Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2007

SCIENCE A **BLY1B**
Unit Biology B1b (Evolution and Environment)

BIOLOGY
Unit Biology B1b (Evolution and Environment)

Monday 25 June 2007 Morning Session

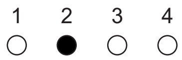
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

You may use a calculator.

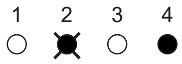
Time allowed: 30 minutes

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.

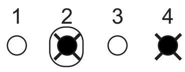
Instructions for recording answers
- Use a **black ball-point pen**.
- For each answer **completely fill in the circle** as shown:



- 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 16 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

Organisms are adapted for survival in many different ways.

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

A leaves are poisonous

B leaves have prickles

C blue skin with yellow spots

D white colour

	How adaptation helps survival
1	camouflages an animal in the Arctic
2	warns birds not to eat it
3	hurts the mouth of animals that try to eat it
4	makes animals that eat it ill

QUESTION TWO

The burning of forests to create more land for growing rice is affecting the environment.

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

A biodiversity

B carbon dioxide

C energy

D methane

Forests remove . . . **1** . . . from the atmosphere.

Cutting down forests reduces the amount of . . . **2** . . . .

Growing more rice is increasing the amount of . . . **3** . . . in the atmosphere.

The greenhouse effect is caused by the re-radiation of . . . **4** . . . back to the Earth.

Turn over for the next question

QUESTION THREE

Young tigers usually look like their parents.

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

A characteristics

B chromosomes

C genes

D mutations

Coat colour and length of the whiskers of tigers are known as . . . **1** . . . .

Coat colour and length of the whiskers are controlled by . . . **2** . . . .

The thread-like structures found in the nuclei of tiger cells are . . . **3** . . . .

Occasionally, white tigers are born.

Changes such as this are caused by . . . **4** . . . .

QUESTION FOUR

Human activities affect the environment.

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

A burning fuels that release sulfur dioxide

B digging a new quarry

C sewage disposal

D using pesticides on crops

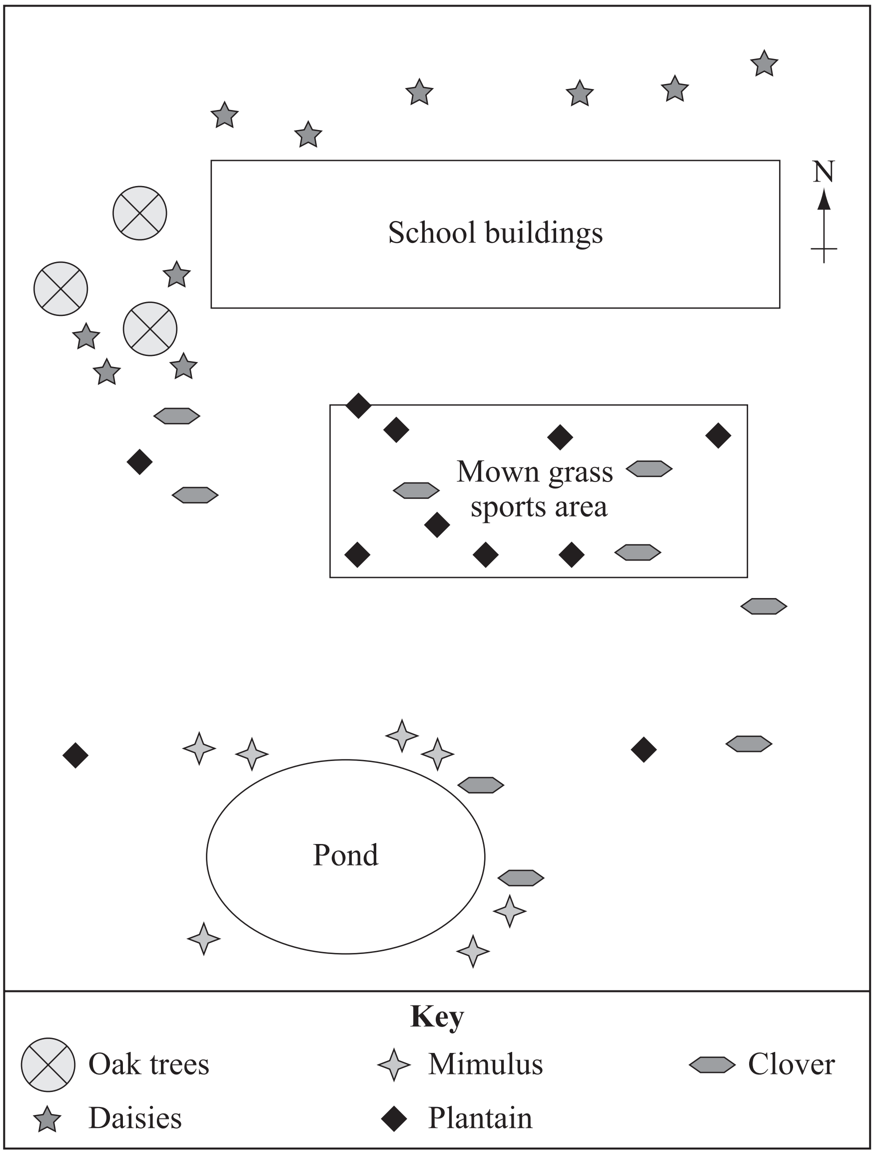
	Effect on the environment
1	pollutes hedges that surround fields
2	pollutes river water directly
3	produces acid rain
4	reduces the land available for wild plants

