

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE  
SCIENCE A**

**A212/01**

Unit 2: Modules B2 C2 P2 (Foundation Tier)

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**



|                       |  |                      |  |
|-----------------------|--|----------------------|--|
| Candidate<br>forename |  | Candidate<br>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.

2

Answer **all** the questions.

1 This question is about the materials we use.

(a) Which of these materials is a **single chemical** and which is a **mixture** of chemicals?

For each material put a tick (✓) in the correct box.

| material  | single chemical | mixture |
|-----------|-----------------|---------|
| crude oil |                 |         |
| ethene    |                 |         |
| iron      |                 |         |
| wood      |                 |         |

[2]

(b) Plastic is often used instead of glass for fizzy drinks bottles.

The table below lists some properties of plastic bottles.

For each **property of plastic bottles** show whether it makes plastic bottles

- **better than glass bottles**
- **worse than glass bottles**
- **no different to glass bottles.**

Put a tick (✓) in the correct box for each row of the table.

| property of plastic bottles | better than glass bottles | worse than glass bottles | no different to glass bottles |
|-----------------------------|---------------------------|--------------------------|-------------------------------|
| do not break when dropped   |                           |                          |                               |
| transparent                 |                           |                          |                               |
| less heavy                  |                           |                          |                               |

[2]

3

- (c) Plastics have replaced many materials that were 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: 7]

**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.

**(a)** Use the article to answer these questions.

**(i)** How much paper is recycled **in Britain**?

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

All the paper collected is recycled.

☐

More than half the paper collected is recycled.

☐

Less than half the paper collected is recycled.

☐

None of the paper collected is recycled.

☐

[1]

**(ii)** Why is only 4 million tonnes of paper recycled in Britain?

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

We are using more paper every year.

☐

Waste paper is dumped in landfill.

☐

We cannot process any more waste paper.

☐

Waste paper is not collected.

☐

[1]

5

(iii) How can Britain reduce the environmental impact of its waste paper?

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

Put more waste into landfill.

☐

Build more recycling plants.

☐

Send more waste to other countries.

☐

Recycle less waste.

☐

Make less waste.

☐

[2]

(iv) Why does sending waste paper to China increase the environmental impact of recycling?

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

Processing waste paper in China is cheaper than in Britain.

☐

Energy is used to transport the waste to China.

☐

The costs of collecting the waste are larger.

☐

China puts the waste paper into landfill.

☐

[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.

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

.....

.....

.....

..... [2]

**[Total: 7]**

3 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.

☐

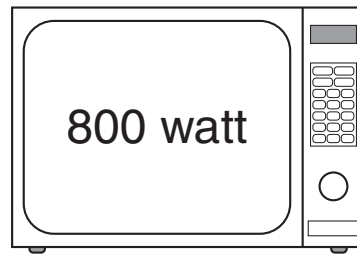
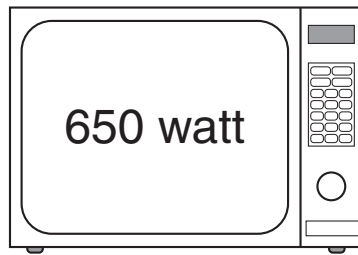
Microwaves are part of the electromagnetic spectrum.

☐

[1]

8

(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.



**Anne**

Some microwaves may leak out of my oven. But I find it is ideal for cooking for one person, as I live alone.



**Clive**

Microwaves are not ionising, so they cannot do any harm.

**Bilal**

I do not like the taste of food cooked in microwave ovens. I think the microwaves damage the food.



**Donna**

Mobile phones use microwaves too and I have heard they are dangerous. Perhaps they are OK if you do not use them too often.



- (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]

Turn over

10

- 4 Before humans started burning fossil fuels, natural processes kept the concentration of carbon dioxide in the atmosphere constant.

Explain how **plants** and **animals**, between them, kept the concentration of carbon dioxide constant.

.....

.....

.....

