A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

COMBINED SCIENCE: TRILOGY

F

Foundation Tier

Physics Paper 1F

8464/P/1F

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]

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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**

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.**

[Turn over]

0 1 . 3 **FIGURE 1, on page 7, shows a wind farm.**

The total power output of the wind farm is 19.6 MW

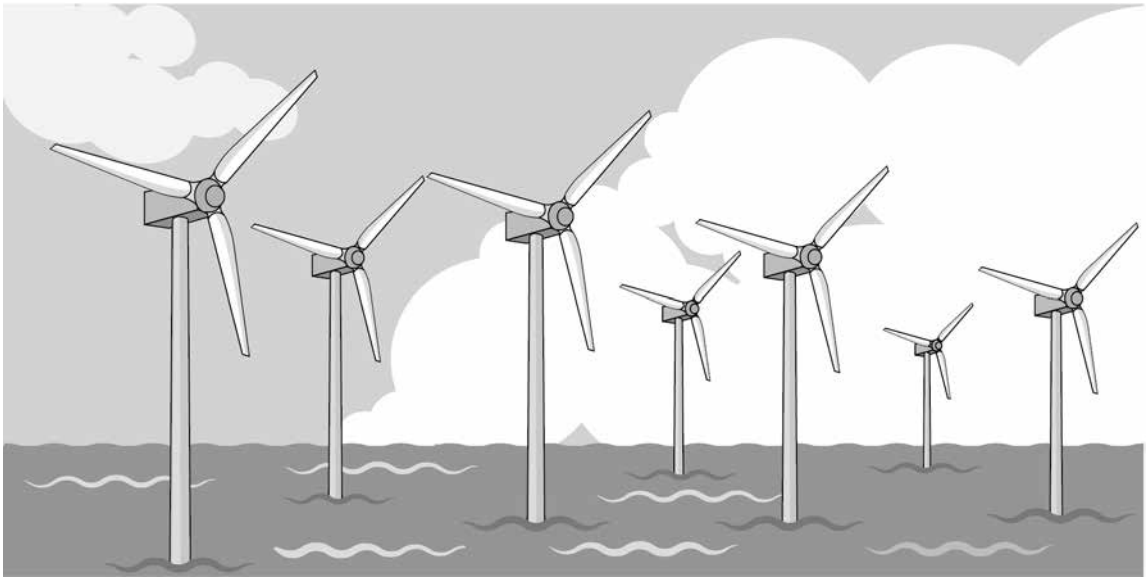
All of the wind turbines have the same power output.

