AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
SCIENCE A
PHYSICS

F

Foundation Tier Unit Physics P1

Wednesday 24 May 2017 Afternoon Time allowed: 1 hour

Materials
For this paper you must have:
- a ruler
- a 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.
- 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 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.

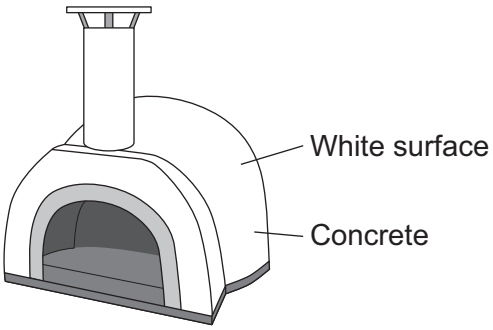
Advice
- In all calculations, show clearly how you work out your answer.

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

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

1 **Figure 1** shows an outdoor pizza oven.

Figure 1



1 (a) The pizza oven is designed to stay hot for a long time.

Use the correct answer from the box to complete each sentence. Each answer may be used once, more than once or not at all.

[2 marks]

conduction	**convection**	**radiation**

The white surface reduces energy transfer by _____ .

The concrete has a low U-value which means energy is transferred

slowly by _____ .

1 (b) The pizza oven is heated by burning wood.

What type of fuel is wood?

[1 mark]

Tick (✓) **one** box.

	Tick (✓)
biofuel	
fossil fuel	
non-renewable fuel	

1 (c) The concrete used to make the pizza oven has a specific heat capacity of 880 J/kg °C
The mass of the concrete is 250 kg

Calculate the energy transferred to the concrete to increase its temperature by 380 °C

Use the correct equation from the Physics Equations Sheet.

[2 marks]

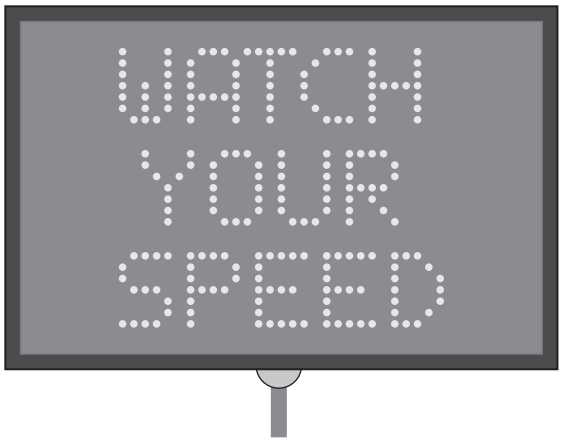
Energy transferred = _____ J

5

Turn over for the next question

2 **Figure 2** shows an electric road sign.

