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# GCSE COMBINED SCIENCE: TRILOGY

# F

Foundation Tier  
Physics Paper 1F

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	
7	
<b>TOTAL</b>	



**0 1**

There are many different energy resources.

**0 1 . 1**Which **two** energy resources are renewable?**[2 marks]**Tick **two** boxes.

Biofuel

Coal

Gas

Geothermal

Nuclear fuel

**0 1 . 2**

Some non-renewable energy resources are more reliable than others.

Which statement correctly describes a reliable resource?

**[1 mark]**Tick **one** box.

It does not burn fuel.

It is predictable.

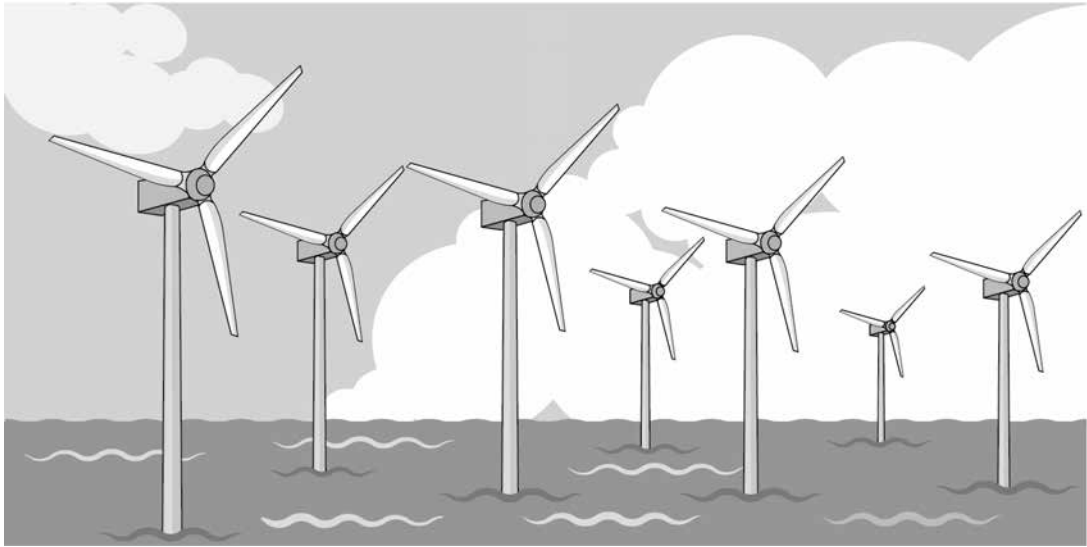
It will never run out.

It is cheap to use.



0 1 . 3 Figure 1 shows a wind farm.

Figure 1



The total power output of the wind farm is 19.6 MW

All of the wind turbines have the same power output.

What is the power output of **one** wind turbine?

[1 mark]

Tick **one** box.

2.7 MW

2.8 MW

2.9 MW

3.2 MW

3.3 MW

0 1 . 4 Give **two** reasons why people might **not** like having wind turbines near their homes. [2 marks]

