

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
November 2007

SCIENCE A
Unit Biology B1b (Evolution and Environment)

BLY1B



BIOLOGY
Unit Biology B1b (Evolution and Environment)

Thursday 22 November 2007 Morning Session

For this paper you must have:

- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

Time allowed: 30 minutes

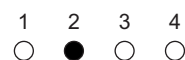
Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Evolution and Environment' printed on it.
- Attempt **one Tier only**, either the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

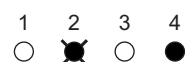
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:



- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION ONE

Questions **ONE** to **SIX**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

This question is about pollution.

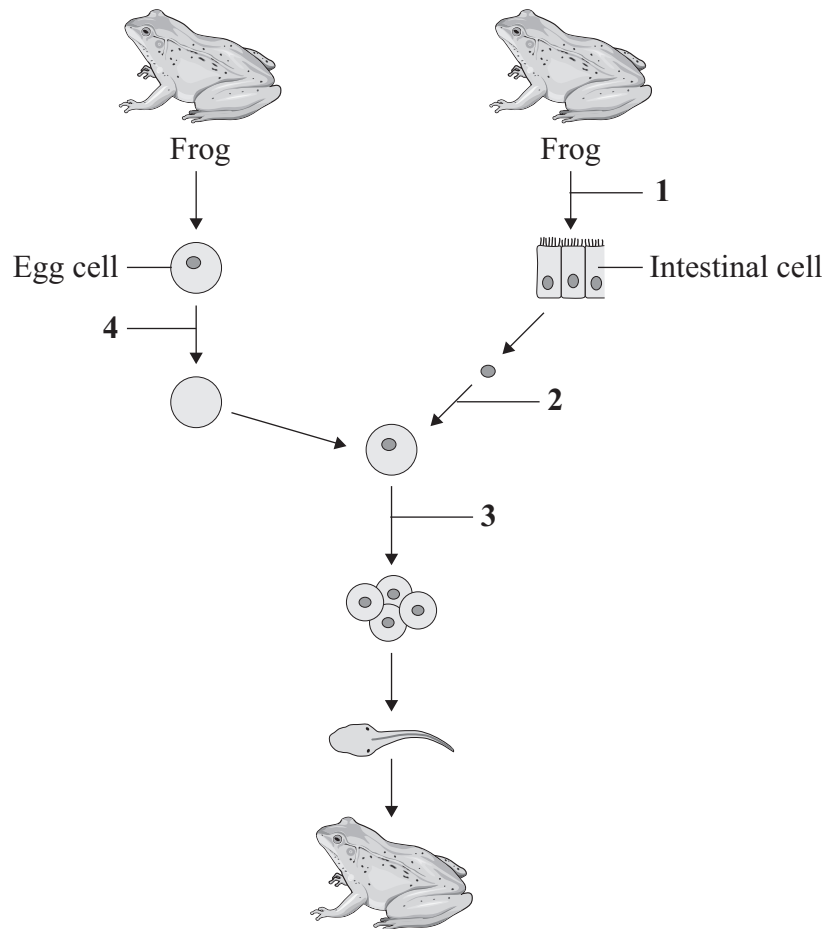
Match substances, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** carbon dioxide
- B** sewage
- C** pesticide
- D** sulfur dioxide

	Information
1	used in farming to kill insects
2	large quantities are released by some cities into the sea
3	dissolves in rainwater to form acid rain
4	a greenhouse gas released by burning timber

QUESTION TWO

The diagram shows a method that may be used to clone frogs.



Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** on the diagram.

- A** egg cell nucleus removed
- B** intestinal cell nucleus inserted into egg cell
- C** cells from the intestine removed from frog
- D** egg develops into an embryo

Turn over ►

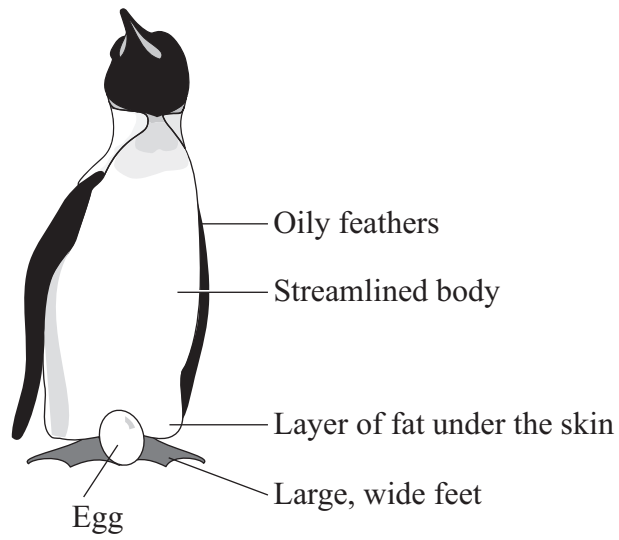
QUESTION THREE

Penguins live in the Antarctic where the land is often frozen and the sea is cold.

Penguins are good swimmers and feed on fish.

They lay their eggs on land and carry them with their feet.

Penguins have adaptations that help them to survive in Antarctic conditions.



Match adaptations, **A**, **B**, **C** and **D**, with the conditions **1–4** in the table.

