

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
March 2013

Science B

SCB3FP

Unit 3 Making My World a Better Place

F

Written Paper

Friday 8 March 2013 9.00 am to 10.00 am

For this paper you must have:

- a ruler.
- You may use a calculator.

Time allowed

- 1 hour

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 6(c) 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.



M A R 1 3 S C B 3 F P O 1

G/J91436 6/6/6/6/6

SCB3FP

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

1 (a) Scientists make new materials to improve products.

Use the correct words from the box to complete the sentences.

photochromic material	superconductor	thermochromic material
------------------------------	-----------------------	-------------------------------

The material used to make forehead thermometers is a

.....

The Maglev train and MRI scanners use a

.....

(2 marks)

1 (b) Some types of material change colour when exposed to bright light.

Give **two** uses of this type of material.

1

2

(2 marks)



- 1 (c) One example of a smart material is memory wire. Memory wire is used to make spectacle frames. If memory wire is bent it returns to its original shape.



- 1 (c) (i) Suggest **one** advantage of using memory wire to make spectacle frames, compared with plastic frames.

.....
(1 mark)

- 1 (c) (ii) Suggest **one** disadvantage of using memory wire to make spectacle frames, compared with plastic frames.

.....
(1 mark)

6

Turn over for the next question

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2 A factory is making bracelets.

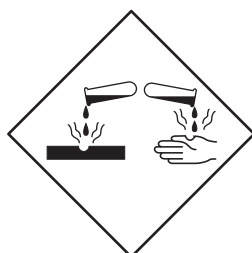
The factory does this by electroplating aluminium bracelets with copper.

2 (a) Give **one** reason why the factory might want to electroplate an aluminium bracelet with copper.

.....
(1 mark)

2 (b) Before the bracelets can be electroplated, the bracelets need to be cleaned with concentrated acid.

Containers of concentrated acids have the following hazard symbol on them.



2 (b) (i) What does the hazard symbol mean?

.....
(1 mark)

2 (b) (ii) Workers in the factory need to be protected when working with concentrated acids.

Tick (✓) **two** ways of minimising the risks of using concentrated acids.

Wear protective goggles.

Use more acid than you need.

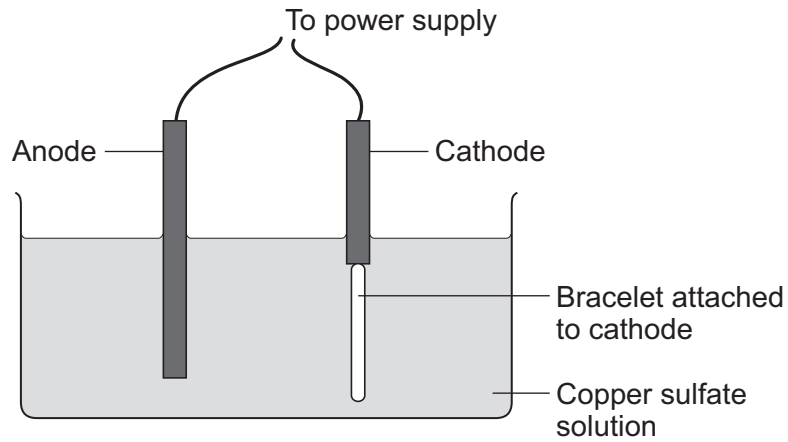
Don't eat or drink when using the acids.

Keep the acids locked out of reach.

(2 marks)



- 2 (c) The diagram shows the equipment used to electroplate an aluminium bracelet with copper.



Draw a ring around the correct answer to complete each sentence.

The bracelet is attached to the cathode. The cathode is

negative.
neutral.
positive.

The anode is made of

aluminium.
copper.
sulfate.

When the current is switched on, the positive copper

atoms
ions
isotopes

move to

the bracelet through the

copper.
electrolyte.
wires.

(4 marks)