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 _____

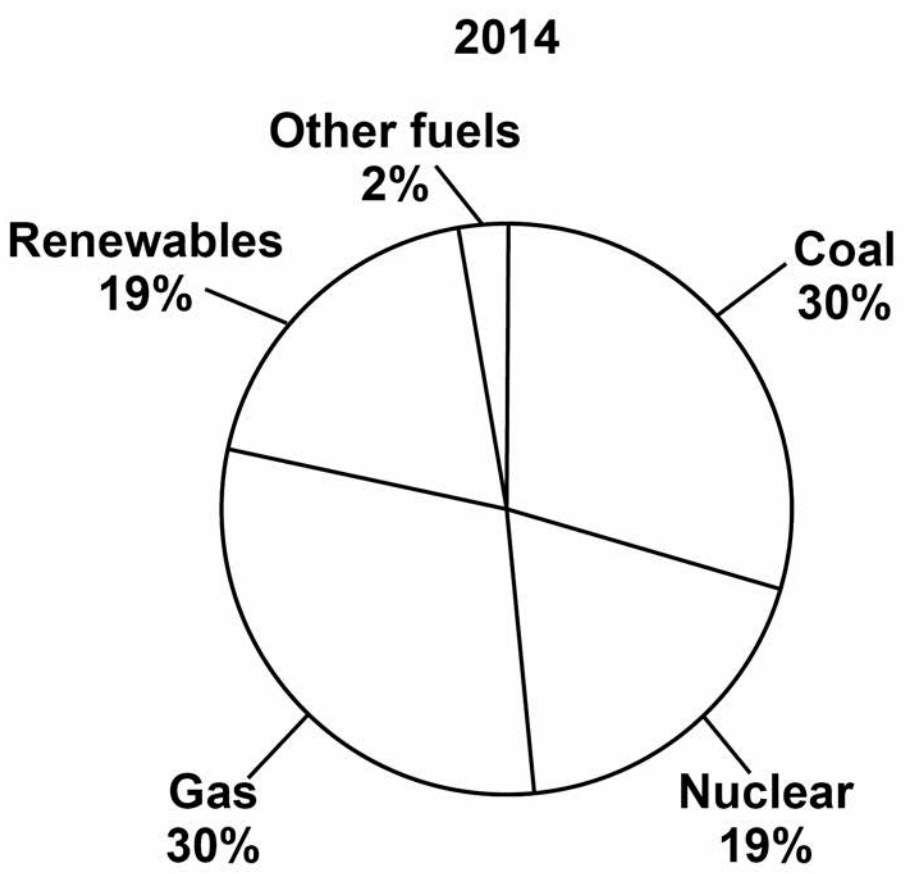
_____

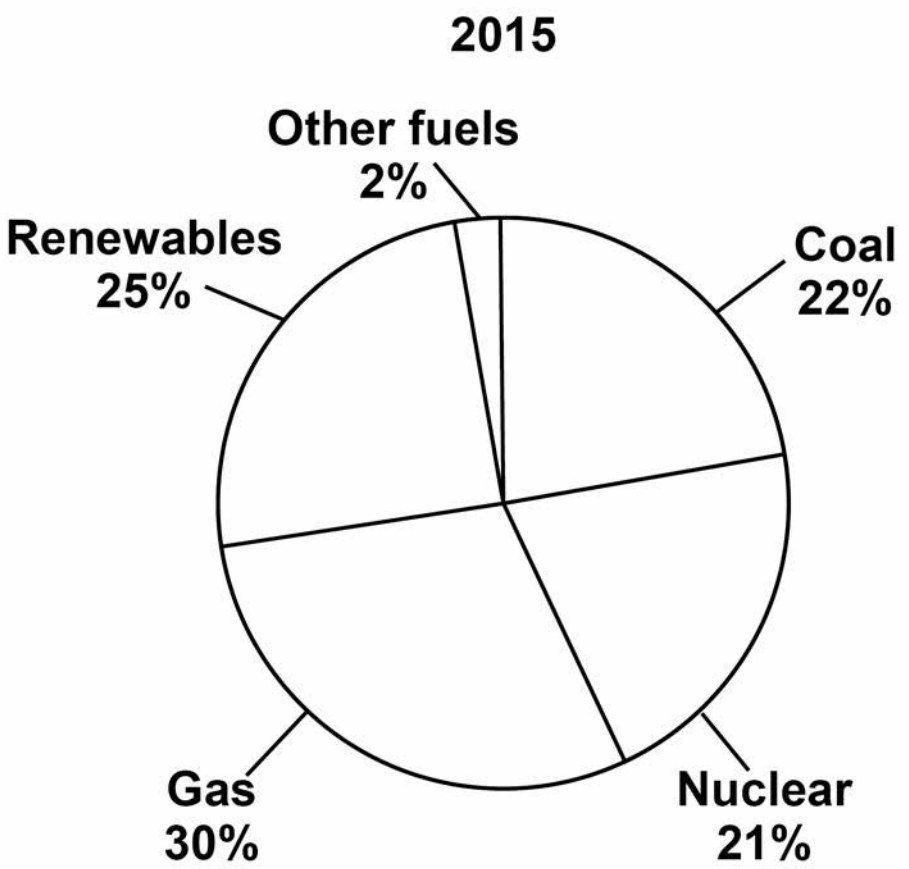
[Turn over]

0 1 . 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




2015
Other fuels
2%
Renewables
25%
Coal
22%
Gas
30%
Nuclear
21%

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

Explain the environmental impacts of the changes. [4 marks]

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 × current

Choose the correct unit from the list. [3 marks]

C

J

W

Power = _____

Unit _____

[Turn over]

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

FIGURE 4 shows three different sized power sources.