1 \_\_\_\_\_

2 \_\_\_\_\_

Turn over ►

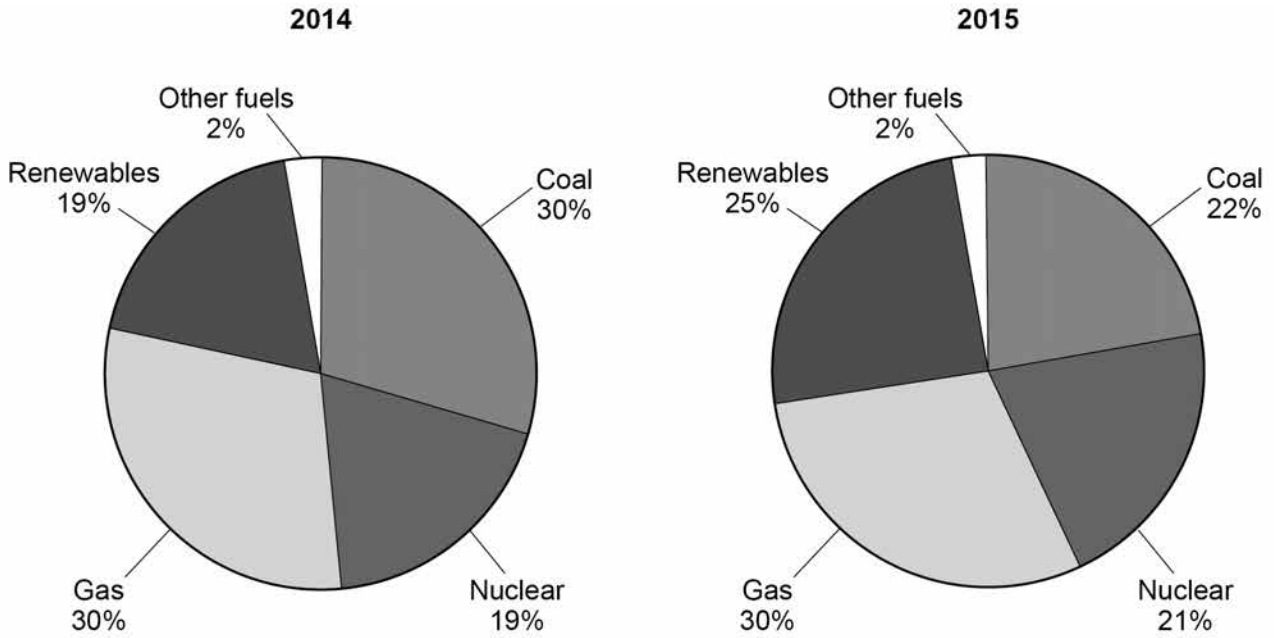


0 1 . 5

**Figure 2** shows the electricity generated by different energy resources in the UK.

The total amount of electricity generated was the same in 2014 and in 2015

**Figure 2**



There are changes in the amounts of different energy resources used between 2014 and 2015

Explain the environmental impacts of the changes.

**[4 marks]**

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0 2

**Figure 3** shows a mobile phone being recharged by a portable power source.

**Figure 3**



0 2 . 1

Why does the battery in the phone need recharging?

[1 mark]

Tick **one** box.

The store of chemical energy in the battery has reduced.

The store of thermal energy in the battery has reduced.

The store of kinetic energy in the battery has reduced.

The store of gravitational energy in the battery has reduced.

**Question 2 continues on the next page**

**Turn over ►**



**0 2 . 2**

The power source provides a current of 1.86 A at a potential difference of 3.90 V

Calculate the power of the power source.

Use the equation:

power = potential difference  $\times$  current

Choose the correct unit from the box.

**[3 marks]**

<b>C</b>	<b>J</b>	<b>W</b>
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Power = \_\_\_\_\_

Unit \_\_\_\_\_



0 2 . 3 A student needs a new power source.

Figure 4 shows three different sized power sources.

Figure 4

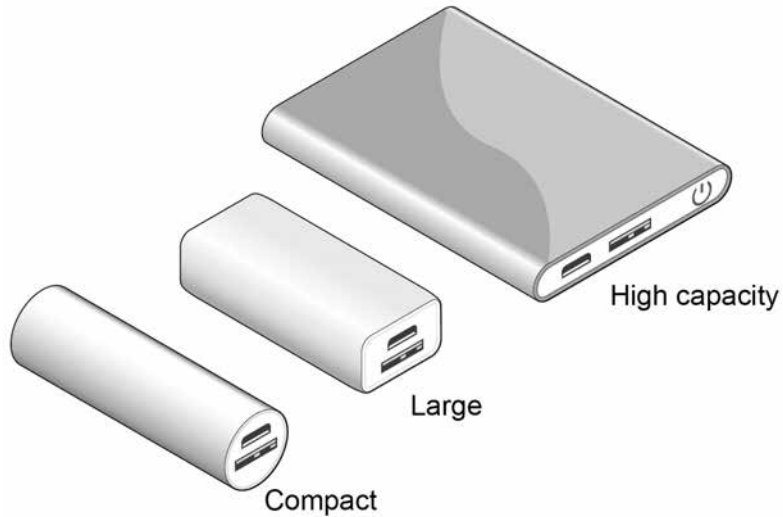


Table 1 gives data about the different power sources.