..... [2]

[Total: 2]

11

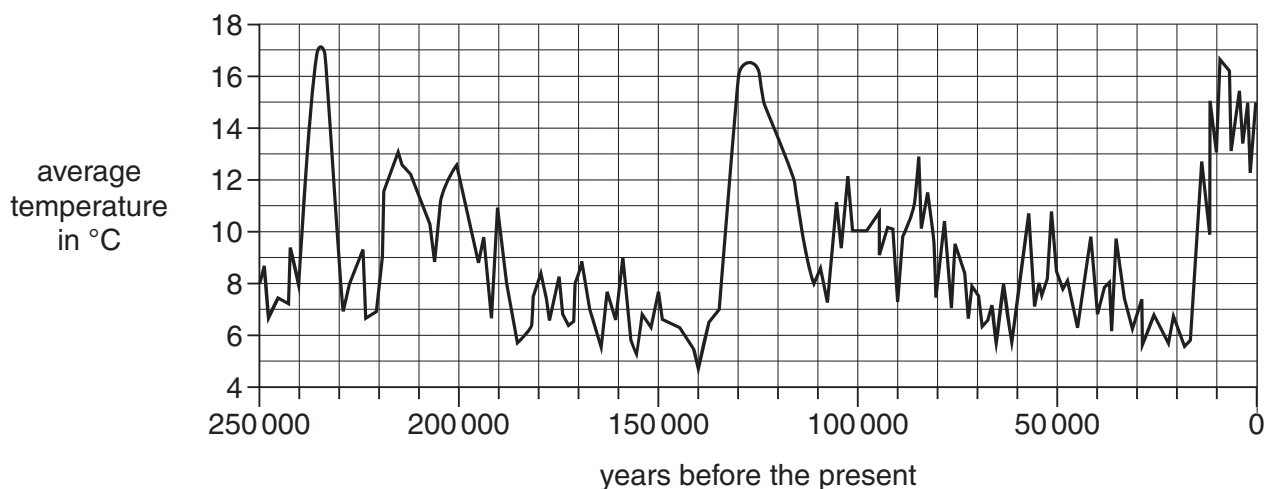
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**Question 5 begins on page 12**

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5 This question is about global warming.

- (a) Look at the first graph showing how the average temperature of the atmosphere has changed over the last 250 000 years.



Use the graph to answer these questions.

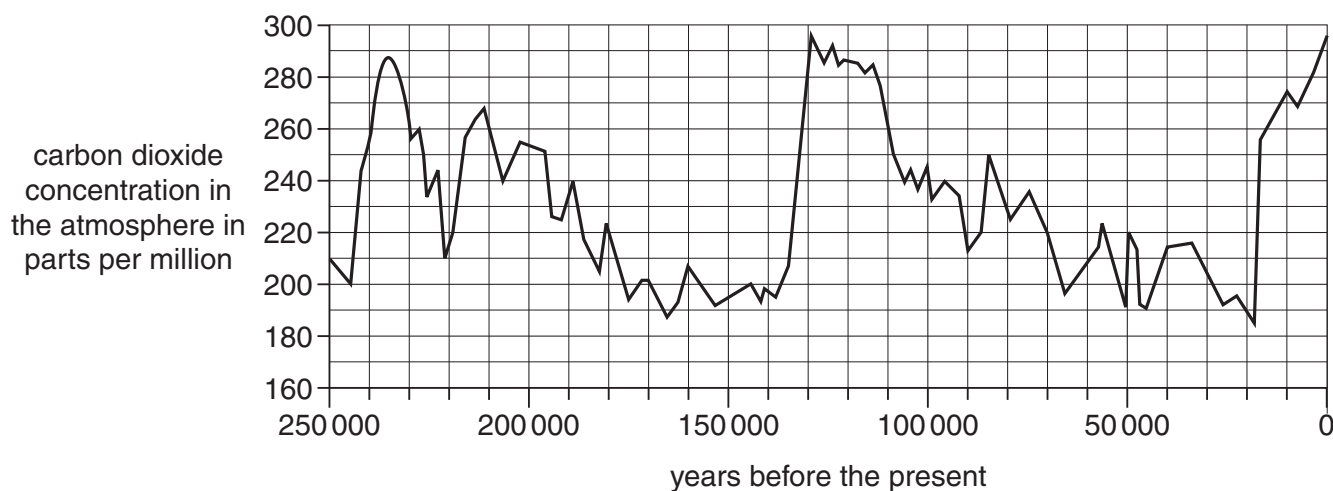
- (i) What was the average temperature 100 000 years ago?

answer = ..... °C [1]

- (ii) What is the highest temperature recorded on the graph?

answer = ..... °C [1]

- (b) Compare the graph above with the one below.



