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Surname _____

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GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier

Physics Paper 1F

8464/P/1F

F

Wednesday 23 May 2018 Afternoon

Time allowed: 1 hour 15 minutes

For this paper you must have:

- a ruler
- a scientific calculator
- the Physics Equations Sheet (enclosed).

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



J U N 1 8 8 4 6 4 P 1 F 0 1

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INSTRUCTIONS

- Use black ink or black ball-point pen.
- 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.

DO NOT TURN OVER UNTIL TOLD TO DO SO



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



01.2 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.

[Turn over]



01.3 FIGURE 1, on page 7, shows a wind farm.

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

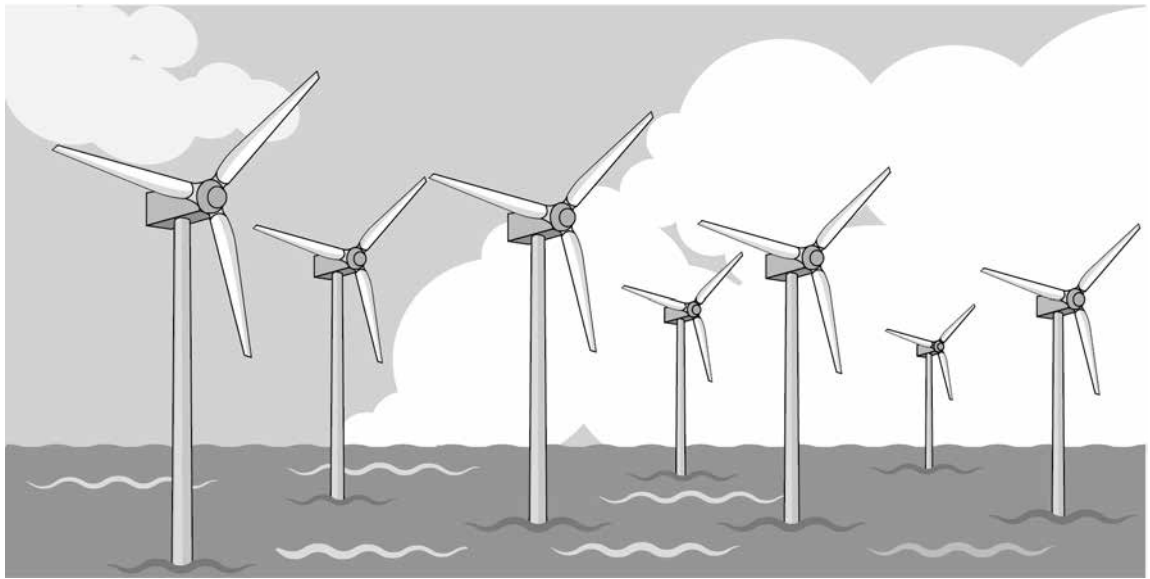
2.9 MW

3.2 MW

3.3 MW



FIGURE 1



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

1 _____

2 _____

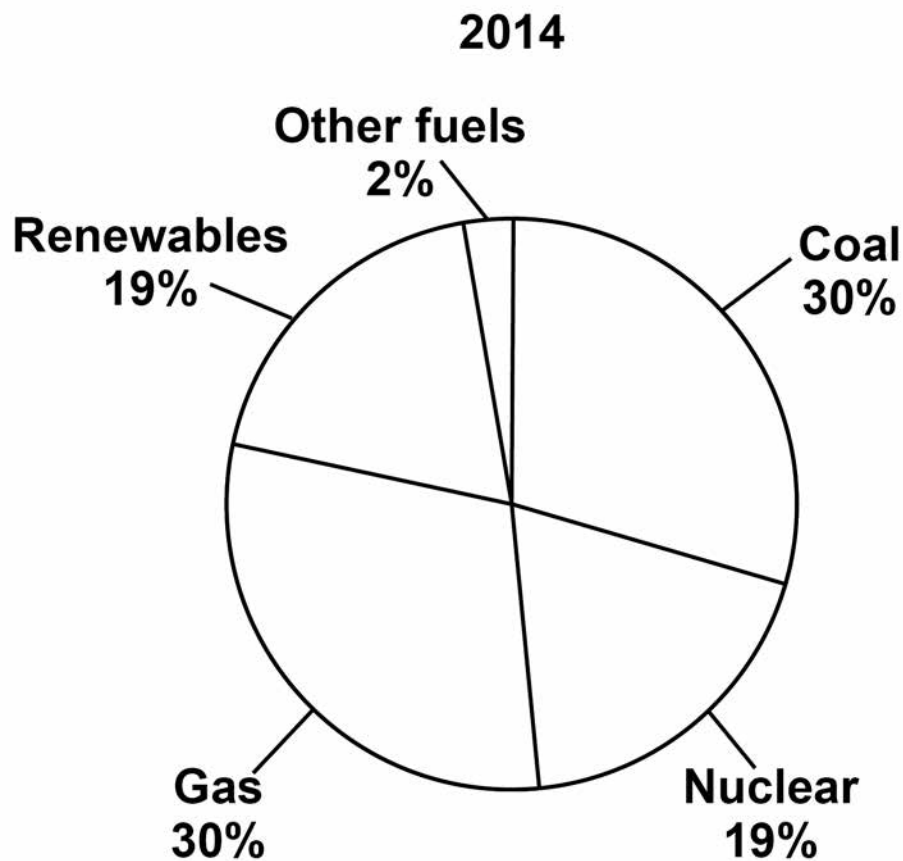
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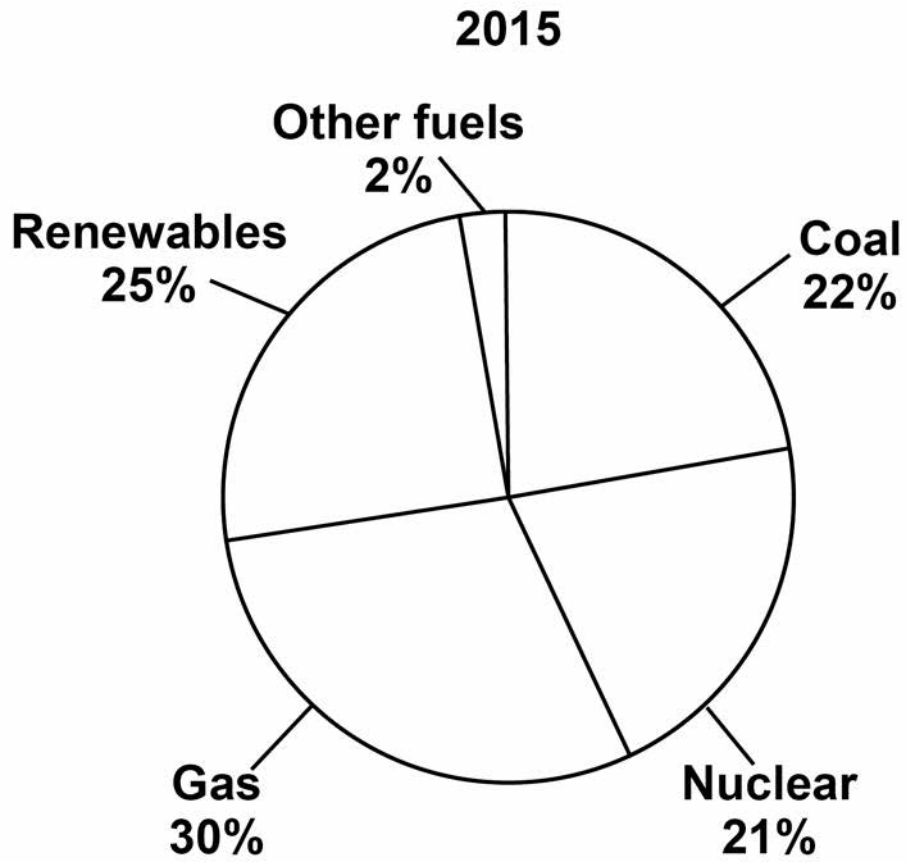


01.5 FIGURE 2, on pages 8 and 9, shows the electricity generated by different energy resources in the UK.

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

FIGURE 2





[Turn over]



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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.



