

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	
TOTAL	



General Certificate of Secondary Education  
Foundation Tier  
January 2010

**Science B**  
Unit Physics P1

**PHY1F**  
**F**

**Physics**  
Unit Physics P1

**Written Paper**

**Wednesday 20 January 2010 9.00 am to 9.45 am**

**For this paper you must have:**

- a ruler.

You may use a calculator.

**Time allowed**

- 45 minutes

**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. Answers written in margins or on blank pages will not be marked.
- 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 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

**Advice**

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



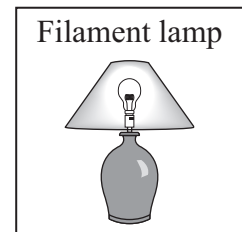
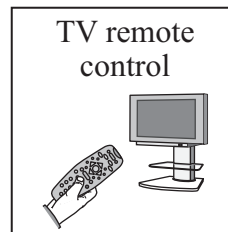
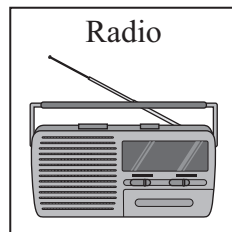
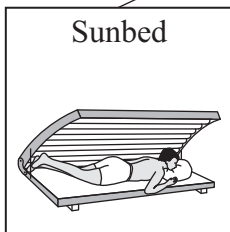
J A N 1 0 P H Y 1 F 0 1

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

- 1 (a) The diagram shows the electromagnetic spectrum.  
The pictures show four devices that use electromagnetic waves. Each device uses a different type of electromagnetic wave.

Draw a line from each device to the type of electromagnetic wave that it uses.  
One has been done for you.

Gamma rays	X-rays	Ultraviolet rays	Visible light	Infra red rays	Microwaves	Radio waves
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(3 marks)

- 1 (b) A headline from a recent newspaper article is shown below.



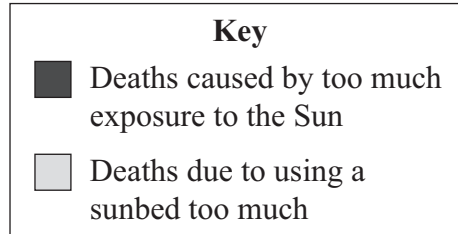
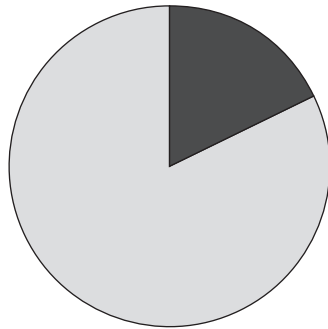
- 1 (b) (i) What serious health problem may be caused by using a sunbed too much?

.....

(1 mark)



- 1 (b) (ii) The pie chart compares the number of deaths in Britain each year, which may have been caused by using sunbeds too much, with those which may have been caused by too much exposure to the Sun.



It is difficult for a doctor to be certain that a person has died because of using a sunbed too much.

Suggest why.

.....

.....

(1 mark)

- 1 (b) (iii) A spokesperson for a leading cancer charity said:

‘We want people, especially young people,  
to know the possible dangers of using a sunbed.’

Why is it important that you know the possible dangers of using a sunbed?

.....

.....

(1 mark)

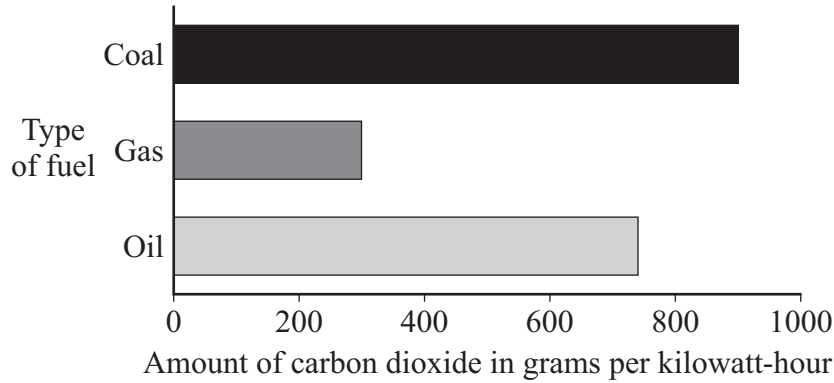
6
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Turn over ►



- 2 (a) Most electricity in the UK is generated in power stations that burn fossil fuels.

