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	

AQA

General Certificate of Secondary Education
Foundation Tier
June 2015

Science B

SCB3FP

Unit 3 Making My World a Better Place

F

Friday 12 June 2015 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed
- 1 hour

A

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 7(b) 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 transfer of heat energy can take place in a number of ways.

Table 1 describes different ways in which heat energy is transferred.

Complete **Table 1** to name each description.

[2 marks]

Tick (✓) **two** boxes.

Table 1

Description	**Conduction**	**Convection**	**Radiation**
Heat energy is transferred by liquids moving.			
Hot objects emit heat energy.			

1 (b) Heat energy is lost from houses in different ways.

Table 2 shows information about the cost and savings of different types of insulation.

Table 2

Type of Insulation	**Cost in £**	**Saving per year in £**	**Payback time in years**
Loft Insulation	300	150	2.0
Floor Insulation	540	60	
Draught Proofing	30	20	1.5

$$\text{Payback time} = \frac{\text{cost}}{\text{saving per year}}$$

1 (b) (i) Calculate the payback time for the floor insulation.

[1 mark]

.....

.....

..... years

1 (b) (ii) Calculate how much money the loft insulation would save over ten years after paying for the materials.

[2 marks]

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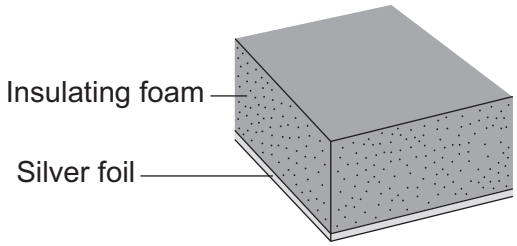
Saving = ...

1 (b) (iii) Loft insulation reduces energy loss from houses.

Figure 1 shows the structure of loft insulation.

Figure 1



Which type of heat energy transfer is reduced by the silver foil in **Figure 1**?

[1 mark]

.....

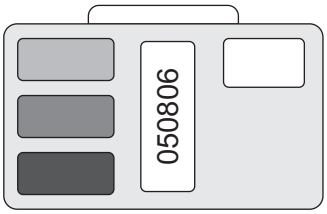
6

Turn over for the next question

2 **Figure 2** shows the inside of an open radiation film badge.

Radiation film badges contain different materials to stop different types of radiation.

Figure 2



2 (a) Draw **one** line from each material to the correct description of the radiation that the material stops.

[3 marks]

Material	**Description**
Lead	Stops alpha radiation from passing through. Does not stop beta and gamma radiation.
Paper	Stops alpha and most beta radiation from passing through. Does not stop gamma radiation.
Thin aluminium	Stops alpha, beta and gamma radiation from passing through.
	Stops alpha and gamma radiation from passing through. Does not stop beta radiation.

2 (b) (i) Radioactive tracers are used in medical imaging.

Some radioactive tracers emit gamma rays.

How are the gamma rays detected during medical imaging?

[1 mark]

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2 (b) (ii) Radiotherapy can be used to treat disorders such as cancer.

Give **one** disadvantage of using radiotherapy to treat cancer.

[1 mark]

.....

.....

.....

2 (b) (iii) Suggest **one** ethical factor a doctor would need to consider before starting radiotherapy with a cancer patient.

[1 mark]

.....

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.....

6

Turn over for the next question

3 (a) Nickel jewellery can be electroplated.

During electroplating, jewellery is coated in a thin layer of metal.

3 (a) (i) Name **one** other electroplated object found in a house.

[1 mark]

.....

3 (a) (ii) Nickel jewellery can be electroplated with silver.

[2 marks]

Tick (✓) **two** reasons why nickel jewellery is electroplated.

