AQA Style

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier   Physics Paper 1

Time allowed: 1 hour 15 minutes

Materials

• A ruler

• A pen and pencil

• A calculator

• Physics Equation Sheet

Instructions and Information

• Answer all the questions using a black pen.

• Answer the questions in the space available and cross out any work you do not want to be marked.

• In any calculations make sure you show your working out.

• The marks for each question are shown in brackets.

• The maximum mark for the paper is 70.

• You must make your work as neat as possible and use good English in your answers.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Name _____

Date _____

BEYOND
SCIENCE

0 1   Electricity can be supplied with a direct current or an alternating current. The mains electricity supply in UK homes uses an alternating current.

0 1 . 1   What is an alternating current?

Tick **one** box.

[1 mark]

a current that repeatedly changes direction ☐

a current that alternates between components ☐

a current that is always in the same direction ☐

a current that alternates between routes in a parallel circuit ☐

0 1 . 2   What is the potential difference of the domestic electricity supply in the UK?

Tick **one** box.

[1 mark]

1×10^{-1} V ☐

0V ☐
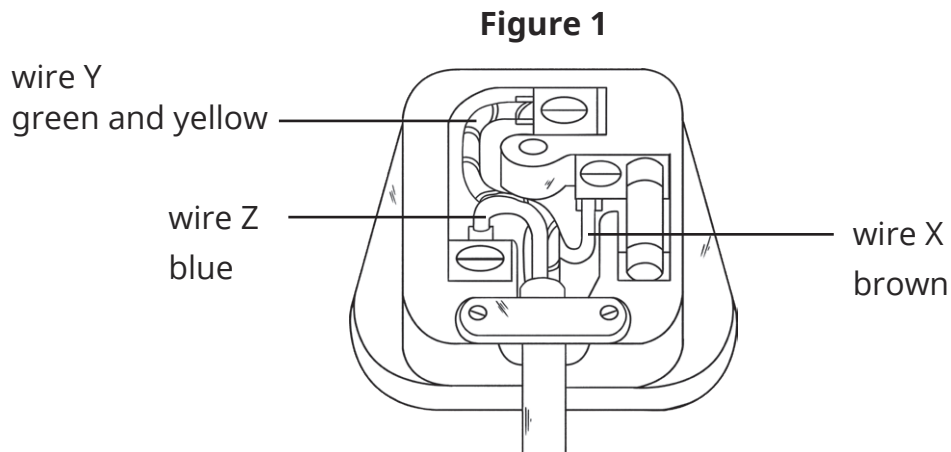
50V ☐

230V ☐

0 1 . 3 **Figure 1** shows the wiring inside a plug. There are three different coloured wires.

Figure 1

wire Y
green and yellow

wire Z
blue

wire X
brown

Name wire **Z**.

[1 mark]

_____

0 1 . 4 The wires in the plug are made from copper. They are surrounded by a layer of rubber or flexible plastic.

Explain why.

[2 marks]

_____

_____

0 1 . 5 The plug is connected to a games console.

The console is connected to a 110V power supply.

The current in the console is 1.2A.

Calculate the power of the console.

Use the equation:

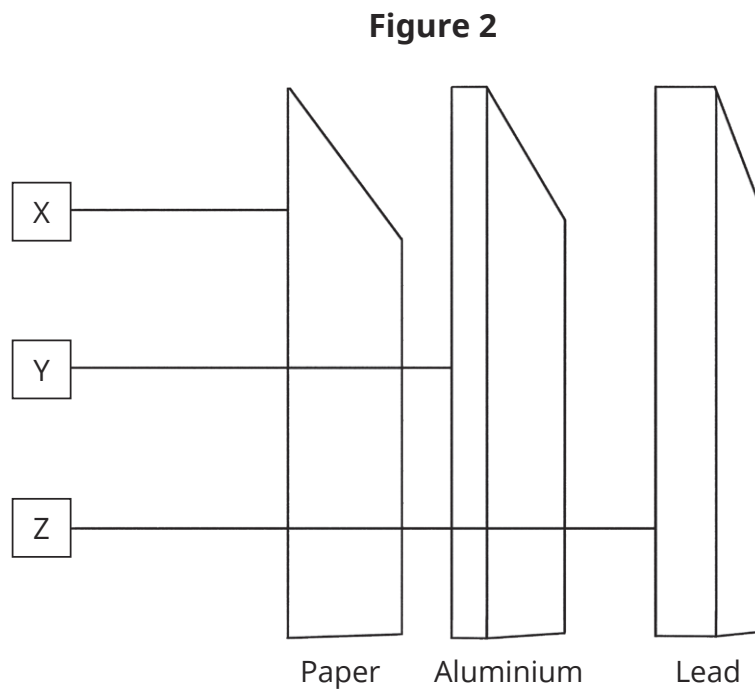power = potential difference × current

[2 marks]