The bar chart shows how much carbon dioxide is produced for each kilowatt-hour of electricity generated using a fossil fuel.



- 2 (a) (i) Which fossil fuel produces the smallest amount of carbon dioxide for each kilowatt-hour of electricity generated?

.....

(1 mark)

- 2 (a) (ii) Which **one** of the following statements gives the reason why the data has been shown as a bar chart and not as a line graph?

Put a tick (✓) in the box next to your answer.

Both variables are categoric.

Both variables are continuous.

One variable is categoric, the other is continuous.

(1 mark)

- 2 (a) (iii) Why does a nuclear power station **not** produce any carbon dioxide?

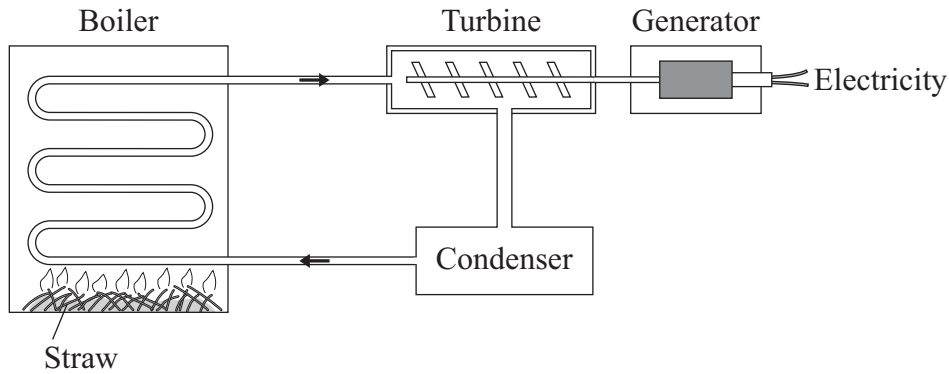
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.....

(1 mark)



2 (b) Some types of power station generate electricity by burning straw.



2 (b) (i) Use words from the box to complete the following sentences.

**boiler    gas    generator    steam    turbine    water**

Straw is burned in a ..... . Water is heated to make ..... which is used to drive a .....

This turns a ..... to produce electricity.

*(4 marks)*

2 (b) (ii) Straw is a type of renewable energy source known as a biofuel.

Name **one** other type of renewable energy source used to produce electricity.

.....  
*(1 mark)*

2 (b) (iii) A power station generates 36 000 000 watts (36 MW) of electrical power by burning straw. The average power used in each home in the UK over one year is 2000 watts.

Calculate the number of homes that the power station could supply electricity to.

Show clearly how you work out your answer.

.....  
.....

Number of homes = .....  
*(2 marks)*

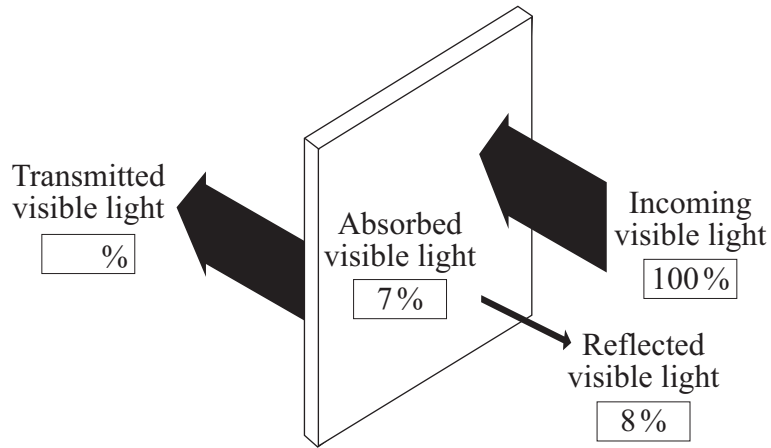
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Turn over ▶



