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RECOGNISING ACHIEVEMENT

F

Wednesday 5 June 2013 – Afternoon

GCSE GATEWAY SCIENCE
PHYSICS B

B751/01 Physics modules P1, P2, P3 (Foundation Tier)

B722330613

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

B751101

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **28** pages. Any blank pages are indicated.

EQUATIONS

$$\text{energy} = \text{mass} \times \begin{matrix}\text{specific}\\ \text{heat}\\ \text{capacity}\end{matrix} \times \begin{matrix}\text{temperature}\\ \text{change}\end{matrix}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

$$\text{efficiency} = \frac{\text{useful energy output } (\times 100\%)}{\text{total energy input}}$$

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy supplied} = \text{power} \times \text{time}$$

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{distance} = \text{average speed} \times \text{time}$$

$$s = \frac{(u + v)}{2} \times t$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{work done} = \text{force} \times \text{distance}$$

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

$$\text{power} = \text{force} \times \text{speed}$$

$$KE = \frac{1}{2}mv^2$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

$$GPE = mgh$$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$m_1u_1 + m_2u_2 = (m_1 + m_2)v$$

$$\text{refractive index} = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$$

$$\text{magnification} = \frac{\text{image size}}{\text{object size}}$$

$$I_e = I_b + I_c$$

$$\frac{\begin{matrix}\text{voltage across}\\ \text{primary coil}\end{matrix}}{\begin{matrix}\text{voltage across}\\ \text{secondary coil}\end{matrix}} = \frac{\begin{matrix}\text{number of}\\ \text{primary turns}\end{matrix}}{\begin{matrix}\text{number of}\\ \text{secondary turns}\end{matrix}}$$

$$\text{power loss} = (\text{current})^2 \times \text{resistance}$$

$$V_pI_p = V_sI_s$$

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Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

SECTION A – Module P1

1 Allan wants to reduce energy losses from his house.

He asks an energy adviser for help.

(a) The adviser uses a thermal imaging camera to produce a photograph of the house.

It is used to indicate where heat energy is lost from the house.

The adviser writes a report for Allan.

He includes a black and white photocopy of the original photograph in his report.

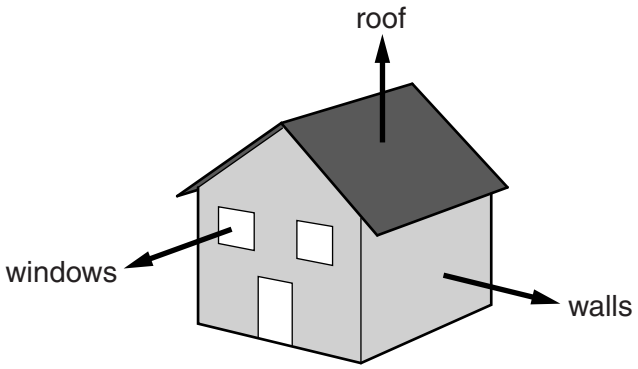
Complete the sentences about the **original** photograph.

The temperature is represented by different ..... .

This type of photograph is known as a ..... .

[2]

(b) The adviser's report has a diagram which shows where some of the energy is lost.



Energy saving methods are used to reduce energy losses from houses.

Many of these methods use air to reduce energy loss.

Describe the energy saving methods that could reduce energy losses from Allan's house using air. Explain how air is important.

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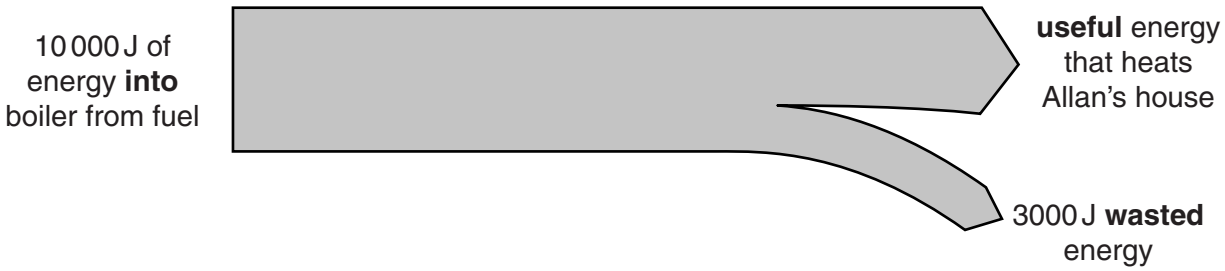
..... **[3]**

Turn over for the remainder of question 1

(c) The energy adviser also suggests that Allan replaces his old central heating boiler.