Turn over for the next question

QUESTION FIVE

A survey was carried out to investigate the distribution of plants in the grounds of a school.

A diagram was drawn to present the findings of the survey.



The diagram is not to scale.

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

A Clover

B Daisy

C Mimulus

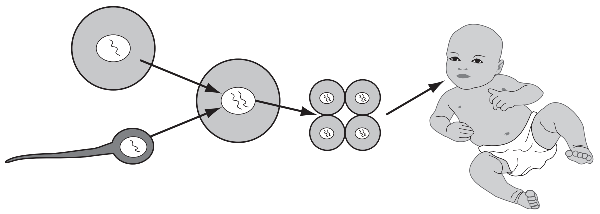
D Plantain

	Feature of the plant
1	grows mainly in shaded places
2	grows in the widest range of habitats
3	prefers living in damp soil
4	is best able to survive being cut by a lawn mower

Turn over for the next question

QUESTION SIX

The diagrams show four methods of producing new individuals of animals or plants.



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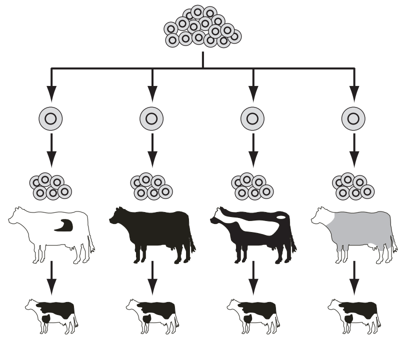

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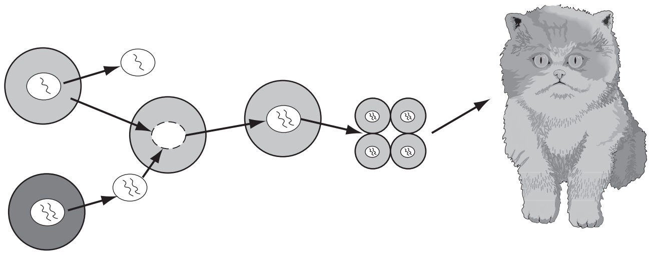

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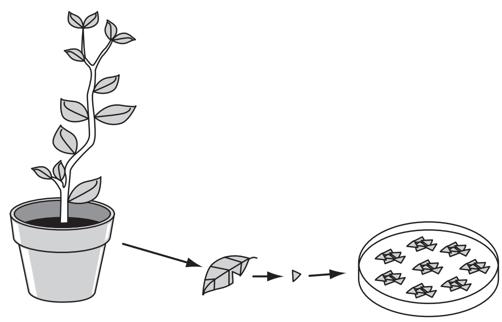


4

Match statements, **A**, **B**, **C** and **D**, with the diagrams **1–4**.

A fusion of two gametes

B fusion cell cloning

C transplanting embryos

D tissue culture

Turn over for the next question

SECTION TWO

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

Each of these questions has four parts.