_____

_____

_____

power = _____ W

7

0 2   A teacher demonstrated the penetration of three types of nuclear radiation through different materials.

The demonstration is shown in **Figure 2**.

Figure 2

0 2 . 1   Which letter in **Figure 2** represents beta radiation?

[1 mark]

Tick **one** box.

X ☐

Y ☐

Z ☐

0 2 . 2 Radioactive sources can be dangerous.
Give one safety precaution that should be taken when handling radioactive sources.

[1 mark]

_____

_____

0 2 . 3 When uranium decays, it emits a particle with the symbol $^4_2$He.
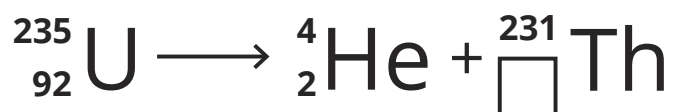
Write down the name of this particle.

[1 mark]

_____

0 2 . 4 Uranium decays to form thorium. The decay can be represented by the equation in **Figure 3**.

Figure 3

$$^{235}_{92}U \longrightarrow {}^{4}_{2}He + {}^{231}_{\square}Th$$

Determine the atomic number of thorium-231.

[1 mark]

_____

0 2 . 5 Uranium can also decay by releasing a gamma wave.

What effect does this have on the mass of the uranium nucleus?

[1 mark]

_____

_____

5

BEYOND
SCIENCE

0 3 A circuit diagram is a visual display of an electric circuit. Circuit diagrams use standard symbols.

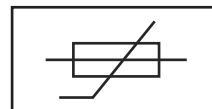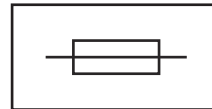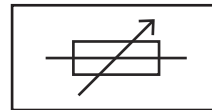**0 3 . 1** Draw **one** line from each component to its circuit symbol
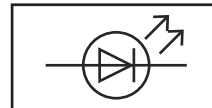
[3 marks]

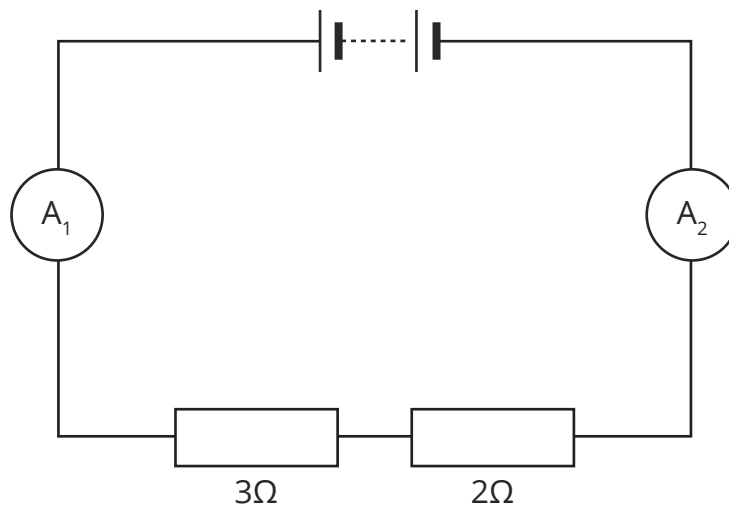| **Component**	**Circuit Symbol**
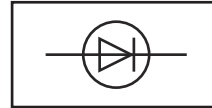
0 3 . 2 **Figure 4** shows a circuit. The circuit contains two resistors joined in series.

Figure 4

Calculate the total resistance of the two resistors.

[1 mark]

_____

_____

total resistance = _____ Ω

0 3 . 3 The current through ammeter 1 (A_1) is 0.6A.

What is the current through ammeter 2 (A_2)?

Explain your answer.