- A** oily feathers
- B** large, wide feet
- C** thick layer of fat under the skin
- D** streamlined body

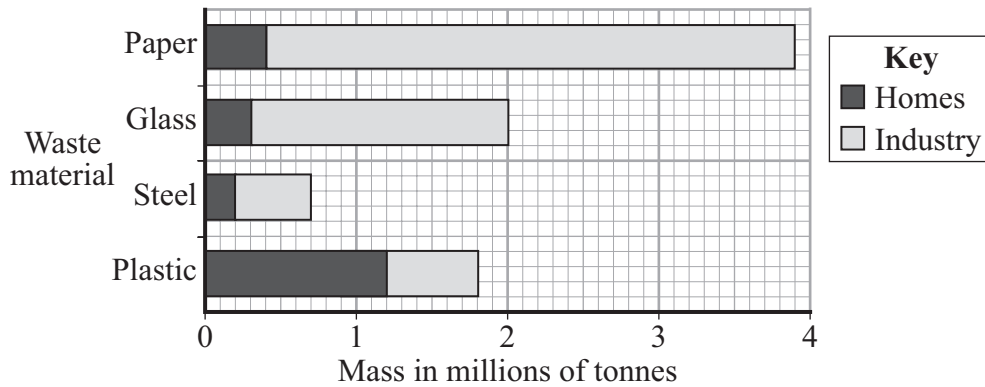
	The adaptation . . .
1	helps the penguins to survive the cold conditions of the land and the sea.
2	prevents the penguins from becoming waterlogged when swimming.
3	helps the penguins to carry their eggs on land.
4	helps to reduce resistance when the penguins are swimming.

QUESTION FOUR

The human population is increasing rapidly.

This increases the amount of waste produced.

The bar chart shows the mass of waste produced by homes and industry in the UK in 2005.



Match materials, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** glass
- B** paper
- C** plastic
- D** steel

Information	
1	recycling of this material means fewer forests are cut down
2	industry produced 1.7 million tonnes of waste of this material
3	the material that formed the smallest mass of waste from homes
4	one third of this waste material came from industry

Turn over for the next question

Turn over ►

QUESTION FIVE

New individuals of animals and plants can be produced by different methods.

Match methods, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

- A** tissue culture
- B** taking cuttings
- C** sexual reproduction
- D** transplanting embryos

A method used to produce plants quickly and cheaply is . . . **1**

A method using small groups of cells from a plant is . . . **2**

A method that involves joining of male and female gametes is . . . **3**

A method that involves splitting apart cells from a developing animal and then putting them into host mothers is . . . **4**

QUESTION SIX

The drawing shows a museum specimen of an ivory-billed woodpecker which is now thought to be extinct.

Some birdwatchers claim to have heard its distinct call.

Other birdwatchers have heard knocking on the trunk of a tree.

Some people on websites claim to have seen it but nobody has a photograph.



Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

- A** a recent photograph of an ivory-billed woodpecker
- B** people claiming to have seen the ivory-billed woodpecker
- C** the distinct bird calls
- D** the knocking on the trunk of a tree

The most reliable evidence, **so far**, that the ivory-billed woodpecker is **not** extinct is . . . **1**

After that, the next most reliable evidence would be . . . **2**

The most valid evidence that the ivory-billed woodpecker is **not** extinct would be . . . **3**

The evidence that must be considered carefully for any bias must be . . . **4**

Turn over ►

SECTION TWOQuestions **SEVEN** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION SEVEN

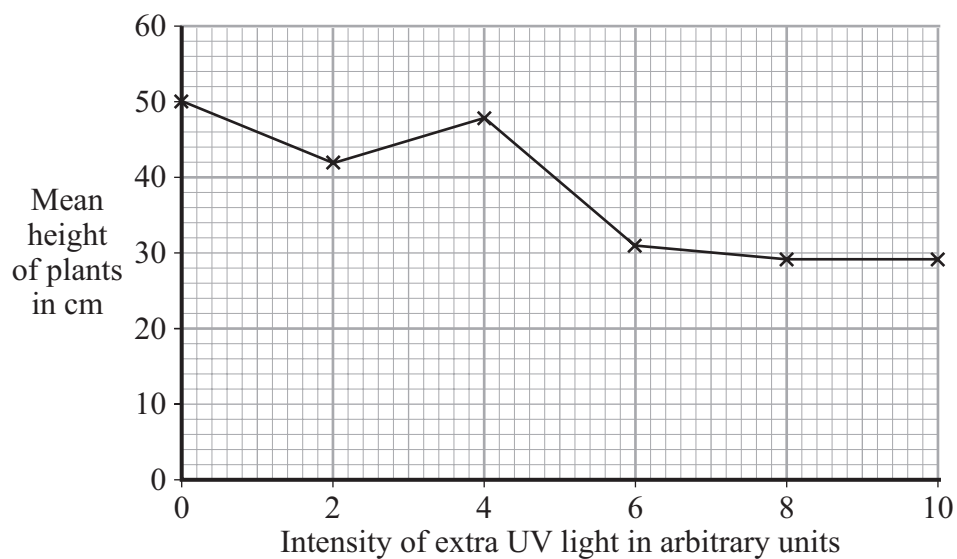
This question is about the effect of extra ultraviolet (UV) light on the growth of pea plants.

The mean height of 120 plants grown with normal light but without extra UV light was recorded.

