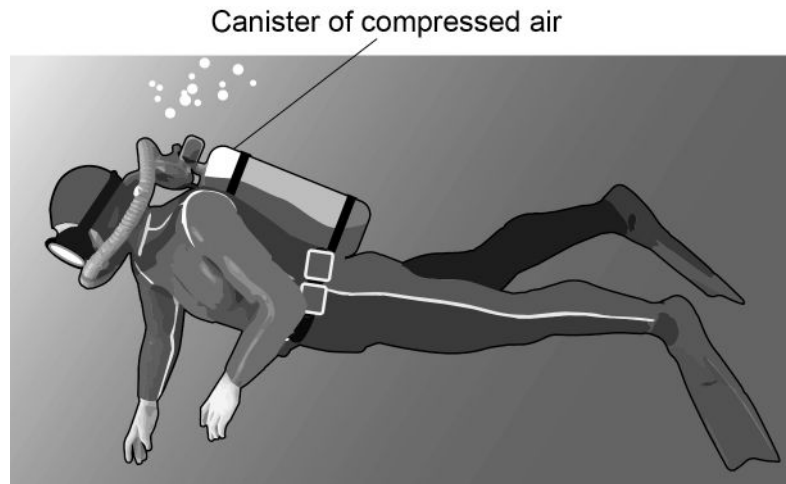


0 3

Figure 5 shows a diver.

The diver is using a canister of compressed air so that he can breathe underwater.

Figure 5



0 3 . 1

Which **two** sentences describe the movement of the air particles in the canister?

[2 marks]

Tick **two** boxes.

They vibrate about a fixed position.

They move in random directions.

The motion of all the particles is predictable.

They move with a range of different speeds.

They move in circular paths.

0 3 . 2

The temperature of the air inside the canister increases.

What happens to the movement of the air particles?

[1 mark]

Turn over ►



0 3 . 3

It could be dangerous if the temperature of the air inside the canister increased by a large amount.

Explain why.

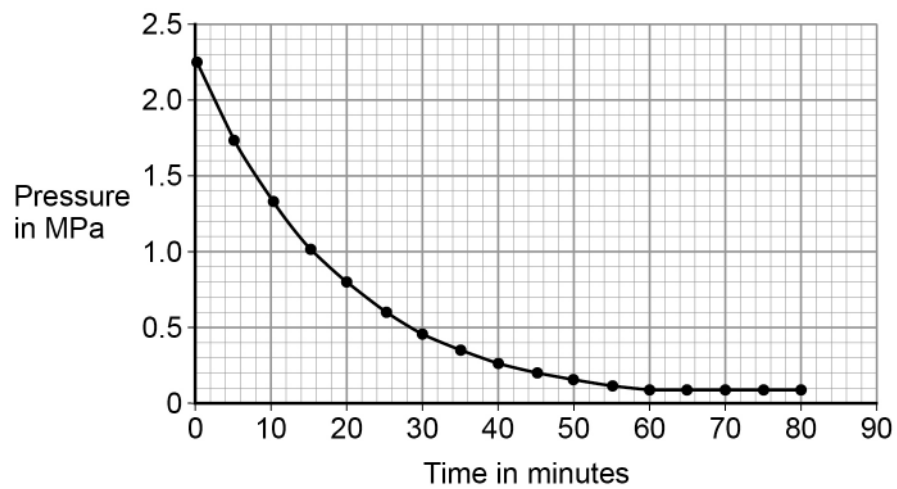
[2 marks]

A canister of air was tested to find out how the pressure changed when it was used by a diver.

- Air was allowed to escape from the canister.
- The pressure of the air in the canister was recorded every 5 minutes for 80 minutes.

Figure 6 shows the results.

Figure 6



0 3 . 4

Estimate the atmospheric pressure.

Use Figure 6

[1 mark]

Atmospheric pressure = _____ MPa



0 3 . 5 Divers can safely stay underwater until the pressure of the air in the canister has reduced to 25% of its original value.

Determine the maximum time the diver can safely stay underwater.

Use **Figure 6**

[3 marks]

Time = _____ minutes

0 3 . 6 What happens to the volume of the air when it is released from the canister?

[1 mark]

Turn over for the next question

10

Turn over ►



0 4

The Chernobyl disaster was a nuclear accident that happened in 1986

Radioactive isotopes were released into the environment.

The radioactive isotopes emitted alpha, beta and gamma radiation.

0 4 . 1

What is an alpha particle?

[1 mark]

Tick **one** box.

2 charged particles and 2 neutral particles.

2 charged particles and 4 neutral particles.

4 charged particles and 2 neutral particles.