[2 marks]

current _____ A

explanation _____

_____

_____

0 3 . 4 A voltmeter is used to measure potential difference. Draw a voltmeter on **Figure 4** to show how it should be connected to measure the potential difference across the battery.
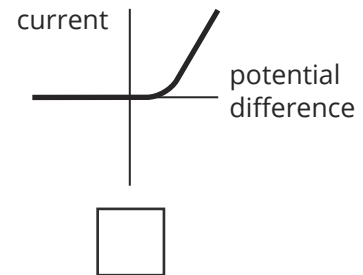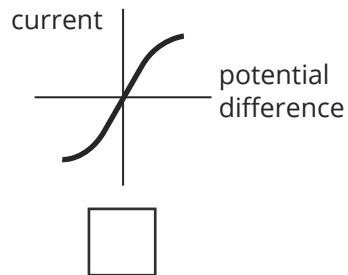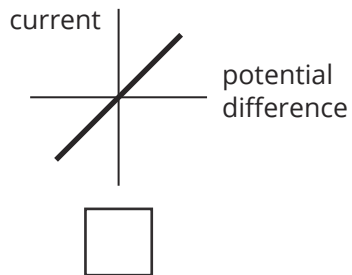
[1 mark]

0 3 . 5   A different circuit contains a lamp. As current flows through the lamp the resistance of the lamp changes.

Which graph represents the resistance of the lamp?

[1 mark]

Tick **one** box.

current

potential
difference

☐

current

potential
difference

☐

current

potential
difference

☐

0 3 . 6   A current of 4A flows through the lamp for 120 seconds.

Calculate the charge transferred while the lamp is on.

Use the equation:

charge = current × time

[2 marks]

_____

_____

_____

charge = _____ C

10

0 4   Different energy sources are used to generate electricity. Some energy sources are renewable, others are not.

0 4 . 1   What does 'renewable energy source' mean?

[1 mark]

_____

_____

0 4 . 2   Name **one** non-renewable source of energy.

[1 mark]

_____

0 4 . 3   Three examples of energy resources are:
- geothermal
- tides
- wind

Explain which of the energy resources is the least reliable.

[2 marks]

_____

_____

_____

_____

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0 4 . 4 **Figure 5** shows an example of a hydroelectric power station. Electricity is generated when the water flows at speed from the reservoir at the top to the reservoir at the bottom. The flowing water turns turbines that are attached to generators and electricity is produced.

Figure 5
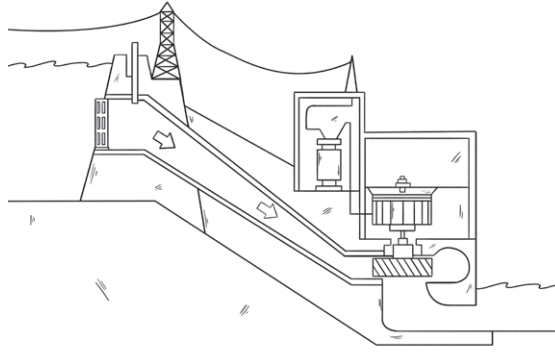
Name the type of energy stored in the water when it is contained in the top reservoir.

[1 mark]

_____

0 4 . 5 1000kg of water is released from the reservoir.

It travels down the slope at 20m/s.

Calculate the kinetic energy of the flowing water.

Use the equation:

kinetic energy = 0.5 × mass × (speed)^2

[2 marks]

_____

_____

_____

_____

kinetic energy = _____ J

0 4 . 6 Complete the sentence. Choose the answer from the box.

| electricity | movement | sound |

[1 mark]

As the water flows through the power station, some energy is wasted as

_____ .

0 4 . 7 Give **one** advantage and **one** disadvantage of a hydroelectric power station.

[2 marks]

advantage: _____

_____

disadvantage: _____

_____

10

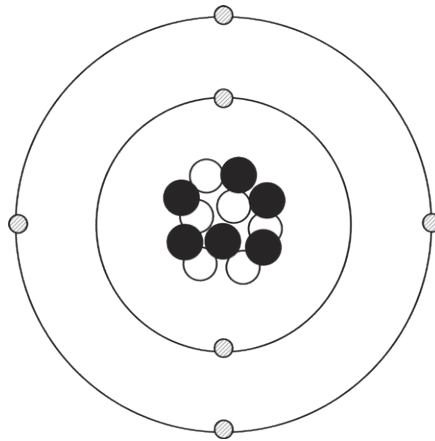**Turn over for the next question**

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0 5 Atoms contain three different types of subatomic particles: protons, neutrons and electrons. Figure 6 shows a diagram of an atom.