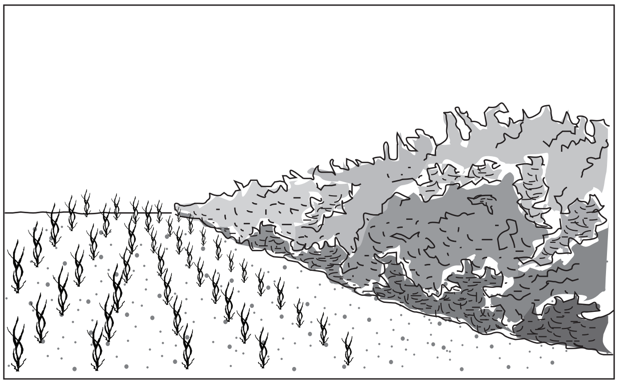
In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION SEVEN

An investigation was carried out to find out whether the growth of wheat plants was affected by their distance from a hedge.

Groups of 100 wheat plants were planted at different distances from a hedge. The heights of the plants were measured after six weeks.



The table shows the results.

Distance from hedge in metres	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
Average height of plant in centimetres	45	52	60	68	77	90

7A The results were made more reliable by . . .

1 measuring the heights of the plants after six weeks.

2 measuring the heights of the plants in centimetres.

3 planting groups of 100 seeds.

4 planting seeds at different distances from the hedge.

7B The best method of measuring the heights of the plants would be to use . . .

1 a 1 metre rule.

2 graph paper.

3 a pair of dividers.

4 a 15 centimetre ruler.

7C The greatest difference between the average heights of the wheat occurred between . . .

1 2.5 and 3.0 metres from the hedge.

2 3.0 and 3.5 metres from the hedge.

3 3.5 and 4.0 metres from the hedge.

4 4.0 and 4.5 metres from the hedge.

7D The plants furthest from the hedge grew tallest.

This was because the hedge and the wheat compete for . . .

1 food.

2 mates.

3 nutrients.

4 territory.

Turn over for the next question

QUESTION EIGHT

One theory of evolution states that all different species of living organisms alive today have evolved from much simpler life forms. These simpler life forms first appeared more than three billion years ago.

The remains of extinct animals and plants may form fossils that can be found in rocks.

Fossils are studied to find out how present-day species have changed from earlier species.

8A The presence of fossils supports the theory of evolution because . . .

1 fossil organisms are found in different layers of rocks.

2 fossil organisms have features in common with present-day organisms.

3 present-day organisms have evolved from fossil organisms.

4 adaptation to the environment by fossil organisms caused the development of new species.

8B Which of the following is **not** a cause of extinction?

1 changes in the environment

2 mutation

3 new diseases

4 new predators

8C Darwin's theory of evolution via natural selection was only gradually accepted because . . .

1 books were expensive.

2 Darwin was not a scientist.

3 Lamark had a better theory.

4 the causes of variation were not known at that time.

8D Scientists are uncertain about the origin of life on Earth because . . .

1 fossils last for only a few million years.

2 humans evolved later than most other organisms.

3 new competitors caused the extinction of the earliest organisms.

4 the earliest organisms had soft bodies.

Turn over for the next question

QUESTION NINE

Read the passage.

> Parts of the Essex coastline are being artificially flooded by seawater to help prevent flooding to other parts of the coastline where houses are built.
>
> This flooding results in areas of farmland being covered by seawater as the tide comes in.
>
> As a result, the species of plants growing in the flooded areas are likely to be replaced by other plants.
>
> Scientists are monitoring the changes in the plant populations and species.

9A Which of the following would be the most effective way of monitoring any changes in the plant species growing in the flooded areas?

1 Measure the heights of the different species of plants before and after flooding.

2 Select random areas and count each species of plant before and after the areas are flooded.

3 Select random areas and count each species of plant when the areas are flooded.

4 Count the total number of each species of plant over a period of time.

9B When choosing an area to monitor, the scientists identified an area that was level.

This was important because . . .

1 it is important to control all the variables.

2 it is the only way to establish a causal link between the seawater and the growth of plant species.

3 there would be fewer species to monitor.