8

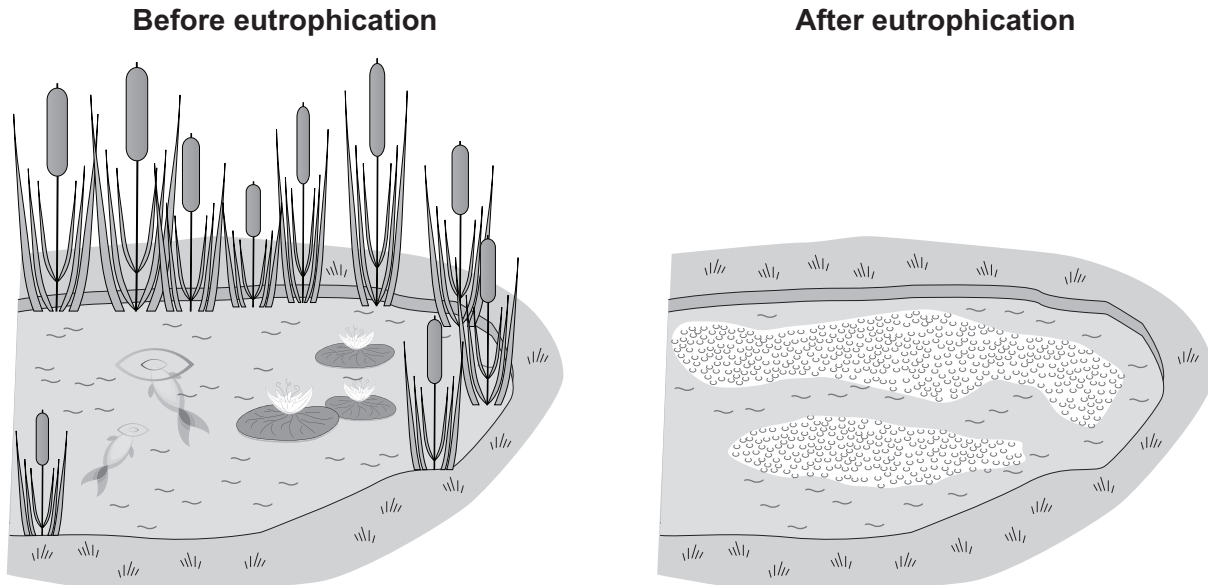
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3 (a) Some farmers use fertilisers to make their crop plants grow bigger.

If the farmer uses too much fertiliser, eutrophication can happen.

The diagram shows a lake before and after eutrophication has happened.



Sentences **A**, **B**, **C**, **D** and **E** describe the process of eutrophication.

The sentences are not in the correct order.

- A** The fertiliser causes algae to grow on the surface of the water.
- B** The water plants die and bacteria break down the plants.
- C** The fertilisers wash into lakes.
- D** Algae prevents sunlight reaching the water plants.
- E** This uses up the oxygen in the lake.

Put the sentences in the correct order. The first one has been done for you.



(3 marks)



3 (b) Environmental scientists use indicator species to monitor pollution.

Complete the sentences.

Bloodworms are used to indicate pollution levels in

Lichens are used to indicate pollution levels in

(2 marks)

3 (c) (i) As well as environmental pollution, many people are affected by high levels of air pollution in their own houses. This makes people ill.

Give **two** common symptoms a person might have when indoor pollution is high.

1

2

(2 marks)

3 (c) (ii) Two gases that can be found in homes are carbon monoxide and radon.

Give **one** source of carbon monoxide and **one** source of radon gas.

Carbon monoxide

Radon

(2 marks)

9

Turn over for the next question

Turn over ►



4 (a) Scientists can use genetic engineering to produce:

- drugs to treat diseases
- organisms with specific characteristics.

There are many techniques that are used for genetic engineering.

Draw **one** line from each definition to the correct technique.

Definition

Technique

A new 'healthy' gene is inserted
into cells

A genetically identical offspring
is produced

Animals or plants with specific
characteristics are bred together
over many generations

Cloning

Gene therapy

Selective breeding

Altering crops using
genetic modification (GM)

(3 marks)



4 (b) Over 2 million people suffer from diabetes and have to inject themselves with insulin.

4 (b) (i) Human insulin can be made in large amounts using genetic modification.

Draw a ring around the correct answer to complete each sentence.

The human insulin gene is removed using

- enzymes.
- hormones.
- scissors.

A ring of bacterial

- cytoplasm
- DNA
- membrane

is opened.

The two pieces of genetic material are joined together and

inserted into a

- bacterium.
- fungus.
- human.

(3 marks)

4 (b) (ii) Insulin used to be taken from pigs.

Insulin is now made using genetically modified organisms.

Suggest **two** advantages of producing insulin from genetically modified organisms instead of pigs.

- 1
-
- 2
-

(2 marks)

8

Turn over ▶



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5 (a) (i) Aspirin is a drug. Aspirin can be used to treat the symptoms of disease.

Tick (✓) **two** uses of aspirin.

Painkiller

Anti-inflammatory

Antibiotic

Antidepressant

(2 marks)

5 (a) (ii) Some people take recreational drugs.

Give **two** reasons why some people become physically dependent on recreational drugs.

