Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
June 2013

Science A
Unit Physics P1

PH1FP

F

Physics
Unit Physics P1

Thursday 13 June 2013 9.00 am to 10.00 am

For this paper you must have:
- a ruler
- a calculator
- the Physics Equations Sheet (enclosed).

Time allowed
- 1 hour

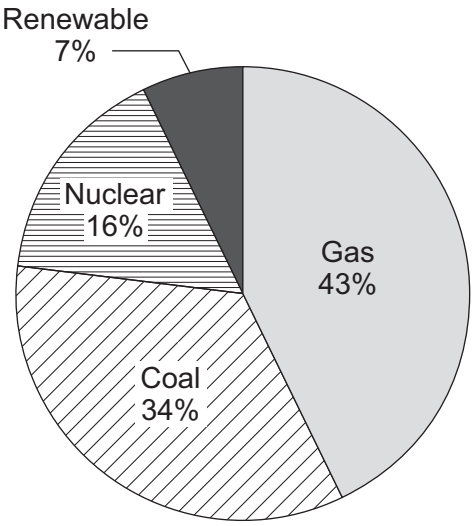
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 9(a) should be answered in continuous prose. In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 (a) The pie chart shows the proportions of electricity generated in the UK from different energy sources in 2010.



1 (a) (i) Calculate the percentage of electricity generated using fossil fuels.

.....

Percentage = ... %

(1 mark)

1 (a) (ii) The pie chart shows that 7% of electricity was generated using renewable energy sources.

Which **one** of the following is **not** a renewable energy source?

Tick (✓) **one** box.

Oil ☐

Solar ☐

Wind ☐

(1 mark)

1 (b) Complete the following sentence.

In some types of power station, fossil fuels are burned to heat ..... to produce steam.

(1 mark)

1 (c) Burning fossil fuels releases carbon dioxide into the atmosphere.

Why do many scientists think adding carbon dioxide to the atmosphere is harmful to the environment?

Tick (✓) **one** box.

Carbon dioxide is the main cause of acid rain. ☐

Carbon dioxide causes global warming. ☐

Carbon dioxide causes visual pollution. ☐

(1 mark)

4

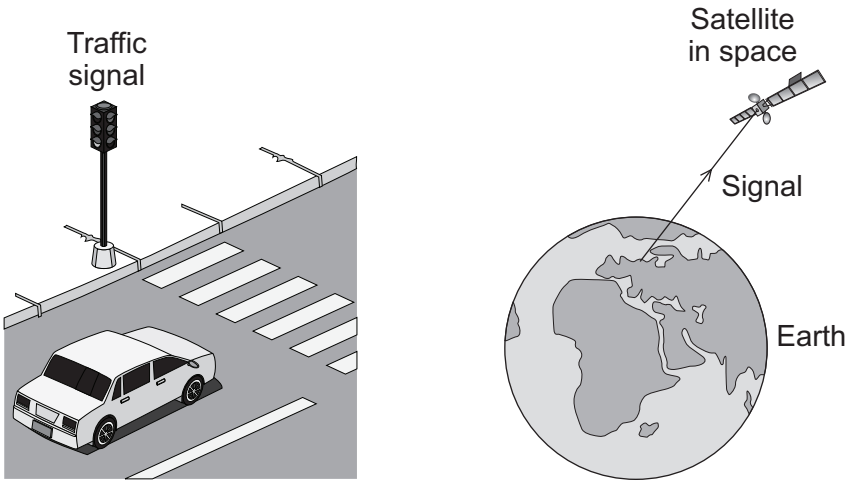
Turn over for the next question

2 **Diagram 1** shows four of the seven types of wave in the electromagnetic spectrum.

Diagram 1

J	**K**	**L**	Visible light	Infrared	Microwaves	Radio waves

2 (a) The **four** types of electromagnetic wave named in **Diagram 1** above are used for communication.



2 (a) (i) Which type of electromagnetic wave is used when a traffic signal communicates with a car driver?

.....

(1 mark)

2 (a) (ii) Which type of electromagnetic wave is used to communicate with a satellite in space?

.....

(1 mark)

2 (b) Gamma rays are part of the electromagnetic spectrum.

Which letter, **J**, **K** or **L**, shows the position of gamma rays in the electromagnetic spectrum?