FIGURE 4

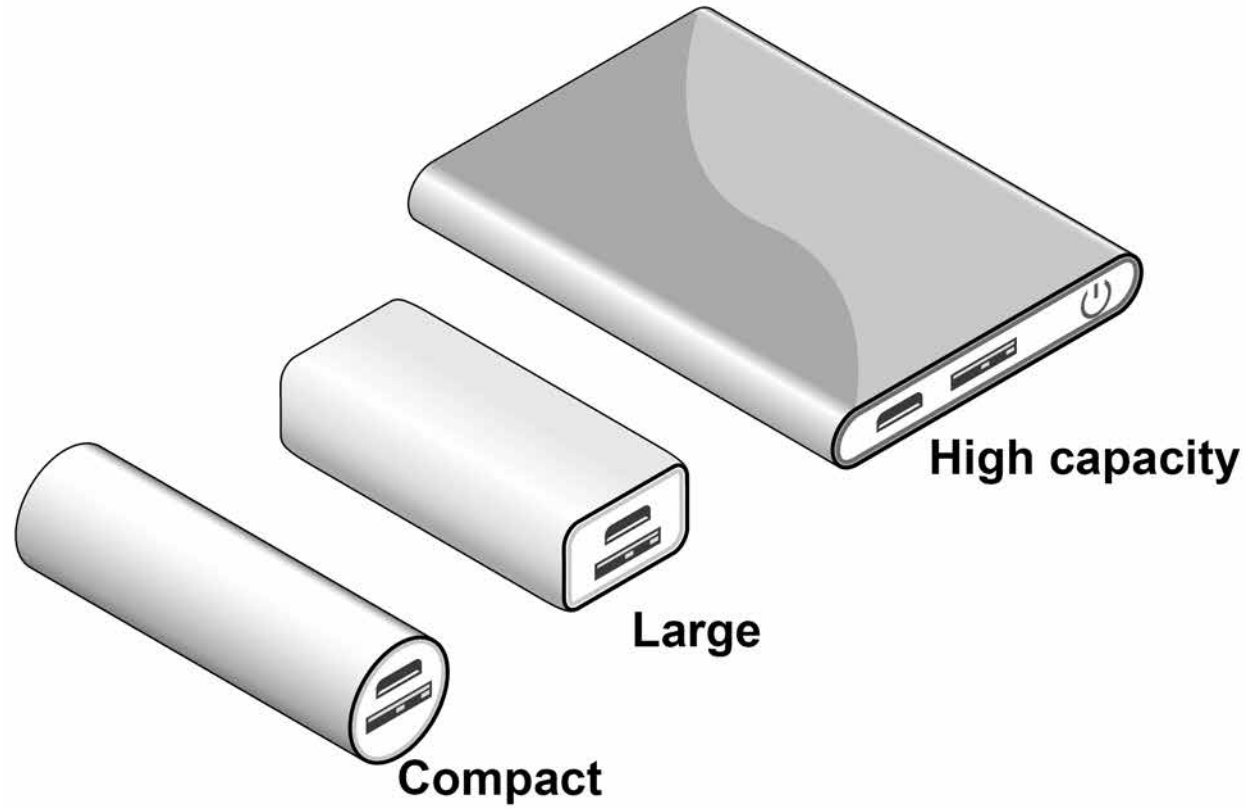


TABLE 1 gives data about the different power sources.