4 the seawater would cover the whole area of land for the same length of time.

9C The results of the investigation showed a change in the numbers of two grasses that grow on farmland.

Sea cordgrass numbers increased and Poa grass numbers decreased.

The scientists had the idea that the Poa grass was not able to tolerate the salt concentration in seawater.

This idea is a . . .

1 conclusion.

2 hypothesis.

3 model.

4 theory.

9D To test the idea that increasing salt concentration causes a decrease in the growth of Poa grass an investigation was set up in a laboratory.

To ensure valid results from the investigation it is important to use . . .

1 fresh seawater at a series of dilutions.

2 pure water and add different amounts of salt to it.

3 fresh seawater and add different types of salt to it.

4 seawater and evaporate it to leave the salts.

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**.

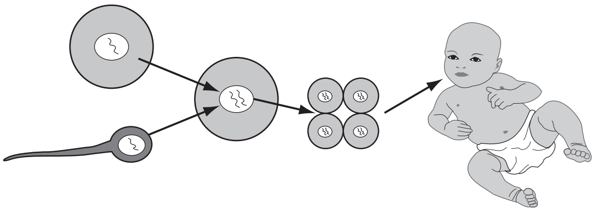
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

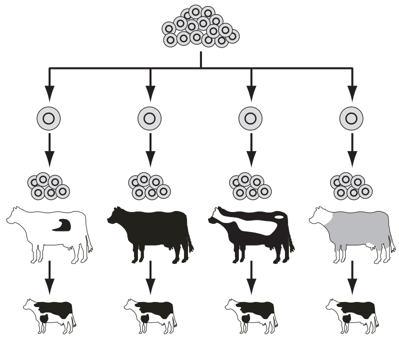
Mark your choices on the answer sheet.

QUESTION ONE

The diagrams show four methods of producing new individuals of animals or plants.



1



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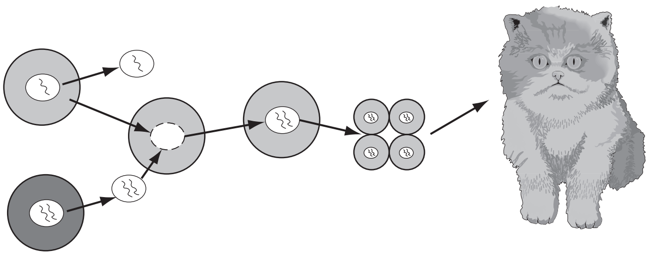

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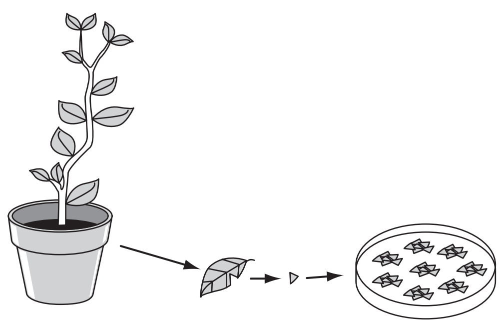

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Match statements, **A**, **B**, **C** and **D**, with the diagrams **1–4**.

A fusion of two gametes

B fusion cell cloning

C transplanting embryos

D tissue culture

QUESTION TWO

This question is about pollution and greenhouse gases.

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

A trees

B cattle

C lichens

D invertebrates

	The organisms can . . .
1	be used as an indicator of air pollution.
2	be used as an indicator of water pollution.
3	'lock-up' carbon dioxide.
4	release methane into the atmosphere.

Turn over for the next question

SECTION TWO

Questions **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

One theory of evolution states that all different species of living organisms alive today have evolved from much simpler life forms. These simpler life forms first appeared more than three billion years ago.

The remains of extinct animals and plants may form fossils that can be found in rocks.

Fossils are studied to find out how present-day species have changed from earlier species.

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1 fresh seawater at a series of dilutions.

2 pure water and add different amounts of salt to it.