Figure 2

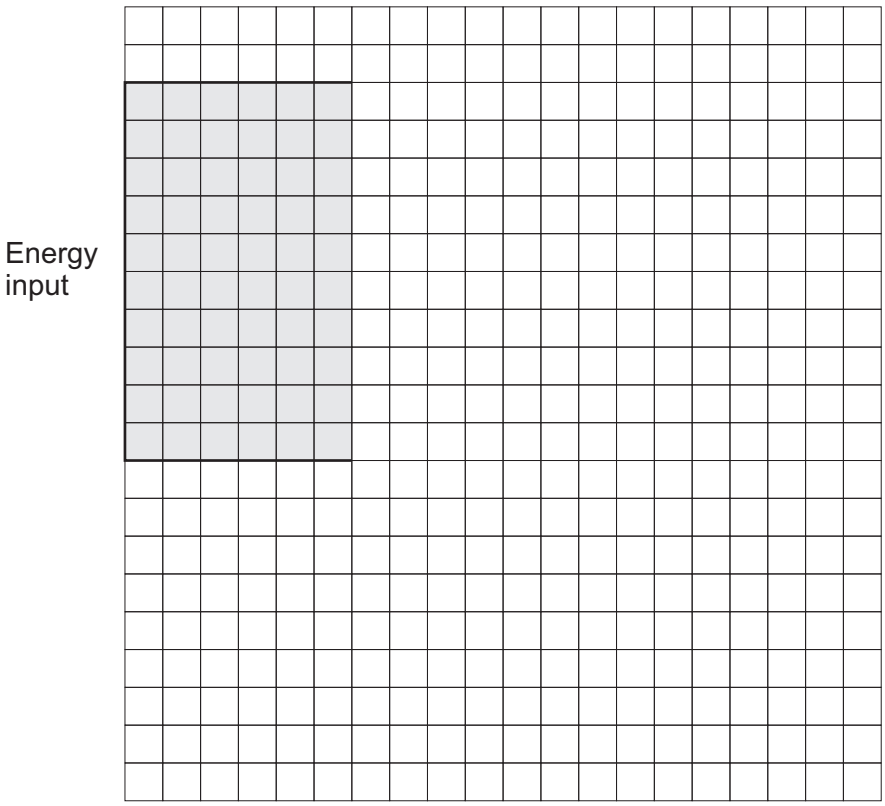


2 (a) The road sign is powered by an electrical generator which has an efficiency of 40%.

Complete the Sankey diagram in **Figure 3** for an electrical generator which has an efficiency of 40%.

[2 marks]

Figure 3



2 (b) The road sign uses high efficiency LED bulbs. What does high efficiency mean?

Tick (✓) **one** box.

[1 mark]

	Tick (✓)
the bulbs have a high energy input	
a high proportion of the energy output is useful	
a high proportion of the energy output is wasted	

2 (c) Some road signs are powered by batteries recharged by solar cells.

In one sign the solar cells have a total power output of 200 W

Calculate the energy that the solar cells will transfer in 3600 seconds.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

Energy = _____ J

2 (d) Some road signs are powered by batteries recharged by **both** solar cells and wind turbines.

Give **two** advantages of having **both** solar cells and wind turbines available to recharge the batteries.

[2 marks]

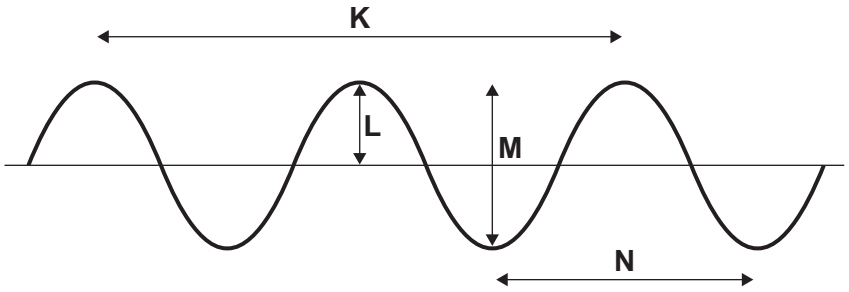
1 _____

2 _____

7

3 (a) **Figure 4** shows an electromagnetic wave.

Figure 4



3 (a) (i) Which arrow, **K**, **L**, **M** or **N**, shows the wavelength of the wave?

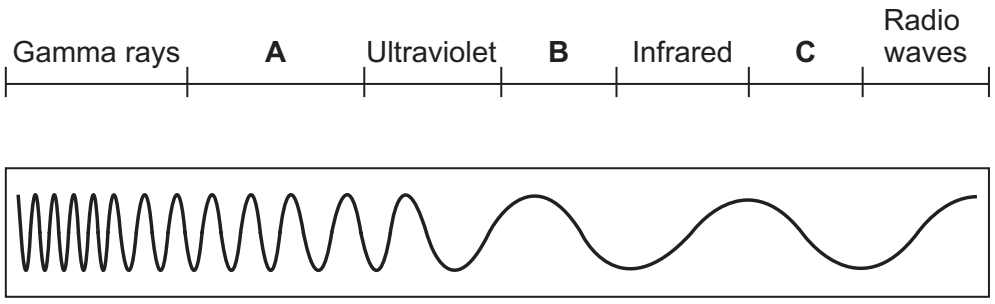
[1 mark]

3 (a) (ii) Which arrow, **K**, **L**, **M** or **N**, shows the amplitude of the wave?

[1 mark]

3 (b) **Figure 5** shows the electromagnetic spectrum.

Figure 5



A laser emits visible light.