Because nickel is a smart material ☐

For decoration ☐

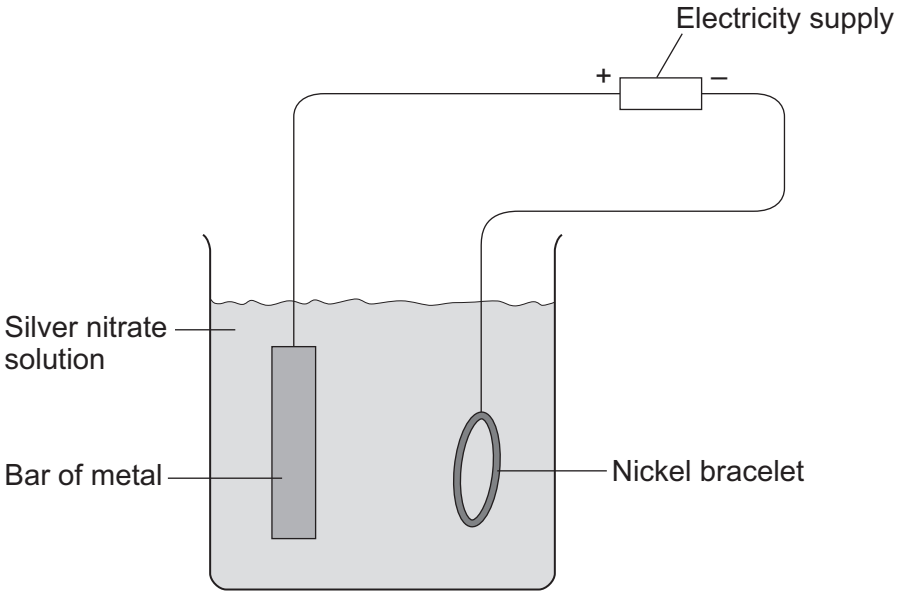
So that it changes colour in sunlight ☐

To prevent allergies ☐

To stop it breaking ☐

3 (b) **Figure 3** shows the equipment used to electroplate a nickel bracelet with silver.

Figure 3



Use the information from **Figure 3** to answer the following questions.

3 (b) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

cathode	**cell**	**electrolyte**

The nickel bracelet is the ..... .

3 (b) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

anode	**electrode**	**electrolyte**

The silver nitrate solution is the ..... .

3 (b) (iii) Use the correct answer from the box to complete the sentence.

[1 mark]

atoms	**cells**	**ions**

Electrolysis involves the movement of charged particles called ..... .

3 (b) (iv) What metal is the metal bar in **Figure 3** made from?

[1 mark]

.....

Question 3 continues on the next page

3 (c) A factory makes metal bracelets from different metals.

Read the information in **Table 3** about the costs of making the metal bracelets from different metals.

Table 3

Metal used to make bracelet	Cost of metal per gram in £	Number of grams needed to make one bracelet	Total cost of metal to make one bracelet in £
Silver	0.40	5	2.00
Nickel	0.05	5	.....

Use the information in **Table 3** to answer the following questions.

3 (c) (i) Calculate the total cost of the metal to make one nickel bracelet.

[1 mark]

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.....

.....

.....

Total cost of the metal to make one nickel bracelet = ...

3 (c) (ii) The total cost of the metal to make one nickel bracelet electroplated with silver is £1.25.

Give **one** reason why a person may buy a nickel bracelet electroplated with silver, rather than a solid silver bracelet.

[1 mark]

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9

4 Chemicals in the soil may give off a radioactive gas called radon, which can pollute our home.

4 (a) (i) Name **two** substances found in soil that give off radon.

[2 marks]

1 .....

2 .....

4 (a) (ii) Which disorder does radon cause?

Draw a ring around the correct answer.

[1 mark]

asthma **cancer** **flu**

4 (a) (iii) How can the level of radon in a house be reduced?

[1 mark]

Tick (✓) **one** box.