The Sankey diagram shows energy data for Allan's boiler.



(i) Calculate the efficiency of Allan's boiler.

Give your answer as a percentage.

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efficiency ..... % **[3]**

(ii) The adviser tells Allan that his boiler is in a low efficiency band.

Band	Efficiency range
A	90% and above
B	86% – 90%
C	82% – 86%
D	78% – 82%
E	74% – 78%
F	70% – 74%
G	below 70%

Is the energy adviser correct?

answer ..... .

Explain your answer.

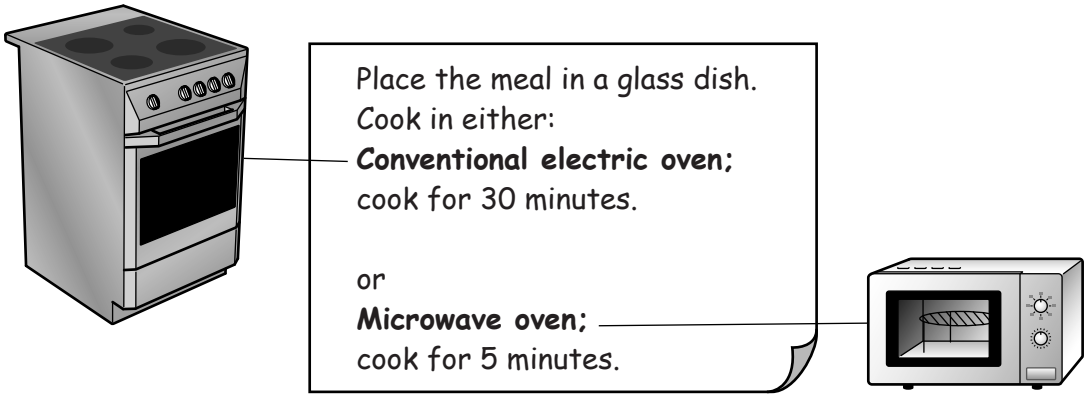
.....

..... **[1]**

[Total: 9]

2 **(a)** Damien wants to cook a curry he bought at the supermarket.

He looks at the label on the packaging of the meal.



Cooking using infrared in the conventional electric oven uses 20 times more energy than the microwave oven to cook the meal.

Describe and explain how the meal is cooked in each oven and why they require such different cooking times.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(b) Microwaves are also used for mobile phone messages.

Damien is worried about his daughter Susie using her mobile phone.

Damien and Susie each make a statement about using mobile phones.

Damien: "I think that using mobile phones is harmful. They cause some types of cancer."

Susie: "Results of a study that ran for a number of years were published in 2011. It showed no clear link between using mobile phones and increased cancer risk."

One of these statements is based on scientific evidence. The other statement is not.

Explain why.