TABLE 1

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

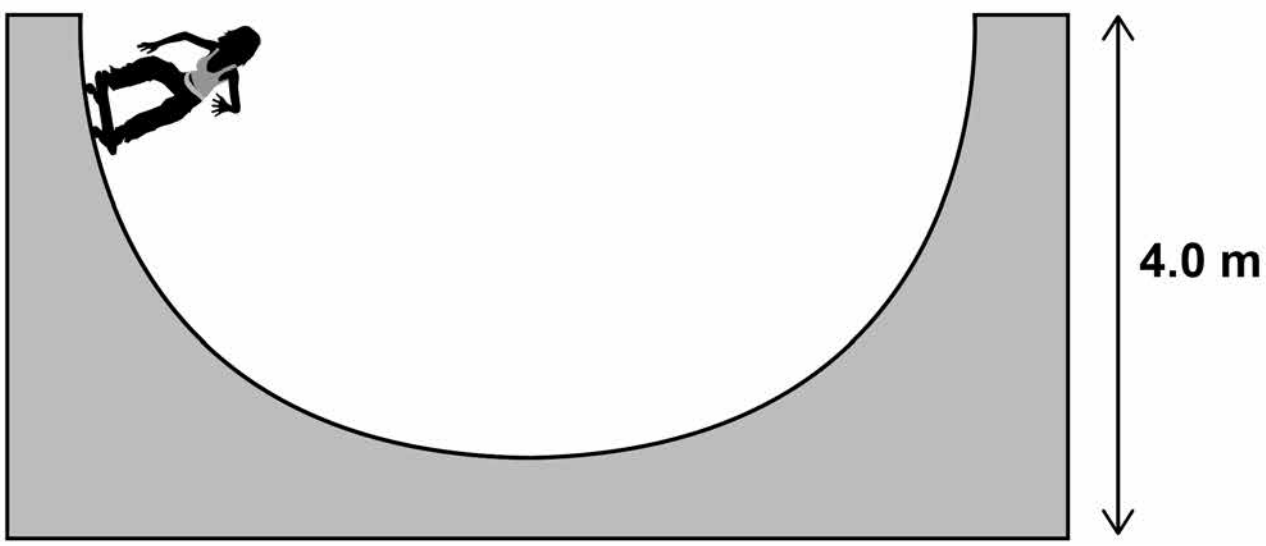
The student chose the large power source.

Suggest why the student chose the large power source. [4 marks]

8

0 3 **FIGURE 5 shows a girl skateboarding on a semi-circular ramp. The girl has a mass of 50 kg**

FIGURE 5



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 × gravitational field strength × height

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

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 × mass × (speed)^2

[2 marks]

_____

_____

_____

Kinetic energy = _____ **J**

[Turn over]

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]