3 Glass reflects, absorbs and transmits both infra red radiation and visible light.

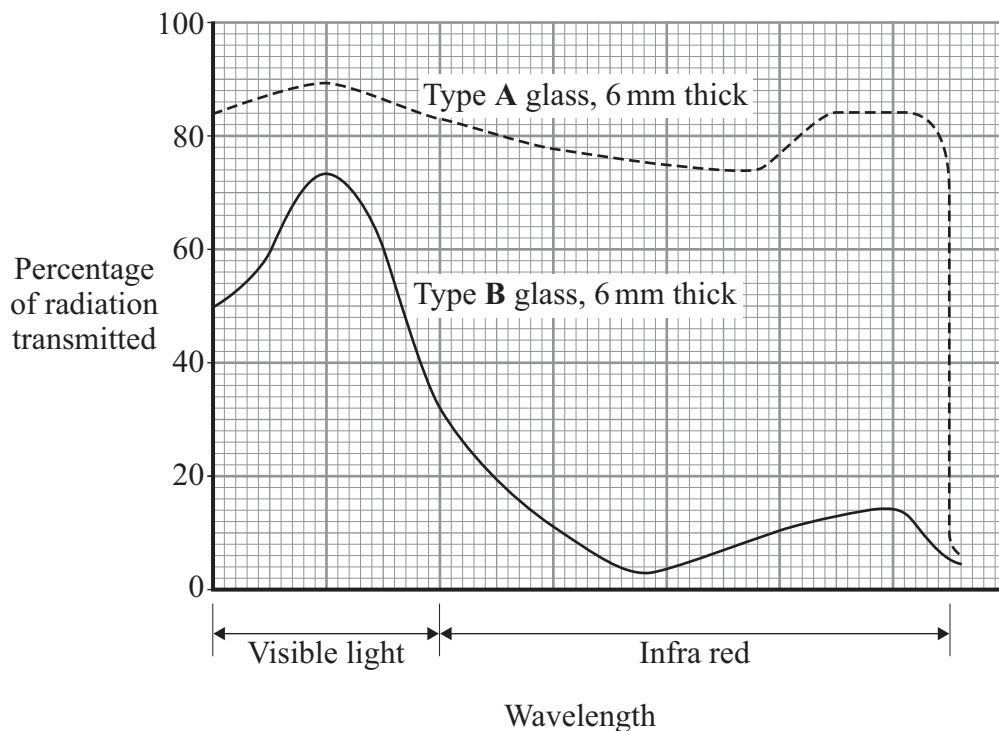
3 (a) The diagram shows the percentages of visible light that are reflected and absorbed by one type of glass.



What percentage of visible light is transmitted by this type of glass?

..... %  
(1 mark)

3 (b) The amounts of infra red radiation and visible light transmitted by glass depend on the type and thickness of glass. The data obtained from tests on two different types of glass is displayed in the graph below.



- 3 (b) (i) To be able to compare the two types of glass, it was important to control one variable.

What variable was controlled in the tests?

.....  
(1 mark)

- 3 (b) (ii) A homeowner has a glass conservatory built on the back of the house. The homeowner tells the builder that the inside of the conservatory should stay as cool as possible throughout the summer.

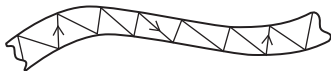
Explain why the builder uses 'type B' glass for the conservatory.

.....  
.....  
.....  
.....  
(2 marks)

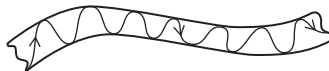
- 3 (c) Infra red and visible light can be used to send signals along an optical fibre.