Table 1

Power source	Number of charges	Mass in grams
Compact	1	100
Large	5	200
High capacity	10	600

The student chose the large power source.

Suggest why the student chose the large power source.

[4 marks]

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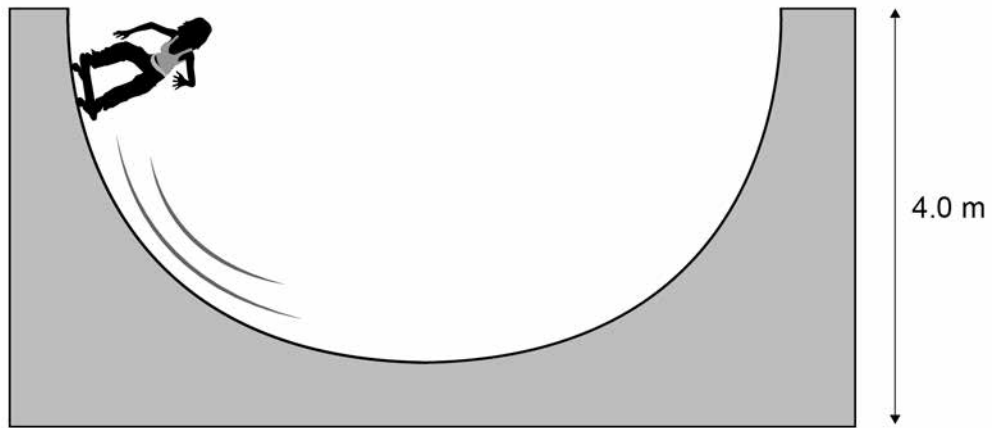
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0 3

Figure 5 shows a girl skateboarding on a semi-circular ramp.

Figure 5



The girl has a mass of 50 kg

0 3 . 1

Calculate the gravitational potential energy (g.p.e.) of the girl at the top of the ramp.

Use the equation:

g.p.e. = mass  $\times$  gravitational field strength  $\times$  height

gravitational field strength = 9.8 N/kg

[2 marks]

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g.p.e. = \_\_\_\_\_ J

0 3 . 2

The girl has a speed of 7 m/s at the bottom of the ramp.

Calculate the kinetic energy of the girl at the bottom of the ramp.

Use the equation:

kinetic energy = 0.5  $\times$  mass  $\times$  (speed)<sup>2</sup>

[2 marks]

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Kinetic energy = \_\_\_\_\_ J





0 3 . 3

Not all of the g.p.e. has been transferred to kinetic energy.

Which **two** statements explain why?

**[2 marks]**

Tick **two** boxes.

Some energy is wasted.

The mass of the girl is too low.

The ramp is not high enough.

The g.p.e. of the girl is not zero.

The speed of the girl is too great.

0 3 . 4

Explain how lubricating the wheels of the skateboard can increase the speed of the girl.

Use ideas about energy in your explanation.

**[3 marks]**

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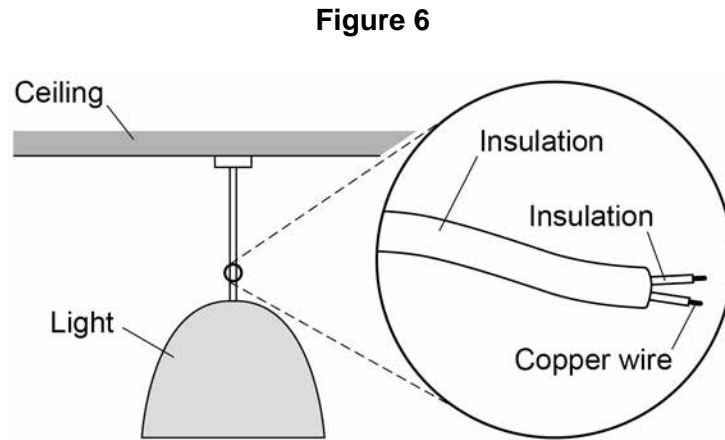
9

**Turn over for the next question****Turn over ►**

**0 4**

Some ceiling lights in the home are connected to the mains by a two-core cable.