Use data from the two graphs to explain the meaning of **correlation**.

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

13

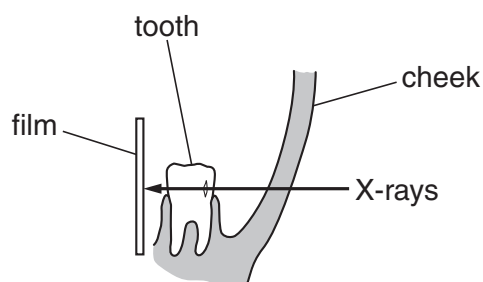
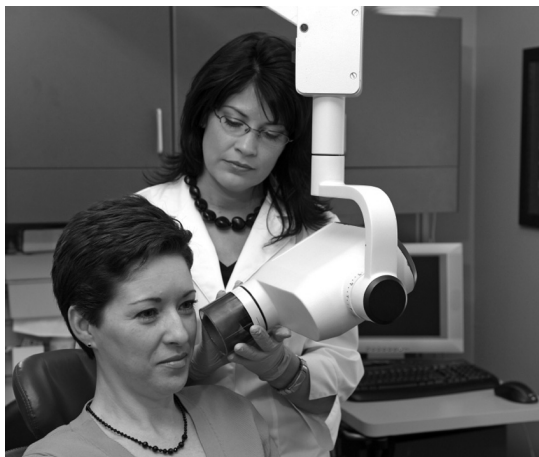
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**Question 6 begins on page 14**

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- 6 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.

|             |  |          |       |  |  |            |
|-------------|--|----------|-------|--|--|------------|
| radio waves |  | infrared | light |  |  | gamma rays |
|-------------|--|----------|-------|--|--|------------|

[1]

- (b) Which of these statements explains how the X-rays get through the patient's cheek?

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

X-rays are absorbed by the patient's cheek.

☐

X-rays are emitted by the patient's cheek.

☐

X-rays are reflected by the patient's cheek.

☐

X-rays are transmitted by the patient's cheek.

☐

[1]

15

- (c) X-rays can damage living cells.

Which of the following statements explains why dentists use X-rays?

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

X-rays stop the teeth from rotting.

☐

The patient wears protective clothing.

☐

Dentists use harmless X-rays.

☐

The benefit from using X-rays outweighs the risk.

☐

[1]

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

When the X-ray tube is switched on, 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.

You cannot see X-rays.

☐

X-rays are absorbed by bones.

☐

X-rays are weaker farther away from the tube.

☐

X-rays are an electromagnetic radiation.