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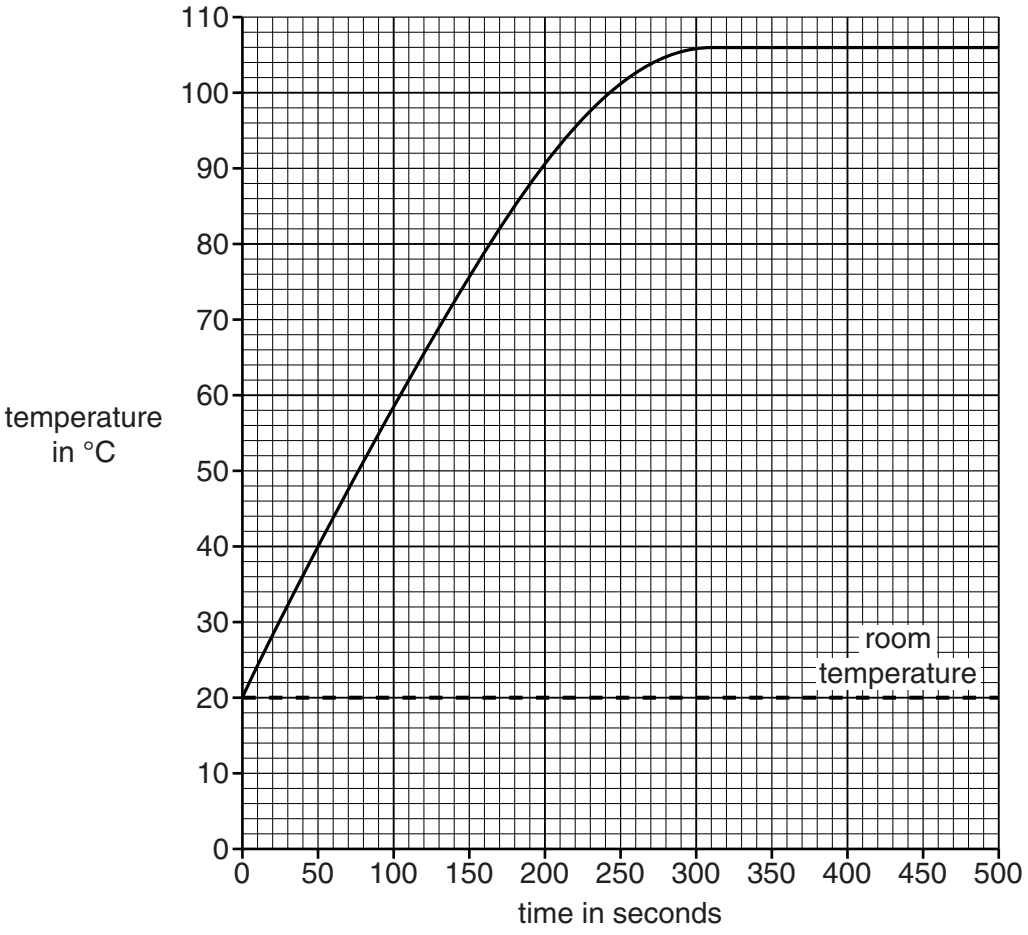
..... **[2]**

[Total: 8]

3 Layla heats a beaker containing a liquid and records its temperature.

Look at the graph of her results.



(a) Layla concludes that the liquid boiled during the experiment.

How does the graph show this?

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..... **[1]**

(b) What is the boiling point of the liquid?

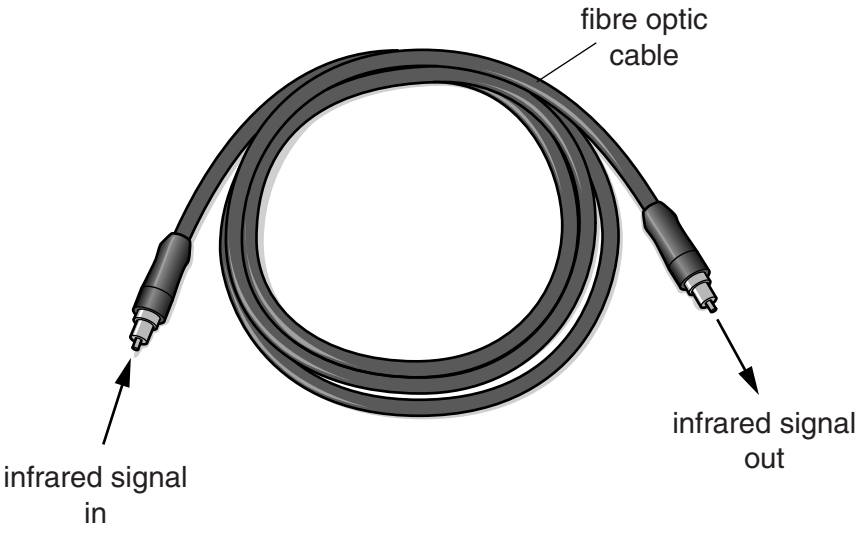
answer ..... °C. **[1]**

[Total: 2]

4 Reeta is learning about different types of waves.

Electromagnetic waves are used for communication.

(a) (i) Infrared waves can transmit signals from one end of a fibre optic cable to the other.