**Figure 6** shows a ceiling light.

**0 4 . 1**

Suggest why some ceiling lights do **not** have an earth wire.

**[2 marks]**


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**0 4 . 2**

Write down the equation that links charge flow, current and time.

**[1 mark]**


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**0 4 . 3**

There is a current of 2.95 A in one of the copper wires for 60 seconds.

Calculate the charge flow through the wire.

Use your equation from question **04.2**

**[2 marks]**


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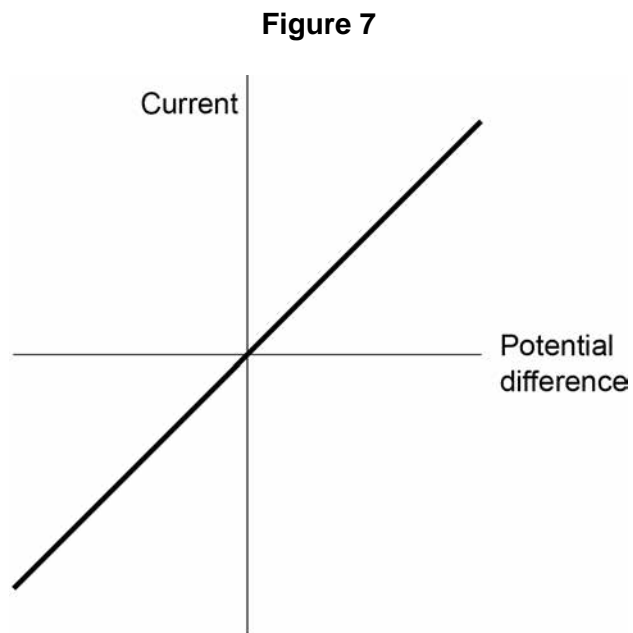
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Charge flow = \_\_\_\_\_ C



0 4 . 4

**Figure 7** shows a current potential difference graph for a piece of copper wire.



Draw another line on **Figure 7** for a wire with a different resistance.

**[2 marks]**

**Question 4 continues on the next page**

**Turn over ►**



Some fuses have a thin piece of copper that melts if the current is too large.

**0 4 . 5** Draw the circuit symbol for a fuse.

**[1 mark]**

**0 4 . 6** Describe how the movement of the copper particles in the wire changes when copper melts.

**[2 marks]**

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**0 4 . 7** Old copper wires are melted when they are recycled.

Calculate the energy needed to melt 500 kg of copper at its melting point.

Specific latent heat of fusion of copper = 200 kJ/kg

Use the Physics Equations Sheet.

**[3 marks]**

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



**0 5**

Radioactive nuclei can emit alpha, beta or gamma radiation.

**0 5 . 1**

Which type of radiation is the most penetrating?

**[1 mark]**Tick **one** box.Alpha ( $\alpha$ )Beta ( $\beta$ )Gamma ( $\gamma$ )**0 5 . 2**

Which type of radiation is the most ionising?

**[1 mark]**Tick **one** box.Alpha ( $\alpha$ )Beta ( $\beta$ )Gamma ( $\gamma$ )**0 5 . 3**

Which type of radiation has the longest range in air?

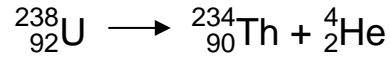
**[1 mark]**Tick **one** box.Alpha ( $\alpha$ )Beta ( $\beta$ )Gamma ( $\gamma$ )**Question 5 continues on the next page****Turn over ►**

When radioactive isotopes in the Earth's crust decay they release energy.