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 list. [3 marks]

C

J

W

Power = _____

Unit _____

[Turn over]



02.3 A student needs a new power source.

FIGURE 4 shows three different sized power sources.

FIGURE 4

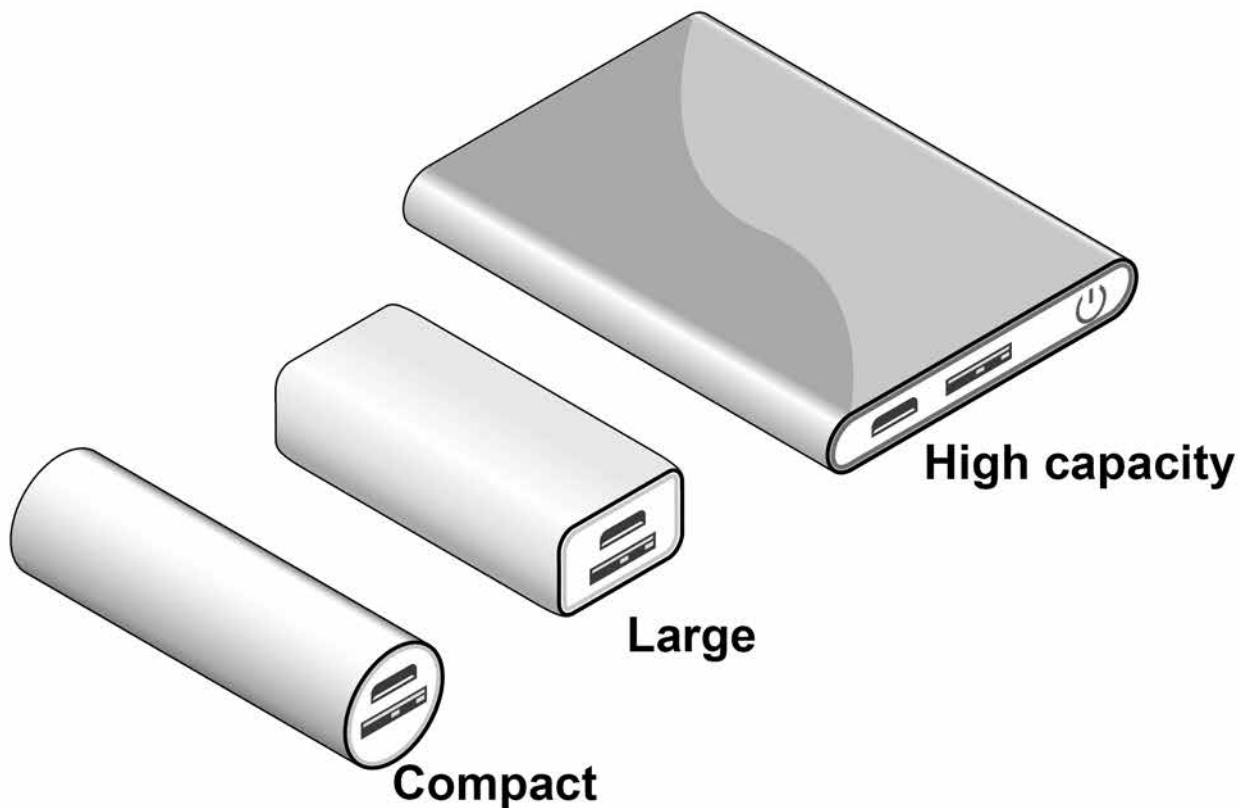


TABLE 1 gives data about the different power sources.