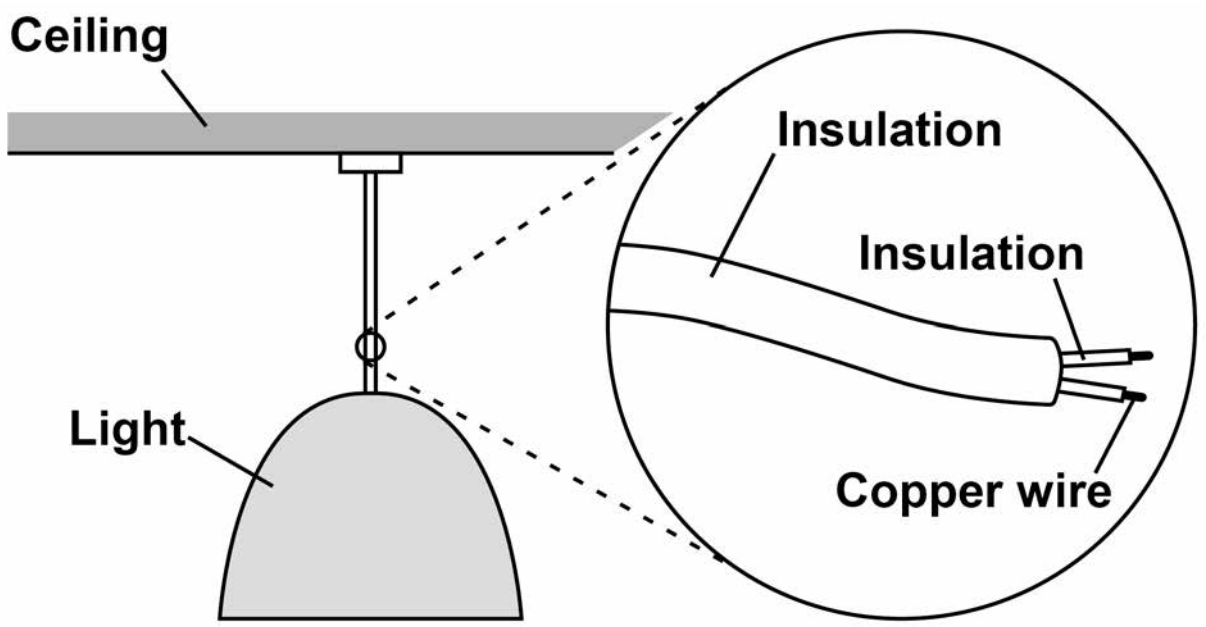
9

[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.

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]

_____

_____

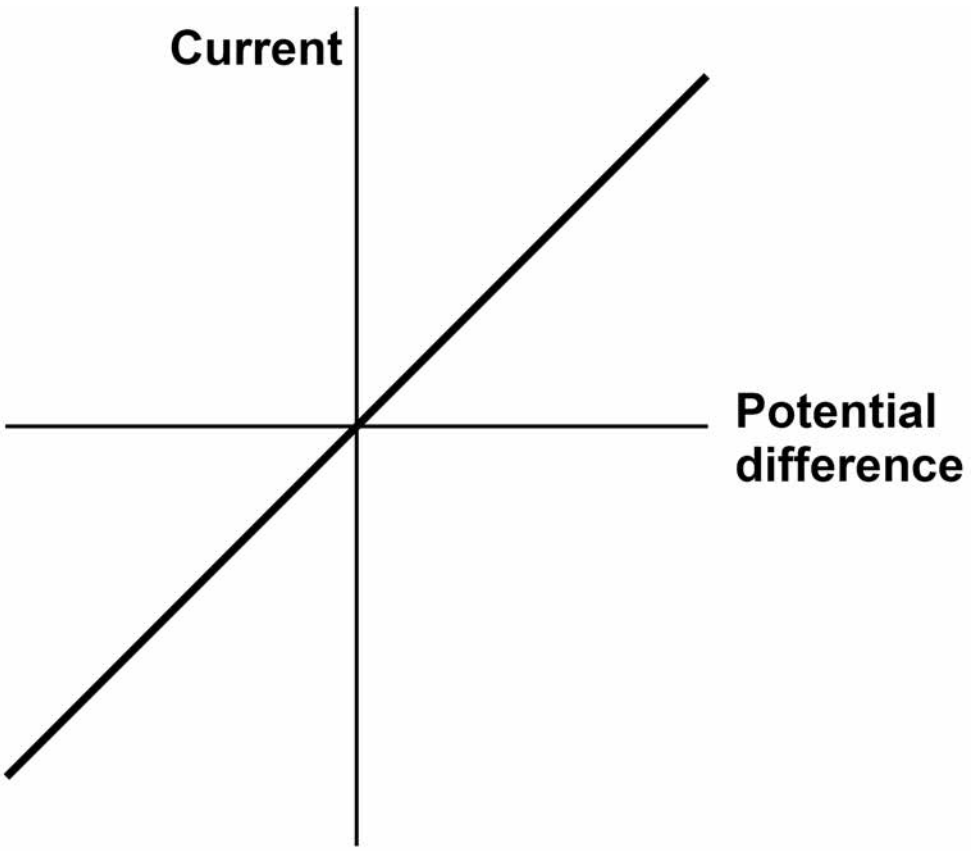
_____

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

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

$$^{238}_{92}\text{U} \longrightarrow {}^{234}_{90}\text{Th} + {}^{4}_{2}\text{He}$$