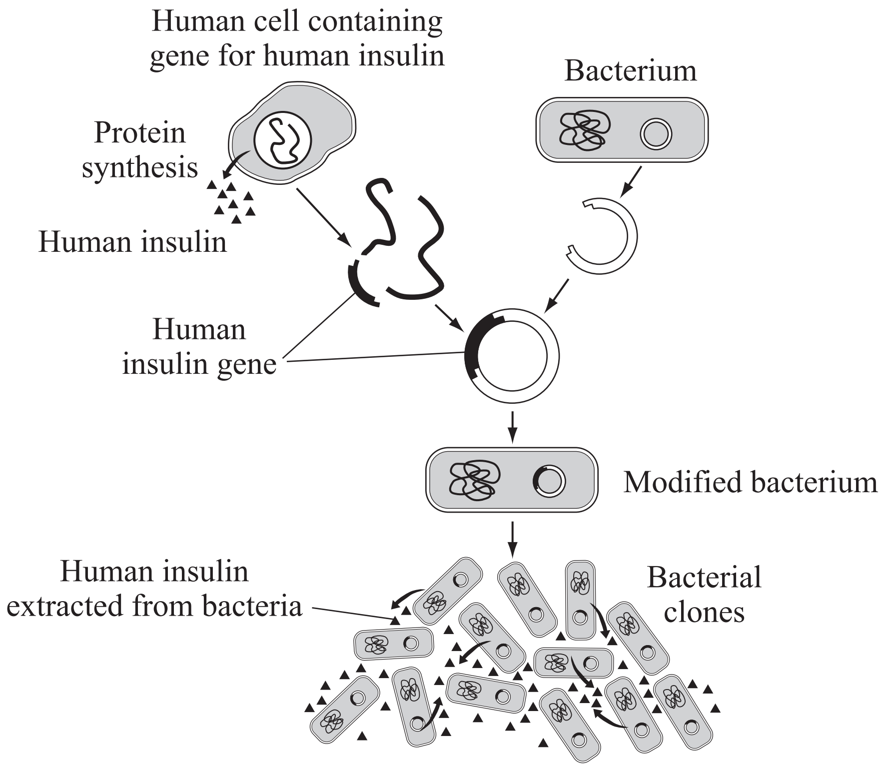
3 fresh seawater and add different types of salt to it.

4 seawater and evaporate it to leave the salts.

Turn over for the next question

QUESTION FIVE

The diagram shows some of the stages involved in the production of the human protein insulin, by a bacterium.



5A The human insulin gene was cut out of a human . . .

1 chromosome.

2 gamete.

3 nucleus.

4 embryo.

5B The removal of the insulin gene from the human cell is carried out by . . .

1 an enzyme.

2 a hormone.

3 a human gene.

4 a bacterium.

5C The advantage of using bacteria rather than mammals to manufacture the insulin is that . . .

1 it needs less research.

2 the bacteria can provide more insulin than a mammal.

3 the bacteria will produce insulin that is less toxic.

4 there are likely to be fewer ethical objections.

5D This method of producing a product using bacteria is an example of . . .

1 sexual reproduction.

2 evolution.

3 genetic engineering.

4 natural selection.

Turn over for the next question

QUESTION SIX

Read the passage.

GM Cotton

The bollworm is an insect that attacks cotton plants.

Scientists have developed genetically modified (GM) cotton plants by inserting a gene into the cotton plants.

The gene enables the cotton plants to produce a poison to kill the bollworm and prevent damage to the cotton crop.

Cotton growers do not need to buy as much pesticide to control the bollworm.

GM cotton seeds are more expensive than ordinary cotton seeds.

However, after seven years of growing the GM cotton, growers are now buying and using as much pesticide as farmers growing non-GM cotton.

6A Which of the following is likely to occur as a result of the bollworm being unable to feed on the cotton plants?

1 Other insects may increase in number.

2 Other insects will not be able to feed on the cotton plants.

3 The bollworm will become resistant to the poison produced by the cotton crop.

4 The predators of the bollworm will begin to eat the cotton plants.

6B The gene that was inserted into the cotton plants allowed the plants to . . .

1 produce more cotton.

2 produce a pesticide.

3 resist all insects.

4 resist pesticides.

6C After growing GM cotton for three years, the cotton growers were making 30 % more profit than when they grew the non-GM cotton.

This was a result of . . .

1 not having to buy as much pesticide.

2 having a bigger market for their cotton.

