

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Foundation Tier and Higher Tier
June 2012

Science A
Unit Biology B1b (Evolution and Environment)
Biology
Unit Biology B1b (Evolution and Environment)

BLY1BP
F&H

Friday 22 June 2012 Afternoon 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 'Biology Unit 1b' 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.

1	2	3	4
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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 **FIVE**.

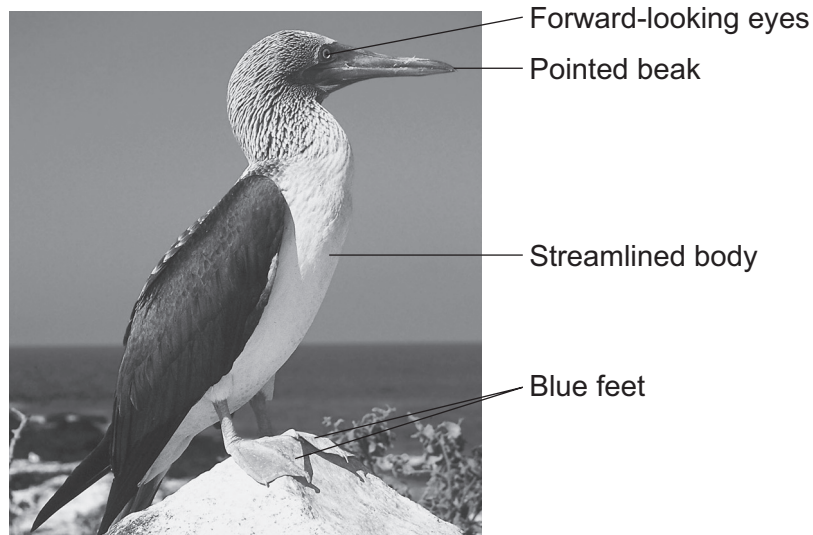
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The male blue-footed booby dives into the sea to catch fish.



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

- A** blue feet
- B** forward-looking eyes
- C** pointed beak
- D** streamlined body

	Helps to . . .
1	spear fish
2	allow the bird to enter the sea smoothly
3	judge the distance of fish under the surface of the sea
4	attract females for mating

QUESTION TWO

Animals and plants sometimes compete for resources.

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

- A** food
- B** light
- C** water
- D** mates

In order to grow, animals compete for . . . **1**

Tall plants compete better than short plants for . . . **2**

In order to grow, plants use their roots to take up . . . **3**

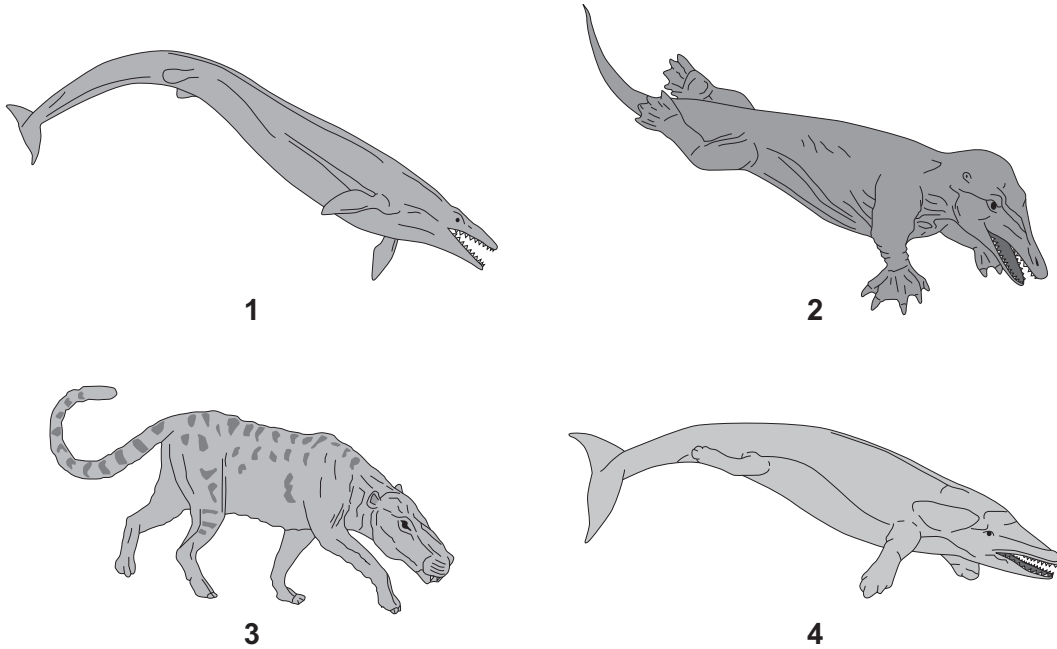
Animals defend their territories so that it is easier to attract . . . **4**