TABLE 1

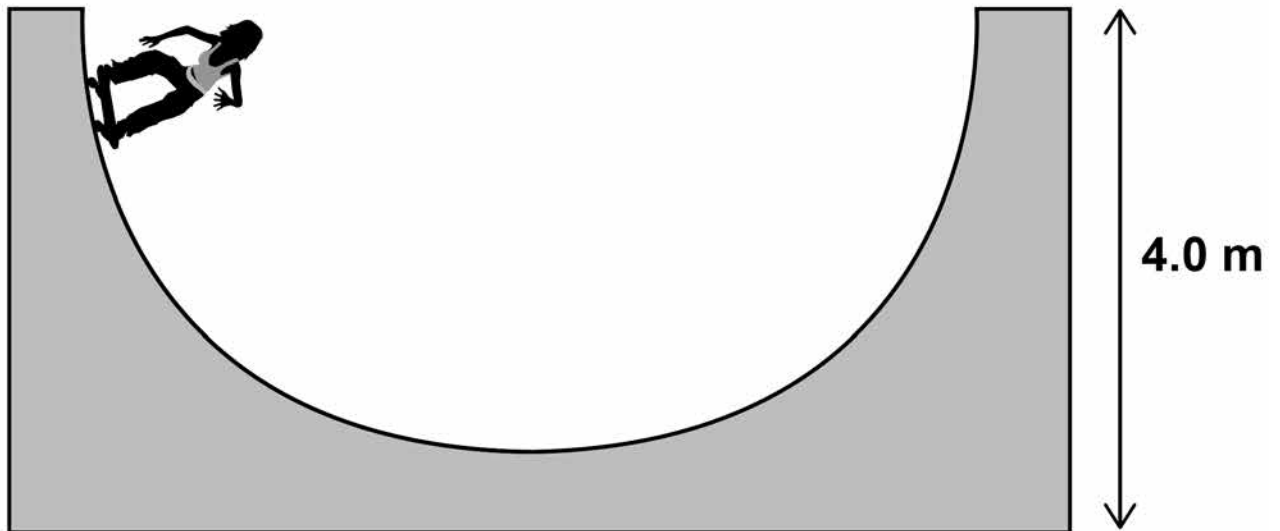
Power source	Number of charges	Mass in grams
Compact	1	100
Large	5	200
High capacity	10	600



03

FIGURE 5 shows a girl skateboarding on a semi-circular ramp. The girl has a mass of 50 kg

FIGURE 5



03

1

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

Use the equation:

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

gravitational field strength = 9.8 N/kg [2 marks]

g.p.e. = _____ J



03. **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:

$$\text{kinetic energy} = 0.5 \times \text{mass} \times (\text{speed})^2$$

[2 marks]

Kinetic energy = _____ J

[Turn over]



03.3 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.

