OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

A212/02

SCIENCE A

Unit 2: Modules B2 C2 P2 (Higher Tier)

OCE/25632

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)

Monday 17 January 2011
Morning

Duration: 40 minutes

A212202

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. Pencil may be used for graphs and diagrams only.
- 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).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- 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 **42**.
- This document consists of **20** pages. Any blank pages are indicated.

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PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 This question is about the materials we use.

(a) Plastic has replaced glass for some containers of fizzy drinks.

Which statement gives the **best** explanation of why plastic has replaced glass?

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

It can be recycled and is transparent.	☐
It can be recycled and is flexible.	☐
It is airtight and can be closed again.	☐
It does not break and can be made in different colours.	☐
It does not break as easily and is less dense.	☐

[1]

(b) Plastics have replaced many materials that we used in the past.

Name a material, other than glass, that has been replaced by a plastic.

.....

State what the material was used for.

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

Give **two** reasons why it is **better** to use a plastic for this job.

.....

.....

.....

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

[Total: 4]

2 Read this newspaper article.

> Britain is getting better at collecting waste, but not at processing it.
>
> 8.6 million tonnes of paper are collected each year, but only 4 million tonnes are recycled in Britain.
>
> The rest is exported, which increases the environmental impact of recycling. Much of it goes to China where recycling is cheaper. In China there is a big demand for recycled paper.
>
> One answer is for Britain to produce less waste in the first place. Another is for Britain to develop a bigger recycling industry of its own.

Use the article to answer the following questions.

(a) What percentage of the waste paper that is collected is recycled in Britain?

Put a (ring) around the correct answer.

21.5% **40.0%** **46.5%** **56.5%** **86.0%**

[1]

(b) Sentences **A**, **B**, **C**, **D**, **E** and **F** are about recycling paper.

A Energy is used to transport the waste paper to China.

B Not enough waste paper is collected in Britain.

C The amount of waste paper that can be processed is limited.

D The costs of collecting waste paper are high.

E There is a big demand for more recycled paper.

F Wood is a renewable resource.

(i) Which sentence, **A**, **B**, **C**, **D**, **E** or **F**, explains why Britain only recycles 4 million tonnes of waste paper?

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

(ii) Which sentence, **A**, **B**, **C**, **D**, **E** or **F**, explains why sending waste paper to China increases the environmental impact of recycling?

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

The article continues.

Scientists have asked the Government to stop trying to recycle so much waste.

They want to use the waste to make energy.

17 % of the energy Britain needs could come from waste by 2020.

This could be done by burning dry waste and by making methane from animal and plant waste.

(c) Explain the environmental advantage of using waste to supply 17 % of Britain's energy needs.

.....

.....

.....

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

[Total: 5]

3 Look at the properties of six polymers.

polymer	flexibility	when heated
melamine	brittle	does not melt
nylon	flexible	melts at 210 °C
PVC	flexible	melts at 330 °C
low density poly(ethene)	flexible	melts at 80 °C
high density poly(ethene)	flexible	melts at 120 °C
vulcanised rubber	almost inflexible	does not melt

(a) (i) Which polymer has the weakest forces between its molecules?

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

(ii) Which two polymers have crosslinks between their molecules?

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

(b) A plasticizer can be added to PVC.

PVC without plasticizer is used to make drainpipes and lunch boxes.

PVC with plasticizer is used to make clothes including raincoats.

(i) How is PVC without plasticizer **different** from PVC with plasticizer?

Put a tick (✓) in the box next to **each** correct answer.

PVC **without** plasticizer …

… is softer. ☐

… is waterproof. ☐

… is less flexible. ☐

… has a lower tensile strength. ☐

… has polymer chains closer together. ☐

… has polymer chains further apart. ☐

[1]

(ii) PVC without plasticizer is used to make drainpipes and lunch boxes.

Which parts of the Life Cycle Assessment (LCA) will be **different** for these two products?

Put ticks (✓) in the boxes next to the **two** best answers.

The environmental impact of making PVC from crude oil.	☐
The energy used to make PVC.	☐
The energy used to make the product with the PVC.	☐
The length of time the product is used.	☐
Pollution from the disposal of the PVC.	☐

[2]

[Total: 5]

4 Read this article about an inventor.

Inventor of the microwave oven

In 1946, Percy Spencer was working close to radar equipment, which generates microwaves. He found that a chocolate bar in his pocket had melted. It had been heated by the microwaves.