Turn over for the next question

Turn over ►

QUESTION THREE

The diagrams show extinct ancestors of the whale.

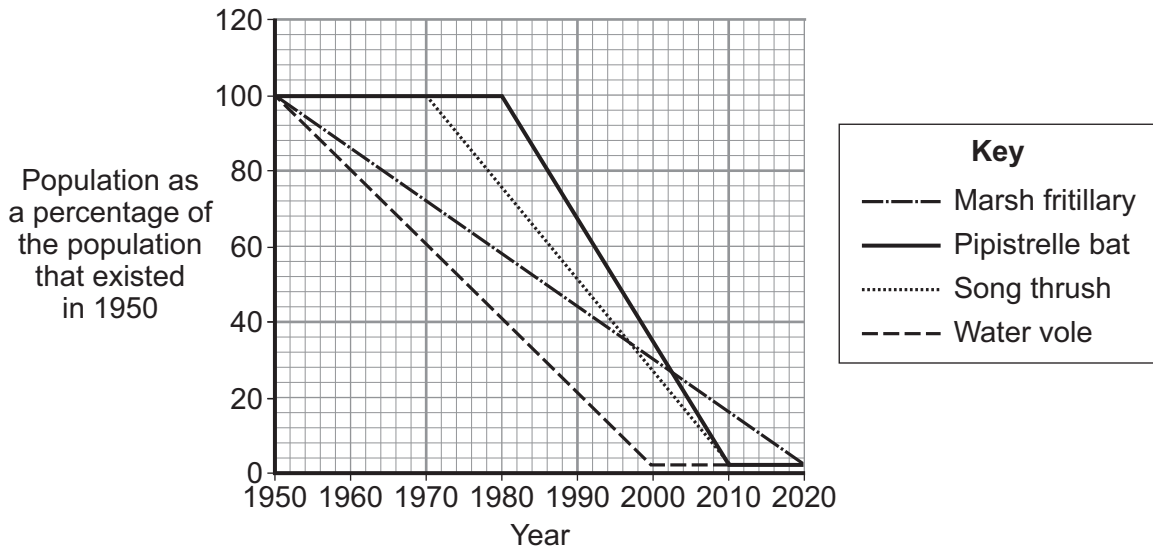


Match statements, **A**, **B**, **C** and **D**, with the animals **1–4**.

- A** the animal that lived only on land
- B** the animal that lived both on land and in water
- C** the animal with the largest tail fin
- D** the animal whose limbs have almost disappeared

QUESTION FOUR

The graph shows the changes in the population of four endangered species in the UK. The graph also shows expected changes in the population of the four endangered species.



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

- A** Marsh fritillary
- B** Pipistrelle bat
- C** Song thrush
- D** Water vole

1	the first organism to become almost extinct
2	the organism whose population first began to decrease in 1970
3	the organism that is not expected to be almost extinct until 2020
4	the organism whose population decreased at the fastest rate

Turn over for the next question

Turn over ►

QUESTION FIVE

Farms may pollute the environment.

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

A carbon dioxide

B fertiliser

C pesticide

D sewage

	Feature
1	spread on land to help crop growth
2	chemical sprayed on crops to kill insects
3	produced by tractors
4	pollutes river water directly

Turn over for the next question

Turn over ►

Section TwoQuestions **SIX** to **NINE**.