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

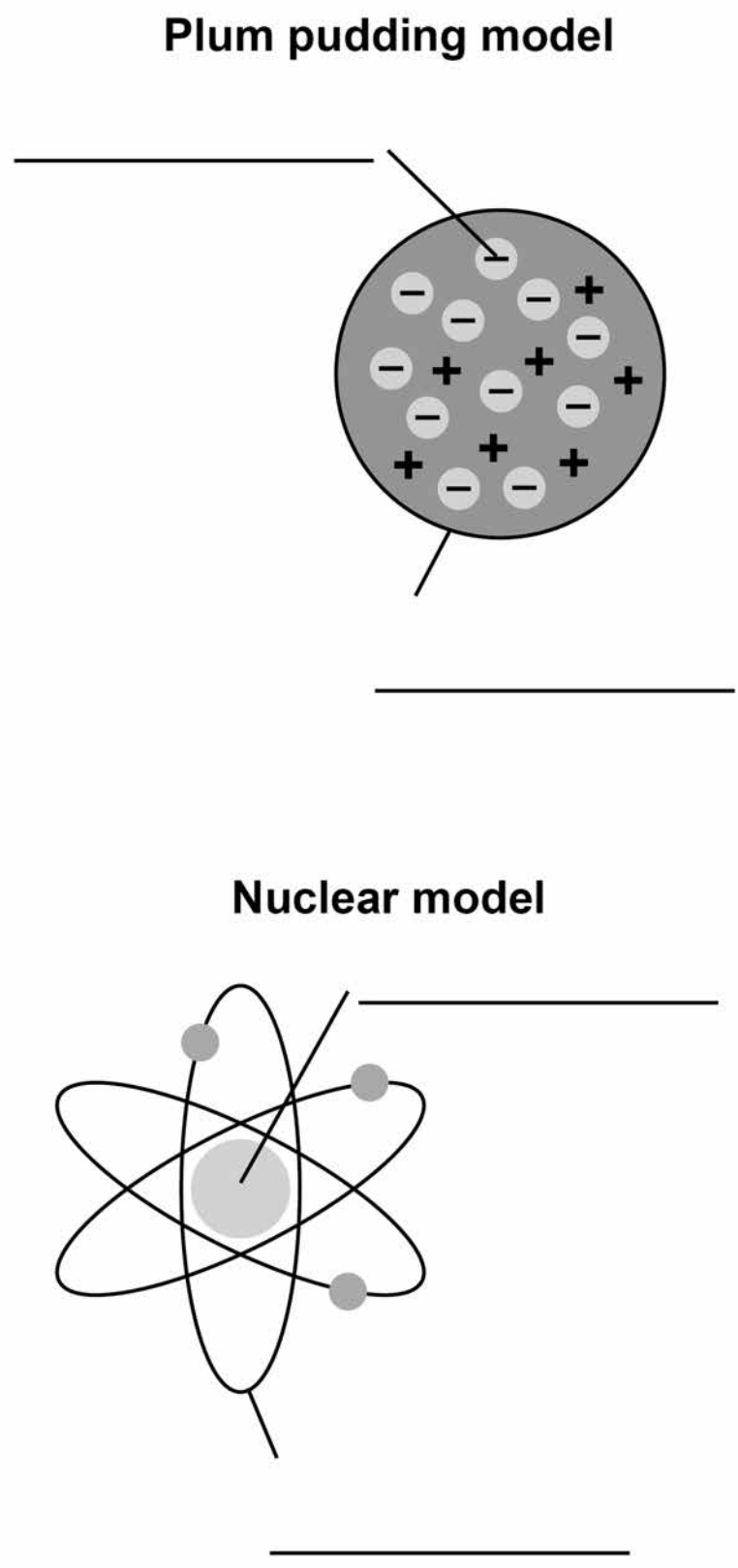
Use the Physics Equations Sheet. [3 marks]

Change in thermal energy = _____ J

8

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 list. [4 marks]

atom	**neutron**
electron	**orbit**
nucleus	**proton**

0 6 . 2 Explain why the total positive charge in every atom of an element is always the same. [2 marks]

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.