How does the infrared signal pass from one end of the cable to the other end?

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..... **[2]**

(ii) Infrared radiation can also be used for cooking.

Write down one **other** use of infrared radiation.

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..... **[1]**

(b) A cable is not always needed for communications.

Write down **one** advantage of not needing a cable for a device used for communications.

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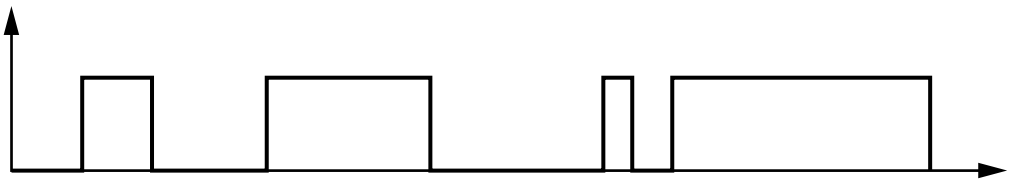
..... **[1]**

(c) There are two types of signals used for transmission.

These types of signal are analogue and digital.

Reeta draws this diagram of one type of signal.



Explain which type of signal Reeta's diagram shows **and** why it is not the other type.

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..... **[2]**

[Total: 6]

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Question 5 begins on page 14

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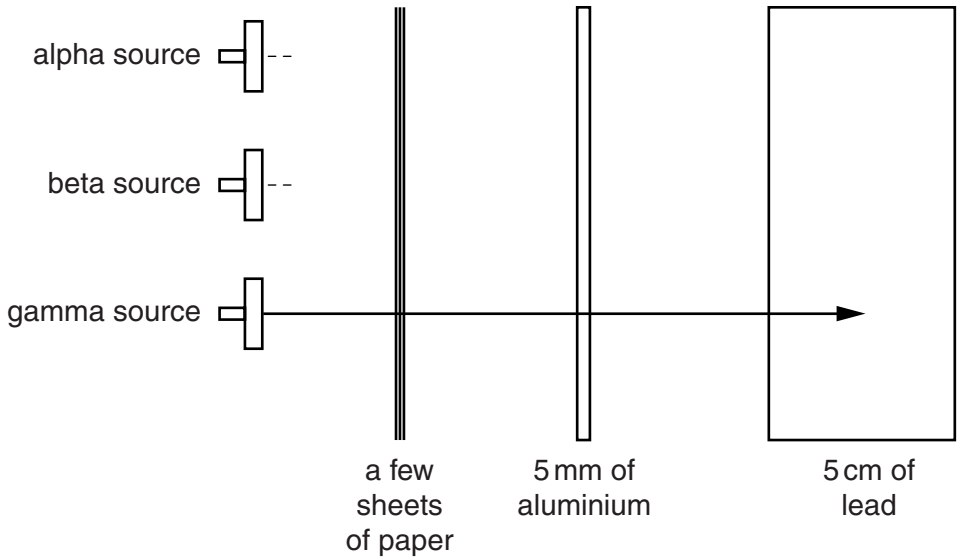
SECTION B – Module P2

5 This question is about nuclear radiation.

(a) Complete the diagram to show the penetrating power of alpha **and** beta radiation.

Gamma radiation has been completed for you.



[1]

(b) Describe how to handle radioactive materials safely.

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..... **[2]**

(c) Nuclear radiation can be beneficial or harmful.

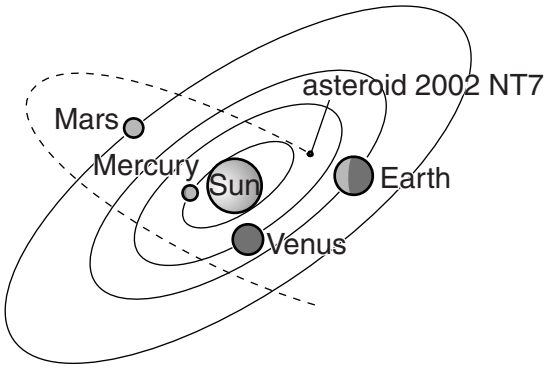
Tick (✓) the correct box next to each statement to show if the radiation is beneficial or harmful.

	beneficial	**harmful**
Alpha radiation used in smoke detectors.	☐	☐
Gamma radiation used as a tracer.	☐	☐
Radiation causing ionisation in healthy body cells.	☐	☐
Radioactive waste from nuclear power stations.	☐	☐

[2]

[Total: 5]

6 The asteroid named 2002 NT7 is a Near Earth Object (NEO).



Asteroid 2002 NT7 has a low probability of colliding with the Earth in the year 2019.