1

2

(2 marks)

Question 5 continues on the next page

Turn over ►



5 (b) Patients in hospitals can sometimes develop infections caused by *Staphylococcus*.

Staphylococcus can be resistant to antibiotics such as penicillin.

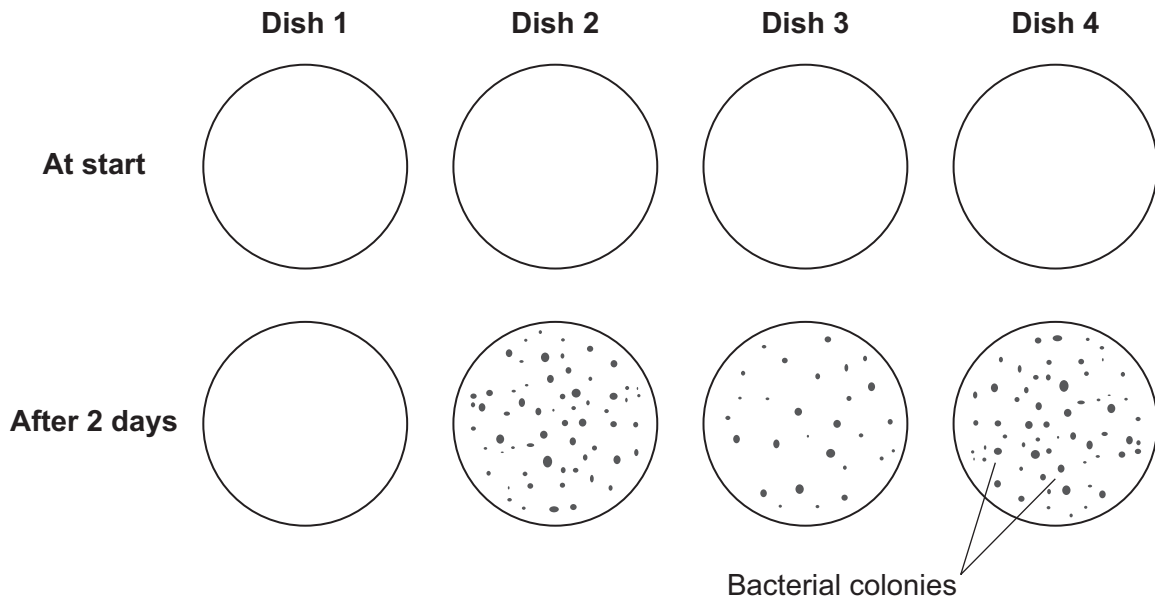
A medical scientist did an investigation to see how effective one type of penicillin was against *Staphylococcus* taken from two different patients.

He set up four sterile dishes as follows:

- **Dish 1** had *Staphylococcus* from Patient 1 and penicillin.
- **Dish 2** had *Staphylococcus* from Patient 2 and penicillin.
- **Dish 3** had *Staphylococcus* from Patient 1 with **no** penicillin.
- **Dish 4** had *Staphylococcus* from Patient 2 with **no** penicillin.

The dishes were incubated at 35 °C for two days.

The results are shown in the diagram.



5 (b) (i) Suggest a reason why the scientist used **Dish 3** and **Dish 4** in his investigation.

.....

.....

(1 mark)



5 (b) (ii) Describe the difference in appearance of **Dish 1** and **Dish 2** after two days.

.....
.....

(1 mark)

5 (b) (iii) Explain why there is a difference between **Dish 1** and **Dish 2** after two days.

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

(3 marks)

5 (b) (iv) Suggest how Patient 2 should be treated to get rid of the infection.

.....
.....

(1 mark)

10

Turn over for the next question

Turn over ►



6 Energy consultants give advice about improving the energy efficiency of buildings.
 Payback time can be used to help make decisions about different ways of saving energy.

The table shows the usual payback times for different energy-saving measures.

Energy-saving measure	Cost in £	Saving per year in £	Payback time in years	Total saving over 10 years in £
Loft insulation	300	60	5	300
Draught proofing	40	40	1	360
Hot water tank jacket	20	20	1	180
Thermostatic heating controls	120	20	6	
Cavity wall insulation	525	75		225

6 (a) The equation below can be used to calculate payback time.

$$\text{payback time} = \frac{\text{cost}}{\text{savings per year}}$$

Calculate the payback time for installing cavity wall insulation.

.....

Payback time years
 (2 marks)

6 (b) Calculate the total saving over 10 years for installing thermostatic heating controls.

.....

Total saving £
 (3 marks)



7 (a) Nitrous oxide is one of the three main greenhouse gases causing global warming.