From this, he developed the idea for cooking with what he called the Radarange. This type of cooker is now called a microwave oven.

(a) The following facts about microwaves are all true.

Which of them is described **in the article**?

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

Microwaves can be absorbed by food. ☐

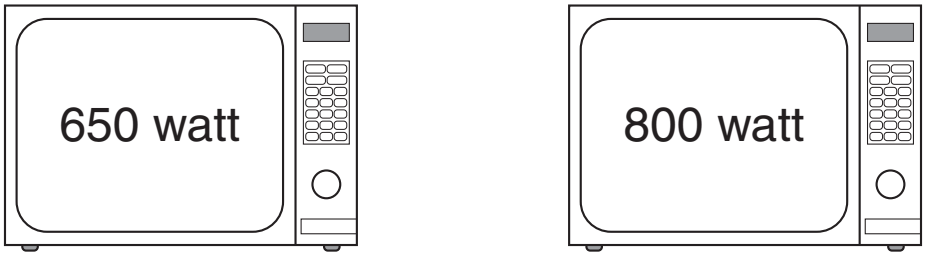
Microwaves consist of photons. ☐

Microwaves are non-ionising radiation. ☐

Microwaves are part of the electromagnetic spectrum. ☐

[1]

(b) The diagram shows two microwave ovens with different power ratings.



The 800 watt oven cooks food faster than the 650 watt oven.

The energy of the microwave photons in the two ovens is the same.

Which of the following statements explains why the 800 watt oven cooks faster?

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

The 800 watt oven has a bigger space for heating. ☐

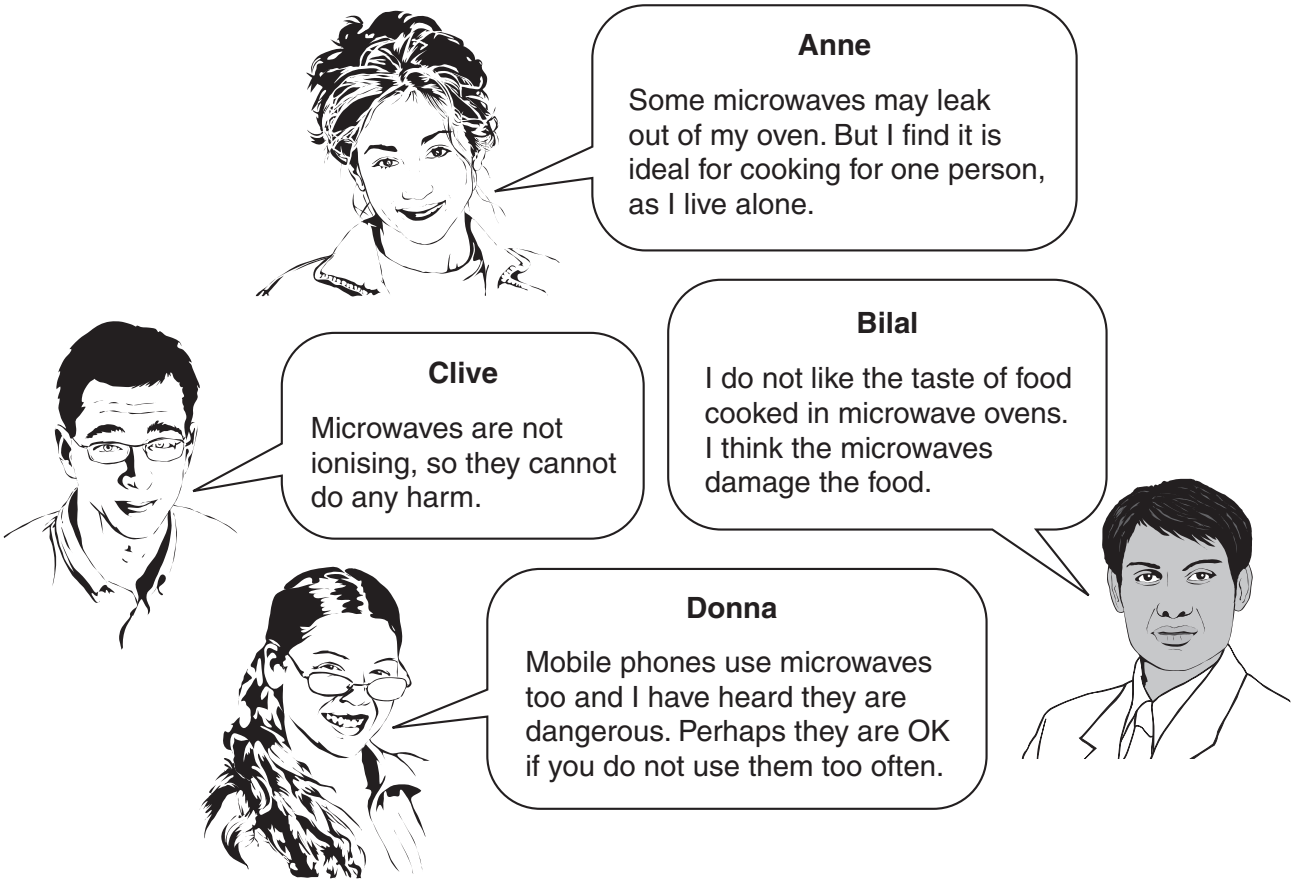
Food molecules vibrate more easily in the 650 watt oven. ☐