The mean height was 50 cm.

Five more batches of seeds were grown, each with normal light but different amounts of extra UV light.

The results are shown in the graph.



7A Which instrument would be best for measuring the height of the pea plants?

- 1 a 15 cm ruler
- 2 a microscope
- 3 a protractor
- 4 a metre rule

7B Why were 120 plants used in each batch instead of just 1 plant?

- 1 because the independent variable is the number of plants
- 2 because the plants grow to different heights
- 3 to make it easier to calculate the mean
- 4 to make the results more precise

7C One of the results seems to be anomalous.

Which is this?

- 1 0 units of extra UV light
- 2 2 units of extra UV light
- 3 4 units of extra UV light
- 4 6 units of extra UV light

7D Which of the following conclusions can be drawn from the data in the graph?

- 1 Above a certain level of UV light there is no further effect on the height of the plants.
- 2 All plants will grow taller if they are given extra UV light.
- 3 Too much UV light will eventually kill the plants.
- 4 Below a certain level of UV light the plants fail to grow.

Turn over for the next question

Turn over ►

QUESTION EIGHT

Rabbits and hares are closely related species.

They are thought to have descended from a common ancestor that is now extinct.

8A Extinction may be caused by . . .

- 1 an increase in variation.
- 2 a lack of new competitors.
- 3 fossilisation.
- 4 changes in the environment.

8B The evidence that rabbits and hares have evolved from a common ancestor would be shown by . . .

- 1 comparing modern rabbits and hares with other related species.
- 2 studying the fossil record of rabbits and hares.
- 3 studying the fossils of predators of rabbits and hares.
- 4 comparing the behaviour of rabbits and hares.

8C Rabbits and hares both feed on plants and have teeth adapted for this.

Which one of the following is **not** a possible factor for the development of the specialised teeth of rabbits and hares?

- 1 adaptation to the environment
- 2 changes in the environment
- 3 evolution of predators
- 4 natural selection

8D What is a mutation?

- 1 a change in the physical appearance of an organism
- 2 a change in a gene
- 3 a form of natural selection
- 4 a change in the environment

Turn over for the next question

Turn over ►

QUESTION NINE

This question is about global warming.

9A Methane contributes to global warming.

Which human activity has increased the release of methane into the atmosphere?

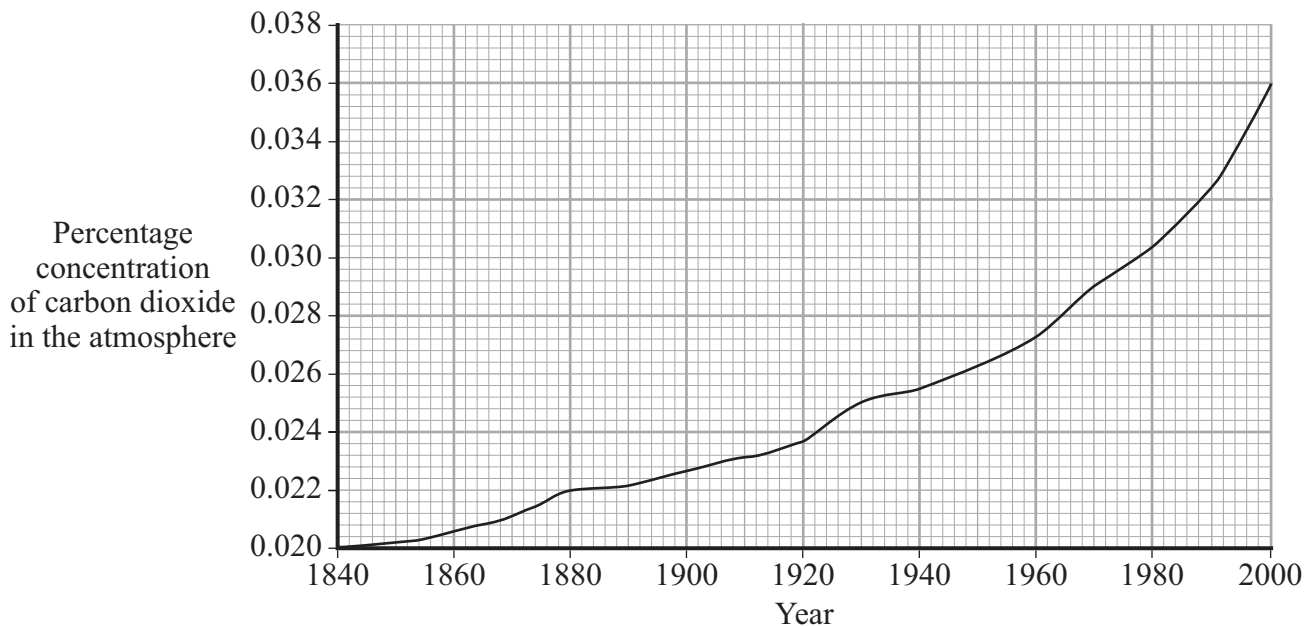
- 1 deforestation
- 2 growing more rice
- 3 producing more sewage
- 4 producing more smoke from industries

9B How does an increase in greenhouse gases in the atmosphere contribute to an increase in global temperature?

- 1 More of the radiation from the Sun is trapped in the atmosphere.
- 2 The atmosphere radiates more heat back to the Earth.
- 3 The Earth radiates more heat back into the atmosphere.
- 4 The Earth absorbs more heat from the Sun.

Graph 1 shows the changes in carbon dioxide concentration in the atmosphere between 1840 and 2000.

Graph 1

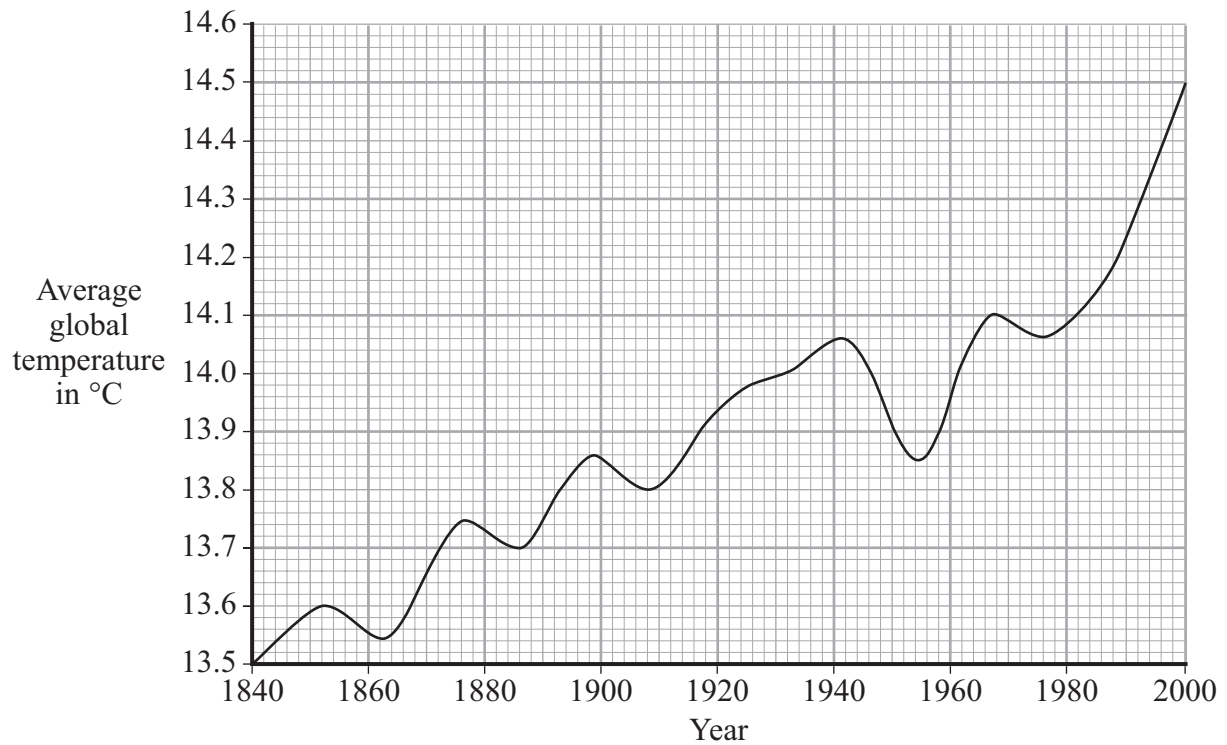


9C The average increase in the percentage concentration of carbon dioxide in the atmosphere between 1880 and 2000 was . . .

- 1 0.000012% per year
- 2 0.00013% per year
- 3 0.00012% per year
- 4 0.014% per year

Graph 2 shows the changes in the average global temperature between 1840 and 2000.

Graph 2



9D The data from **Graph 1** and **Graph 2** suggests that . . .

- 1 there is no link between carbon dioxide concentration and global temperature.
- 2 carbon dioxide causes global warming.
- 3 there may be an association between carbon dioxide concentration and global temperature.
- 4 global temperature varies too much to draw a conclusion.

END OF TEST

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION ONE

Questions **ONE** and **TWO**.

In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The drawing shows a museum specimen of an ivory-billed woodpecker which is now thought to be extinct.

Some birdwatchers claim to have heard its distinct call.

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Some people on websites claim to have seen it but nobody has a photograph.



Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

- A** a recent photograph of an ivory-billed woodpecker
- B** people claiming to have seen the ivory-billed woodpecker
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The most reliable evidence, **so far**, that the ivory-billed woodpecker is **not** extinct is . . . **1**

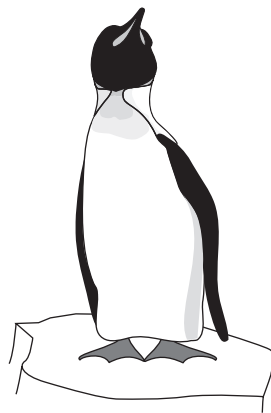
After that, the next most reliable evidence would be . . . **2**

The most valid evidence that the ivory-billed woodpecker is **not** extinct would be . . . **3**

The evidence that must be considered carefully for any bias must be . . . **4**

QUESTION TWO

The drawing shows a penguin. Penguins live in the Antarctic. They swim underwater to catch fish.



Match adaptations **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

- A** oil gland near the tail
- B** heavy, solid bones
- C** dark coloured feathers on back
- D** webbed feet

	The adaptation . . .
1	helps the penguin to swim quickly
2	helps the penguin to absorb heat from the Sun
3	helps the penguin to stay underwater when fishing
4	helps to keep the surface of the penguin waterproof

Turn over ►

SECTION TWOQuestions **THREE** to **NINE**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION THREE

Rabbits and hares are closely related species.

They are thought to have descended from a common ancestor that is now extinct.

3A Extinction may be caused by . . .

- 1 an increase in variation.
- 2 a lack of new competitors.
- 3 fossilisation.
- 4 changes in the environment.

3B The evidence that rabbits and hares have evolved from a common ancestor would be shown by . . .

- 1 comparing modern rabbits and hares with other related species.
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- 4 comparing the behaviour of rabbits and hares.

3C Rabbits and hares both feed on plants and have teeth adapted for this.Which one of the following is **not** a possible factor for the development of the specialised teeth of rabbits and hares?

- 1 adaptation to the environment
- 2 changes in the environment
- 3 evolution of predators
- 4 natural selection

3D What is a mutation?

- 1 a change in the physical appearance of an organism
- 2 a change in a gene
- 3 a form of natural selection
- 4 a change in the environment

Turn over for the next question

Turn over ►

QUESTION FOUR

This question is about global warming.

4A Methane contributes to global warming.

Which human activity has increased the release of methane into the atmosphere?

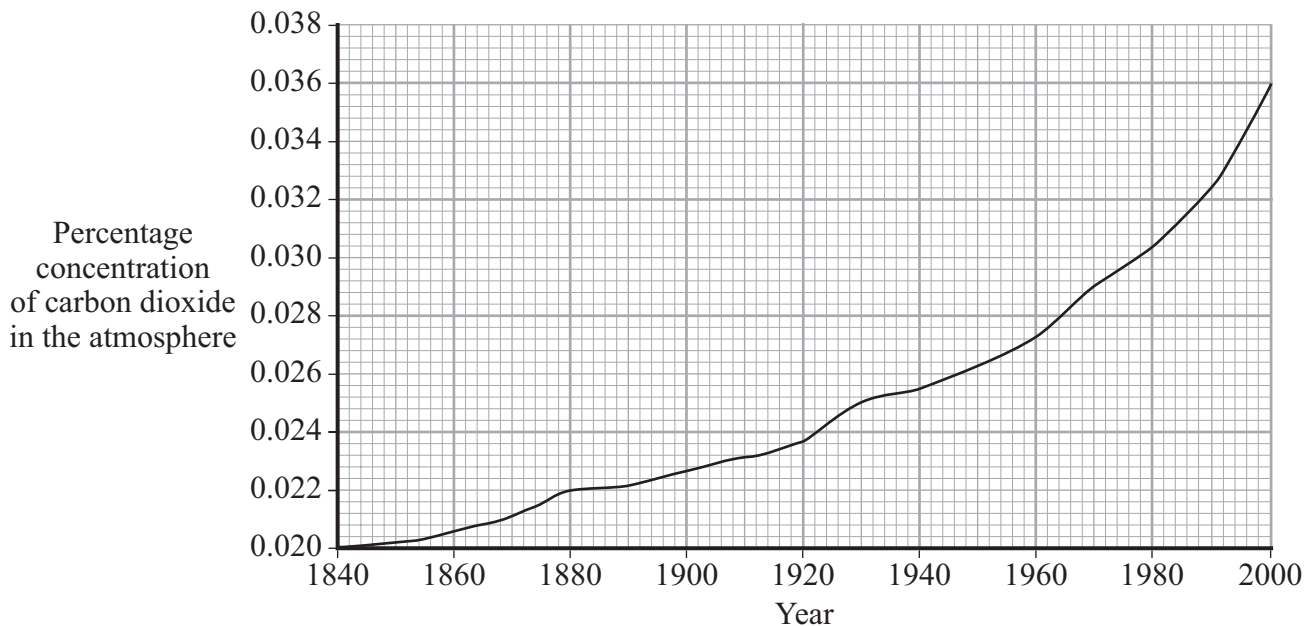
- 1 deforestation
- 2 growing more rice
- 3 producing more sewage
- 4 producing more smoke from industries

4B How does an increase in greenhouse gases in the atmosphere contribute to an increase in global temperature?

- 1 More of the radiation from the Sun is trapped in the atmosphere.
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Graph 1 shows the changes in carbon dioxide concentration in the atmosphere between 1840 and 2000.

Graph 1

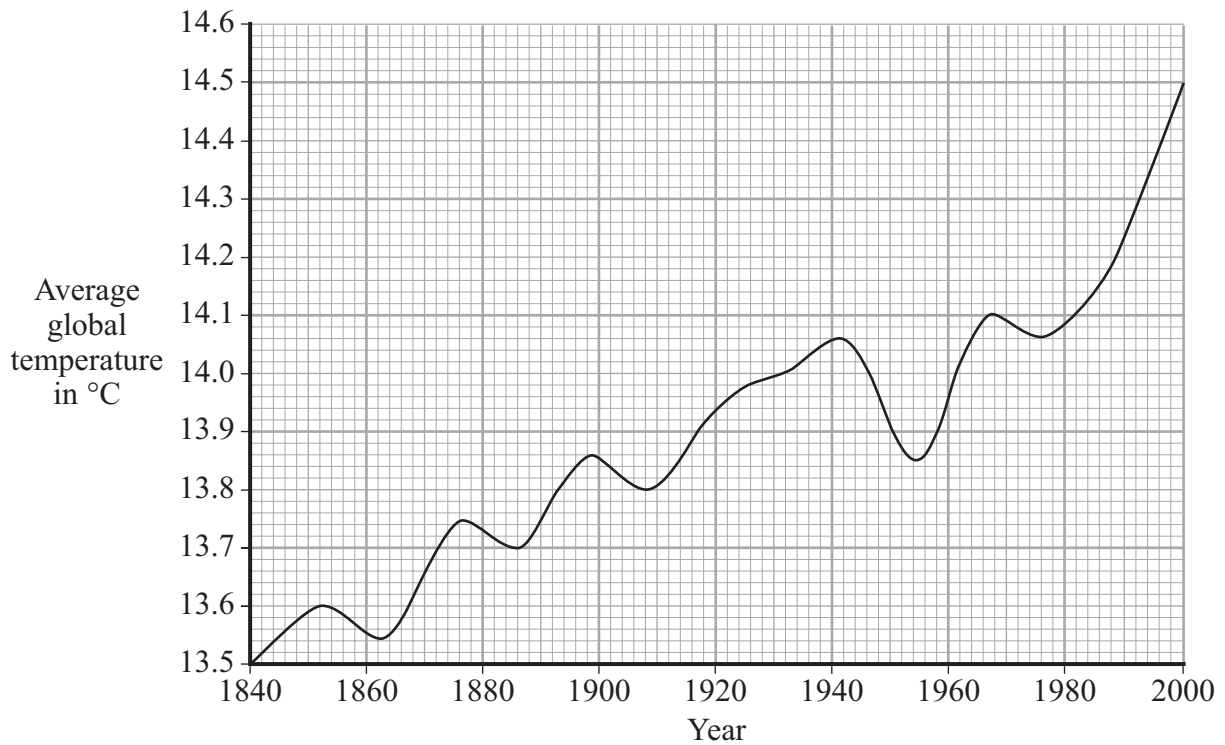


4C The average increase in the percentage concentration of carbon dioxide in the atmosphere between 1880 and 2000 was . . .

- 1 0.000012% per year
- 2 0.00013% per year
- 3 0.00012% per year
- 4 0.014% per year

Graph 2 shows the changes in the average global temperature between 1840 and 2000.

Graph 2



4D The data from **Graph 1** and **Graph 2** suggests that . . .

- 1 there is no link between carbon dioxide concentration and global temperature.
- 2 carbon dioxide causes global warming.
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Turn over ►

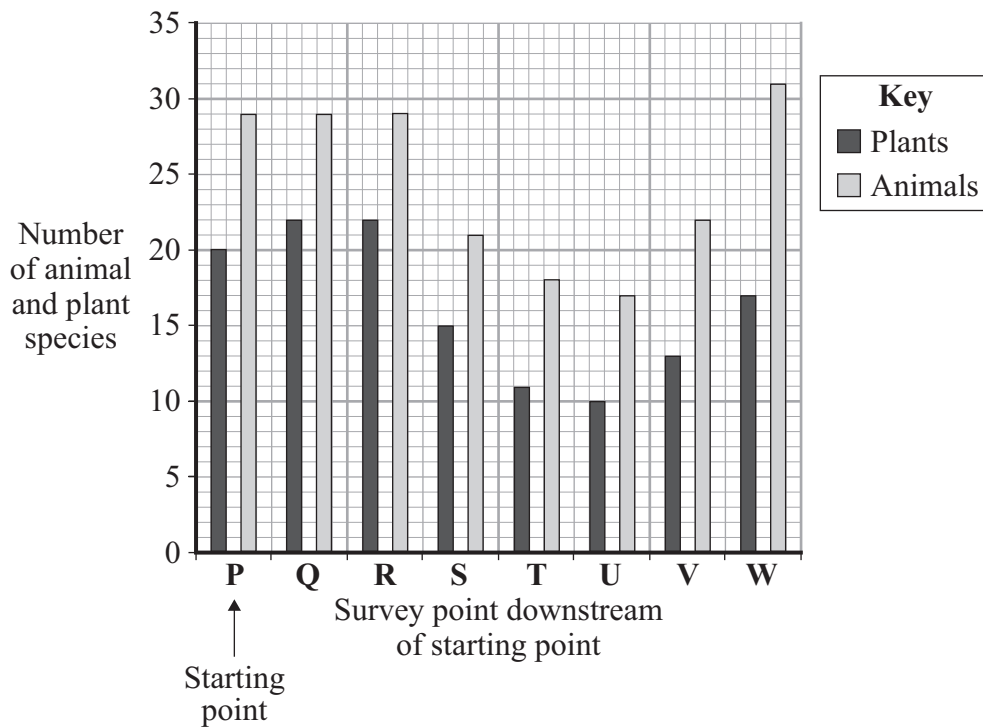
QUESTION FIVE

This question is about indicator species.

5A Which one of the following is **not** a definition of an indicator species?

- 1 a species of animal or plant that may show a change in population due to environmental change
- 2 a species of animal or plant that may show a change in population due to pollution
- 3 a species whose population may fall in response to damage to the environment
- 4 a species of animal or plant whose population is affected only by changes in the population of another species

The bar chart shows the results of a survey into the water quality of a river.



5B Which part of the river is most likely to contain a source of pollution?

- 1 at **R**
- 2 between **R** and **S**
- 3 at **S**
- 4 between **S** and **T**

5C Which row in the table is correct?

	Change in the number of plant species between points P and W	Change in the number of animal species between points P and W
1	-2	-2
2	+2	-3
3	-3	+2
4	+3	-3

5D How could the results have been made more reliable?

- 1 repeating the survey at each point on the river
- 2 sampling more points on the river above starting point P
- 3 calculating the mean number of plants and animals at each point on the river
- 4 increasing the distance between each point

Turn over for the next question

Turn over ►

QUESTION SIX

This question is about genetically modified food.

Read the passage.

In 1996, two supermarkets started to sell genetically modified (GM) tomato puree, a paste made by cooking GM tomatoes.
It was cheaper than non-GM puree and sold very quickly.
The GM tomatoes contained a transferred gene which allowed them to keep ripe longer.
The GM tomatoes were grown in America because the British climate was not suitable.
Laws prevented uncooked GM tomatoes from being sold in Europe.
The cans of tomato puree were clearly labelled to show that the GM puree was made from GM tomatoes.
In 1999, the supermarkets stopped selling the GM tomato puree.

- 6A** Why were the GM tomatoes produced in the first place?
- 1 to produce cheaper puree
 - 2 to produce tastier puree
 - 3 to produce a bigger crop in America
 - 4 to produce larger tomatoes
- 6B** Which of the following is the most likely reason to explain why people stopped buying the GM tomato puree?
- 1 concern about the effects on the British economy
 - 2 concern about the effect on the environment of growing GM crops
 - 3 European laws prohibiting the sale of GM tomatoes
 - 4 the tomatoes could not be grown in Britain

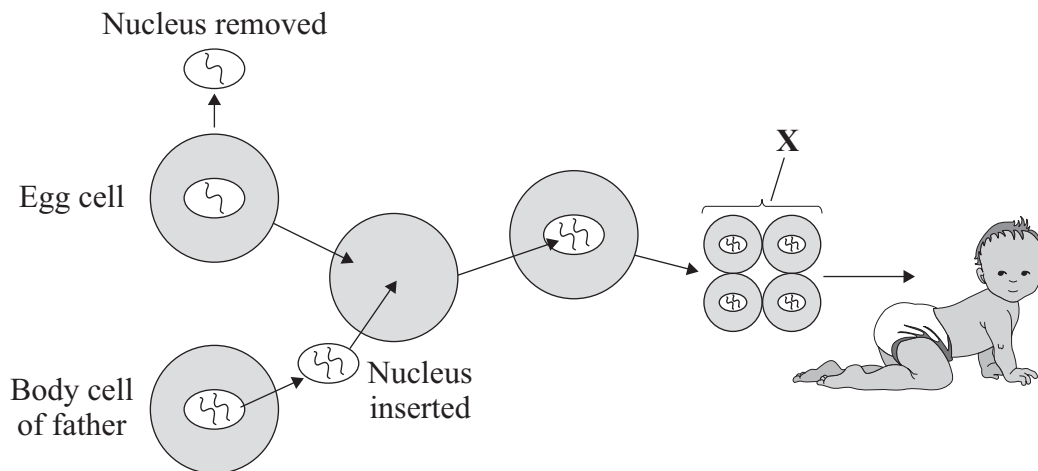
- 6C** How are GM tomatoes produced in the first place?
- 1 producing clones from a mutated plant
 - 2 fusing cells of young tomato plants
 - 3 sexual reproduction of two varieties of tomato plant
 - 4 transferring genes from another species
- 6D** Why were the tins of tomato puree labelled to show that they had been made using GM tomatoes?
- 1 because the supermarkets were worried about health effects
 - 2 so that the public could choose GM or non-GM puree
 - 3 to inform the public about genetic engineering
 - 4 to raise public concern over GM crops

Turn over for the next question

Turn over ►

QUESTION SEVEN

The diagram shows one way in which a human baby could be produced.



7A The baby will have the characteristics of . . .

- 1 the father.
- 2 the mother.
- 3 both the father and the mother.
- 4 neither the father nor the mother.

7B Structure **X** is . . .

- 1 a tissue culture.
- 2 an organ.
- 3 a gamete.
- 4 an embryo.

7C This method of producing a baby involves . . .

- 1 asexual reproduction.
- 2 sexual reproduction.
- 3 fertilisation.
- 4 mutation.

7D This method of producing a baby is banned at present. This is because of . . .

- 1 cultural issues.
- 2 economic issues.
- 3 environmental issues.
- 4 ethical issues.

Turn over for the next question

Turn over ►

QUESTION EIGHT

This question is about evolution.

8A Darwin suggested the theory of evolution by natural selection.

Darwin's theory states that . . .

- 1 living organisms respond quickly to changes in the environment.
- 2 all living organisms are related to each other.
- 3 organisms mutate if environmental conditions change.
- 4 organisms with successful adaptations are more likely to survive.

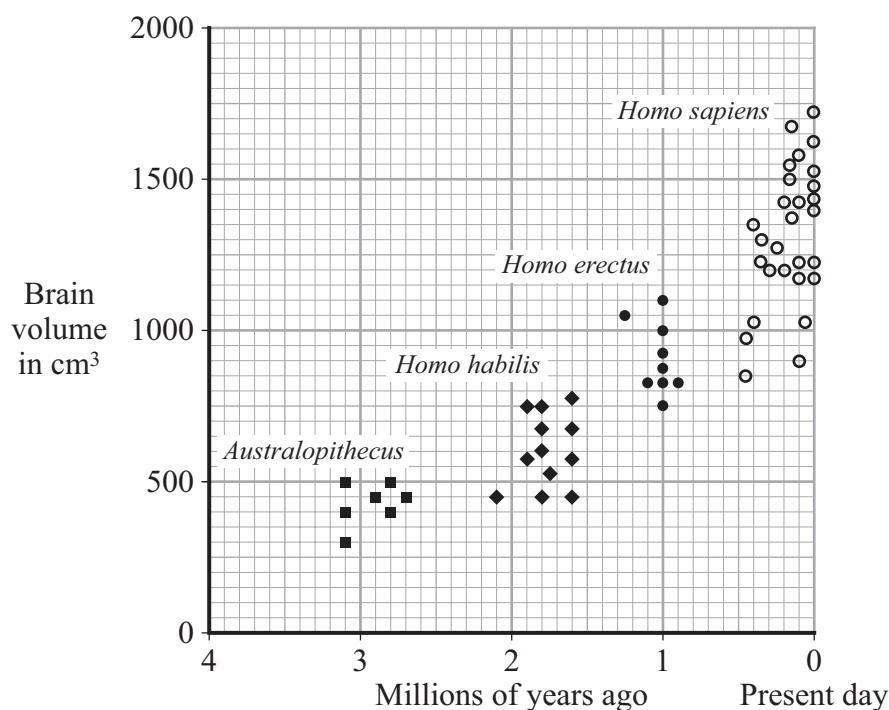
8B Darwin suggested that humans and apes have a common ancestor.

This suggestion was most strongly opposed at the time by . . .

- 1 the general public.
- 2 teachers.
- 3 religious leaders.
- 4 members of parliament.

Modern humans belong to the species *Homo sapiens*. Most scientists think that *Homo sapiens* is related to more primitive species. Three of these primitive species were *Australopithecus*, *Homo habilis* and *Homo erectus*. These three species are now extinct.

The graph shows the volume of the brain of several specimens from each of the species.



8C Which method of measuring the volume of the brain of the extinct species would give the most accurate results?

- 1 weighing the fossil skulls on an electronic balance
- 2 measuring the radius of the fossil skulls, then using this to calculate the volume
- 3 filling the fossil skulls with sand, then pouring the sand into a measuring cylinder
- 4 measuring the volume of water displaced by fossil skulls

8D The data suggests that . . .

- 1 *Australopithecus* had a mean brain volume of 500 cm³.
- 2 all modern humans have bigger brains than their fossil ancestors.
- 3 *Homo sapiens* is more intelligent than *Homo habilis*.
- 4 mean brain volume has increased during the evolution of humans.

Turn over ►

QUESTION NINE

The use of pesticides by farmers affects the environment.

The table gives the characteristics of some pesticides.

Pesticide	Relative leaching potential	Half-life in days	Relative toxicity to fish (LC₅₀)	Toxicity to rats (LD₅₀) in mg per litre
Amdro	high	10	high	128
Cygon	medium	7	medium	6000
Dioxin	low	5	very high	0.0002
Diazinon	high	30	high	1202
Durisban	low	30	very high	230
Malathion	low	1	very high	5500
Orthene	low	3	very low	833
Sevin	low	10	medium	250
Storm	high	6	very high	0.25
Temik	high	12	very high	0.9

- Relative leaching potential is a measure of how quickly the pesticide passes through the soil into rivers.
- Half-life is the time taken for 50% of the pesticide to be broken down in the soil.
- Relative toxicity to fish (LC₅₀) is the concentration of the pesticide which will kill 50% of the fish tested.
- Very high = less than 0.1 mg pesticide per litre of solution.
- Toxicity to rats (LD₅₀) is the dose in mg which will kill 50% of the rats tested.

9A Many small mammals, such as mice, feed on crops grown in the fields.

Which insecticide, applied in the same concentration, is likely to have the greatest effect on the populations of these small mammals?

- 1 Cygon
- 2 Dioxin
- 3 Sevin
- 4 Storm

9B The LD₅₀ for Temik is 75 times greater for humans than for rats.

What is the LD₅₀ of Temik for humans?

- 1 67.5
- 2 150
- 3 675
- 4 18750

9C A farmer grows crops close to a river that is popular with anglers.

Which pesticide should he use on his crops in order to minimise the concentration of pesticides in the river water?

You should assume that all the pesticides are applied in the same concentration.

- 1 Amdro
- 2 Cygon
- 3 Malathion
- 4 Orthene

9D When using a pesticide, the majority of farmers are **least** likely to consider . . .

- 1 the cost of the pesticide.
- 2 the ease of application of the pesticide.
- 3 how the pesticide kills the pests.
- 4 the types of pests killed by the pesticide.

END OF TEST

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