Which **one** of the following diagrams, **X**, **Y** or **Z**, shows the path taken by a signal as it travels along an optical fibre?

Draw a ring around the correct diagram.



**X**



**Y**



**Z**

(1 mark)

5
---

Turn over ►



4 Some rocks inside the Earth contain a radioactive element, uranium-238. When an atom of uranium-238 decays, it gives out an alpha particle.

4 (a) The following statement about alpha particles was written by a student.  
The statement is **not** correct.

*Alpha particles can pass through a very thin sheet of lead.*

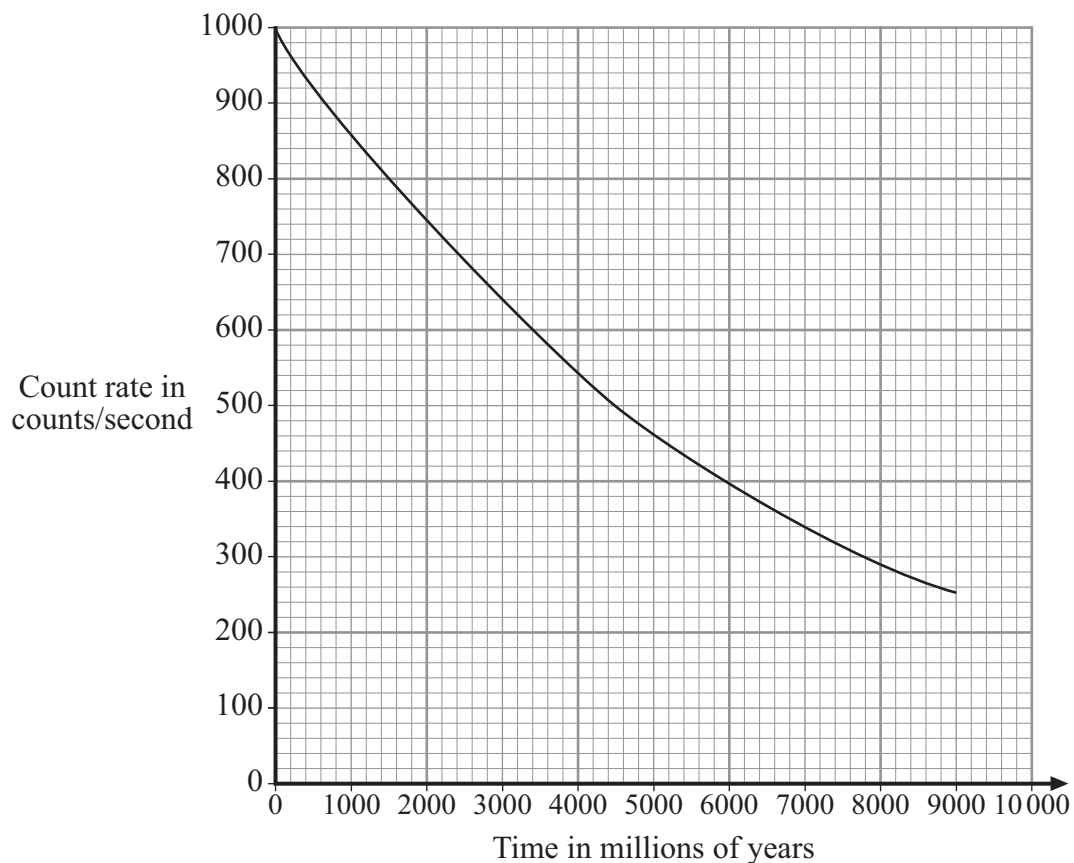
Change **one** word in the statement to make it correct.

Write down your **new** statement.

.....  
.....

(1 mark)

4 (b) The graph shows how the count rate from a sample of uranium-238 changes with time.



The graph can be used to find the half-life of uranium-238. The half-life is 4500 million years.

4 (b) (i) Draw on the graph to show how it can be used to find the half-life of uranium-238.