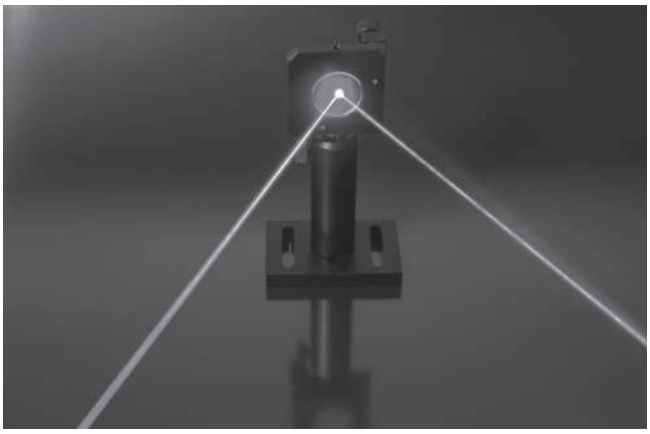
Which letter, **A**, **B** or **C**, on **Figure 5** shows the position of visible light?

[1 mark]

3 (c) Laser light is used in some burglar alarms.

Figure 6 shows laser light being reflected by a mirror. The light then reaches a detector.

Figure 6



3 (c) (i) How does the size of the angle of incidence compare with the size of the angle of reflection?

[1 mark]

_____

_____

3 (c) (ii) When a burglar gets in the way of the laser light, the light no longer reaches the detector.

Suggest **one** reason why.

[1 mark]

_____

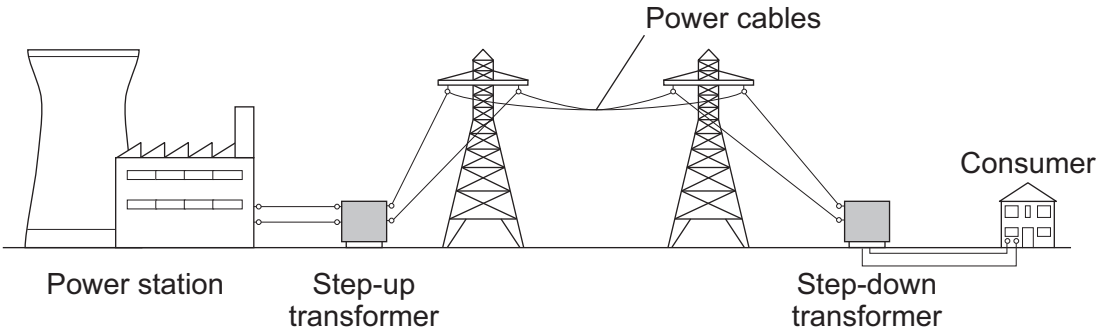
_____

5

Turn over for the next question

4 **Figure 7** shows how electricity is distributed from power stations to consumers.

Figure 7



4 (a) Which parts of **Figure 7** form the National Grid?

[1 mark]

Tick (✓) **one** box.

	Tick (✓)
power station, transformers and power cables	
transformers and power cables	
transformers, power cables and consumer	

4 (b) The power cables in **Figure 7** are overhead power cables. Power cables can be buried underground.

Give **one disadvantage** of burying power cables underground.

[1 mark]

_____

_____

4 (c) Use the correct answers from the box to complete each sentence.

Each word can be used once or not at all.

[3 marks]

energy	**current**	**efficiency**	**power**	**voltage**

The step-up transformer increases the _____ which

decreases the _____ .

Using a step-up transformer increases the _____ of the

electricity distribution process.

4 (d) A householder reads his electricity meter at the start and at the end of a month.

Start: 34 523 (kWh) **End: 34 713 (kWh)**

The cost of 1 kWh is 15 pence.

Calculate the cost of the electricity used that month.

[2 marks]

_____

_____

_____

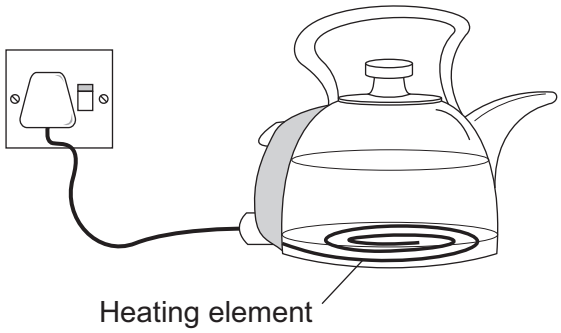
Cost = _____ pence

7

Turn over for the next question

5 **Figure 8** shows an electric kettle being used to heat some water.

Figure 8



5 (a) Complete the following sentences to describe how the water in the kettle is warmed by convection.

[4 marks]

When the kettle is switched on, the temperature of the water near the heating element increases.

As the temperature of the water increases, the water _____ and

becomes less _____ .

The heated water _____ towards the top of the kettle.