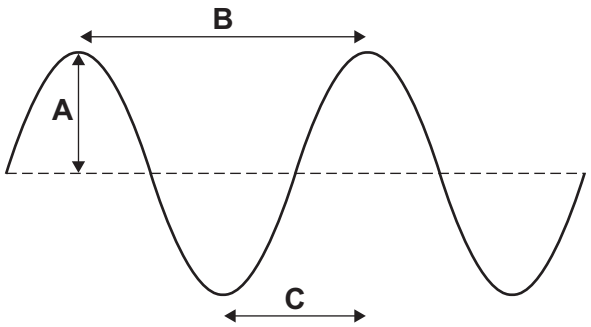
Draw a ring around the correct answer.

J **K** **L**

(1 mark)

2 (c) **Diagram 2** shows an infrared wave.

Diagram 2



2 (c) (i) Which **one** of the arrows, labelled **A**, **B** or **C**, shows the wavelength of the wave?

Write the correct answer, **A**, **B** or **C**, in the box. ☐

(1 mark)

2 (c) (ii) Draw a ring around the correct answer to complete the sentence.

The wavelength of infrared waves is

shorter than

the same as

longer than

the wavelength of radio waves.

(1 mark)

Question 2 continues on the next page

2 (d) Mobile phone networks send signals using microwaves. Some people think the energy a person's head absorbs when using a mobile phone may be harmful to health.

2 (d) (i) Scientists have compared the health of people who use mobile phones with the health of people who do not use mobile phones.

Which **one** of the following statements gives a reason why scientists have done this?

Tick (✓) **one** box.

To find out if using a mobile phone is harmful to health. ☐

To find out if mobile phones give out radiation. ☐

To find out why some people are healthy. ☐

(1 mark)

2 (d) (ii) The table gives the specific absorption rate (SAR) value for two different mobile phones.

The SAR value is a measure of the maximum energy a person's head absorbs when a mobile phone is used.

Mobile Phone	SAR value in W/kg
X	0.28
Y	1.35

A parent buys mobile phone **X** for her daughter.

Using the information in the table, suggest why buying mobile phone **X** was the best choice.

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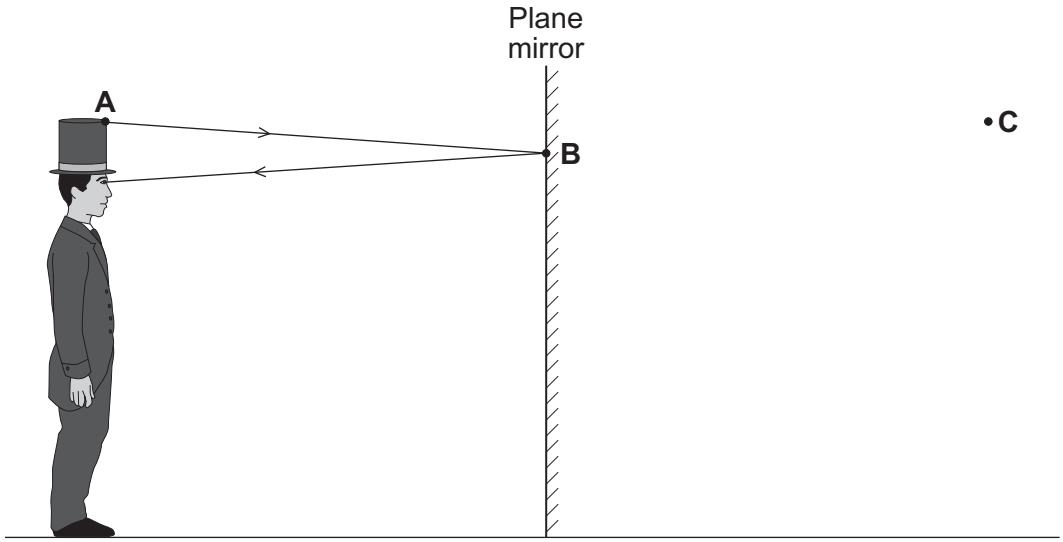
(2 marks)

8

3 A person can see an image of himself in a tall plane mirror.



The diagram shows how the person can see his hat.

3 (a) Which point, **A**, **B** or **C**, shows the position of the image of his hat?

Write the correct answer, **A**, **B** or **C**, in the box. ☐

(1 mark)

3 (b) On the diagram, use a ruler to draw a light ray to show how the person can see his shoe.