The 800 watt oven generates more photons each second. ☐

The intensity of microwaves is greater in the 650 watt oven. ☐

[1]

(c) Some people are concerned about the safety of microwaves.



(i) Which person mentions a way of reducing risk?
Put a tick (✓) in the box next to the correct person.

Anne ☐

Bilal ☐

Clive ☐

Donna ☐ **[1]**

(ii) Which person is discussing risk and benefit?
Put a tick (✓) in the box next to the correct person.

Anne ☐

Bilal ☐

Clive ☐

Donna ☐ **[1]**

[Total: 4]

5 Before fossil fuels were burnt, only natural processes affected the concentration of carbon dioxide in the atmosphere.

Describe and explain the effect of **natural processes** on the concentration of carbon dioxide in the atmosphere.

.....

.....

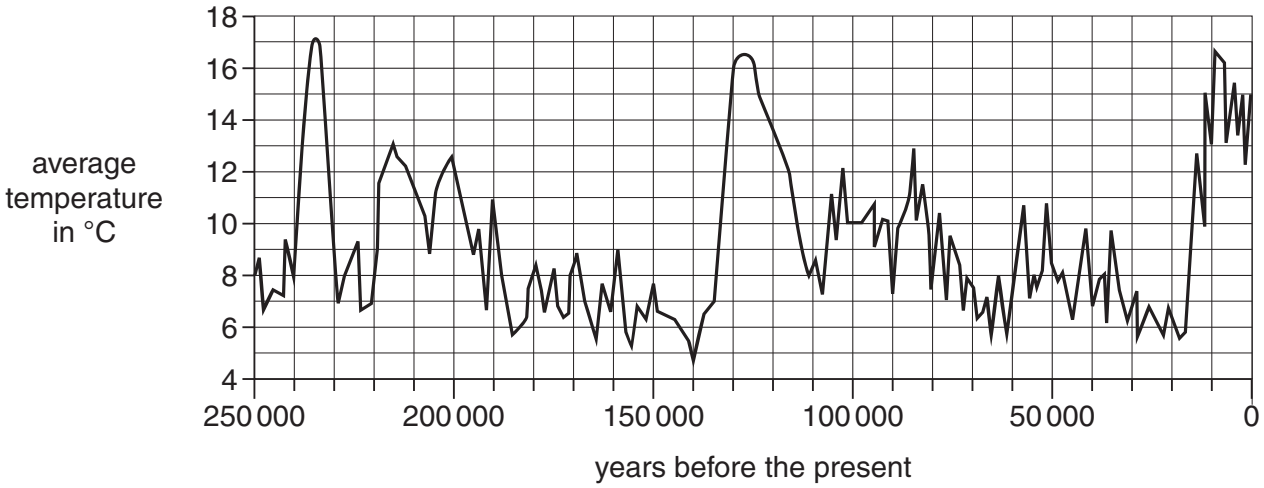
.....