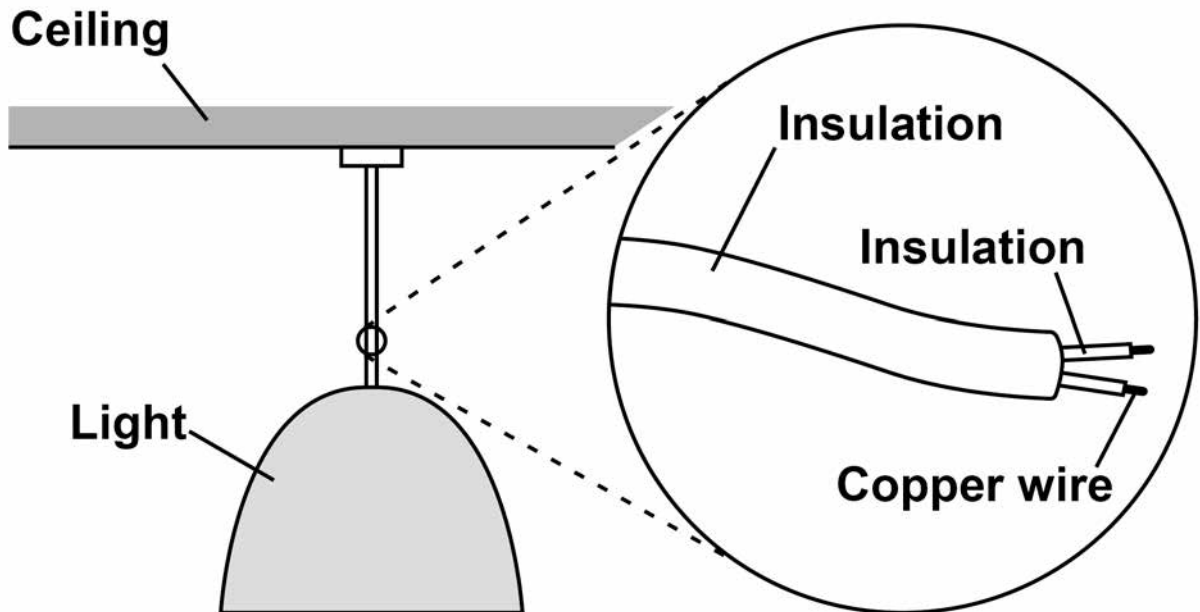


0 4

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

FIGURE 6 shows a ceiling light.

FIGURE 6



0 4 .

1

Suggest why some ceiling lights do NOT have an earth wire. [2 marks]



0 4 . 2 Write down the equation that links charge flow, current and time. [1 mark]

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]

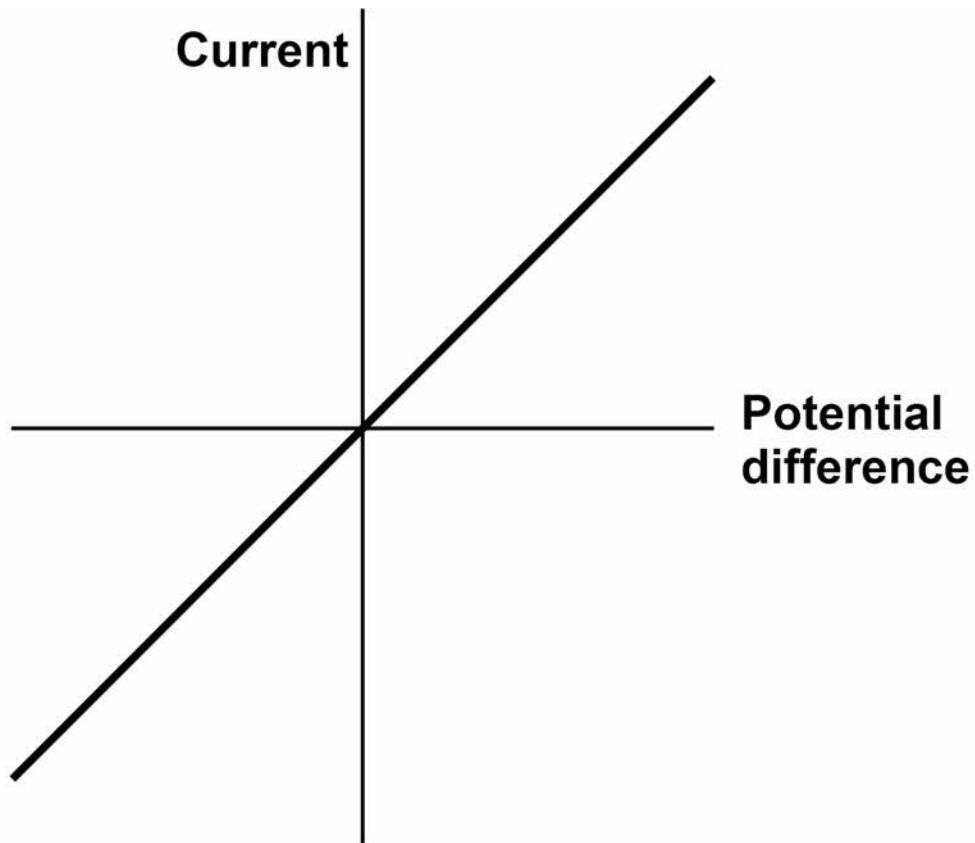
Charge flow = _____ C

[Turn over]



0 4 . 4 FIGURE 7 shows a current potential difference graph for a piece of copper wire.