Check the boiler regularly ☐

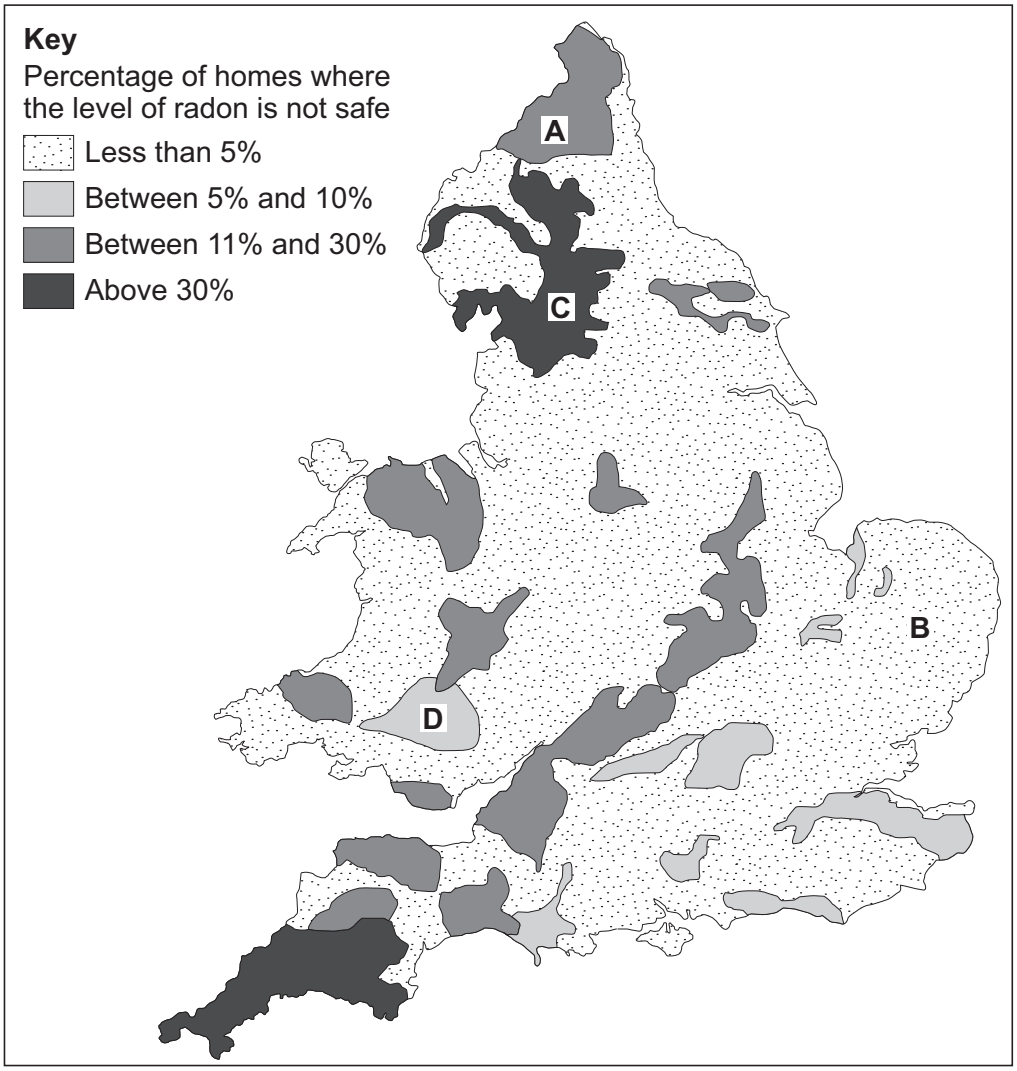
Open the windows ☐

Use less toxic products ☐

Question 4 continues on the next page

4 (b) The map in **Figure 4** shows the percentage of homes where the level of radon in the home is **not** safe.

Figure 4



4 (b) (i) In which area, **A**, **B**, **C** or **D**, is the level of radon most likely to be safe?

[1 mark]

.....

4 (b) (ii) A man is looking for a house to buy. He buys a house in area **C**.

A surveyor advises the man to put more air bricks in the walls below the level of the floorboards to increase ventilation.

Use data from **Figure 4** to give **one** reason why houses in area **C** should have more air bricks.

[1 mark]

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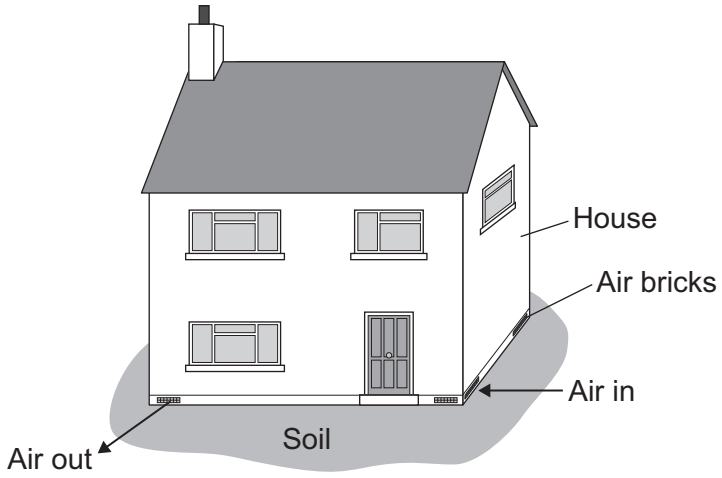
.....

4 (b) (iii) **Figure 5** shows the position of the air bricks.

Figure 5



The air bricks allow air to move under the floorboards.

The surveyor said: "Air bricks are more effective under the floorboards than above the floorboards."

Explain how the air bricks shown in **Figure 5** reduce the levels of radon inside the home.

[2 marks]

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8

5 (a) Mercury is a poisonous metal. Mercury from industry can get into lakes and rivers.

Scientists have developed genetically modified bacteria to remove mercury from lakes and rivers. The genetically modified bacteria contain a gene from a mouse.

5 (a) (i) Sentences **A**, **B**, **C**, **D** and **E** describe the process of genetic modification using a gene from a mouse, as shown in **Figure 6**.

The sentences are not in the correct order.

A The combined bacterial DNA and mouse gene are put into the bacterial cell.

B The bacterial DNA and mouse gene are joined together.

C A ring of bacterial DNA is opened.

D A ring of bacterial DNA is removed from a bacterium.

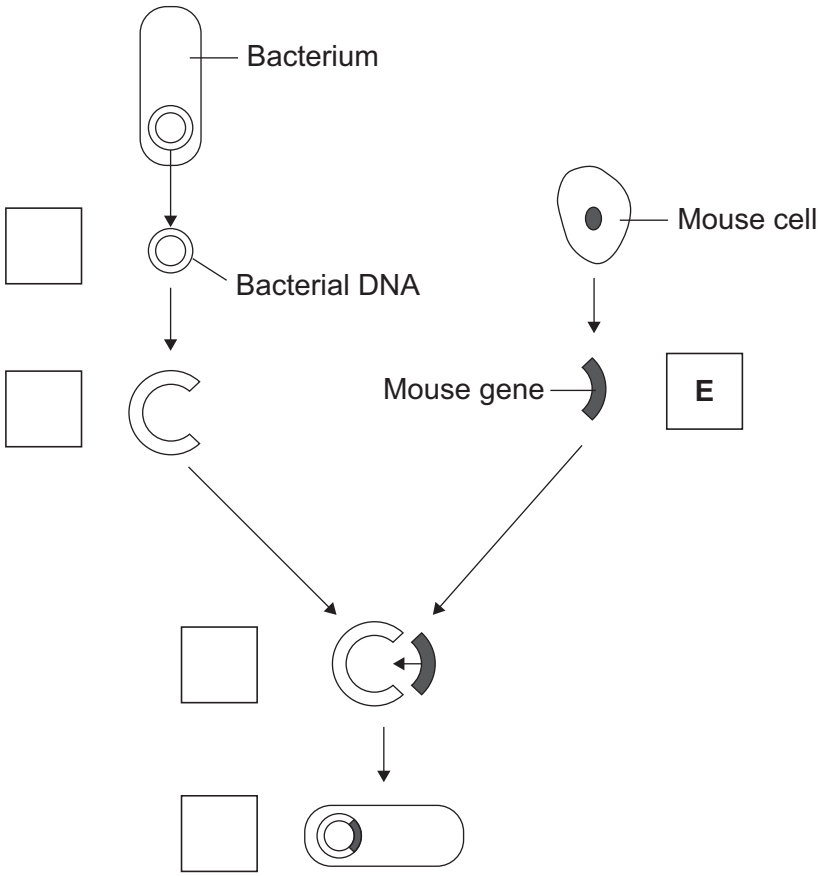
E The desired gene is removed from a mouse cell.

Complete **Figure 6** by labelling each stage of the process.

You should put **one** letter, **A**, **B**, **C** or **D**, in each box on **Figure 6**.
One has been done for you.

[3 marks]

Figure 6



5 (a) (ii) Suggest **one** advantage of removing mercury from lakes and rivers.

[1 mark]

.....

.....

5 (a) (iii) Some people are concerned about using genetically modified bacteria.

Suggest **one** disadvantage of using genetically modified bacteria.

[1 mark]

.....

.....

5 (b) Which **one** of the following is also produced using genetically modified bacteria?

[1 mark]

Tick (✓) **one** box.

Barbiturates ☐

Insulin ☐

Paracetamol ☐

6

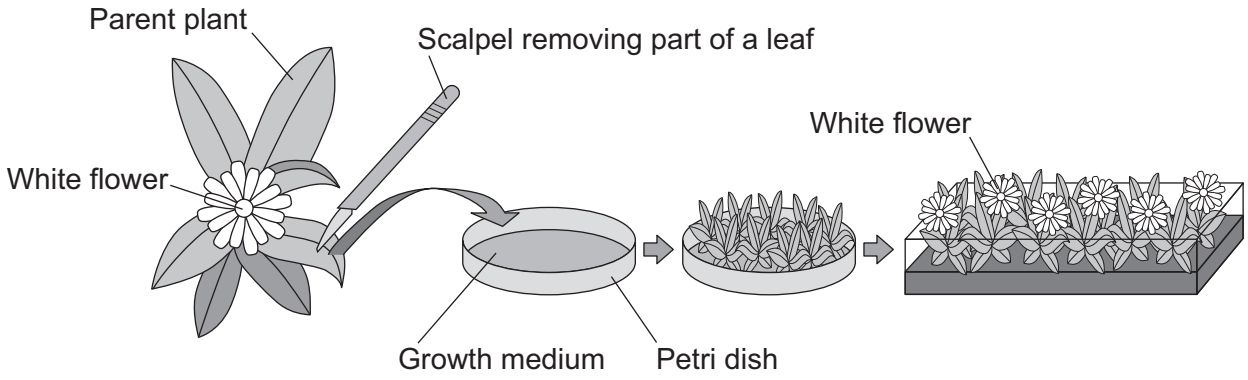
Turn over for the next question

6 (a) Cloning is an example of biotechnology.

Tissue culture is one method used to clone plants.

Figure 7 shows the process of tissue culture.

Figure 7



Give **two** possible advantages of producing plants using tissue culture.

[2 marks]

Tick (✓) **two** boxes.

Disease resistance is increased. ☐

Tissue culture is quick. ☐

The flowers are different colours. ☐

The offspring are identical. ☐

6 (b) One way of producing animals with a particular characteristic is to use selective breeding.

Figure 8 shows a Belgian Blue Cow.

Figure 8

The Belgian Blue cow was produced by selective breeding.

The first step in selective breeding is to choose two parents with the desired characteristics.

Describe the process of selective breeding after the parents have been selected.

[3 marks]

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5

7 (a) (i) Pathogens are microorganisms. Pathogens cause disease.

Which disease is caused by a virus?

Draw a ring around the correct answer.

[1 mark]

cholera **measles** **tuberculosis** **typhoid**

7 (a) (ii) Why do viruses make us feel ill?

[1 mark]

.....

.....

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

Every day our body comes into contact with many pathogens.

Our body has many ways of preventing pathogens from entering it. If pathogens do enter, our body can respond to prevent us from becoming ill.

Describe how our body stops pathogens from entering **and** how our body stops pathogens making us ill.

[6 marks]

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Extra space .....

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8

8 Scientists develop new products. The new products are designed to be better than the traditional products.

8 (a) (i) One new product that scientists have developed is a smart paint. Smart paint can be used on cars.

Give **one** advantage of using a smart paint compared with using a traditional paint.

[1 mark]

.....

.....

.....

8 (a) (ii) Superconductors are a type of smart material.

Explain the advantage of using superconductors compared with traditional conductors.

[2 marks]

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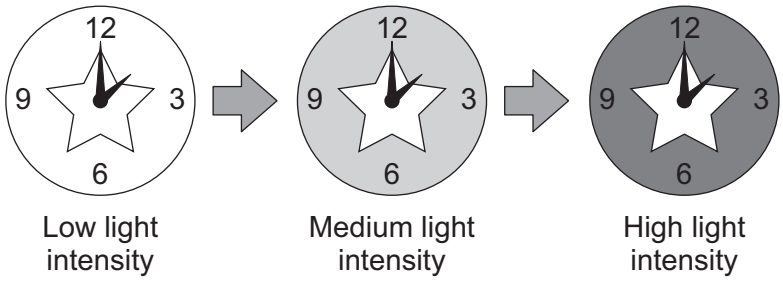
8 (b) Skin cancer affects over 5000 people in the UK each year. Strong sunlight is one cause of skin cancer.

A company has developed a new watch for children to wear when they play outside in sunlight.

Figure 9 shows the watch face after it has been exposed to different intensities of sunlight.

Figure 9



8 (b) (i) What type of material is the watch face in **Figure 9** made from?

[1 mark]

.....

8 (b) (ii) Suggest **one** reason why wearing the new watch may reduce the risk of children getting skin cancer.

[1 mark]

.....

.....

5

Turn over for the next question

9 Drugs are classified as legal or illegal.

9 (a) (i) Tobacco contains a legal drug called nicotine.

What is the effect of nicotine on the body?

[1 mark]

.....

.....

9 (a) (ii) The smoke from burning tobacco contains carbon monoxide.

What harmful effect does carbon monoxide have on the blood?

[1 mark]

.....

.....

9 (b) Some recreational drugs are illegal.

Table 4 shows the number of deaths from poisoning by recreational drugs between 2008 and 2012.

Table 4

Year	Number of deaths from poisoning by recreational drugs
2008	2920
2009	2830
2010	2750
2011	2650
2012	2570

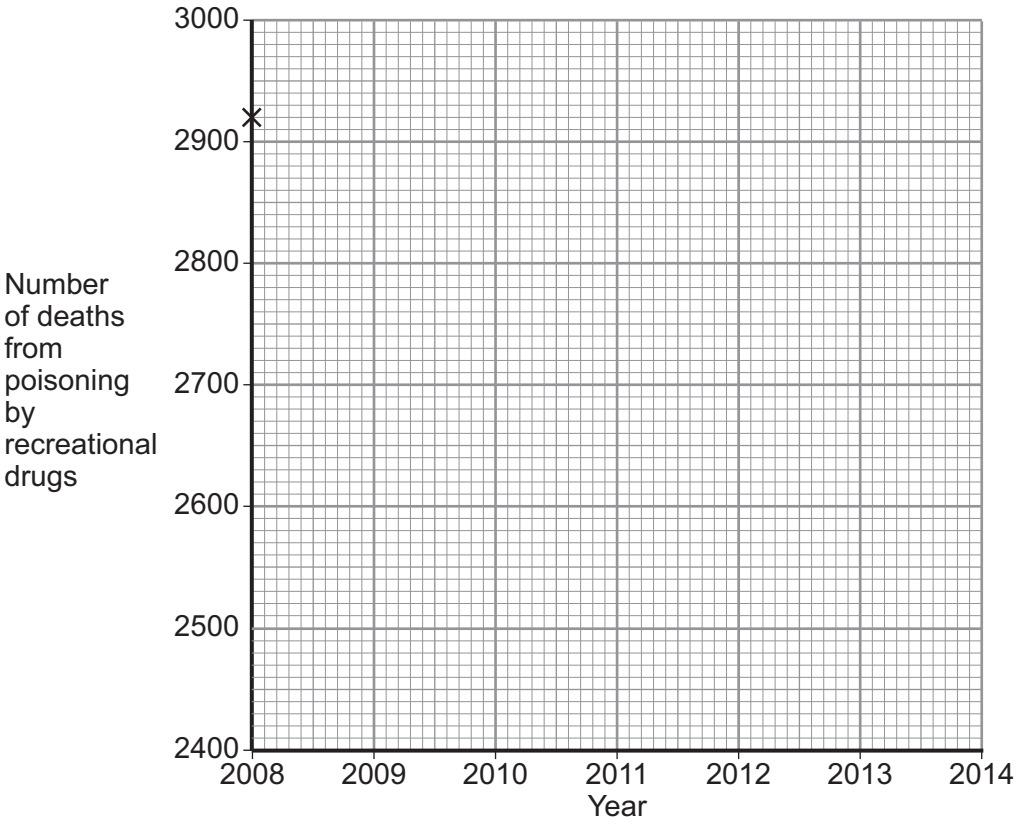
9 (b) (i) Use the data in **Table 4** to complete the graph in **Figure 10** to show how the number of deaths from poisoning by recreational drugs has changed between 2008 and 2012.

You should:

- plot the data
- draw the line of best fit.

[3 marks]

Figure 10



9 (b) (ii) Use your graph in **Figure 10** to predict the number of deaths in 2013 if the pattern from 2008 continued.

[1 mark]

.....

9 (b) (iii) The trend from 2008 may not continue in the same pattern after 2013.

Suggest **one** reason why the trend may change.

[1 mark]

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7

END OF QUESTIONS

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