It has a diameter of 2 km.

Describe why scientists are making detailed observations of this asteroid and describe what could happen if it collides with Earth.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 6]

7 The Sun's energy produces convection currents that cause wind.

Wind is used to drive turbines.

(a) Describe the **advantages** of wind turbines compared to a conventional coal power station.

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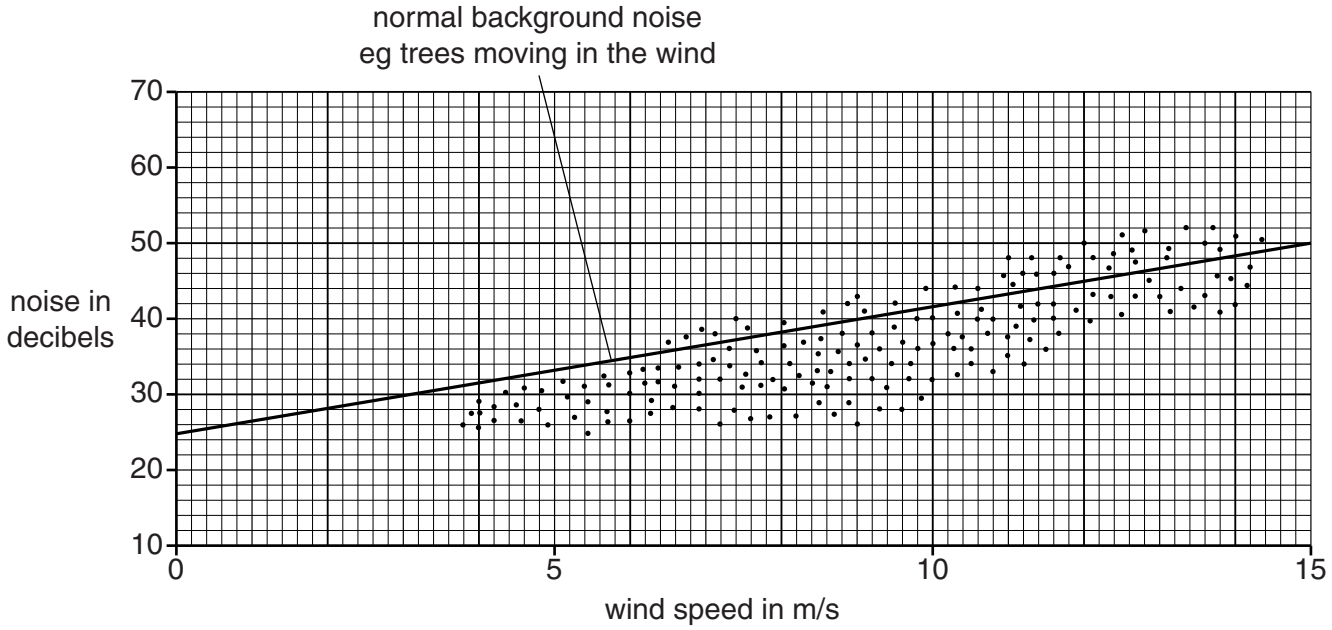
..... **[2]**

(b) The people in the house are concerned about noise from the turbine.

Look at the graph.

Each dot shows a measurement of the noise from the wind turbine.



(i) Use the graph to describe how the wind turbine noise is affected by wind speed.

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..... **[1]**

(ii) The mean wind speed in this area is 5 m/s.

The maximum wind speed in this area is usually less than 15 m/s.

Explain, using data from the graph, why the people in the house **do not** normally need to worry about the noise from the turbine.