(1 mark)





4 (b) (ii) There is now half as much uranium-238 in the rocks as there was when the Earth was formed.

How old is the Earth?

Draw a ring around your answer.

**2250 million years**

**4500 million years**

**9000 million years**

*(1 mark)*

4 (b) (iii) If a sample of uranium-238 were available, it would not be possible to measure the half-life in a school experiment.

Explain why.

.....

.....

.....

.....

*(2 marks)*

<b>5</b>

**Turn over for the next question**

**Turn over ►**



5 (a) An optical telescope, used to observe stars, is to be built either at the bottom or at the top of a high mountain.

5 (a) (i) What type of electromagnetic radiation is detected by an optical telescope?

.....  
(1 mark)

5 (a) (ii) Give **one** advantage of having the telescope at the top of the high mountain rather than at the bottom.

.....  
.....  
(1 mark)

5 (b) Gamma radiation from the Sun is absorbed by the atmosphere.

Where should a telescope designed to detect gamma radiation be positioned?

.....  
.....  
(1 mark)

5 (c) By observing distant galaxies, scientists have found evidence to support the 'Big Bang' theory.

Which statement about the 'Big Bang' theory is correct?

Put a tick (✓) in the box next to your answer.

Scientists have proved beyond doubt that it happened.

It is the only way of explaining the origin of the Universe.

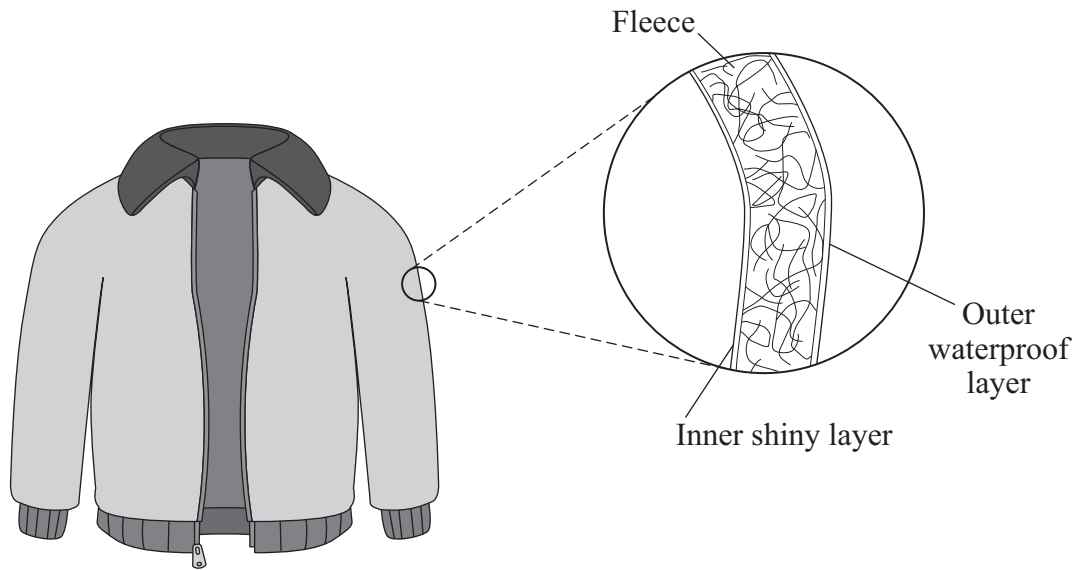
The Universe began from a very small point.

(1 mark)

4
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- 6 (a) The diagram shows a ski jacket that has been designed to keep a skier warm. The jacket is made from layers of different materials.



- 6 (a) (i) The inner layer is shiny to reduce heat transfer.

Which process of heat transfer will it reduce?

.....  
(1 mark)

- 6 (a) (ii) Why is the layer of fleece good at reducing the transfer of heat from a skier's body?