3 paying less for the GM seeds.

4 all insect pests having been destroyed.

6D After growing the GM cotton for seven years, the cotton growers were making less money than they did when growing non-GM cotton.

This was most likely because . . .

1 the bollworm had become resistant to the poison produced by the cotton crop.

2 pesticides could not control the bollworm.

3 the GM cotton seeds had become too expensive to buy.

4 there was no market for the GM cotton.

Turn over for the next question

QUESTION SEVEN

This question is about global warming.

7A How does an increase in greenhouse gases in the atmosphere lead to an increase in global warming?

1 More of the radiation from the Sun passes into the atmosphere.

2 The atmosphere radiates more energy back to Earth.

3 The Earth radiates more energy back into the atmosphere.

4 The sea absorbs more energy from the Sun.

7B Forests are often cut down to clear land for growing crops.

Keeping forests rather than cutting them down for growing crops helps to reduce global warming because . . .

1 carbon dioxide can be ‘locked-up’ in wood for many years.

2 growing crop plants increases the number of microorganisms in the soil.

3 forests release large amounts of carbon dioxide.

4 some crop plants remove sulfur dioxide from the atmosphere.

7C Scientists use computer models to predict increases in global temperature.

The table shows the predictions for global temperature increases from 2000 to 2100 produced by different models.

	Predicted temperature increase 2000 to 2100 in °C		
Model	**Total**	**Land**	**Ocean**
P	4.7	7.0	3.8
Q	4.0	5.0	3.6
R	3.9	4.8	3.4
S	3.7	5.5	3.0
T	3.3	4.2	3.0
U	3.0	4.6	2.4
V	2.3	3.1	2.0
W	2.2	2.8	2.0

Which two predictions are in closest agreement?

1 **R** and **S**

2 **S** and **T**

3 **T** and **U**

4 **V** and **W**

7D The predictions made by using the different models vary because . . .

1 the instruments that scientists use are not sensitive enough.

2 scientists do not have sufficient data on how different factors affect global temperatures.

3 some of the scientists do not have appropriate computer programming skills.

4 it is impossible to do experiments connected with global warming.

Turn over ▸

QUESTION EIGHT

The limbs of animals have changed during the course of evolution.

Diagram 1 shows the ancestral limb plan for the forelimbs of all vertebrates (animals with backbones).

Diagram 1

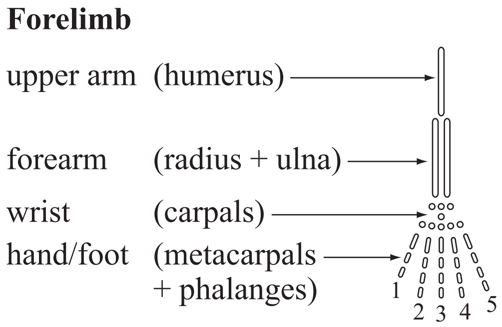
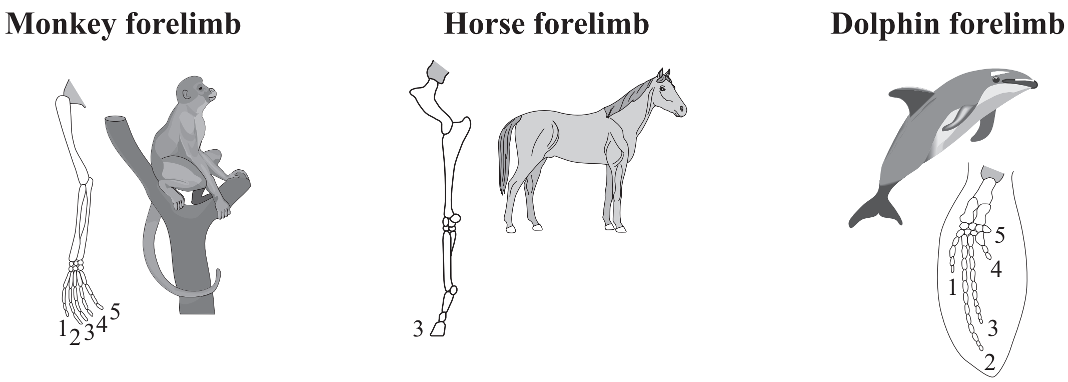


Diagram 2 shows the arrangement of the bones in the forelimbs of three mammals, a monkey, a horse and a dolphin.