FIGURE 7



Draw another line on FIGURE 7 for a wire with a different resistance. [2 marks]



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]

[Turn over]



0 4 . 6 Describe how the movement of the copper particles in the wire changes when copper melts. [2 marks]



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]

Energy = _____ J

[Turn over]

13



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 (α)

Beta (β)

Gamma (γ)



0 5 . 2 Which type of radiation is the most ionising?
[1 mark]

Tick ONE box.

Alpha (α)

Beta (β)

Gamma (γ)

0 5 . 3 Which type of radiation has the longest range in air? [1 mark]

Tick ONE box.

Alpha (α)

Beta (β)

Gamma (γ)

[Turn over]

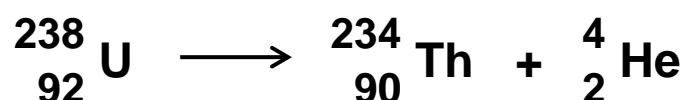


When radioactive isotopes in the Earth's crust decay they release energy.

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]

Change in thermal energy = _____ J

8

[Turn over]

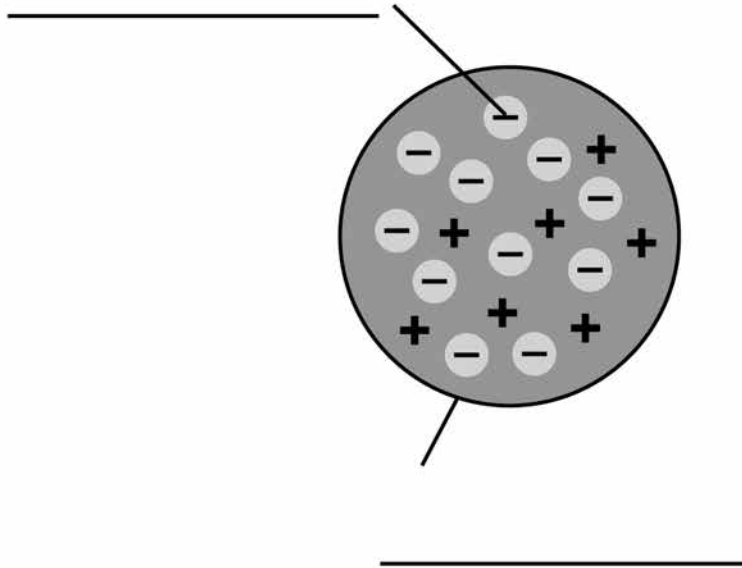


06

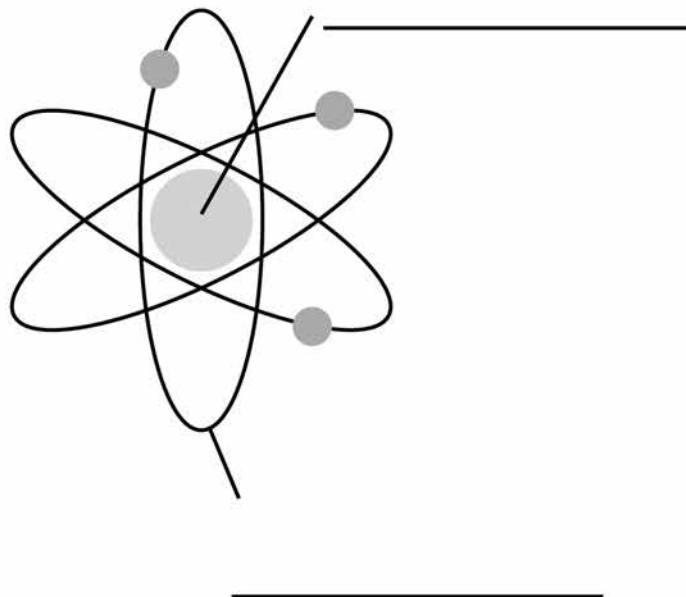
FIGURE 9 shows two models of the atom.