.....

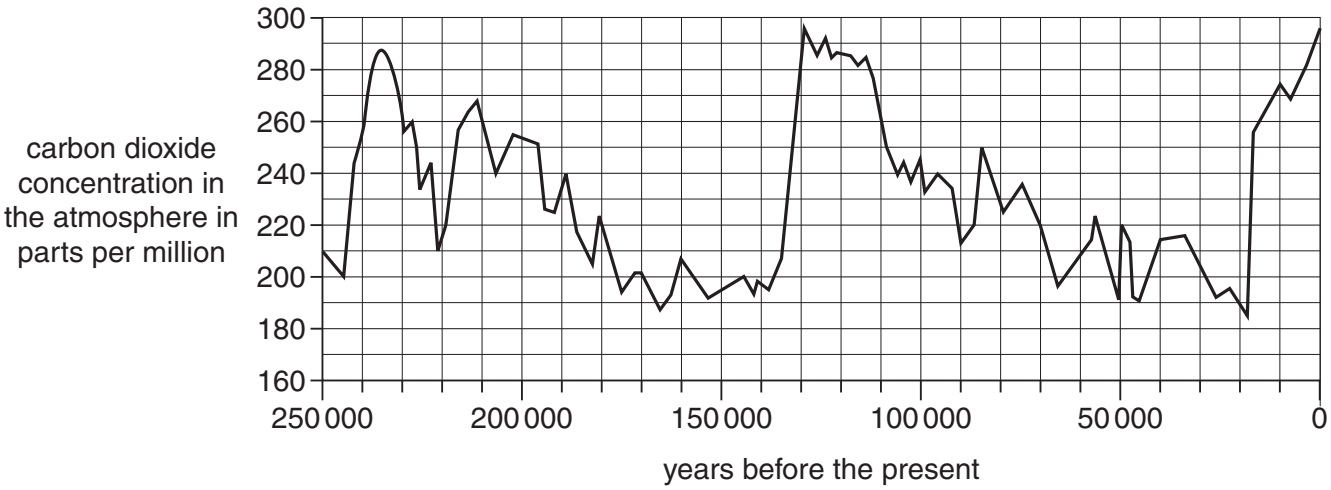
..... **[3]**

[Total: 3]

6 **(a)** The first graph shows how the average temperature of the atmosphere has changed over the last 250 000 years.



Over exactly the same time, the carbon dioxide concentration in the atmosphere changed as shown in the second graph.



Use the data in the graphs to answer these questions.

(i) How many times did the average temperature fall below 6 °C?

answer = ... times **[1]**

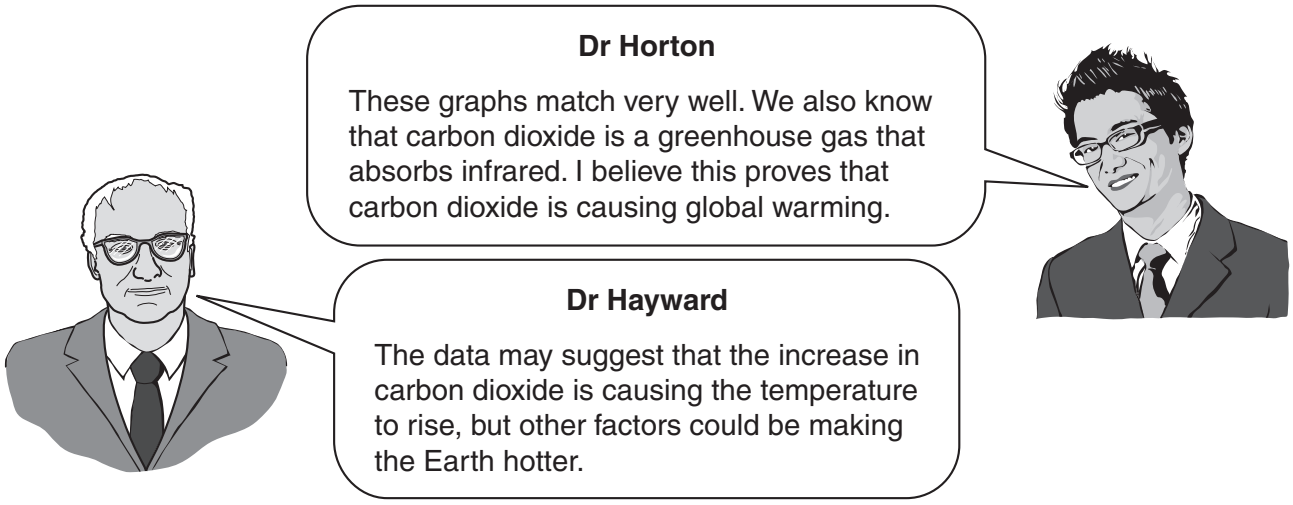
(ii) Use the second graph to estimate the percentage of the time for which the carbon dioxide concentration was above 260 parts per million.