The decay causes the heating of rocks in the crust.

**0 5 . 4** **Figure 8** shows the decay of uranium–238 (U–238) into thorium–234 (Th–234).

**Figure 8**



Complete **Table 2** to show the number of neutrons and protons in the nuclei.

**[2 marks]**

**Table 2**

Isotope	Number of neutrons	Number of protons
uranium–238	146	
thorium–234		90

**0 5 . 5** Geothermal power stations pump water through heated rocks.

The temperature of the water increases from 20 °C to its boiling point of 100 °C

Calculate the change in thermal energy when the mass of water heated is 150 kg

Specific heat capacity = 4 200 J/kg °C

Use the Physics Equations Sheet.

**[3 marks]**

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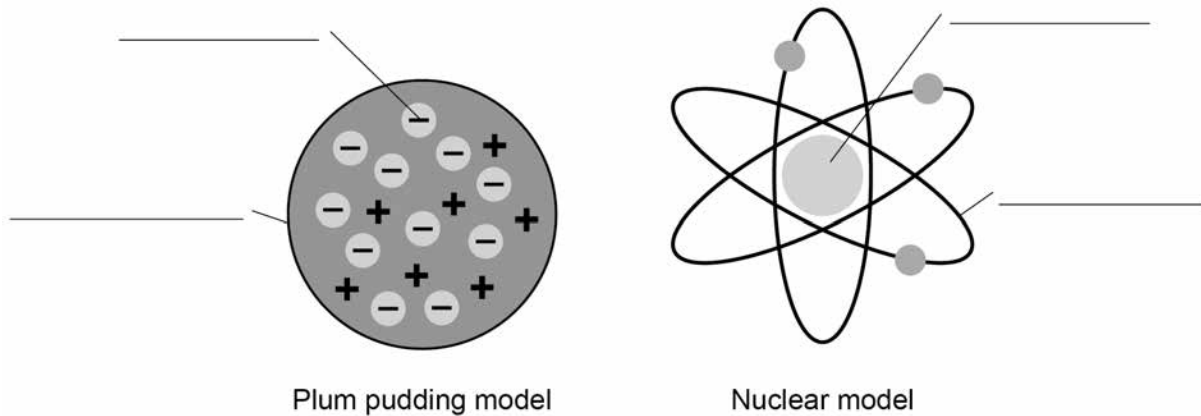
Change in thermal energy = \_\_\_\_\_ J



0 6

Figure 9 shows two models of the atom.

Figure 9



0 6 . 1

Write the labels on **Figure 9**

Choose the answers from the box.

[4 marks]

atom	electron	nucleus
neutron	orbit	proton

0 6 . 2

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

[2 marks]

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Question 6 continues on the next page

Turn over ►



0 6 . 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]

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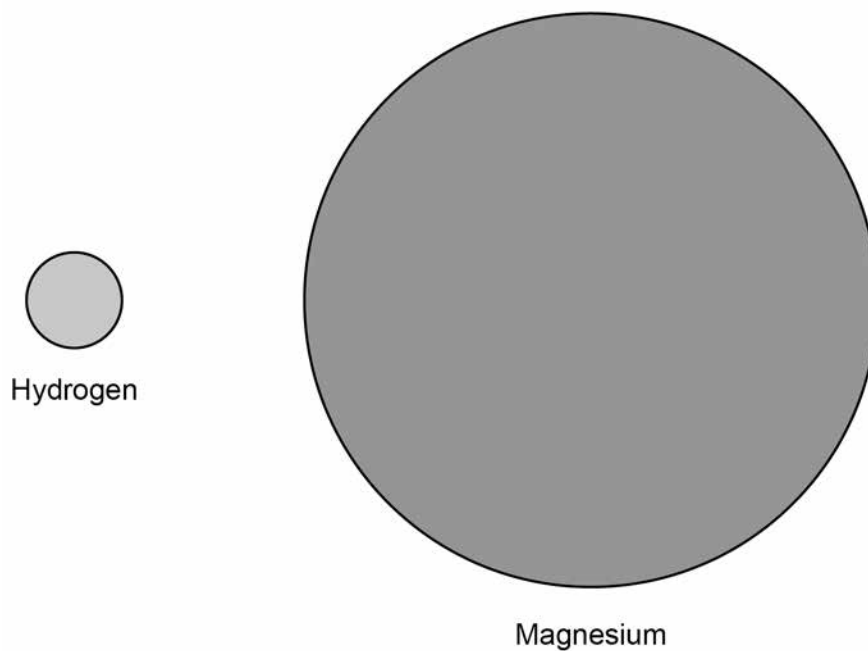
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Speed = \_\_\_\_\_ m/s