4 charged particles and 4 neutral particles.

0 4 . 2

Which statement about beta radiation is true?

[1 mark]

Tick **one** box.

It is the fastest moving type of radiation.

It is the type of radiation with a negative charge.

It is the type of radiation with the greatest mass.

It is the type of radiation with the greatest range in air.



0 4 . 3 Which statement about gamma radiation is true?

[1 mark]

Tick **one** box.

It is a low frequency electromagnetic wave.

It causes the charge of the nucleus to change.

It causes the mass of the nucleus to change.

It has a very long range in air.

Question 4 continues on the next page

Turn over ►



Table 3 shows the half-lives of two of the radioactive isotopes that contaminated the environment.

Table 3

Isotope	Half-life
Caesium-137	30 years
Iodine-131	8 days

0 4 . 4

A soil sample was taken from the area around Chernobyl in 1986

The soil sample was contaminated with equal amounts of caesium-137 and iodine-131

Explain how the risk linked to each isotope has changed between 1986 and 2018

Both isotopes emit the same type of radiation.

[4 marks]

0 4 . 5

Determine the year when the activity of the caesium-137 in the soil sample will be 1/32 of its original value.

[3 marks]

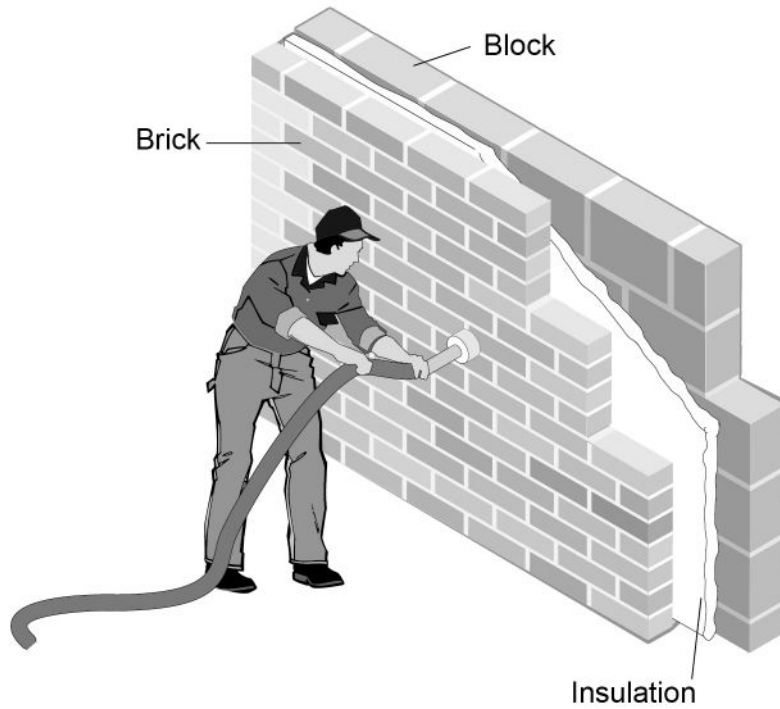
Year = _____



0 5

Figure 7 shows cavity wall insulation being installed in the wall of a house.

Figure 7



0 5 . 1

Explain how the wall reduces unwanted energy transfers.

[3 marks]

Question 5 continues on the next page

Turn over ►



0 5 . 2 The cavity insulation was tested.

- The heating inside the house was switched off.
- The temperature inside the house was measured every 20 minutes for 2 hours.

Table 4 shows the results.

Table 4

Time in minutes	Temperature in °C
0	25.0
20	20.8
40	17.4
60	14.5
80	12.1
100	10.0
120	8.4

Determine the temperature inside the house after 30 minutes.

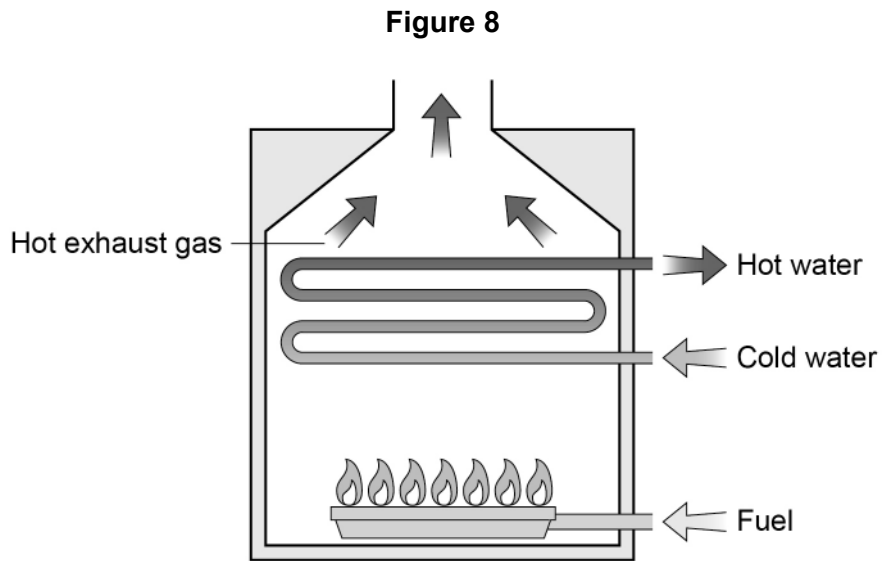
[2 marks]