Each of these questions has four parts.

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

QUESTION SIX

The picture shows a forest being cleared so that rice can be grown.
The trees are chopped down and then burned.

**6A** Burning the trees mainly gives off the gas . . .

- 1 carbon dioxide.
- 2 oxygen.
- 3 methane.
- 4 sulfur dioxide.

6B Which gas in the atmosphere increases in concentration when rice is grown?

- 1 carbon dioxide
- 2 carbon monoxide
- 3 methane
- 4 sulfur dioxide

6C Deforestation reduces . . .

- 1 the temperature of the atmosphere.
- 2 the amount of acid rain.
- 3 the amount of non-renewable energy resources.
- 4 the number of species of animals and plants.

6D We can reduce deforestation by recycling . . .

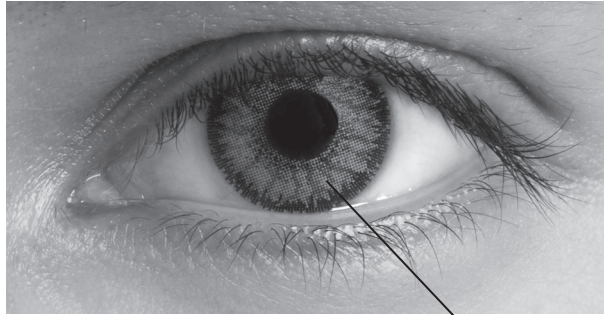
- 1 glass.
- 2 metal.
- 3 paper.
- 4 plastic.

Turn over for the next question

Turn over ►

QUESTION SEVEN

This question is about how eye colour is inherited in humans.



Coloured part of eye

7A Eye colour in humans is controlled by . . .

- 1 a cell.
- 2 a gamete.
- 3 a gene.
- 4 a nucleus.

7B The genetic information for eye colour in humans is passed onto offspring during . . .

- 1 asexual reproduction.
- 2 cloning.
- 3 sexual reproduction.
- 4 tissue culture.

7C The eye colour of a human baby may be different from the eye colour of its parents.

This difference is known as . . .

- 1 characteristics.
- 2 cloning.
- 3 genetic engineering.
- 4 variation.

7D Scientists now have the technology to change the eye colour of a human embryo when the embryo is in the early stages of development.

This technology is not allowed in the UK because . . .

- 1 the technology is too expensive.
- 2 too many parents would choose to have blue-eyed babies.
- 3 the technology can be done in other countries for us.
- 4 there are ethical issues about changing human genes.

Turn over for the next question

Turn over ►

QUESTION EIGHT

There are two varieties of the violet plant: 'shade-loving' violets and 'sun-loving' violets.

The number of each type of violet growing in a wooded area was counted:

- before the trees were removed
- at different times after the trees were removed.