Put a (ring) around the best estimate.

5% **10%** **20%** **30%** **40%**

[1]

(b) Two scientists are talking about these data.



For each question, put a tick (✓) in the **one** correct box.

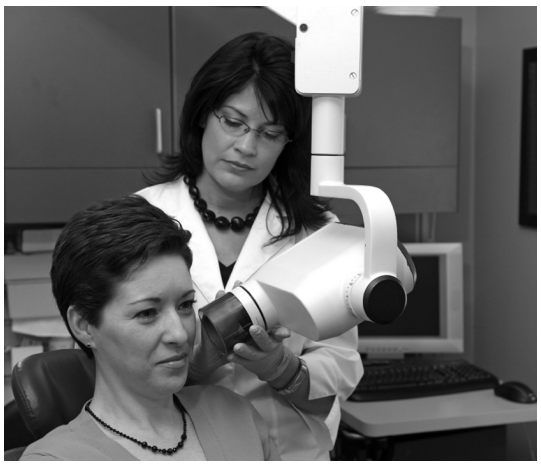
	only Dr Horton	**only Dr Hayward**	**both scientists**	**neither scientist**
Who believes that global warming is occurring now?				
Who believes there is a correlation?				
Who describes a causal mechanism?				

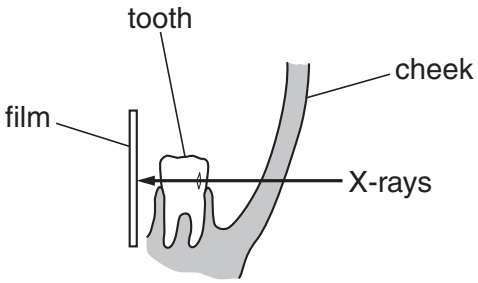
[1]

[Total: 3]

7 Dentists use X-rays to look for cracks and holes inside a patient's teeth.

The X-ray tube is held next to the patient's cheek and an X-ray film is put inside the mouth.





sectional view through patient's jaw

(a) Label the region of X-rays on this diagram of the electromagnetic spectrum.

		infrared		**ultraviolet**		

[1]

(b) Which of these statements explains how an X-ray photo shows cracks and holes inside teeth?

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

X-rays are partly absorbed by teeth. ☐

X-rays are not absorbed by teeth at all. ☐

X-rays are transmitted more by teeth than by the cheek. ☐

X-rays are absorbed by the cracks and holes inside teeth. ☐

[1]

(c) Which two of the following statements, when taken together, explain why dentists use X-rays even though they can damage living cells?

Put ticks (✓) in the boxes next to the **two** correct statements.

Although there is a risk from the X-rays, the risk is small.	☐
The low-energy X-rays used by dentists are not harmful.	☐
The X-rays used kill bacteria in cracks in the teeth.	☐
Without X-rays, the dentist cannot see what is wrong with the teeth.	☐
X-rays are an ionising radiation.	☐

[1]

(d) There is a risk to the dentist because she uses X-rays every day.

When the X-ray tube is switched on, regulations suggest that the dentist moves as far away from the tube as she can.

Which of the following explains why she does this?

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

X-rays are absorbed by her bones.	☐
She is applying the ALARA principle.	☐
She is using the precautionary principle.	☐
She is avoiding any contact with X-rays.	☐

[1]

[Total: 4]

8 This question is about coronary heart disease.

(a) Many of the studies about the factors affecting the chance of having coronary heart disease have been published in peer review journals.