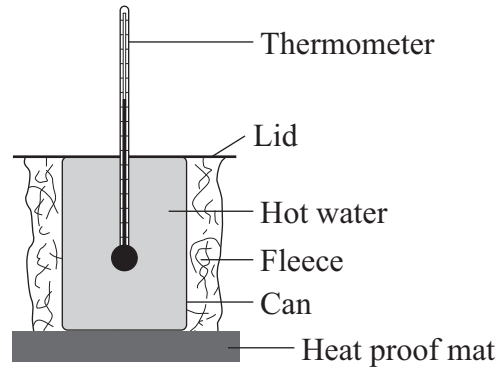
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(1 mark)

**Question 6 continues on the next page**

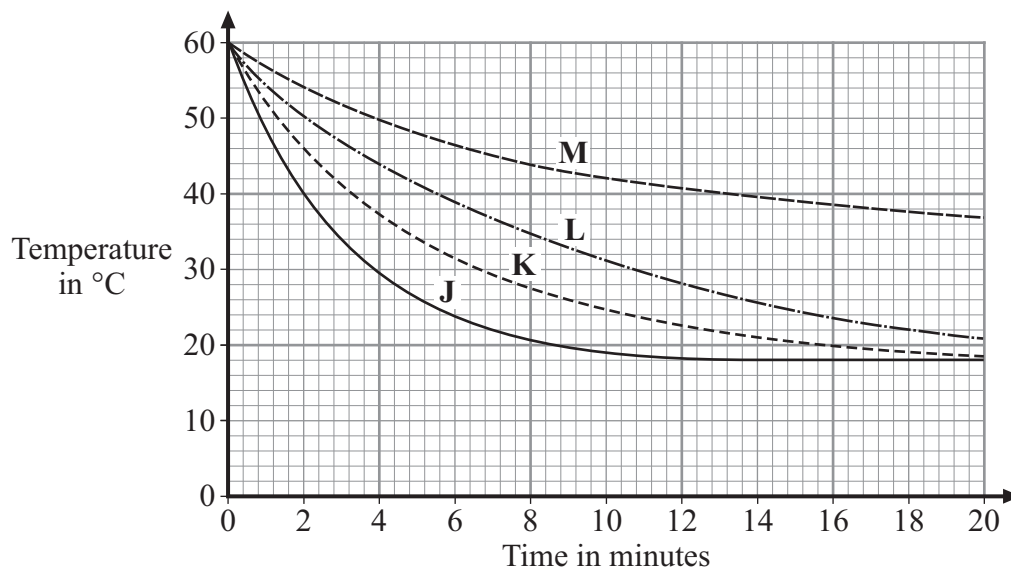
**Turn over ►**



- 6 (b) A student tested four different types of fleece, **J**, **K**, **L** and **M**, to find which would make the warmest jacket. Each type of fleece was wrapped around a can which was then filled with hot water. The temperature of the water was taken every two minutes for 20 minutes.



The graph shows the student's results.



- 6 (b) (i) In each test, the water cooled faster during the first five minutes than during the last five minutes. Why?

.....

.....

(1 mark)



6 (b) (ii) To be able to compare the results, it was important to use the same volume of water in each test.

Give **one** other quantity that was the same in each test.

.....  
.....

(1 mark)

6 (b) (iii) Look at the graph line for fleece **K**.

Estimate what the temperature of the water in the can wrapped in fleece **K** would be after 40 minutes.

.....

(1 mark)

6 (b) (iv) Which type of fleece, **J**, **K**, **L** or **M**, should the student recommend to be used in the ski jacket?

.....

Give a reason for your answer.

.....  
.....  
.....  
.....