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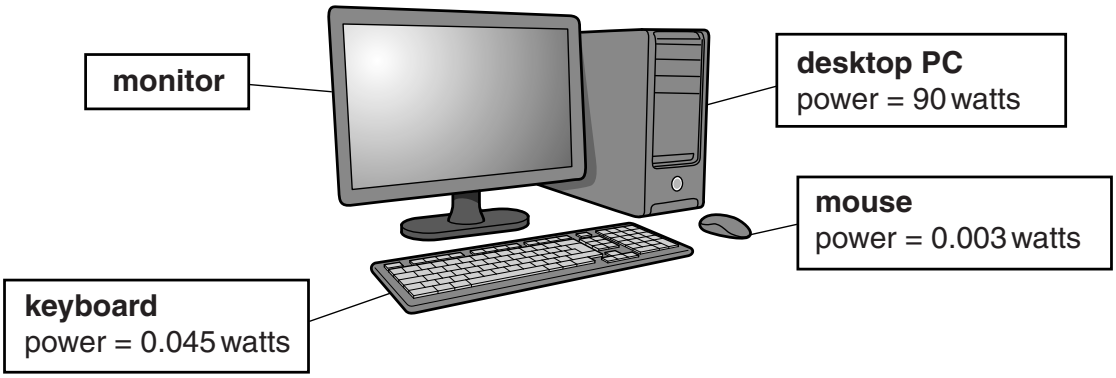
..... **[2]**

[Total: 5]

8 Kyle has a wireless computing system.

Look at the information in the diagram.



(a) The monitor plugs into a 230 V supply and uses a current of 0.5 A.

Calculate the power of the monitor.

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.....

answer ..... W **[2]**

(b) The four parts of the wireless computing system cost different amounts to use.

Complete the list to show the cost of using the four parts of the computing system.

One has been done for you.

most expensive to use .....monitor.....

.....

.....

least expensive to use ..... **[1]**

(c) Increasing the use of technology has increased energy consumption.

This may have contributed to global warming.

People have different views about how to **reduce** global warming.

Fatima thinks that it would help if everyone changed to using low energy light bulbs.

Sara thinks the problem is so big that it does not matter what individuals do.

Claire thinks we could all reduce energy use by walking instead of driving cars.

Identify two **opposing** views and describe what long term effects each view could have on the environment.

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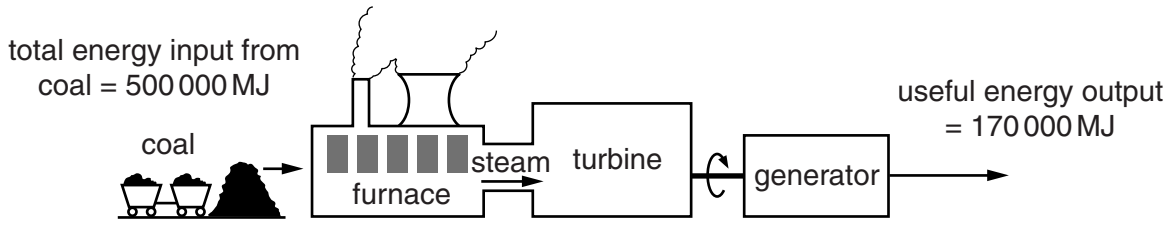
..... **[2]**

[Total: 5]

9 Electricity is generated in power stations.



(a) Calculate the efficiency of this power station.

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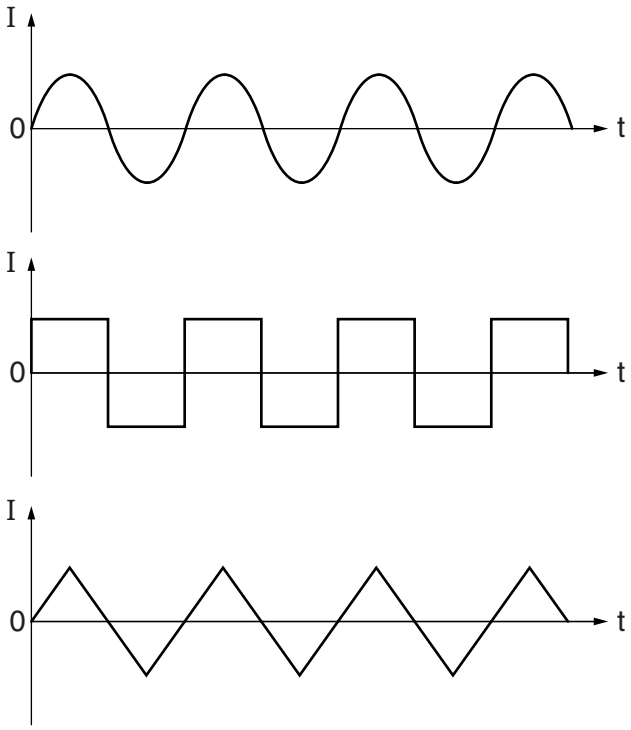
efficiency ..... **[2]**

(b) The generator in the power station produces alternating current (AC).