Name the **two** other main greenhouse gases.

.....

.....

(2 marks)

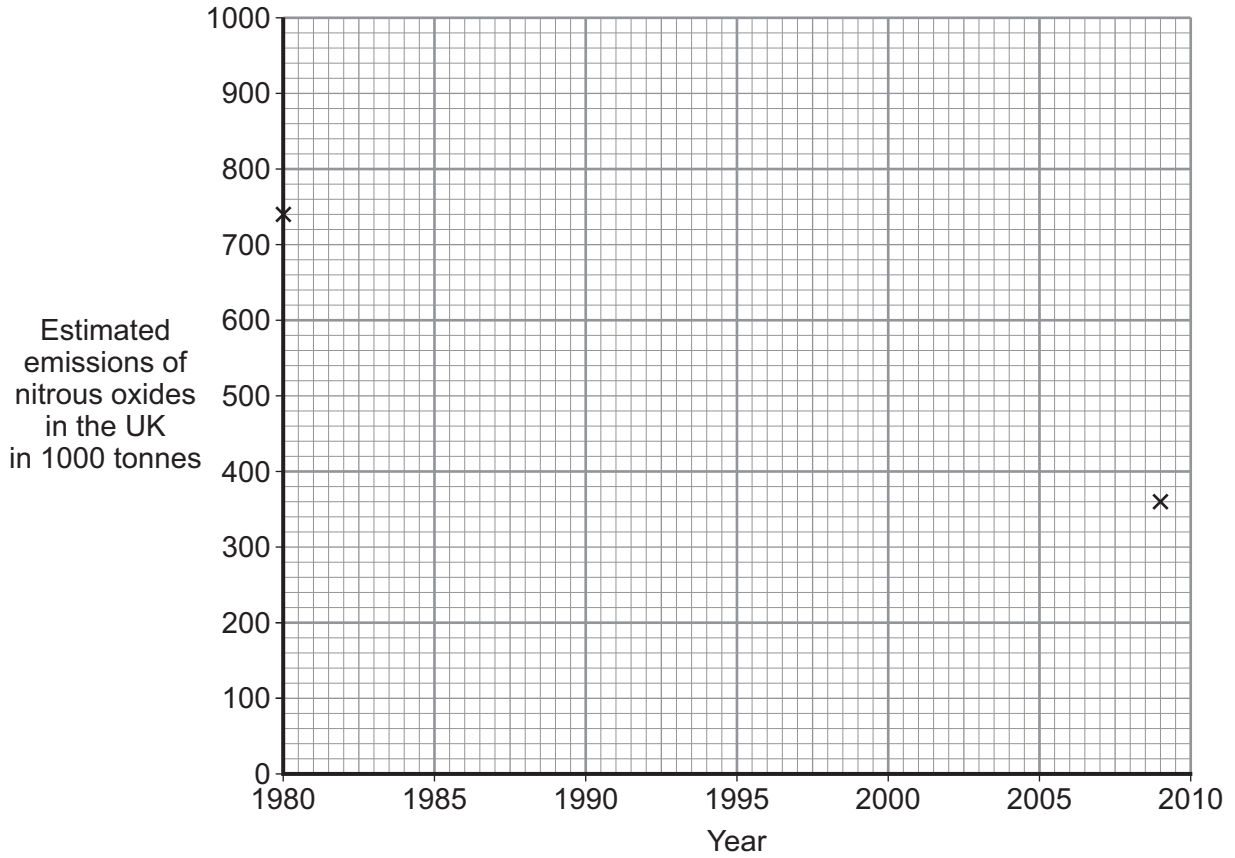
7 (b) The table below shows how emissions of nitrous oxides from road transport have changed from 1980 to 2009.

Year	Estimated emissions of nitrous oxides in the UK (× 1000 tonnes)
1980	740
1985	820
1990	980
1995	900
2000	740
2005	570
2009	360



7 (b) (i) Use the data to plot a graph to show how the nitrous oxide emissions from road transport have changed between 1980 and 2009.

The first and the last points have been done for you.



(2 marks)

7 (b) (ii) Describe the pattern shown in the graph.

.....

.....

.....

.....

(3 marks)

Question 7 continues on the next page

Turn over ►



7 (b) (iii) Tick (✓) **one** possible reason for the decrease in nitrous oxide emissions from road transport in the last few years.

There has been a decrease in the use of cars from 1990.

All new cars have catalytic converters.

Nitrous oxide is no longer used in fuels.

Leaded fuel is not sold anymore.

(1 mark)

8

END OF QUESTIONS



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