(2 marks)

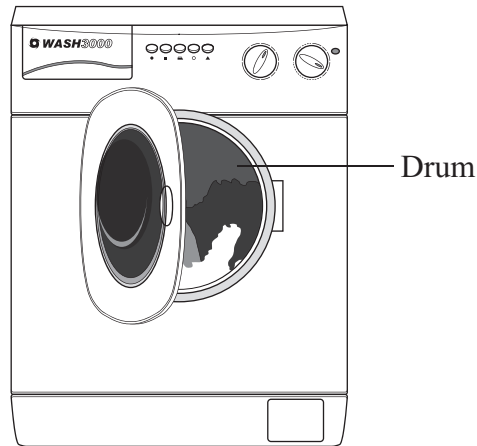
7
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**Turn over for the next question**

**Turn over ►**



- 7 The picture shows a new washing machine. When the door is closed and the machine switched on, an electric motor rotates the drum and washing.



- 7 (a) Complete the following sentences.

- 7 (a) (i) An electric motor is designed to transform electrical energy into  
..... energy.

(1 mark)

- 7 (a) (ii) Some of the electrical energy supplied to the motor is wasted as  
..... energy and ..... energy.

(1 mark)

- 7 (b) What happens to the energy wasted by the electric motor?

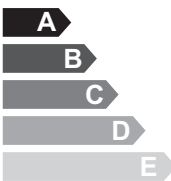

.....

.....

(1 mark)



7 (c) The diagram shows the label from the new washing machine.

<b>Model – Wash 3000</b>	
<b>Energy A</b>	
More efficient  Less efficient	
Energy consumption kWh/wash cycle (based on 40 °C wash)	1.1

An ‘A’ rated washing machine is *more energy efficient* than a ‘C’ rated washing machine.

Explain what being *more energy efficient* means.

.....

.....

.....

.....

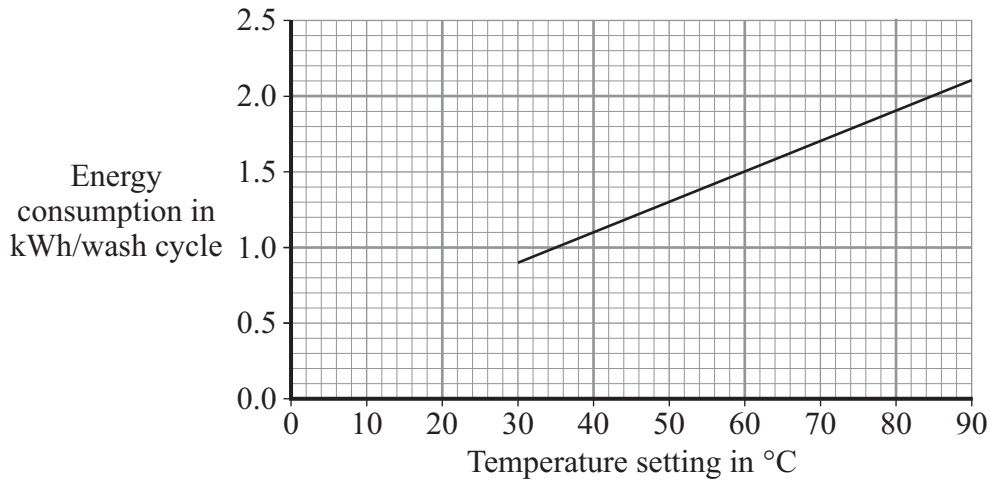
(2 marks)

**Question 7 continues on the next page**

**Turn over ▶**



- 7 (d) The graph shows that washing clothes at a lower temperature uses less energy than washing them at a higher temperature. Using less energy will save money.



- 7 (d) (i) Electricity costs 12 p per kilowatt-hour (kWh).  
The temperature setting is turned down from 40 °C to 30 °C.

Use the graph and equation in the box to calculate the money saved each wash cycle.

total cost = number of kilowatt-hours × cost per kilowatt-hour
--

Show clearly how you work out your answer.

.....  
 .....

Money saved = ..... p  
 (2 marks)

- 7 (d) (ii) Suggest why reducing the amount of energy used by washing machines could reduce the amount of carbon dioxide emitted into the atmosphere.

.....  
 .....

(1 mark)

**END OF QUESTIONS**