(3 marks)

3 (c) Which **one** of the words in the box is used to describe the image formed by a plane mirror?

Draw a ring around the correct answer.

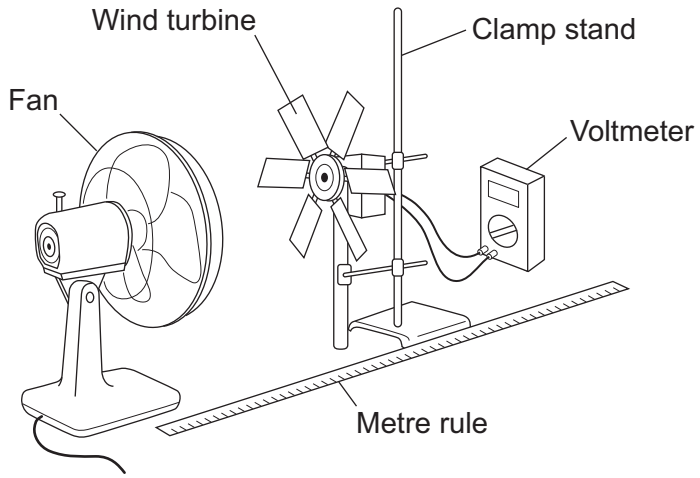
imaginary	**real**	**virtual**

(1 mark)

5

4 (a) A student investigated how the number of blades on a wind turbine affects the output voltage of the turbine.

The student used the apparatus shown in the diagram.



The fan was used to turn the wind turbine.

4 (a) (i) The fan was always the same distance from the wind turbine.

Why?

.....

.....

(1 mark)

4 (a) (ii) After switching the fan on, the student waited 20 seconds before taking the voltmeter reading.

Suggest why.

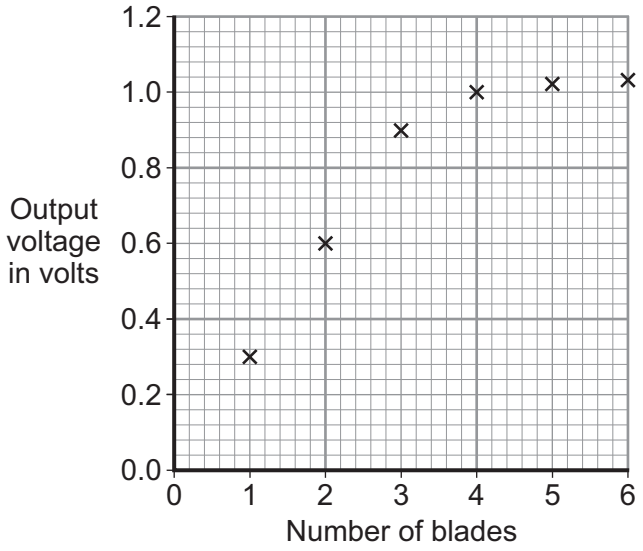
.....

.....

(1 mark)

4 (a) (iii) The student changed the number of blades on the wind turbine.

The student's results are shown in the scatter graph.



What conclusion can be made from the results in the scatter graph?

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.....

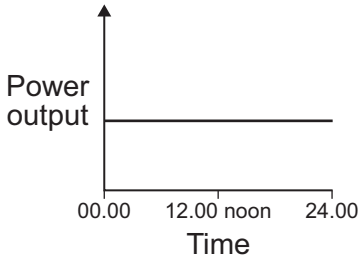
(2 marks)

Question 4 continues on the next page

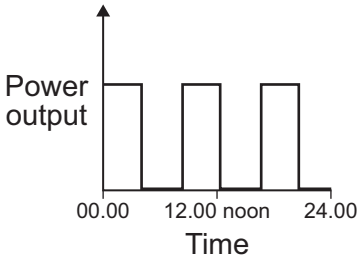
4 (b) The amount of electricity generated using wind turbines is increasing.

Which graph, **A**, **B** or **C**, is most likely to show the electrical power output from a wind turbine over one day?

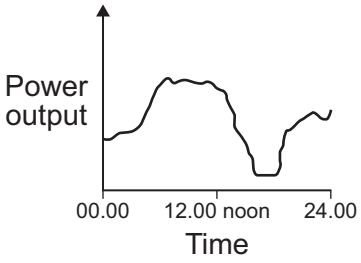
Graph **A**



Graph **B**



Graph **C**



Write the correct answer, **A**, **B** or **C**, in the box. ☐

Give a reason for your answer.