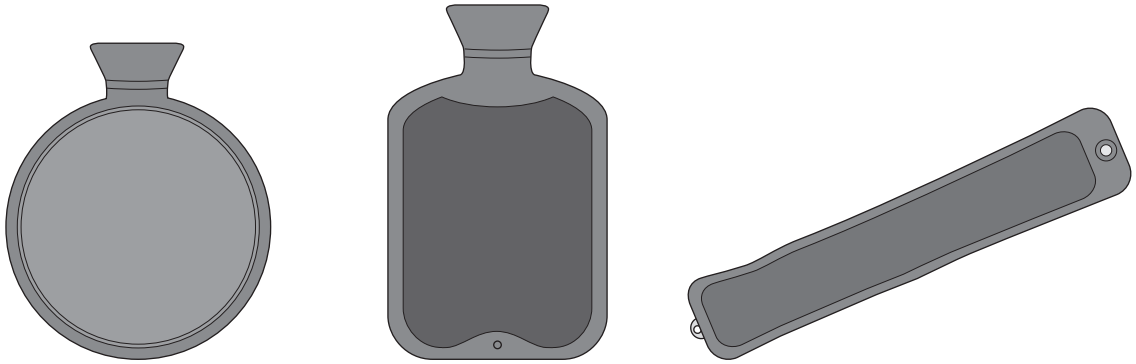
The movement of the water sets up a convection _____ .

5 (b) Three different designs of hot water bottle are each filled with water at 90 °C from the kettle.

Figure 9 shows the three different designs. Each hot water bottle is made from a different material but holds the same amount of water.

Figure 9

Design A **Design B** **Design C**



State **two** factors that would affect the time it would take the hot water bottles to cool down to room temperature.

[2 marks]

1 _____

2 _____

6

Turn over for the next question

6 Starter pistols are used in athletics events to start races. A starter pistol makes a loud bang and produces a puff of smoke.

Figure 10 shows two people who investigated the speed of sound using a starter pistol and a stopclock.

Figure 10

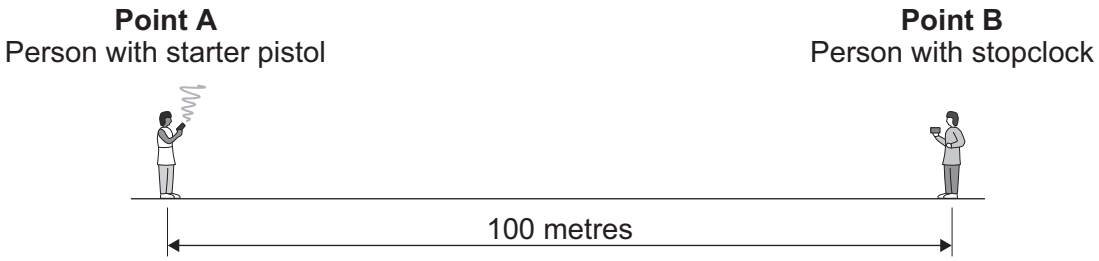


Figure 10 is not drawn to scale.

6 (a) The person at **Point B** sees the puff of smoke before hearing the bang from the starter pistol.

What does this tell you about the speed of sound compared with the speed of light?

[1 mark]

6 (b) The frequency of the sound wave produced by the pistol was 800 Hz

The wavelength of the sound wave was 0.42 m

Calculate the speed of the sound wave.

Use the correct equation from the Physics Equations Sheet.

Choose the correct unit.

m/s^2 **m/s** **m^2/s**

[3 marks]

Speed = _____ unit _____

6 (c) Complete **Table 1** to show the properties of the sound wave at **Point B** compared with the sound wave at **Point A**.

[3 marks]

Tick (✓) **one** box for each property comparison.

Table 1

Properties of the sound wave at Point B compared to Point A	greater than	less than	the same as
amplitude			
frequency			
speed			

6 (d) A sound wave can be reflected. What name is given to a reflected sound wave?

[1 mark]

_____

6 (e) Which **two** of these statements are true for sound waves?

[2 marks]

Tick (✓) **two** properties.