Figure 6

0 5 . 1 Name the **two** types of subatomic particles found in the nucleus of an atom.

[1 mark]

1. _____

2. _____

0 5 . 2 Explain why an atom has no overall charge.

You should refer to the subatomic particles in your explanation.

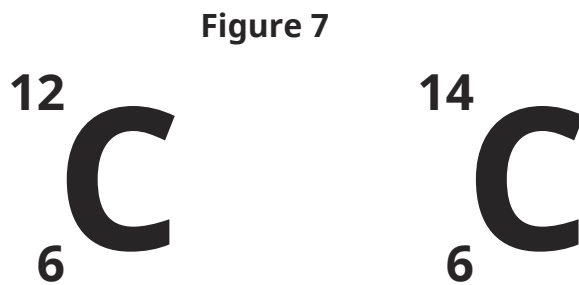[2 marks]

_____

_____

_____

BEYOND SCIENCE

0 5 . 3 Carbon-12 and carbon-14 are isotopes of carbon. **Figure 7** shows a representation of each isotope.

Figure 7

$$^{12}_{6}C \qquad ^{14}_{6}C$$

What are isotopes?

[2 marks]

_____

_____

0 5 . 4 Radioactive substances give out radiation from their nucleus. The half-life of carbon-14 is 5730 years.

What does 'half-life' mean?

[1 mark]

_____

_____

0 5 . 5   Radiation can be measured by a Geiger-Müller tube and counter.

Table 1 shows the count-rate for a radioactive source over 8 hours.

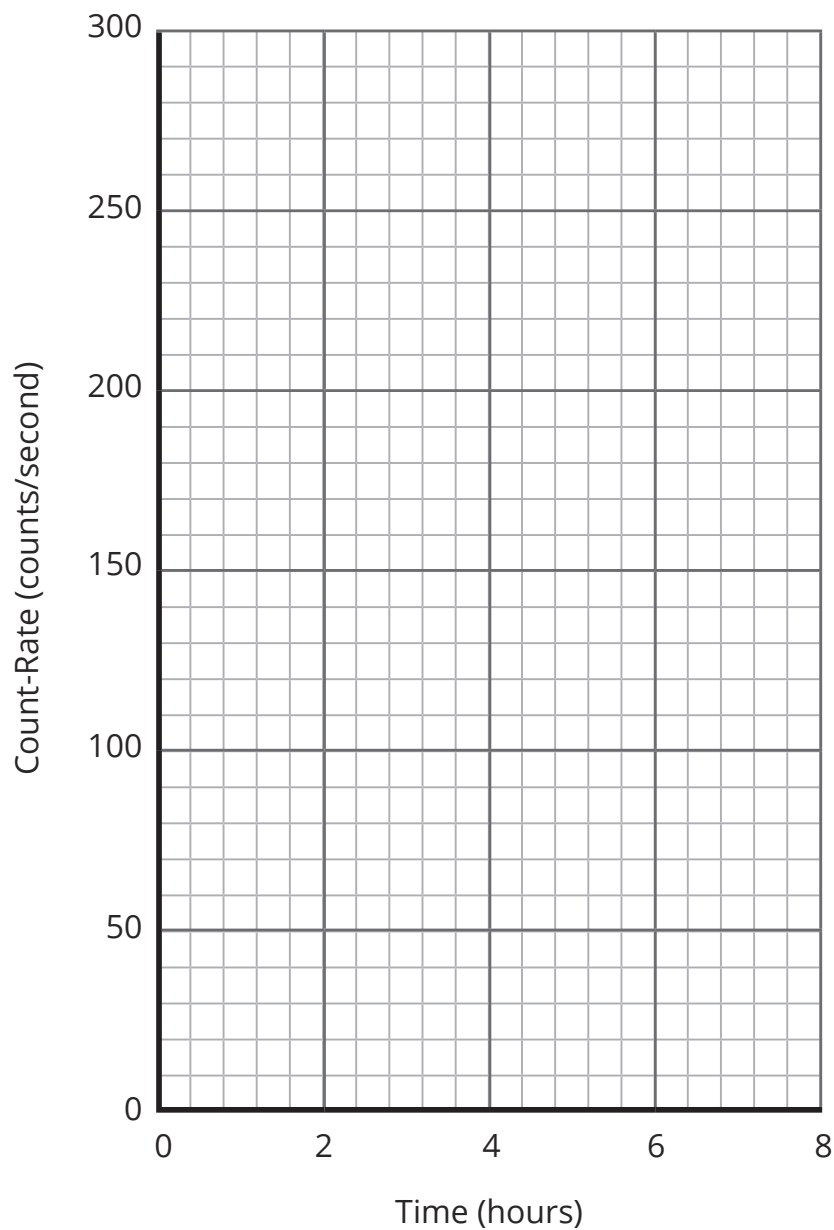| Time (hours)	Count Rate (counts/second)
0	280
2	190
4	140
6	100
8	70