(i) Name the type of current a battery produces.

..... **[1]**

(ii) Look at the three different current-time graphs.



Describe why all the graphs show alternating currents.

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..... **[1]**

[Total: 4]

SECTION C – Module P3

10 This question is about choosing the best car to buy.

(a) Look at the information about these cars.

Car	Power in kW	Engine capacity in litres	Mass of car in kg	Fuel consumption in km per litre
Audi	367	6.3	2050	23
BMW	300	6.0	2050	25
Jaguar	375	5.0	1900	25
Rolls Royce	340	6.8	2700	18
Volvo	225	3.0	1850	29

(i) Which car has the **highest** power output?

Choose from:

Audi **BMW** **Jaguar** **Rolls Royce** **Volvo**

..... **[1]**

(ii) This high-powered car does **not** have the worst fuel consumption.

Use the data to suggest and explain a reason why.

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.....

..... **[2]**

(iii) Which car has the **best** fuel consumption?

Choose from:

Audi **BMW** **Jaguar** **Rolls Royce** **Volvo**

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Suggest reasons why this is the case.

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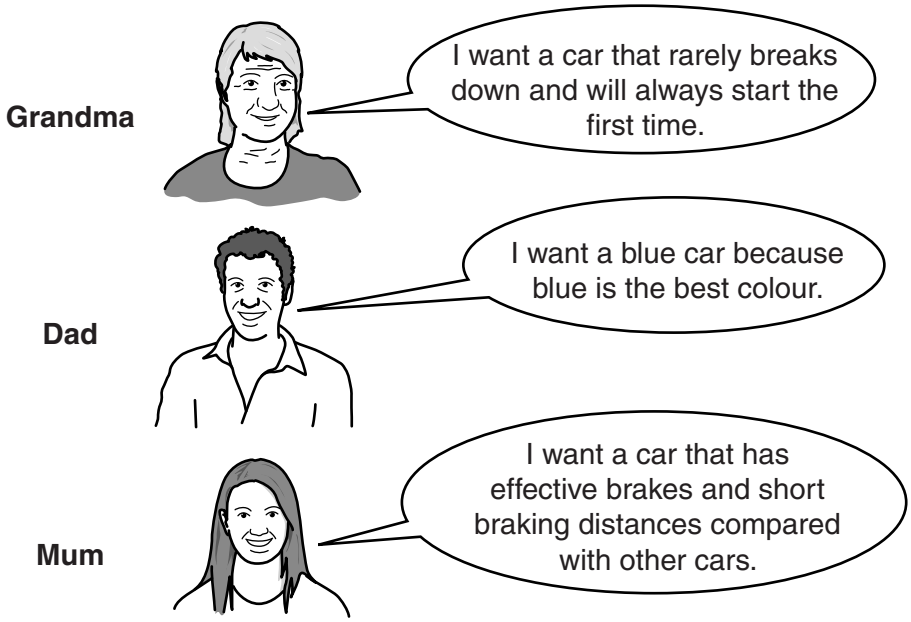
..... **[3]**

Turn over for the remainder of question 10

(b) Jennie's family cannot decide which car to buy.

Read what they are saying.



Some parts of what they are saying can be supported by scientific evidence. Other parts are only views, claims or opinions.

(i) Whose statement can be **completely** supported by scientific evidence?