0 6 . 4

**Figure 10** shows two atoms represented as solid spheres.

**Figure 10**



A hydrogen atom has a radius of  $2.5 \times 10^{-11}$  m

Determine the radius of a magnesium atom.

Use measurements from **Figure 10**

[2 marks]

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Radius = \_\_\_\_\_ m

10





0 7

A student wanted to determine the density of the irregular shaped object shown in **Figure 11**

**Figure 11**



0 7 . 1

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

**[6 marks]**

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Question 7 continues on the next page

Turn over ►



07.2

Another student did a similar experiment.

He determined the density of five common plastic materials.

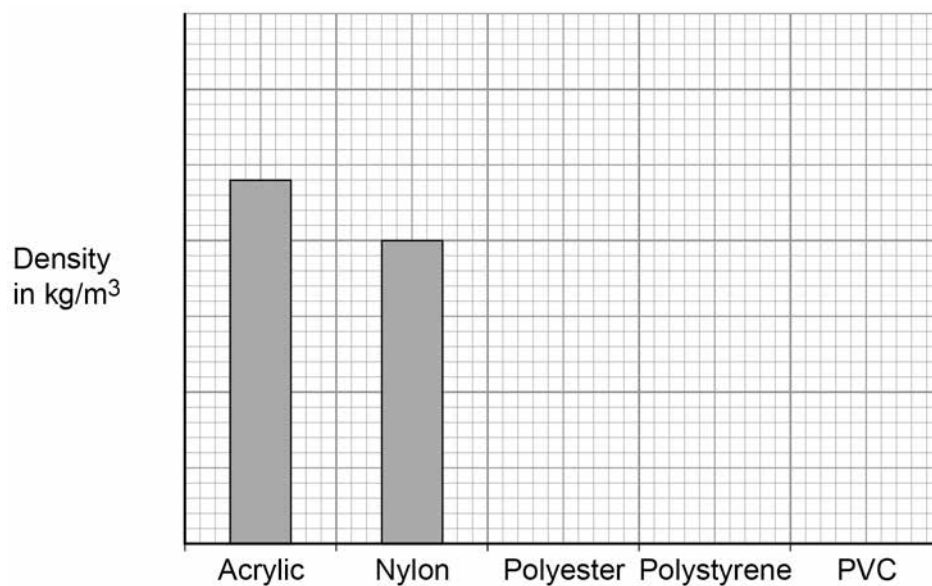
**Table 3** shows the results.

**Table 3**

Plastic material	Density in $\text{kg/m}^3$
Acrylic	1200
Nylon	1000
Polyester	1380
Polystyrene	1040
PVC	1100

**Figure 12** shows the results plotted in a bar chart.

**Figure 12**



Complete **Figure 12**

You should:

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

**[4 marks]**



**0 7 . 3** The student is given a piece of a different plastic material.

The student determined the density of the material three times.

**Table 4** shows the results.

**Table 4**

	Density in $\text{kg/m}^3$
1	960
2	1120
3	1040

Determine the uncertainty in the student's results.

**[2 marks]**

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Uncertainty = \_\_\_\_\_  $\text{kg/m}^3$

12

**END OF QUESTIONS**



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ANSWER IN THE SPACES PROVIDED**

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