Complete **Figure 8** using the results in **Table 1**.

Draw a line of best fit.

[3 marks]

Figure 8

0 5 . 6   Use your completed graph to determine the half-life of the radioactive isotope.

Show clearly on **Figure 8** how you obtain your answer.

[2 marks]

_____

_____

_____

half-life = _____ hours

11

Turn over for the next question

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| 0 | 6 | | An electric kettle is used to boil water.

| 0 | 6 | . | 1 | Complete the sentences. Choose answers from the box.

[3 marks]

| thermal | sound | gravitational potential |
| electrical | magnetic | |

The kettle transfers _____ energy into useful

_____ energy. Some of the energy is wasted as

_____.

| 0 | 6 | . | 2 | What happens to the wasted energy?

[1 mark]

_____

_____

| 0 | 6 | . | 3 | Write down the equation that links efficiency, total energy input and useful energy output.

[1 mark]

_____

_____

| 0 | 6 | . | 4 | The kettle is supplied with 200J of energy every second. It transfers 66J as useful energy.

Calculate the efficiency of the kettle.

[2 marks]

_____

_____

_____

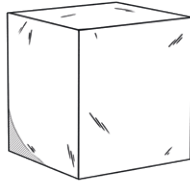efficiency = _____

7

BEYOND SCIENCE

0 7   A group of students wanted to find out the density of the objects shown in **Figure 9**.
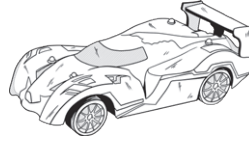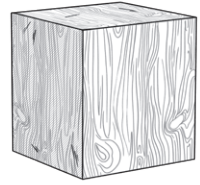
Figure 9

| key | regular aluminium block | toy car | regular wooden block |

0 7 . 1   Which unit is used to measure density?

[1 mark]

Tick **one** box.

m/cm^2 ☐

N/kg ☐

kg/m^3 ☐

m/s^2 ☐

Turn over for the next question

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0 7 . 2   Describe a method that could be used to calculate the density of the objects in **Figure 9**.

You should include:

- the equipment required;
- what would be measured;
- any calculations needed.

[6 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

0 7 . 3   Explain how the density of water changes when it is heated.

[3 marks]

_____

_____

_____

10

BEYOND SCIENCE

0 8   A chef wants to melt 0.5kg of chocolate.

0 8 . 1   Describe the movement of particles in the chocolate before it is heated.

[1 mark]

_____

_____

0 8 . 2   The chef heats the chocolate over a pan of boiling water. The temperature of the chocolate increases by 9°C.

9450J of energy is transferred to the chocolate.

Calculate the specific heat capacity of the chocolate.

Use the correct equation from the Physics Equation Sheet.

[3 marks]

_____

_____

_____

_____

specific heat capacity = _____ J/kg °C

0 8 . 3   When the chocolate reaches 30°C, it starts to melt.

The energy required for all of the chocolate to melt can be calculated using the equation:

thermal energy for a change of state = mass × specific latent heat

What is the difference between specific heat capacity and specific latent heat?

[2 marks]

_____

_____

_____

_____

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0 8 . 4 Describe what happens to the temperature of the chocolate as it melts.

[1 mark]

_____

0 8 . 5 Explain what will happen to the mass of the chocolate when it has all melted.

[2 marks]

_____

_____

0 8 . 6 Melting is an example of a physical change.

Explain why melting is a physical change rather than a chemical change.

[1 mark]

_____

_____

10

END OF QUESTIONS

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