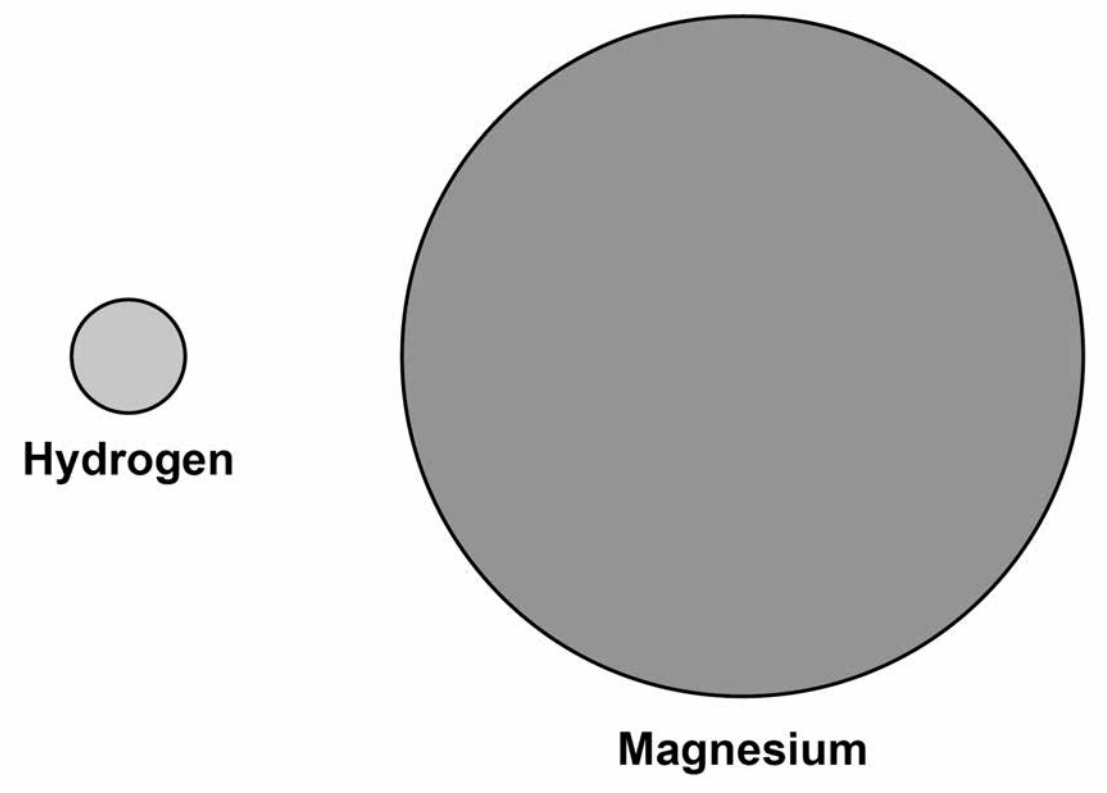
Speed of light = 300 000 000 m/s

[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

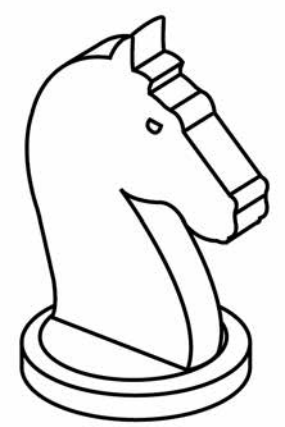
Magnesium atom 36 mm

Radius = _____ m

10

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]**

0 7 . 2 **Another student did a similar experiment.**

He determined the density of five common plastic materials.