FIGURE 9

Plum pudding model



Nuclear model



06.1 Write the labels on FIGURE 9

Choose the answers from the list. [4 marks]

atom

neutron

electron

orbit

nucleus

proton

06.2 Explain why the total positive charge in every atom of an element is always the same.
[2 marks]

[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

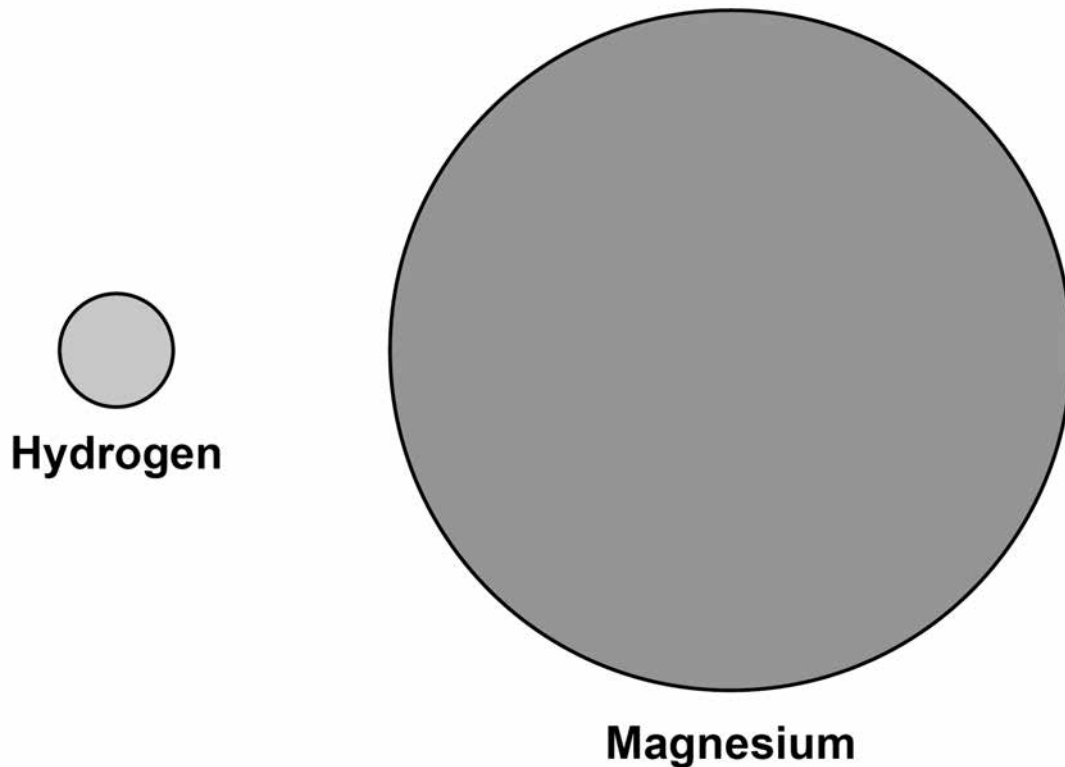
[2 marks]

Speed = _____ m/s

- 0 6 . 4** FIGURE 10 shows two atoms represented as solid spheres.



FIGURE 10



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

Determine the radius of a magnesium atom.
[2 marks]

Take the radius of the atoms as measured on
FIGURE 10 to be:

Hydrogen atom 6 mm

Magnesium atom 36 mm

Radius = _____ m

10

[Turn over]



07

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

FIGURE 11



07

1

Plan an experiment that would allow the student to determine the density of the object. [6 marks]



07.2 Another student did a similar experiment.

He determined the density of five common plastic materials.

TABLE 3 shows the results.