Temperature = _____ °C



0 5 . 3

Figure 8 shows the gas boiler used to heat the house.



Describe how different energy stores are changed by the boiler.

[3 marks]

0 5 . 4

To heat the house, the boiler transfers 15 MJ of energy in 10 minutes.

Calculate the power of the boiler.

Write any equation that you use.

[4 marks]

Power = _____ W

Turn over for the next question

12

Turn over ►



0	6
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A student built a circuit using filament lamps.

0	6	.	1
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Sketch a current potential difference graph for a filament lamp on **Figure 9**

[2 marks]

Figure 9

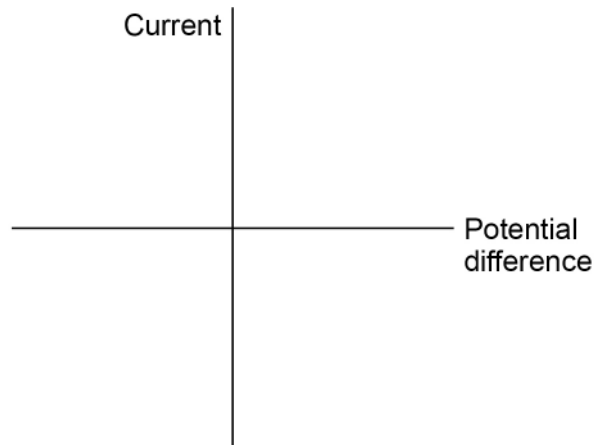
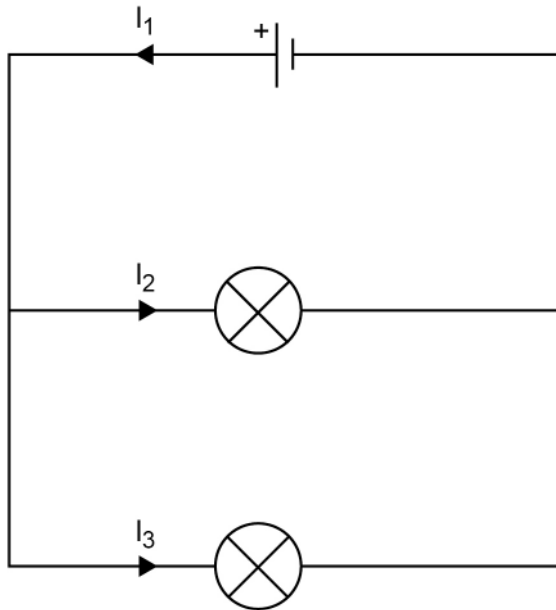


Figure 10 shows the circuit with two identical filament lamps.

Figure 10



0 6 . 2 Compare the currents I_1 , I_2 and I_3

[2 marks]

Question 6 continues on the next page

Turn over ►



0 6 . 3 Calculate the charge that flows through the cell in 1 minute.

Each filament lamp has a power of 3 W and a resistance of 12 Ω

Write any equations that you use.

Give the unit.

[6 marks]

Charge = _____

Unit = _____



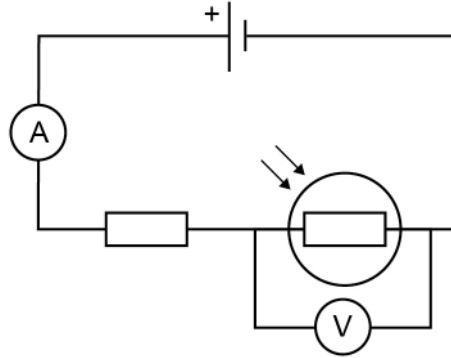
0 6 . 4

The student builds a different circuit.

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Figure 11 shows the circuit.

Figure 11



Explain how the readings on both meters change when the environmental conditions change.

[6 marks]

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED**

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