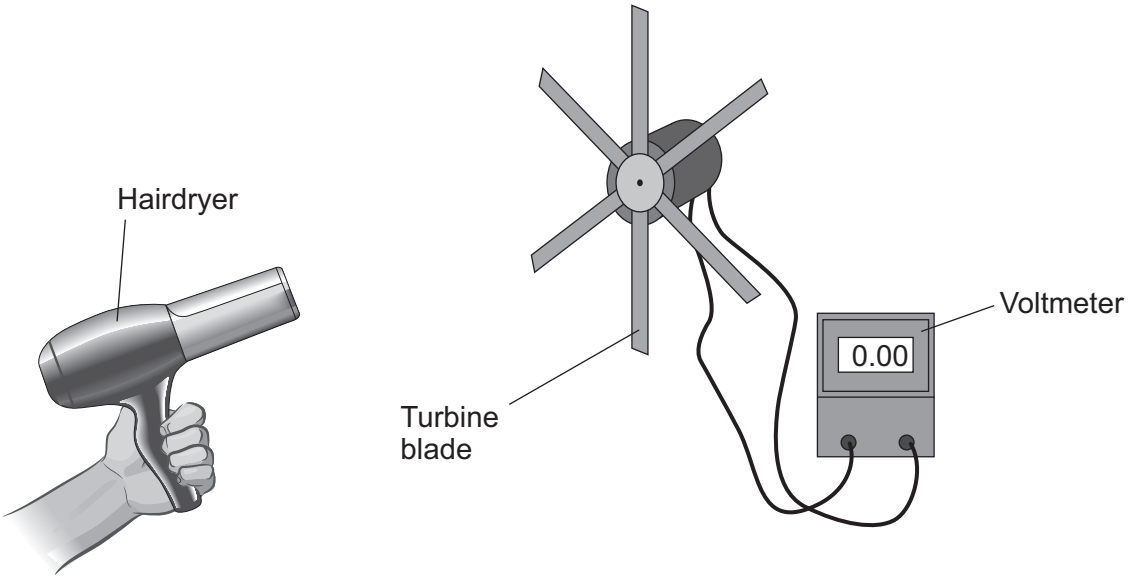
	Tick (✓)
Sound waves can travel through a vacuum.	
Sound waves are transverse waves.	
Sound waves are longitudinal waves.	
Sound waves transfer energy.	
Sound waves are electromagnetic waves.	

10

Turn over for the next question

7 A student investigated how the output voltage of a model wind turbine was affected by the number of turbine blades. The equipment he used is shown in **Figure 11**.

Figure 11



7 (a) Suggest **two** factors, other than the number of turbine blades, that will affect the output voltage of the model wind turbine.

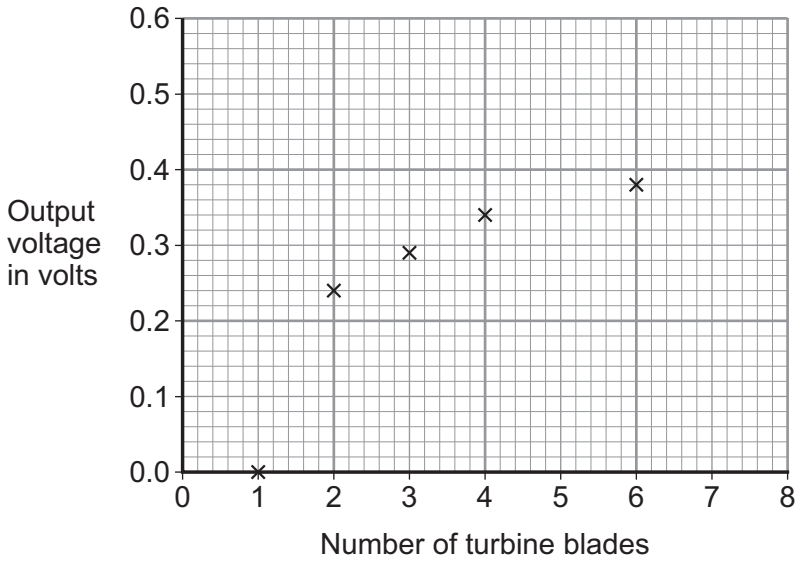
[2 marks]

1 _____

2 _____

7 (b) Some of the student's results are shown in **Figure 12**.

Figure 12



7 (b) (i) Plot the remaining results in **Figure 12** using the data in **Table 2**.

[2 marks]

Table 2

Number of turbine blades	Output Voltage in volts
5	0.39
7	0.50
8	0.56

7 (b) (ii) The output voltage for 6 turbine blades is lower than expected. The low value was caused by a measurement error.

State the name of this type of measurement error.