.....

.....

.....

(2 marks)

6

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

5 (a) A lorry has an air horn. The air horn produces sound waves in the air.

5 (a) (i) Use **one** word to complete the following sentence.

Sound waves cause air particles to ..... .

(1 mark)

5 (a) (ii) The air horn produces sound waves at a constant frequency of 420 Hz.
The wavelength of the sound waves is 0.80 m.

Calculate the speed of the sound waves.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Speed = ... m/s

(2 marks)

5 (b) A person standing at the side of the road, as the lorry goes past, hears the sound from the air horn change pitch.

5 (b) (i) What determines the pitch of a sound?

Draw a ring around the correct answer.

amplitude **frequency** **loudness**

(1 mark)

5 (b) (ii) As the lorry moves away from the person, the air horn continues to produce sound waves with a wavelength of 0.80 m.

What is the wavelength of the sound waves the person heard?

Draw a ring around the correct answer.

shorter than 0.8 m **equal to 0.8 m** **longer than 0.8 m**

(1 mark)

5 (b) (iii) The sound waves the person heard from the moving air horn are different to the sound waves the air horn produced.

What name is given to this effect?

Draw a ring around the correct answer.

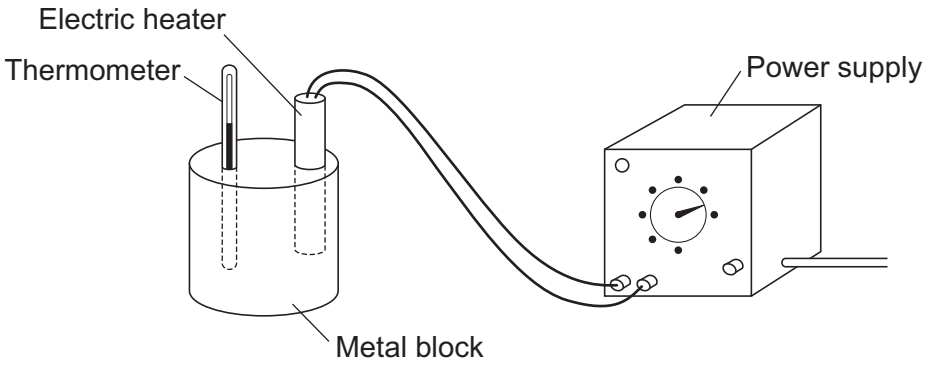
diffraction **Doppler** **refraction**

(1 mark)

6

Turn over for the next question

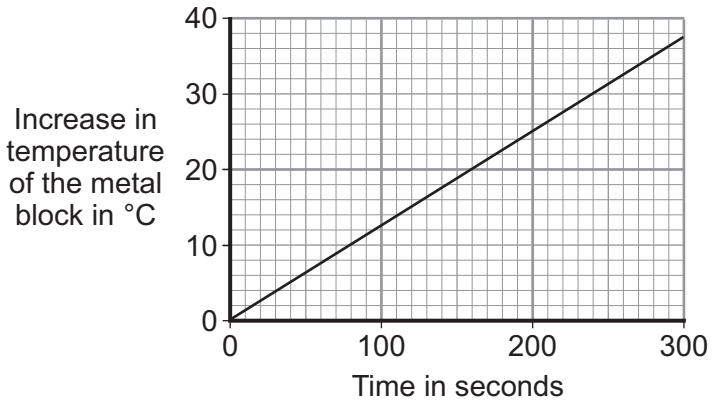
6 (a) A student used the apparatus drawn below to investigate the heating effect of an electric heater.



6 (a) (i) Before starting the experiment, the student drew **Graph A**.

Graph A shows how the student expected the temperature of the metal block to change after the heater was switched on.

Graph A



Describe the pattern shown in **Graph A**.