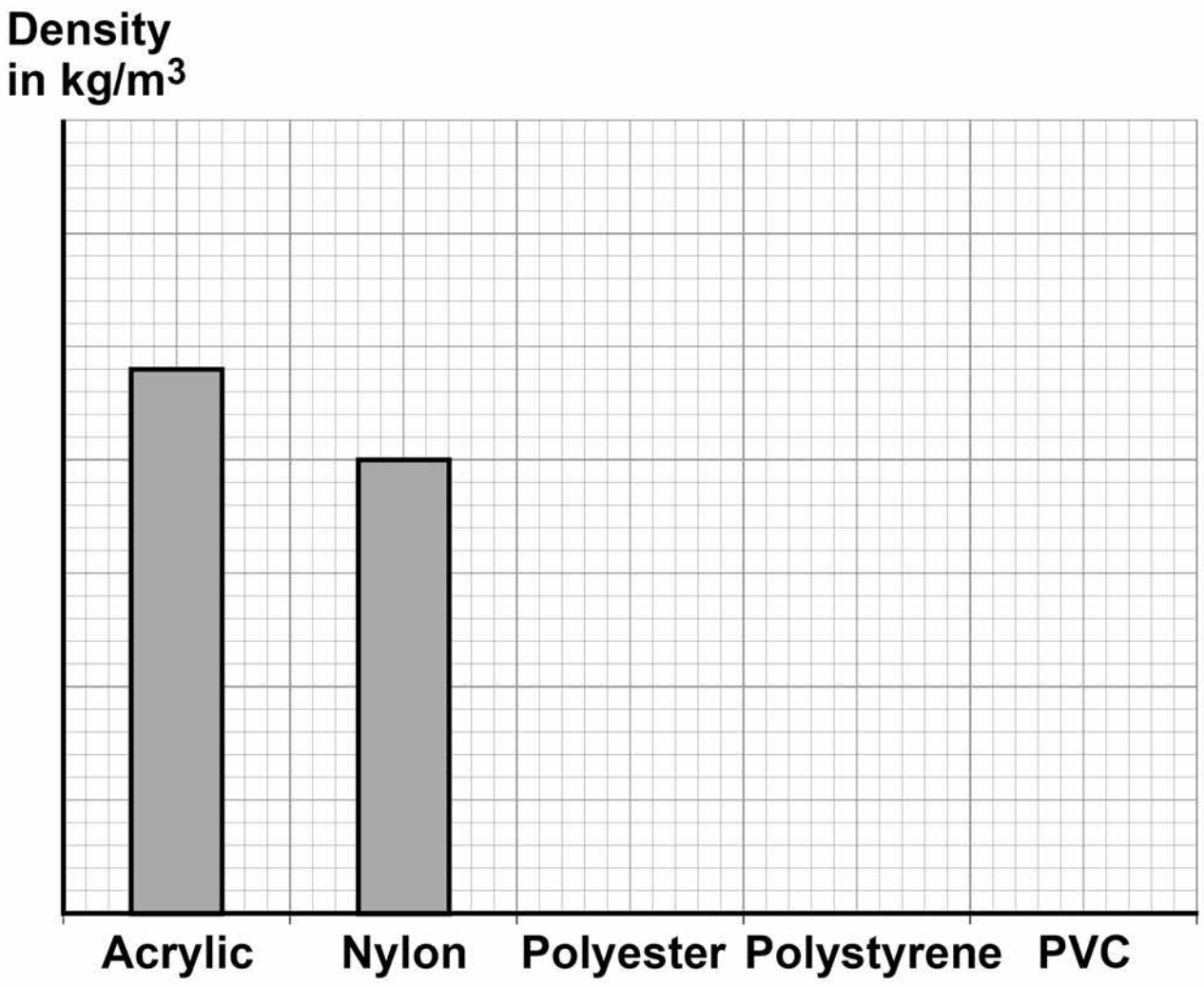
TABLE 3 shows the results.

TABLE 3

Plastic material	Density in kg/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]

[Turn over]

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 kg/m^3
1	960
2	1120
3	1040

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

_____

_____

_____

Uncertainty = _____ **kg/m^3**

END OF QUESTIONS

12

There are no questions printed on this page

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	