AQA

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.

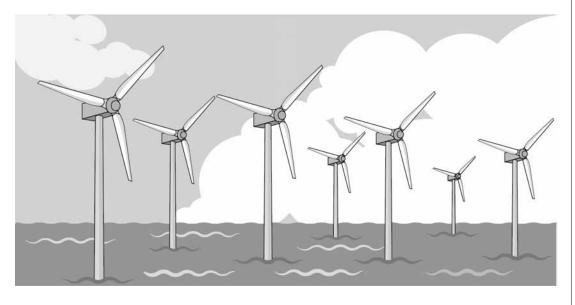| For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

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.
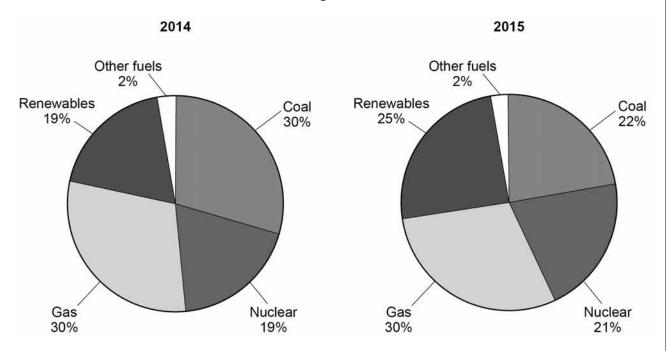**[2 marks]**

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 × current

Choose the correct unit from the box.

[3 marks]

C	J	W

Power = _____

Unit _____

Do not write outside the box

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

Figure 4 shows three different sized power sources.

Figure 4

High capacity

Large

Compact
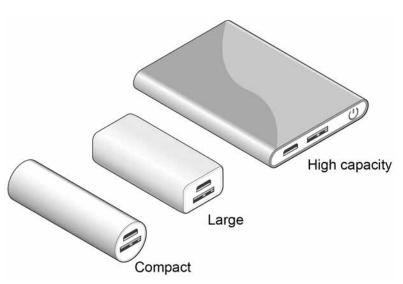
Table 1 gives data about the different power sources.

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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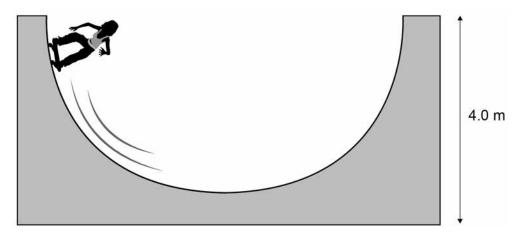
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Turn over ▶

0 3   **Figure 5** shows a girl skateboarding on a semi-circular ramp.

Figure 5

4.0 m

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 × 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

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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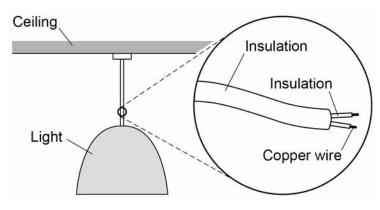_____

_____

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.

Figure 6

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]

_____

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.

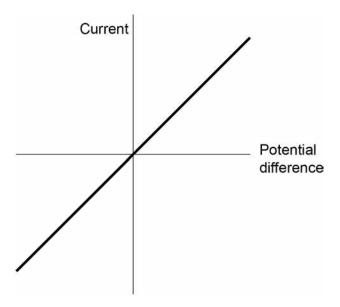Use your equation from question **04.2**

[2 marks]

_____

_____

Charge flow = _____ C

| 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]

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]

_____

_____

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 (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) ☐

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

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

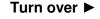Complete **Table 2** to show the number of neutrons and protons in the nuclei.

[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

0 6 **Figure 9** shows two models of the atom.

Figure 9

Plum pudding model   Nuclear model

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.
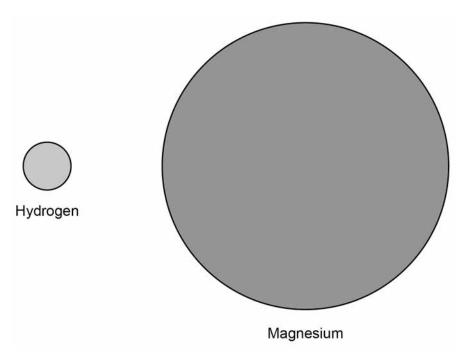**[2 marks]**

Question 6 continues on the next page

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

Hydrogen

Magnesium

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

Determine the radius of a magnesium atom.

Use measurements from **Figure 10**

[2 marks]

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 ▶

0 7 . 2 Another student did a similar experiment.
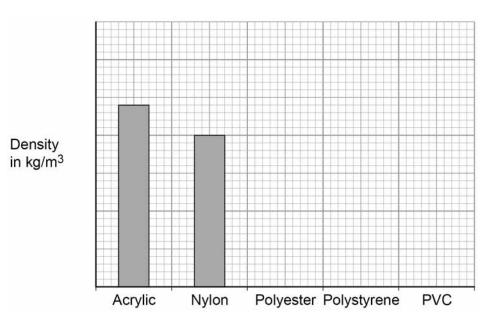
He determined the density of five common plastic materials.

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]

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

12

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED**