

Surname		Other Names	
Centre Number			Candidate Number
Candidate Signature			

General Certificate of Secondary Education  
November 2006



**SCIENCE A**  
**Unit Biology B1b (Evolution and Environment)**

**BLY1B**

**BIOLOGY**  
**Unit Biology B1b (Evolution and Environment)**

Wednesday 22 November 2006 Morning Session

**For this paper you must have:**

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

You may use a calculator.

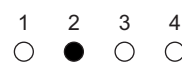
Time allowed: 30 minutes

**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.

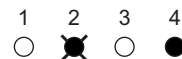
**Instructions for recording answers**

- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:

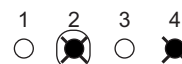


- Do **not** extend beyond the circles.

- 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.

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

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## 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.

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### QUESTION ONE

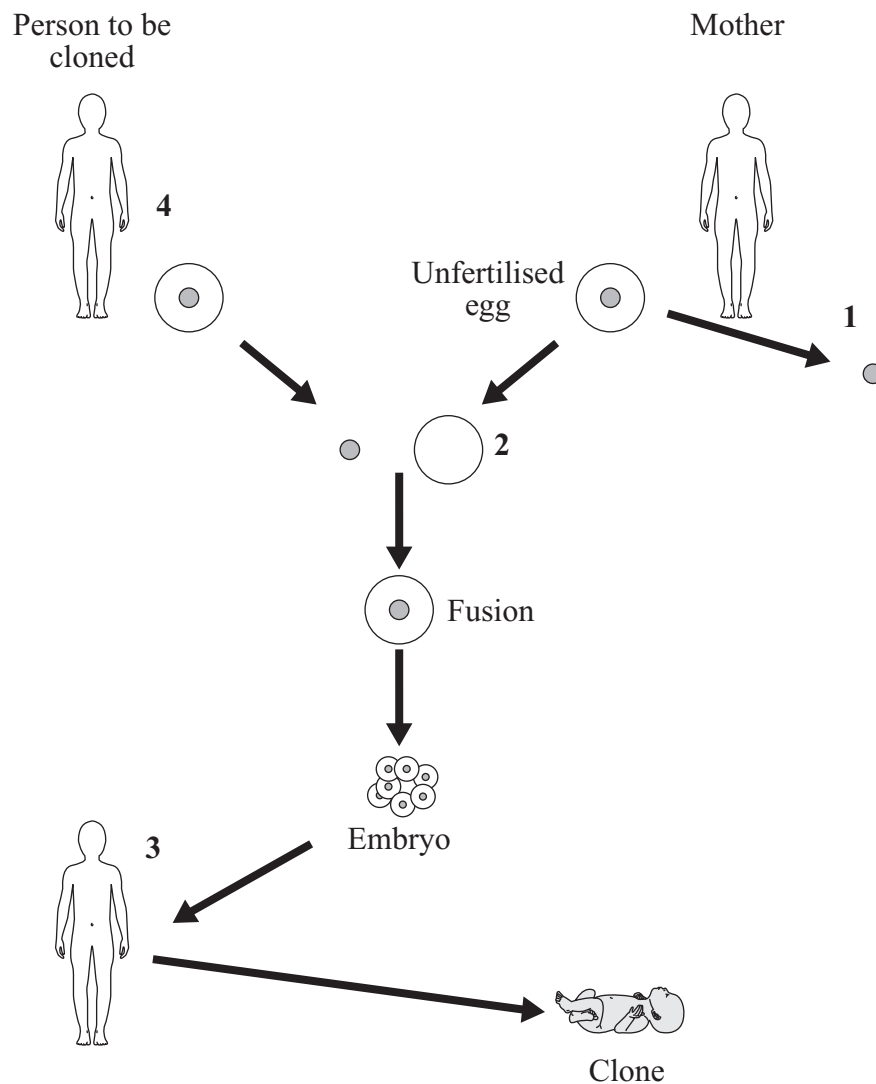
Animals are adapted to survive in their habitat. One of the adaptations is camouflage.

Match fish, **A**, **B**, **C** and **D**, to the type of plant **1–4** which would best help to camouflage them.  
(The drawings are not to scale.)



**QUESTION TWO**

The diagram shows how it may be possible to clone a human.



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

- A** A body cell is taken from a donor person.
- B** The embryo is put into the womb of the mother.
- C** The nucleus from the donor cell is put into the unfertilised egg.
- D** The nucleus is taken from an unfertilised egg.

**Turn over ►**

**QUESTION THREE**

Animals and plants sometimes compete.

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

**A** food

**B** light

**C** territory

**D** water

Plants compete with each other for . . . **1** . . . from the soil and for . . . **2** . . . .

Animals compete with each other for . . . **3** . . . and defend their . . . **4** . . . .

**QUESTION FOUR**

Camels live in deserts.

Deserts are dry and hot during the day but can be very cold at night.

Camels have adaptations which help them to survive in desert conditions.



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

- A** does not sweat very much
- B** has large feet
- C** has nostrils which can be closed
- D** has thick fur

	<b>Conditions which the adaptation helps camels to survive</b>
<b>1</b>	cold nights
<b>2</b>	sandstorms
<b>3</b>	soft, sandy ground
<b>4</b>	lack of water

**Turn over ►**

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**QUESTION FIVE**

Different structures are involved in the reproduction of animals and plants.

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

- A** clone
- B** gamete
- C** gene
- D** nucleus

	<b>Involvement in reproduction</b>
<b>1</b>	It is a part of a cell that contains chromosomes.
<b>2</b>	It is a sex cell.
<b>3</b>	It controls a characteristic of plants and animals.
<b>4</b>	It is produced as a result of asexual reproduction.

**QUESTION SIX**

Animals and plants have developed on Earth over billions of years.

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

- A** fossils
- B** life-forms
- C** mutation
- D** evolution

The theory of . . . **1** . . . states that all species have developed from simpler . . . **2** . . . .

Evidence for this theory can be found by studying . . . **3** . . . .

New forms of genes may develop as a result of . . . **4** . . . .

**Turn over for the next question**

**Turn over ►**

## SECTION TWO

Questions **SEVEN** to **NINE**.

Each of these questions has four parts.

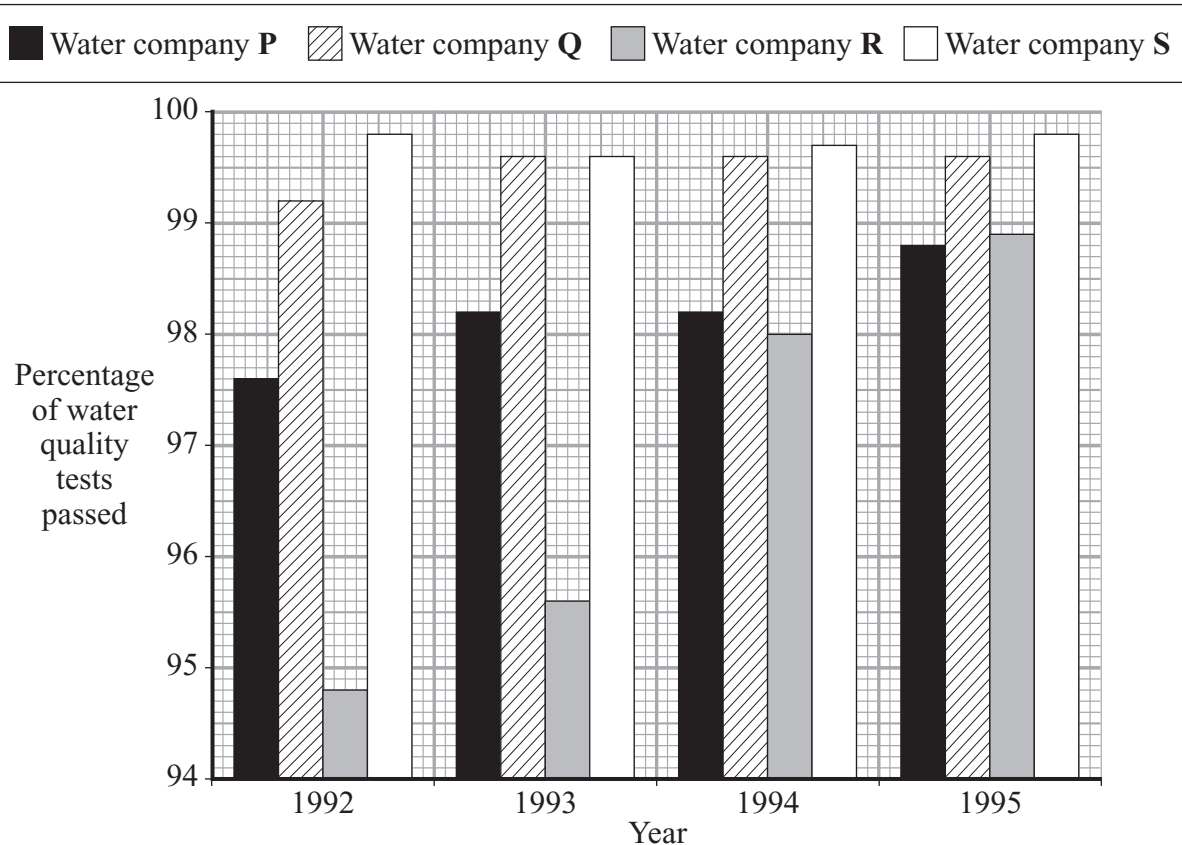
In each part choose only **one** answer.

Mark your choices on the answer sheet.

### QUESTION SEVEN

The bar chart shows the quality of the water supplied to homes by four different water companies, **P**, **Q**, **R** and **S**, in England from 1992 to 1995.

The water quality is measured by testing for different substances in samples of water. The results are recorded as a percentage of the tests passed.



The table shows the number of tests carried out by each company.

Water company	Number of tests each year
<b>P</b>	14 403
<b>Q</b>	53 989
<b>R</b>	310 083
<b>S</b>	480 832



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**7A** Which water company had the highest water quality in three of the four years?

- 1 P
- 2 Q
- 3 R
- 4 S

**7B** Which water company produced the most reliable data?

- 1 P
- 2 Q
- 3 R
- 4 S

**7C** Samples of water to be tested may be taken from different parts of the water supply.

It would be best to take the samples of water for testing from . . .

- 1 the pipes taking water to houses.
- 2 the reservoirs.
- 3 the rivers.
- 4 the water treatment plant.

**7D** Which of these tests on water measures a categoric variable (a variable that does not have a numerical value)?

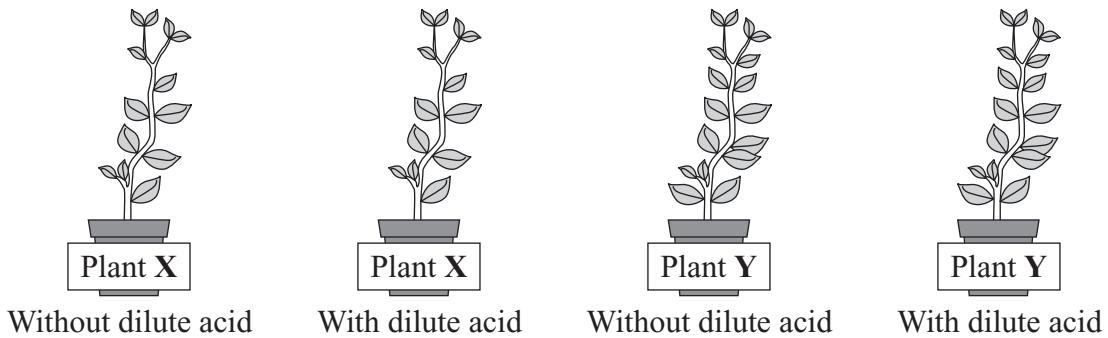
- 1 amount of bacteria in the water
- 2 concentration of metals in the water
- 3 concentration of pesticides in the water
- 4 whether the water is hard or soft

**Turn over ►**

**QUESTION EIGHT**

A student investigated if dilute acid affected the growth of different species of plant. Two plants of species **X** and two plants of species **Y** were grown in four separate pots.

Dilute acid was added to one of the pots of plant **X** and one of the pots of plant **Y**. No dilute acid was added to the other pots.



The plants were kept in the same conditions. The height of the plants was measured each day for 6 days. The table shows the results.

Day	Height of plant of species X in cm		Height of plant of species Y in cm	
	Without dilute acid	With dilute acid	Without dilute acid	With dilute acid
0	15.0	15.0	14.8	14.8
1	15.5	15.2	15.7	14.9
2	16.7	15.3	16.2	15.2
3	17.1	15.7	17.3	15.4
4	18.2	15.8	18.6	15.6
5	18.7	16.0	19.3	15.7
6	19.6	16.1	20.2	15.7

- 
- 8A** The greatest increase in the height of the plants without dilute acid occurred in . . .
- 1 species X between Day 1 and Day 2.
  - 2 species X between Day 3 and Day 4.
  - 3 species Y between Day 2 and Day 3.
  - 4 species Y between Day 3 and Day 4.
- 8B** What was the difference between the rate of growth of species Y with and without dilute acid?
- 1 0.15 cm per day
  - 2 0.75 cm per day
  - 3 0.85 cm per day
  - 4 4.50 cm per day
- 8C** The most appropriate way for the student to present the results, other than in a table, would be to use . . .
- 1 a bar chart.
  - 2 a line graph.
  - 3 a pie chart.
  - 4 a scattergram.
- 8D** Which of the following changes would **not** improve the design of the investigation?
- 1 measuring the height of the plants every 2 days
  - 2 measuring the height of the plants every day for a longer period of time
  - 3 repeating the investigation several times
  - 4 using more species of plants

**Turn over for the next question**

**Turn over ►**

**QUESTION NINE**

Kwashiorkor is a disease caused by a shortage of protein in the diet. Some African maize is low in protein. Kwashiorkor is common in children who eat this maize.

A European company has developed GM (genetically-modified) maize that contains all the protein requirements for humans.

The company has developed the GM maize so that it cannot reproduce sexually.

African countries have to buy GM maize seed from the company every year.

**9A** Which of the following is the most likely reason for the company to develop maize that cannot reproduce sexually?

- 1 so that farmers have to buy the company's seeds every year
- 2 to increase variation in the maize
- 3 to prevent kwashiorkor
- 4 to produce maize with a high level of protein

**9B** If the GM maize were able to reproduce sexually, this could lead to . . .

- 1 a lack of variation in the offspring.
- 2 the offspring developing specialised cells.
- 3 the offspring having fewer chromosomes.
- 4 the mixing of genetic information from the parents.

**9C** A pressure group is concerned with environmental issues. The pressure group is raising objections to the development of GM crops.

Which is the most likely reason for their objections?

- 1 Genes from GM crops may spread to other plants.
- 2 GM crops are produced secretly.
- 3 It may reduce the variety of food available.
- 4 The GM maize is only available in some countries.

**9D** Trials showed that some GM maize did not grow well in the increasingly dry conditions in Africa.

The weather in Africa may be changing because of . . .

- 1 a lack of acid rain.
- 2 increasing concentrations of carbon dioxide and methane in the atmosphere.
- 3 rising sea levels absorbing water from the atmosphere.
- 4 smoke and sulfur dioxide in the atmosphere.

**END OF TEST**

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

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**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**

Animals and plants have developed on Earth over billions of years.

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

- A** fossils
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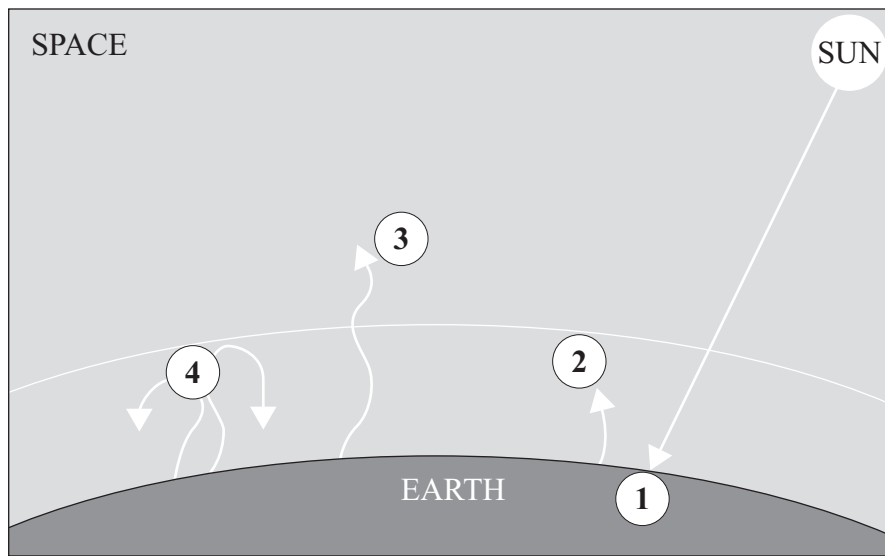
The theory of . . . **1** . . . states that all species have developed from simpler . . . **2** . . . .

Evidence for this theory can be found by studying . . . **3** . . . .

New forms of genes may develop as a result of . . . **4** . . . .

**QUESTION TWO**

The diagram represents the greenhouse effect.



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

- A** Heat energy is re-radiated back into the atmosphere.
- B** Heat energy is re-radiated back to the Earth by greenhouse gases.
- C** Some heat energy escapes into space.
- D** Solar radiation warms the Earth's surface.

**Turn over for the next question**

## SECTION TWO

Questions **THREE** to **NINE**.

Each of these questions has four parts.

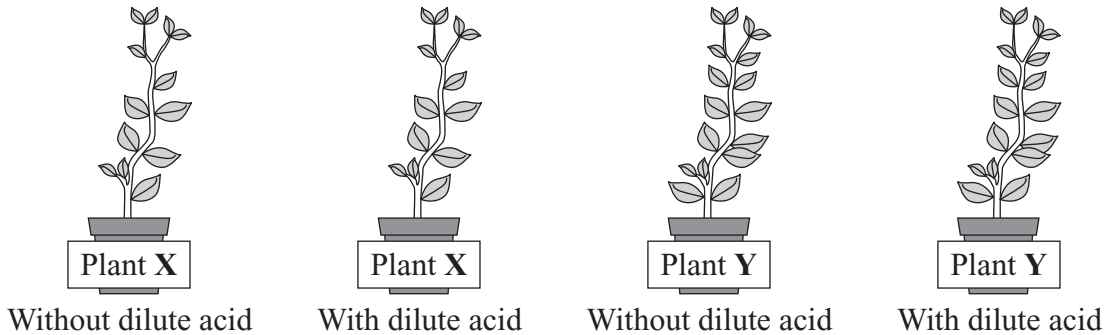
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### QUESTION THREE

A student investigated if dilute acid affected the growth of different species of plant. Two plants of species **X** and two plants of species **Y** were grown in four separate pots.

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- 
- 3A** The greatest increase in the height of the plants without dilute acid occurred in . . .
- 1 species **X** between Day 1 and Day 2.
  - 2 species **X** between Day 3 and Day 4.
  - 3 species **Y** between Day 2 and Day 3.
  - 4 species **Y** between Day 3 and Day 4.
- 3B** What was the difference between the rate of growth of species **Y** with and without dilute acid?
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**QUESTION FOUR**

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A European company has developed GM (genetically-modified) maize that contains all the protein requirements for humans.

The company has developed the GM maize so that it cannot reproduce sexually.

African countries have to buy GM maize seed from the company every year.

- 4A** Which of the following is the most likely reason for the company to develop maize that cannot reproduce sexually?
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  - 2 to increase variation in the maize
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- 4B** If the GM maize were able to reproduce sexually, this could lead to . . .
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- 4C** A pressure group is concerned with environmental issues. The pressure group is raising objections to the development of GM crops.
- Which is the most likely reason for their objections?
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**4D** Trials showed that some GM maize did not grow well in the increasingly dry conditions in Africa.

The weather in Africa may be changing because of . . .

- 1 a lack of acid rain.
- 2 increasing concentrations of carbon dioxide and methane in the atmosphere.
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**Turn over for the next question**

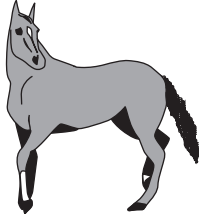

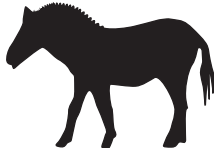

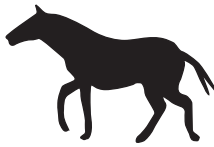


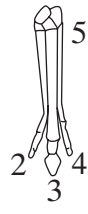

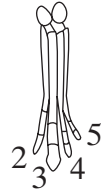
**Turn over ►**

## QUESTION FIVE

The diagram shows some of the changes in horses that have taken place over the past 60 million years.

The numbers on the foot bones refer to different toes.

Horses below the *Present day* are extinct. (The drawings are to the same scale.)

Present day	 Modern horse ( <i>Equus</i> ) 1.6 m	 3
Pliocene era (10 million years ago)	 <i>Pliohippus</i> 1.25 m	 3
Miocene era (30 million years ago)	 <i>Merychippus</i> 1.0 m	 2 4 3
Oligocene era (40 million years ago)	 <i>Mesohippus</i> 0.6 m	 2 4 5 3
Eocene era (60 million years ago)	 <i>Hyracotherium</i> 0.4 m	 2 5 3 4

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**5A** Which of the following is true?

- 1 Mesoshippus had fewer toes than Hyracotherium.
- 2 Merychippus was three times as tall as Hyracotherium.
- 3 The greatest reduction in the size of the second and fourth toes occurred in the Oligocene era.
- 4 The fifth toe was lost in the Miocene era.

**5B** The length of the foot bones of the horse changed over 60 million years.

The advantage of this to the horse is that it . . .

- 1 reduces the length of the leg so that the mass of the horse is spread evenly
- 2 allows the horse to balance on its third toe
- 3 brings the second and fourth toes in line with each other
- 4 increases the length of the leg so that the horse can run faster

**5C** Hyracotherium is now extinct.

All of the following are possible causes for this extinction, **except** . . .

- 1 fossilisation.
- 2 new predators.
- 3 a change in the environment.
- 4 a mutation in pathogens.

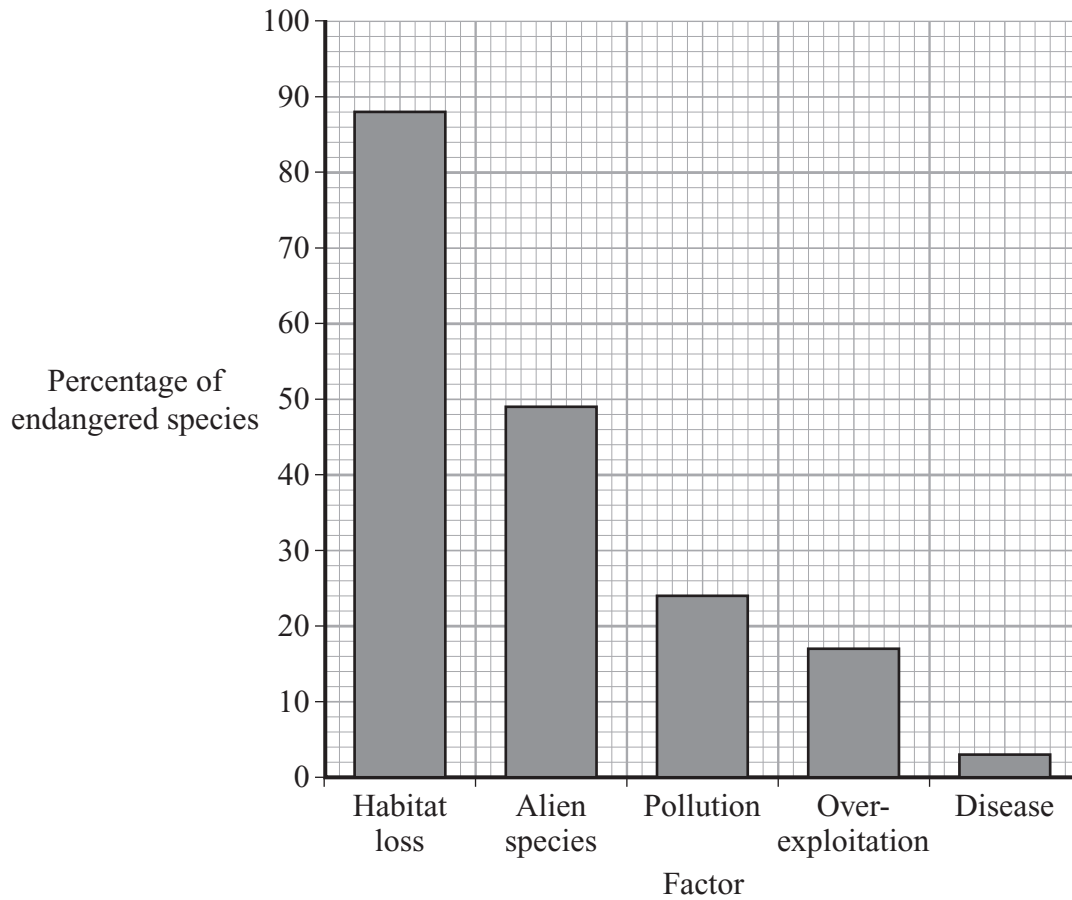
**5D** The changes in the horses, shown in the diagram, are most likely to have happened because . . .

- 1 different genes control the development of different characteristics.
- 2 horses did not evolve before 60 million years ago.
- 3 genes were not mixed during sexual reproduction.
- 4 genetic changes made horses better adapted to their environment.

**Turn over ►**

**QUESTION SIX**

Animals and plants may become endangered because of several factors. The bar chart shows the percentage of endangered species in a country caused by each factor.



**6A** From a total of 125 endangered species, how many were affected by habitat loss?

- 1 12.5
- 2 15
- 3 88
- 4 110

**6B** Disease has little effect as a cause of animals and plants becoming endangered.

This is most likely because . . .

- 1 animals and plants have evolved and developed resistance to most diseases.
- 2 immunity to disease is inherited.
- 3 diseases cannot spread from one species to another.
- 4 the diseases are new and have no effect.

**6C** *Alien species* are plants and animals that have been introduced to a new environment.

Alien species may cause extinction of endangered animal and plant species because . . .

- 1 alien species have the same distribution in the environment.
- 2 alien species lack specific adaptations to the environment.
- 3 alien species are similar to existing competitors in the environment.
- 4 alien species may be better adapted to the environment.

**6D** What is a habitat?

- 1 a place where an organism lives
- 2 a population of organisms
- 3 a territory occupied by an organism
- 4 all the animals and plants living in an area

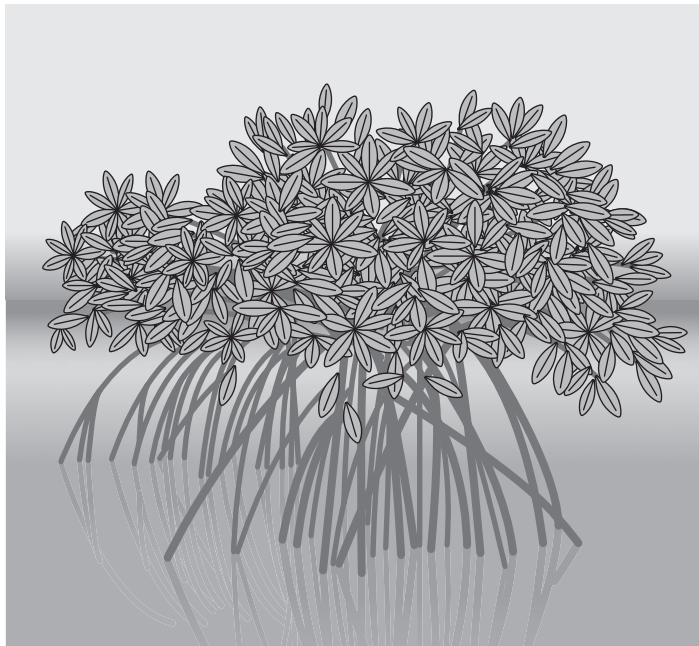
**Turn over for the next question**

**Turn over ►**

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**QUESTION SEVEN**

Mangrove trees grow in swamps and are being cut down in large numbers for use by humans.



**7A** The areas where mangrove forests have been destroyed and removed are used as landfill sites.

Landfill sites are used to dump waste which is then covered with soil.

As the waste decays methane gas is produced.

Methane can contribute to . . .

- 1 the production of acid rain.
- 2 rising sea levels.
- 3 the greenhouse effect.
- 4 water pollution.



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**7B** The landfill sites created by burying waste are used to build tourist resorts.

This decreases the land available for animals and plants and may cause . . .

- 1 global warming.
- 2 a rise in the Earth's temperature.
- 3 rising sea levels.
- 4 the loss of organisms for future use.

**7C** Cutting down large numbers of mangrove trees causes . . .

- 1 a reduction in the biodiversity of animals living in mangrove swamps.
- 2 an increase in the level of methane in the swamp water.
- 3 an increase in the release of oxygen to the atmosphere.
- 4 an increased rate at which carbon dioxide is removed from the atmosphere.

**7D** Removal of large numbers of mangrove trees in Indonesia meant that the coastline was unprotected from the tsunami on 26 December 2004.

Local, regional and national governments are encouraging the replanting of mangrove trees.

This is an example of . . .

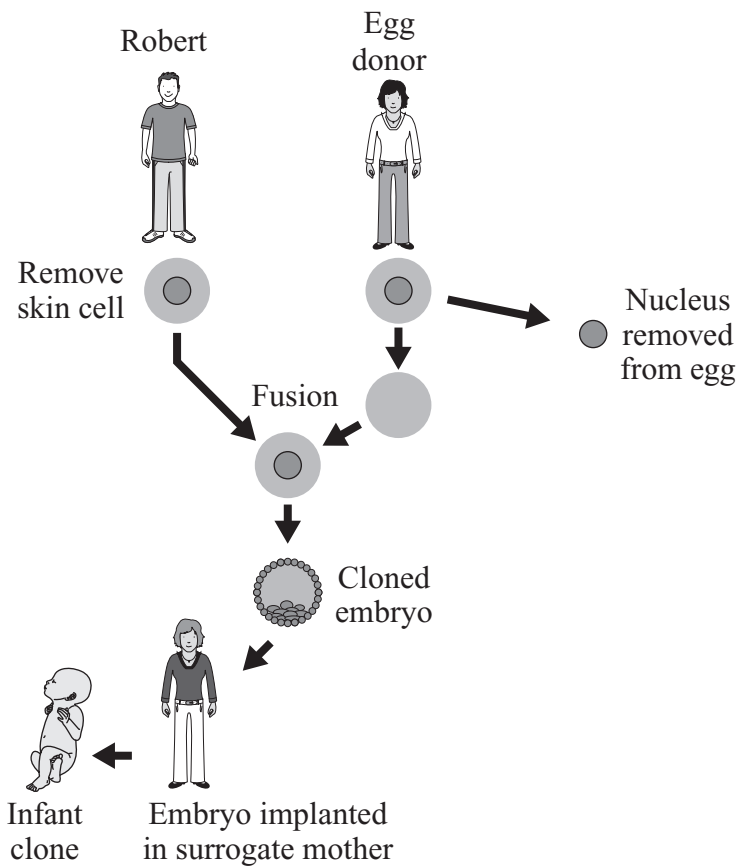
- 1 planned farming.
- 2 sustainable development.
- 3 reduction of pollution.
- 4 a reduction in the rate of human development.

**Turn over for the next question**

**Turn over ►**

## QUESTION EIGHT

The diagram shows how it may be possible to clone a human.



**8A** The process of cloning involves . . .

- 1 asexual reproduction.
- 2 fertilisation.
- 3 fusion of egg and sperm cells.
- 4 sexual reproduction.

**8B** The infant is a clone of Robert because . . .

- 1 they carry the same genetic information.
- 2 they have been produced from the same cell.
- 3 they have the same mother.
- 4 they have the same nucleus.

- 8C** Which of the following is an example of a human clone produced by natural processes?
- 1** A developing embryo is split into a number of cells and allowed to develop in host mothers.
  - 2** One female gamete is fertilised by one male gamete and the resulting embryo splits into two separate embryos.
  - 3** The nucleus of an egg cell is replaced by the nucleus of an adult cell.
  - 4** Two female gametes are fertilised at the same time by two different male gametes.

**8D** Human cloning is currently banned.

Which of the following possible problems associated with the cloning of humans is an issue that society must consider before human cloning can be allowed?

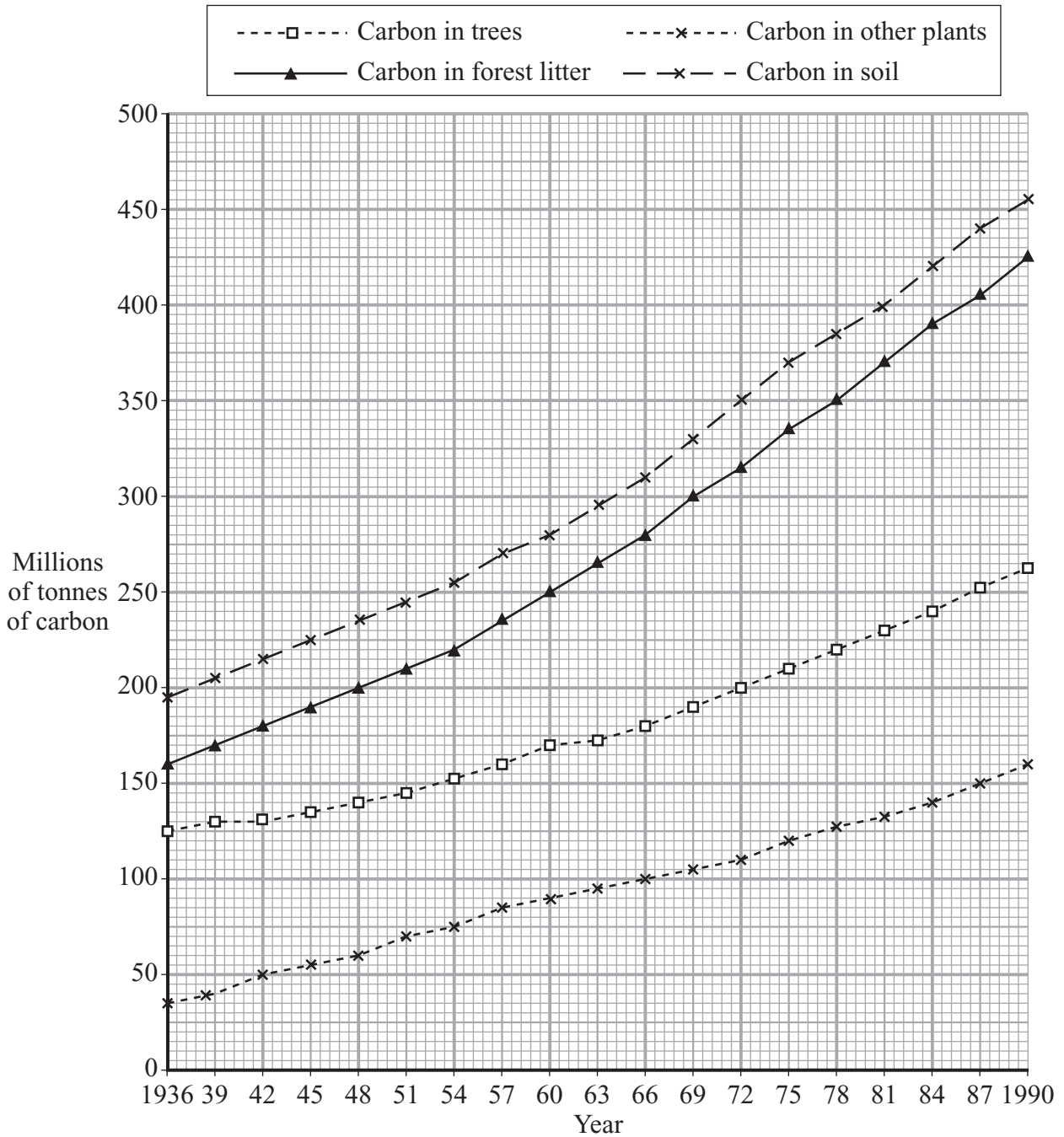
- 1** A human child created by cloning would not have been able to give consent to the procedure.
- 2** Scientists employed by commercial companies do not publish their research.
- 3** The procedures used in animal cloning have not been evaluated.
- 4** There is a high risk of injury to the host mothers in carrying the cloned embryos.

**Turn over for the next question**

**Turn over ►**

### QUESTION NINE

The graph shows the amount of carbon 'locked-up' in different parts of woodlands in a particular place from 1936 to 1990.



**9A** What was the rate of increase in the amount of carbon ‘locked-up’ in forest litter between 1936 and 1960?

- 1 3.75 million tonnes per year
- 2 5.00 million tonnes per year
- 3 9.00 million tonnes per year
- 4 11.66 million tonnes per year

**9B** Different predictions have been made for the amount of carbon ‘locked-up’ in trees in the year 2020. These predictions vary by as much as 40 %.

What is the most likely reason for the large variation in the predicted figures for 2020?

- 1 Major changes in the use of timber may take place.
- 2 The evidence for the predictions is biased.
- 3 These data for 1936 to 1990 lack precision.
- 4 These data for 1936 to 1990 are unreliable.

**Question 9 continues on the next page**

**Turn over ►**

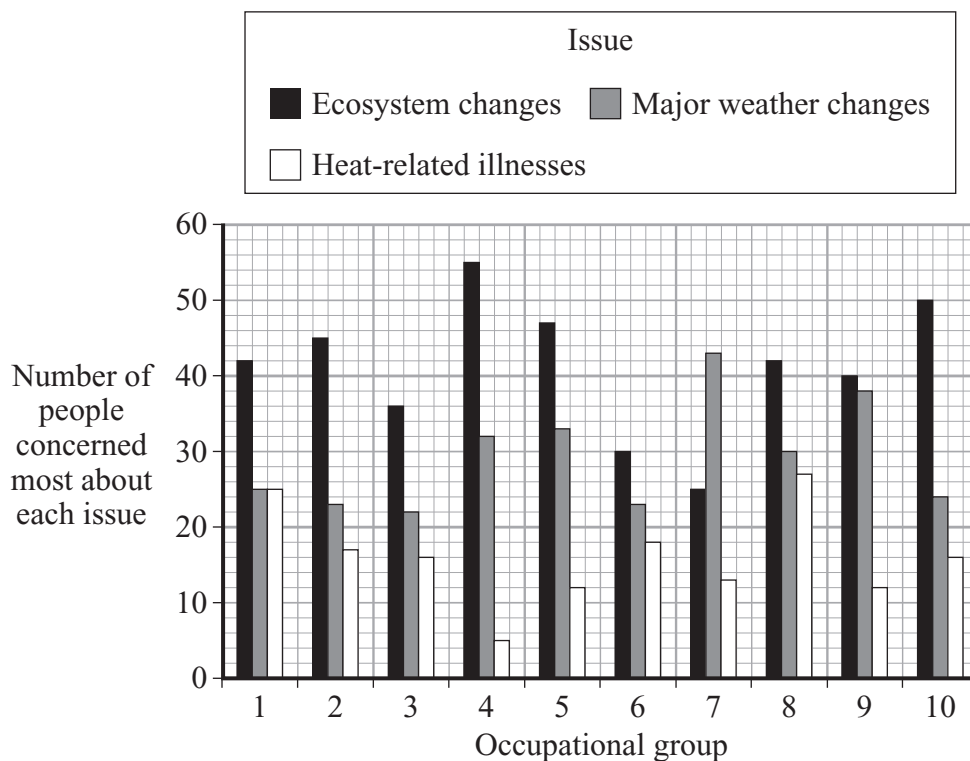
- 9C A survey was carried out to find out people's attitudes to the possible effects of the continued rise in the production of greenhouse gases.

The people were split into 10 different groups according to their type of occupation.

The survey asked people which of three issues, linked to the possible effects of the rise in greenhouse gases, concerned them most.

764 people from a total of 1036 responded to the survey.

Some of the results are shown in the bar chart.



Of the people who responded to the survey, what proportion were in occupational group 5?

- 1 0.016
- 2 0.043
- 3 0.089
- 4 0.120

- 9D** How could any conclusions, drawn from these data from this survey, be made more reliable?
- 1** by asking about one issue rather than three
  - 2** by asking more questions
  - 3** by encouraging more people to respond
  - 4** by using a smaller range of occupations

**END OF TEST**

**There are no questions printed on this page**