TABLE 3

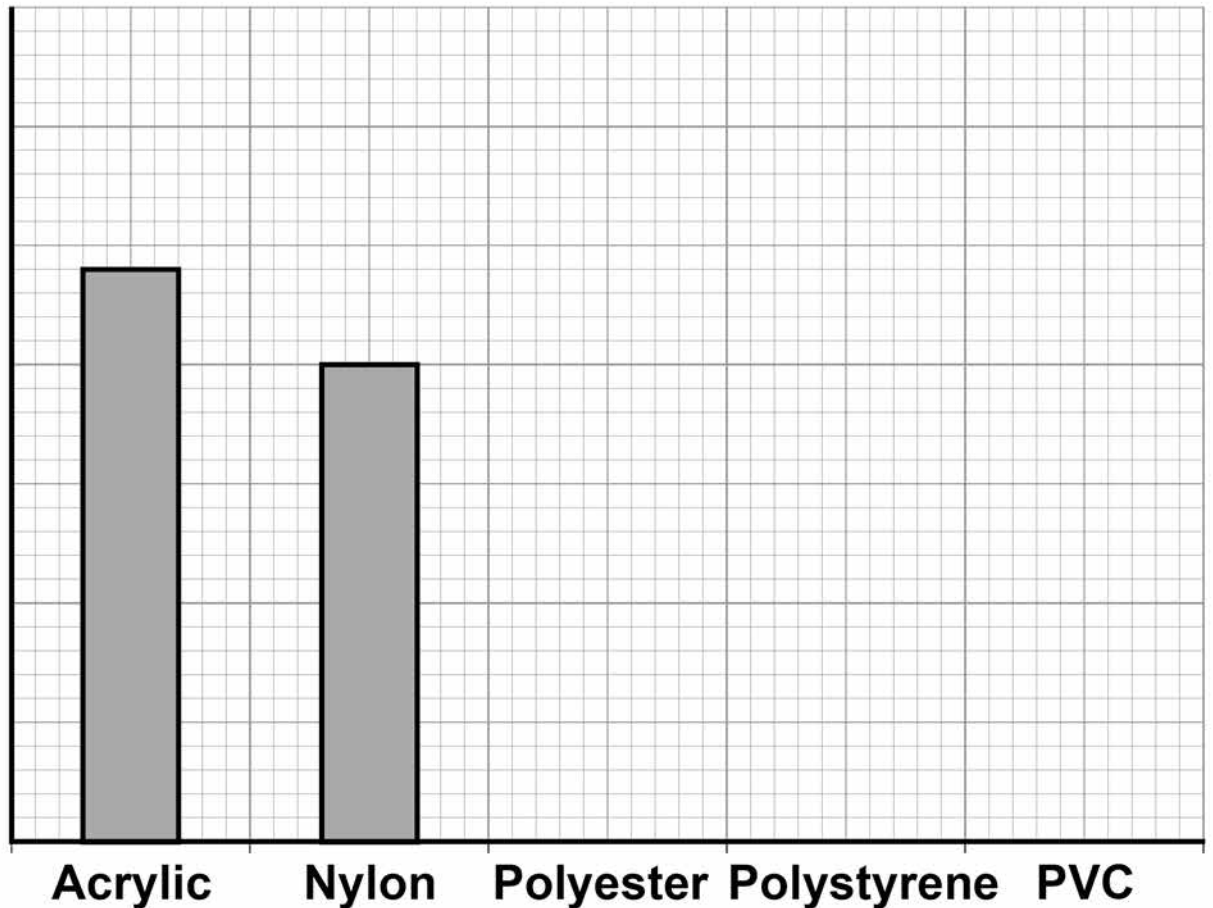
Plastic material	Density in kg/m³
Acrylic	1200
Nylon	1000
Polyester	1380
Polystyrene	1040
PVC	1100

FIGURE 12 shows the results plotted in a bar chart.



FIGURE 12

Density
in kg/m^3



Complete FIGURE 12

You should:

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

[4 marks]

[Turn over]



07.3 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 kg/m ³
1	960
2	1120
3	1040



39

Determine the uncertainty in the student's results. [2 marks]

Uncertainty = _____ kg/m³

END OF QUESTIONS

12



There are no questions printed on this page

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Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

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