Describe the **peer review** process and explain why it is important.

.....

.....

.....

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

(b) Pauline makes notes on the causes of heart disease.

Here is what she has written.

She has made some mistakes.

1. Fat can be deposited in the veins that lead to the heart muscle.
2. Less blood gets to the heart muscle.
3. The blood carries the carbon dioxide the heart muscle needs.
4. The heart muscle cannot respire.
5. Some heart muscle cells die – this may cause a heart attack.

Write down the numbers of the two sentences that contain mistakes and write down the **corrected** sentences.

sentence number .....

corrected sentence .....

.....

sentence number .....

corrected sentence .....

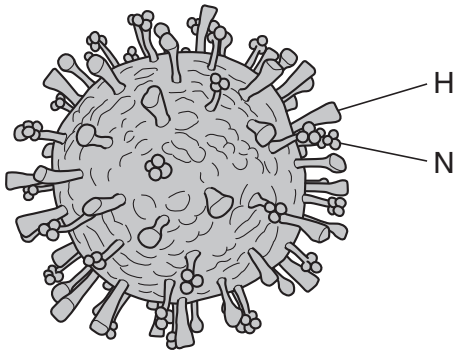
.....

[2]

[Total: 4]

9 This question is about the development of new vaccines and drugs.

(a) In 1976 in the USA there was an outbreak of flu caused by a new type of H1N1 virus.



H and N are proteins found on the surface of the virus.

The US Government decided to make a **new** vaccine against H1N1 to prevent an epidemic.

Why was a new vaccine needed?

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

Viruses quickly become resistant to vaccines so new ones have to be made.	☐
Vaccines trigger the production of antibodies which are needed to fight viruses.	☐
Even if they have already had flu, people will not have antibodies that can attach to the new H and N proteins.	☐
Vaccines stimulate white blood cells to engulf viruses with H and N proteins on the surface.	☐

[1]

(b) It is possible to produce effective vaccines against flu.

However, no effective vaccine has yet been produced against HIV, the virus that causes AIDS.

Explain why it is very difficult to produce an effective vaccine against HIV.

.....

.....

.....

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

(c) New drugs are tested to see how **effective** and how **safe** they are.

Testing takes place in several stages.

For each **stage of drug testing** put **one** tick (✓) in the correct box to show whether the stage is testing **effectiveness**, testing **safety** or testing **both**.

stage of drug testing	**test used to check**		
	effectiveness	**safety**	**both**
human cells grown in the laboratory			
animals			
healthy volunteers			
people with the illness			

[2]

(d) (i) Trials of new drugs in humans usually involve the use of a control group. The participants in the control group do not receive the new drug.

Why is the control group included in the trial?

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

to increase the number of people taking part in the trial	☐
to reduce the risk of side-effects for some of the participants in the trial	☐
to allow the effectiveness of the new drug to be seen	☐
to make the trial ethical	☐
if the trial shows that the drug has benefits it will immediately be offered to the control group	☐

[1]

(ii) When designing a human trial of a new drug, doctors can choose between two types of trial: blind and double blind.

Complete the table comparing the two types of trial.

Put a tick (✓) in **one** box in each row to show the correct description of the type of trial.

type of trial	doctor and patient know who is in the control group	only the doctor knows who is in the control group	neither doctor nor patient know who is in the control group
blind			
double-blind			

[1]

(e) Over a period of time bacteria become resistant to antibiotics.

Therefore new antibiotics need to be developed.

We can slow the spread of antibiotic resistance in bacterial populations by using antibiotics carefully.

Draw a straight line to link each **way of slowing the spread of resistance** with its best **explanation**.

way of slowing the spread of resistance	**explanation**
	it is important to kill all the infecting bacteria
only use antibiotics when you are infected by a dangerous type of bacteria	it is the resistant bacteria that we most need to kill
	once you are feeling well all the bacteria will have been killed
always finish a course of antibiotics even if you feel better	it is important to quickly treat all bacterial infections
	the more often antibiotics are used the more likely resistance is to spread

[2]

[Total: 10]

END OF QUESTION PAPER