Diagram 2



8A What does the pattern in the arrangement of the bones of the three mammals indicate about their evolutionary relationship?

1 They have adapted themselves to different forms of movement.

2 Mammals share a common ancestor with other vertebrates.

3 The bones remain in the same position in all vertebrates.

4 Evolution has caused the bones to change shape in different mammals.

8B The bones of the front flippers of the dolphin are adapted for . . .

1 increasing surface area for exchange of gases.

2 supporting a large surface area of body tissue.

3 bearing the weight of the animal.

4 defending itself against predators.

8C The advantage to the horse of the evolution of its forelimbs is that . . .

1 its balance is improved.

2 the bones line up at the elbow joint.

3 the leg is longer so that the horse can run faster.

4 the carpals have become fused together.

8D Which process causes changes in the limb structure of animals?

1 competition

2 mutation

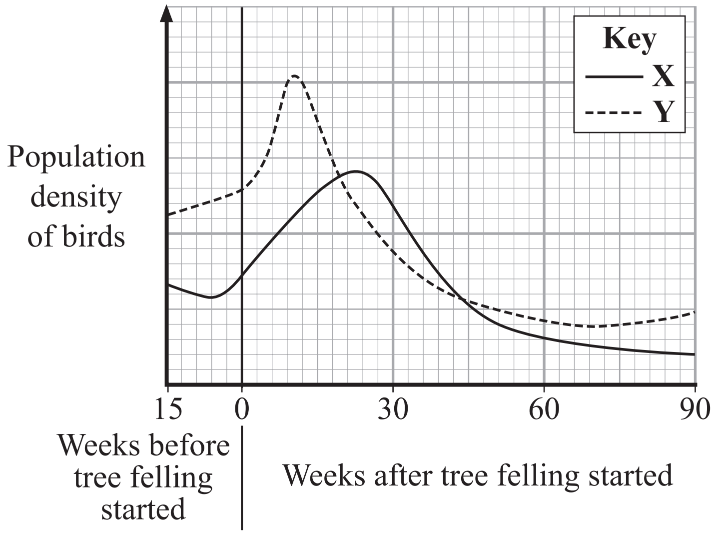
3 natural selection

4 variation

Turn over for the next question

QUESTION NINE

The graph shows the results of a survey into the effect of tree felling on the population density of two different species of bird, **X** and **Y**.



9A Which one of the following statements suggests that species **X** might be a predator of species **Y**?

1 The population density of species **X** is always lower than that of species **Y**.

2 The maximum population density of species **Y** reaches a peak 20 weeks before the population density of species **X** begins to fall.

3 The maximum population density of species **X** occurs as the population density of species **Y** is falling.

4 A fall in the population density of species **X** causes an increase in the population density of species **Y**.

9B The survey team concluded that tree felling caused a reduction in the population density of the birds.

What evidence in the graph supports this conclusion?

1 48 weeks after the start of tree felling, the population density of both species of bird was less than before the tree felling started.

2 72 weeks after the start of tree felling, the population density of species **Y** was less than half of its lowest population density before tree felling started.

3 The fall in the population density of species **Y** occurs before that of species **X**.

4 The fall in the population density of species **Y** was faster than that of species **X**.

9C How might the data about the population density of the two species of bird have been collected in the area where the trees were being felled?

1 Every six weeks, count all the birds of both species for 24 hours over all the area where the trees are being felled.

2 Every six weeks, count all the nests of the birds of both species over all the area where the trees are being felled.

3 Put a numbered ring on all the birds of both species and record how many of these birds are caught and released every six weeks.

4 Mark out several smaller areas and count the number of birds of both species that are seen during a 24-hour period every six weeks.

9D What other evidence might be used to confirm the conclusions of the survey?

1 data from other surveys on the effects of tree felling on bird population densities

2 data from other surveys on the effects of tree felling on the plant population where the birds live

3 data from other surveys on the availability of the birds' food resources

4 data from other surveys on the breeding habits of birds

END OF TEST

There are no questions printed on this page