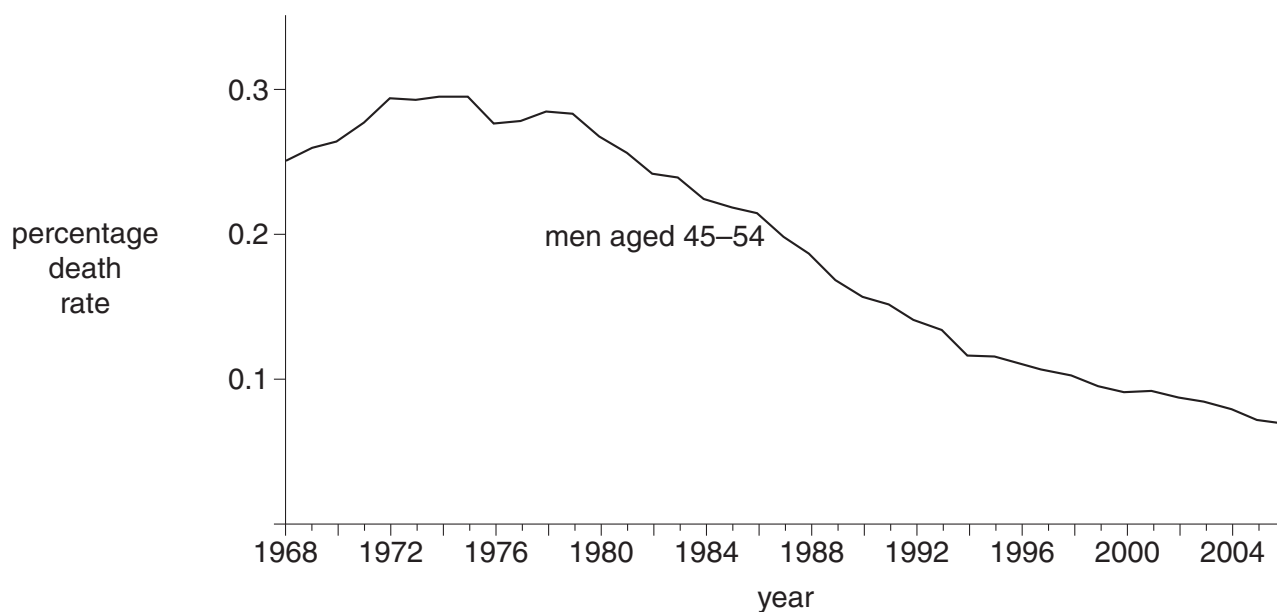
☐

[1]

[Total: 4]

## 7 Look at the graph.

The graph shows the percentage death rate in the UK due to coronary heart disease for men aged 45 to 54 between 1968 and 2006.



- (a) (i) Complete each sentence by putting a ring around the **correct** alternative.

From 1968 the death rate increased until **1972** / **1985** / **1995**.

In 2006 the death rate was **the same as** / **lower than** / **higher than** in 1968. [1]

- (ii) Suggest **two** changes in men's lifestyles that may have resulted in the change from 1968 to 2006.

.....

.....

..... [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. Without oxygen the heart muscle cannot respire.
5. Some heart muscle cells die - this may cause a heart attack.

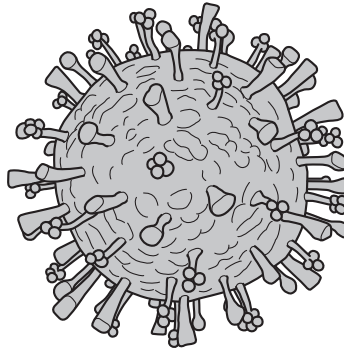
Write down the numbers of the two sentences that contain mistakes.

sentences ..... and ..... [2]

[Total: 5]

8 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.



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

(i) How do vaccines work?

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

Vaccines kill microorganisms.

☐

Vaccines stop microorganisms entering the body.

☐

Vaccines stop microorganisms reproducing.

☐

Vaccines trigger the production of antibodies.

☐

[1]

(ii) Why did the US Government **not** suggest using antibiotics?

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

Antibiotics do not kill viruses.

☐

It takes longer to produce antibiotics than vaccines.

☐

It is cheaper to produce a new vaccine.

☐

Viruses become resistant to antibiotics.

☐

[1]

- (iii) The US Government started to vaccinate the whole population against the new virus.

To prevent a flu epidemic, this would have cost \$137 million.  
 Side effects from the vaccine occurred in about 500 people.  
 Side effects occurred in less than 1 in 100 000 of those vaccinated.  
 Most of the people with side effects recovered but some died.  
 The Government decided to stop the vaccination programme early.  
 Less than a quarter of the population had been vaccinated.

Write down **one** reason for stopping the vaccination programme and **one** reason against stopping the vaccination programme.

for stopping .....

.....

against stopping .....

..... [2]

- (b) (i) 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]

- (ii) A new scientific claim is more reliable if it has been **peer reviewed**.

Put a tick (✓) in the box that best describes peer review.

The new claim has been checked by other scientists.

☐

The original scientist repeats the experiments.

☐

The original scientist checks for errors in the methods.

☐

The new claim has appeared in the newspapers.

☐

[1]

- (c) 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**

only use antibiotics when you are infected by a dangerous type of bacteria

it is important to kill all the infecting 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: 9]

**END OF QUESTION PAPER**

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