Choose from:

Grandma **Dad** **Mum**

..... **[1]**

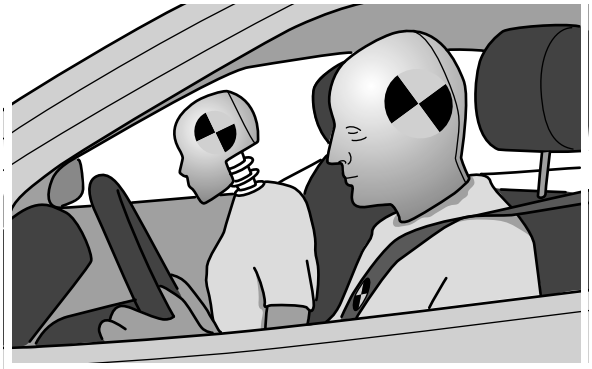
(ii) Whose statement can be **partly** supported by scientific evidence?

Choose from:

Grandma **Dad** **Mum**

..... **[1]**

(c) Scientists test new cars using crash dummies to see how safe they are.



They give each car a safety rating. They share their findings with other scientists.

(i) Why do other scientists want to know about the findings of these tests?

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..... **[1]**

(ii) Scientists sometimes change these safety ratings some years after the cars have been tested.

Suggest reasons why they do this.

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..... **[2]**

(d) Some car safety features absorb energy if the car crashes.

Write about **two** of these features.

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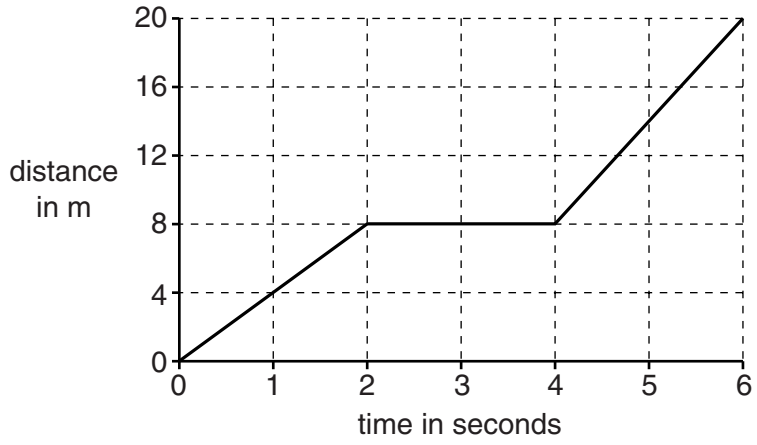
..... **[2]**

[Total: 13]

11 Daisy uses her remote controlled model car.

Look at the simple distance-time graph for this car.



Describe and compare, in detail, the distances moved, and the speeds of her car during the 6-second journey.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

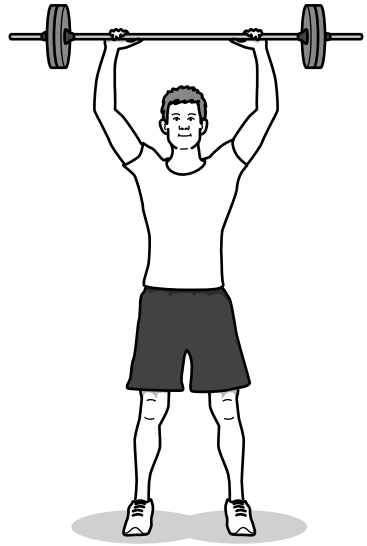
[Total: 6]

12 Hossein is a weightlifter.

His best lift in training is a bar with a mass of 250kg.

He does 5000 J of work on the bar with a mass of 250kg when he lifts it.

The gravitational field strength (g) on Earth is 10 N/kg.



Calculate the weight of this 250kg mass, and how high Hossein lifts the bar.

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weight = ... N

.....

.....

height lifted = ... m

[3]

[Total: 3]

13 Four friends test drive the **same** new car.

They are interested in how economical the car is.

Look at the fuel consumptions for each driver.

Test driver	Fuel used in litres	Distance travelled on test drive in km	Fuel consumption in km per litre
Sally	3.0	30	10
Lindsey	2.5	30	
Ian	3.0	36	12
Karen	5.0	40	8

(a) Calculate the fuel consumption for Lindsey's test drive.

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answer ..... km per litre **[1]**

(b) Suggest reasons why Ian and Karen get **different** fuel consumptions for the same car.

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..... **[2]**

[Total: 3]

END OF QUESTION PAPER

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