[1 mark]

_____

7 (b) (iii) What **two** conclusions can be made from the student's results as the number of blades is increased from 1 to 4?

[2 marks]

1 _____

_____

2 _____

_____

7 (c) Commercial wind turbines can be manufactured with a number of blades between 2 and 8.

Suggest **two** factors that manufacturers would need to consider when designing and constructing commercial wind turbines.

[2 marks]

1 _____

_____

2 _____

_____

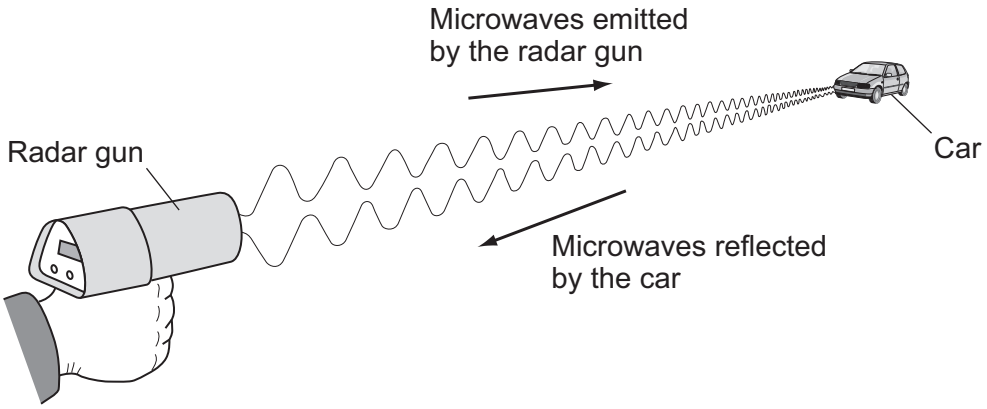
9

Turn over for the next question

8 A radar gun can be used to measure the speed of a car.

Microwaves are emitted by the radar gun and reflected by the car, as shown in **Figure 13**.

Figure 13



8 (a) The microwaves reflected by the moving car have a different frequency from the microwaves emitted by the radar gun.

What is the name of the effect causing this change in frequency?

[1 mark]

_____

8 (b) The data in **Table 3** are measurements taken from three different cars on the same piece of road.

Table 3

Car	Frequency of emitted microwaves in kHz	Frequency of reflected microwaves in kHz
A	27 000 000	27 000 002
B	27 000 000	27 000 000
C	27 000 000	26 999 997

8 (b) (i) State which car in **Table 3** is moving towards the radar gun. Give a reason for your answer.

[2 marks]

Car _____

Reason _____

_____

8 (b) (ii) State which car in **Table 3** is moving the fastest. Give a reason for your answer.

[2 marks]

Car _____

Reason _____

_____

5

Turn over for the next question

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

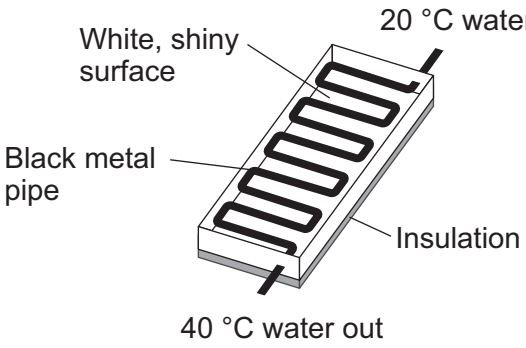
Solar panels use energy from the Sun to heat water.

Two different designs of solar panel are shown in **Figure 14**.

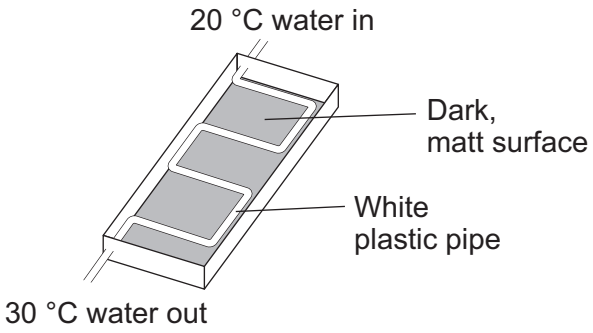
Both designs have the same water flow rate.

Figure 14

Design A



Design B



Explain why **Design A** is better than **Design B** at heating water.

[6 marks]

Extra space _____

6

END OF QUESTIONS

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED