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	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
June 2014

Science B

SCB3HP

Unit 3 Making My World a Better Place

H

Thursday 12 June 2014 9.00 am to 10.00 am

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 2 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 Many people in the UK have chest and lung problems.

Figure 1

Drying clothes indoors is a risk to human health

Scientists found that many homes had become too humid due to drying clothes indoors.

1 (a) (i) Use information given in **Figure 1** to explain how drying clothes in the home could cause an increase in pollution in the home.

[2 marks]

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1 (a) (ii) Suggest **two** ways in which homeowners could reduce or prevent the problems caused by drying clothes in the home.

[2 marks]

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1 (b) Surveyors study where new houses will be built.

Surveyors consider the types of soil and rock that houses will be built on to see whether pollution in the houses may occur.

Explain what might happen to people living in a house if the rock the house is built on contains uranium or radium.

[2 marks]

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6

Turn over for the next question

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

Global warming affects the environment.

Global warming is caused by greenhouse gases in the atmosphere.

Describe the ways in which greenhouse gases may be produced by human activity.

In your answer you should include names of greenhouse gases.

[6 marks]

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Turn over for the next question

3 (a) **Figure 2** shows a spring made of nitinol.

Figure 2

Nitinol is a memory shape metal.

At low temperatures you can straighten a nitinol spring.

When the nitinol spring is heated above a certain temperature, it goes back to its original shape.

This temperature is called the **transition temperature**.

Some students investigated the **transition temperature** of a nitinol spring.

The students:

1 cooled and then straightened the nitinol spring

2 put the straightened nitinol spring into a beaker of water at 10 °C for five minutes

3 recorded if the nitinol spring returned to its original shape

4 repeated steps 1–3 at different temperatures.

Table 1 shows the students' results.

Table 1

Temperature of water in the beaker in °C	Did the shape of the nitinol spring return to normal?
10	No
20	No
30	No
40	No
50	Yes
60	Yes

3 (a) (i) Suggest why the students left the nitinol spring in the water for five minutes before recording their results.

[1 mark]

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3 (a) (ii) Suggest what conclusion can be made about the **transition temperature** of the nitinol spring.

[1 mark]

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3 (a) (iii) Suggest what the students could do to improve the accuracy of the conclusion.

[1 mark]

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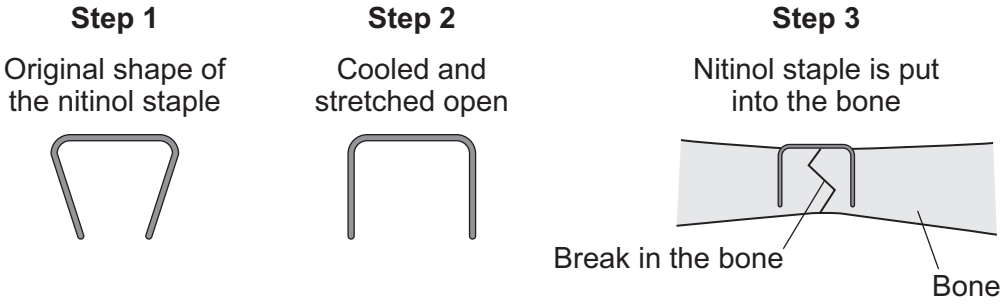
Question 3 continues on the next page

3 (b) Nitinol is also used in staples for bones.

Sometimes, bones have to be stapled together to help the bones repair correctly.

Figure 3 shows how a nitinol staple is used.

Figure 3



3 (b) (i) Suggest what will happen to the two pieces of bone when the nitinol staple warms up to its **transition temperature**.

[1 mark]

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3 (b) (ii) The nitinol used in bone staples has a different **transition temperature** from that of the nitinol spring in part **(a)**.

Average human body temperature is 37 °C.

Suggest what the **transition temperature** of the nitinol staple will be. Give a reason for your answer.

[2 marks]

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3 (b) (iii) Suggest **one** advantage of using a nitinol bone staple compared with a traditional stainless steel bone staple in a broken bone.

[1 mark]

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7

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

4 (a) People with asthma have difficulty breathing and are treated with drugs delivered by inhalers.

Treating asthma costs the NHS one billion pounds each year.

A genetic mutation in some people means that some of the drugs delivered by inhalers will not work very well.

A new genetic screening test could be the first step in personalised drug treatment for people with asthma.

The genetic screening will identify patients who have a specific mutation.

Suggest **three** potential advantages of the new screening test.

[3 marks]

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4 (b) Scientists have been developing a new drug to treat deafness.

The new drug has been tested on mice.

After taking the new drug, some deaf mice recovered some of their hearing.

The new drug cannot yet be given to people who have lost their hearing.

Describe what would happen next before this new drug could be given to people who have lost their hearing.

[3 marks]

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Turn over for the next question

5 The Kyoto agreement aimed to reduce greenhouse gas (GHG) emissions by the year 2012.

The agreement set targets for 37 countries and the European Community to achieve this reduction.

Some countries were not part of the agreement.

5 (a) (i) Which major countries refused to sign the agreement?

Tick (✓) **one** box.

[1 mark]

Australia and USA ☐

Australia and Canada ☐

Canada and USA ☐

5 (a) (ii) Explain how an increased concentration of greenhouse gases in the atmosphere causes global warming.

[2 marks]

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5 (a) (iii) The overall target for the agreement was to reduce GHG emissions by 5% between 2008 and 2012.

Table 2 shows how emissions in some countries have changed since 2008.