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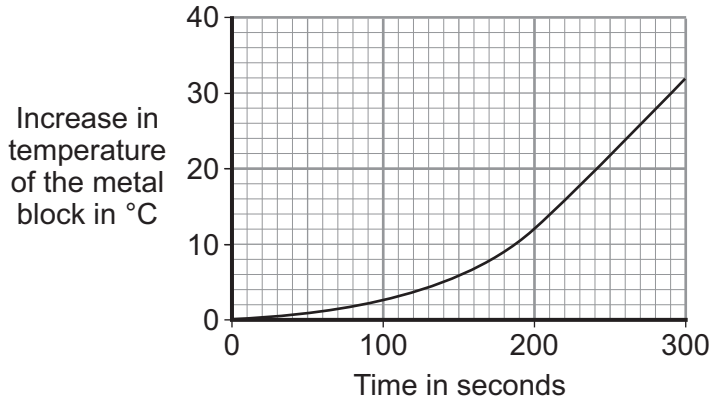
(2 marks)

6 (a) (ii) The student measured the room temperature. He then switched the heater on and measured the temperature of the metal block every 50 seconds.

The student calculated the increase in temperature of the metal block and plotted **Graph B**.

Graph B



After 300 seconds, **Graph B** shows the increase in temperature of the metal block is lower than the increase in temperature expected from **Graph A**.

Suggest **one** reason why.

.....

.....

(1 mark)

6 (a) (iii) The power of the electric heater is 50 watts.

Calculate the energy transferred to the heater from the electricity supply in 300 seconds.

Use the correct equation from the Physics Equations Sheet.

.....

.....

.....

Energy transferred = ... J

(2 marks)

Question 6 continues on the next page

6 (b) The student uses the same heater to heat blocks of different metals. Each time the heater is switched on for 300 seconds.

Each block of metal has the same mass but a different specific heat capacity.

Metal	Specific heat capacity in J/kg°C
Aluminium	900
Iron	450
Lead	130

Which **one** of the metals will heat up the most?

Draw a ring around the correct answer.

aluminium **iron** **lead**

Give, in terms of the amount of energy needed to heat the metal blocks, a reason for your answer.

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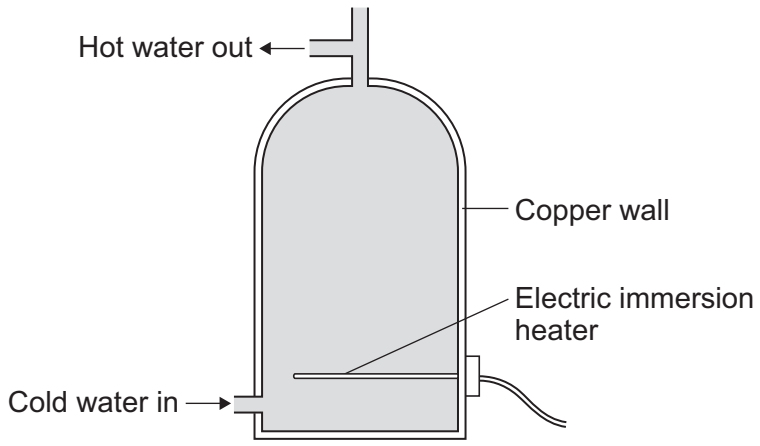
(2 marks)

6 (c) A homeowner uses an electric immersion heater to heat the water in his hot water tank. The hot water tank has no insulation.



6 (c) (i) Draw a ring around the correct answer to complete each sentence.

Energy is transferred through the water by

conduction.

convection.

evaporation.

Energy is transferred through the copper wall of the hot water tank by

conduction.

convection.

evaporation.

(2 marks)

6 (c) (ii) To keep the water in the tank hot for longer, the homeowner fits an insulating jacket around the tank. The insulating jacket costs £12 to buy.

The homeowner expects to save £16 each year from reduced energy bills.

Calculate the pay-back time for the insulating jacket.

.....

.....

Pay-back time = ... years

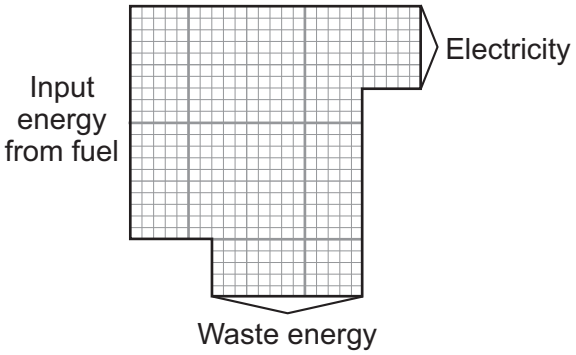
(2 marks)