Table 2

Country	**Percentage change in greenhouse gas emissions since 2008**
Australia	+13.7
Canada	+46.4
Norway	–49.1
Romania	–63.8
UK	–23.5
United States	+8.6

The overall reduction in emissions has been 4% globally since 2008.

A newspaper concluded that **'The Kyoto agreement has been successful'**.

Give the reasons for and against the newspaper's conclusion.

[5 marks]

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Question 5 continues on the next page

5 (b) Many people are concerned about the amount of plastics taking up space in landfill.

Scientists are trying to design new materials to reduce the impact of plastics on our environment.

A company has developed a new plastic pouch to contain a detergent for washing clothes in washing machines.

The plastic pouches are put in the washing machine with the clothes.

5 (b) (i) Name the type of plastic the pouches could be made from.

[1 mark]

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5 (b) (ii) Give **two** properties of the plastic named in part **(b)(i)**.

[2 marks]

1 .....

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5 (b) (iii) Suggest **one** possible advantage of using the plastic pouches rather than traditional washing powders.

[1 mark]

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5 (c) Some plastics degrade after prolonged exposure to sunlight.

What is the name of these plastics?

[1 mark]

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13

Turn over for the next question

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6 Nuclear radiation can be harmful.

Alpha, beta and gamma radiation are the three types of nuclear radiation emitted from radioactive sources.

6 (a) (i) State what beta radiation is and describe its penetrative properties.

[2 marks]

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6 (a) (ii) State what gamma radiation is and describe its penetrative properties.

[2 marks]

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6 (b) Some people in hospitals work with radiation.

6 (b) (i) Explain why people who work with radiation wear film radiation badges.

[2 marks]

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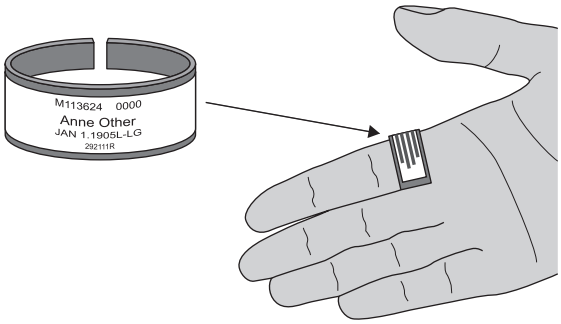
6 (b) (ii) Radiation therapists in hospitals work with cancer patients.

Radiation therapists handle radioactive sources.

They often wear radiation rings (**Figure 4**) instead of film radiation badges.

Figure 4



Suggest why it is safer for radiation therapists to wear radiation rings and not film radiation badges.

[1 mark]

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Figure 5

6 (c) **Figure 5** shows a smoke detector.

Smoke detectors contain an alpha radiation source.

Suggest why people are **not** at risk from the alpha radiation source in a smoke detector in the home.

[1 mark]

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8

Turn over ▶

7 Many objects are electroplated.

Table 3 shows some properties of different metals used to electroplate items.

Table 3

Metal	Corrosion resistance	Electrical conductivity	Cost in £ per 100 grams
Gold	excellent	excellent	2638.00
Copper	poor	excellent	0.43
Silver	excellent	excellent	42.67
Tin	good	poor	1.22

7 (a) (i) Metal audio cables are used to interconnect audio equipment.

The metal audio cables conduct electricity.

Suggest **one** reason why copper is used to make the audio cable wire.

[1 mark]

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7 (a) (ii) Connectors are used to connect the metal audio cable to the audio equipment.

A man looks at two brands of connectors to use with his audio equipment, brands **A** and **B**.

Brand **A** connectors are gold plated and cost £14.99. Brand **B** connectors cost £1.45. Both brands of audio connectors work well.

Suggest which metal from **Table 3** has been used to plate brand **B** connectors. Give a reason for your answer.

[2 marks]

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7 (b) A metal bracelet is plated with copper.

When the bracelet is electroplated there are two electrodes.

One electrode is made by the metal bracelet, the other electrode is made of copper.

7 (b) (i) Give the name of the electrode made by the metal bracelet.

[1 mark]

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7 (b) (ii) Complete the symbol equation to show what happens at the electrode made of copper.

[2 marks]

..... $\longrightarrow$ Cu^{2+} + ...

7 (b) (iii) Write the symbol equation to show what happens at the electrode made by the metal bracelet.

[2 marks]

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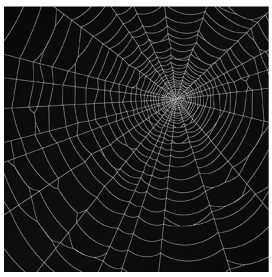
8

Turn over for the next question

8 Spider silk is one of the strongest substances in the world and it can be used to make bullet-proof vests.

Geneticists have developed a way of using genetic engineering to modify goat cells so that the goat produces spider silk protein in its milk.



In this process:

- the cells of the goats are modified to produce the spider silk protein in their milk
- the goats are milked
- the protein is removed from the milk
- the protein is made into thread to make bullet-proof vests.

8 (a) Describe how the goat cells are modified to produce spider silk protein.

[3 marks]

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8 (b) (i) The geneticists have modified only female goat cells.

Suggest why.

[1 mark]

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8 (b) (ii) In order to produce a herd of goats which can produce spider silk protein:

- genetic modification is done at the embryonic stage
- modified goats are cloned.

Suggest **two** reasons why the farmer clones the modified goat.

[2 marks]

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END OF QUESTIONS

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