11

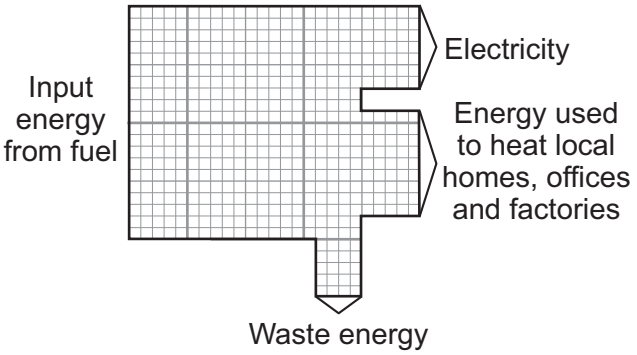
Turn over for the next question

7 The Sankey diagrams show the energy transfers in a traditional coal-burning power station and a combined heat and power (CHP) station.

Traditional coal-burning power station



CHP station



7 (a) What effect does the waste energy from a power station have on the surroundings?

.....

.....

(1 mark)

7 (b) Calculate the efficiency of the CHP station.

Use the correct equation from the Physics Equations Sheet.

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Efficiency = ...

(2 marks)

7 (c) Why is a CHP station more efficient than a traditional coal-burning power station?

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(2 marks)

7 (d) A CHP station is usually used to meet the demand for electricity within the local area. The electricity is not transmitted and distributed through the National Grid.

7 (d) (i) What is the National Grid?

Tick (✓) **one** box.

A system of cables and pylons. ☐

A system of cables and transformers. ☐

A system of cables, transformers and power stations. ☐

(1 mark)

7 (d) (ii) Using the electricity locally and not transmitting it through the National Grid increases the overall efficiency of a CHP station by 7%.

Give **one** reason why.

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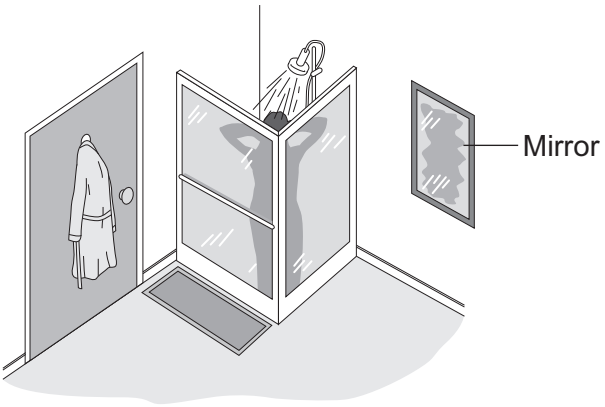
(1 mark)

7

Turn over for the next question

8 The picture shows a person taking a hot shower.



8 (a) When a person uses the shower the mirror gets misty.

Why?

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(3 marks)

8 (b) The homeowner installs an electrically heated mirror into the shower room.

When a person has a shower, the heated mirror does **not** become misty but stays clear.

Why does the mirror stay clear?

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.....

.....

.....

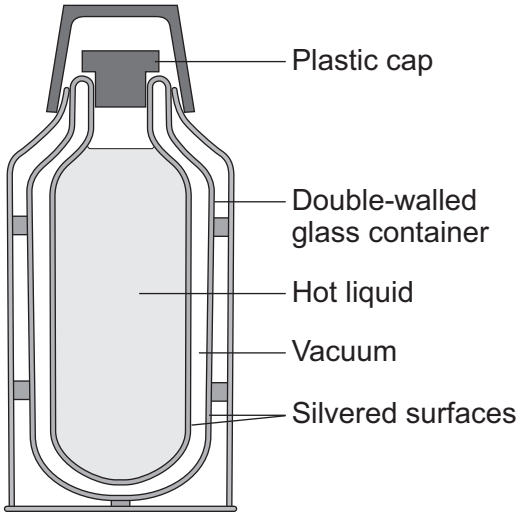
(2 marks)

5

Turn over for the next question

9 (a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagram shows the structure of a vacuum flask.



A vacuum flask is designed to reduce the rate of energy transfer by heating processes.

Describe how the design of a vacuum flask keeps the liquid inside hot.

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(6 marks)

9 (b) Arctic foxes live in a very cold environment.

Arctic foxes have small ears.

How does the size of the ears help to keep the fox warm in a cold environment?

.....

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.....

.....

.....

(2 marks)

8

END OF QUESTIONS

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