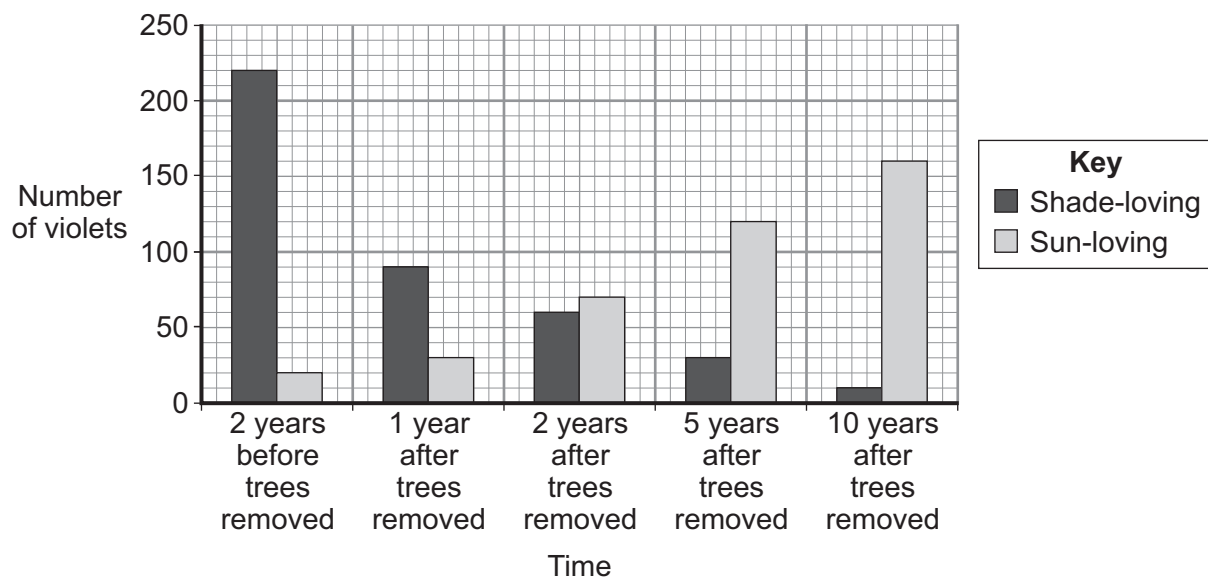
8A The number of violets was surveyed using quadrats.

Which is the best way to use quadrats to estimate the number of violets?

- 1 place a quadrat carefully once in the area with the most violets
- 2 place a quadrat carefully in several areas with the most violets
- 3 place a quadrat randomly once anywhere in the wood
- 4 place several quadrats randomly anywhere in the wood

The results of the survey are shown in the table and the bar chart.

Type of violet	2 years before trees removed	1 year after trees removed	2 years after trees removed	5 years after trees removed	10 years after trees removed
Shade-loving	220	90	60	30	10
Sun-loving	20	30	70	120	160



8B How long after the trees were removed was there the smallest **total** number of violets in the wood?

- 1 1 year
- 2 2 years
- 3 5 years
- 4 10 years

8C Which pattern describes the change in the violet population in the area over the 12 years?

- 1 an increase in shade-loving violets and an increase in sun-loving violets
- 2 a decrease in shade-loving violets and an increase in sun-loving violets
- 3 an increase in the total number of violets
- 4 an increase, then a decrease in the total number of violets

8D What would be the most likely result if trees were allowed to regrow in the area?

- 1 an increased proportion of shade-loving violets
- 2 a decrease in the total number of violets
- 3 an increased number of sun-loving violets
- 4 a decreased number of shade-loving violets

Turn over for the next question

Turn over ►

QUESTION NINE

The photograph shows a snake eating a cane toad.



Cane toads were first introduced into Australia in 1935. The toads contain toxins and most species of Australian snake die after eating the toad.

The cane toad toxin does not affect all snakes in the same way. The cane toad toxin has less effect on longer snakes.

Scientists investigated how red-bellied black snakes had changed in the 70 years since cane toads were introduced. The scientists found that red-bellied black snakes had become about 5% longer.

This increase in length is an example of natural selection.

9A The increase in the length of the red-bellied black snakes over the past 70 years is a result of . . .

- 1 changes in the temperature of the environment.
- 2 fewer competitors.
- 3 more food.
- 4 mutations.

9B The longer red-bellied black snakes . . .

- 1 have learned not to eat cane toads.
- 2 are more likely to survive after eating cane toads.
- 3 can feed on a wider range of species.
- 4 have caused an increase in the number of cane toads.

- 9C** The longer red-bellied black snakes . . .
- 1 are more likely to become extinct.
 - 2 are less easy for predators to see.
 - 3 are more likely to survive to breed.
 - 4 are less affected by changes in the environment.
- 9D** The offspring of the longer red-bellied black snakes . . .
- 1 will have the gene responsible for growing longer.
 - 2 will be more affected by the cane toad toxin.
 - 3 will avoid eating cane toads.
 - 4 will mutate to become longer.

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

Farms may pollute the environment.

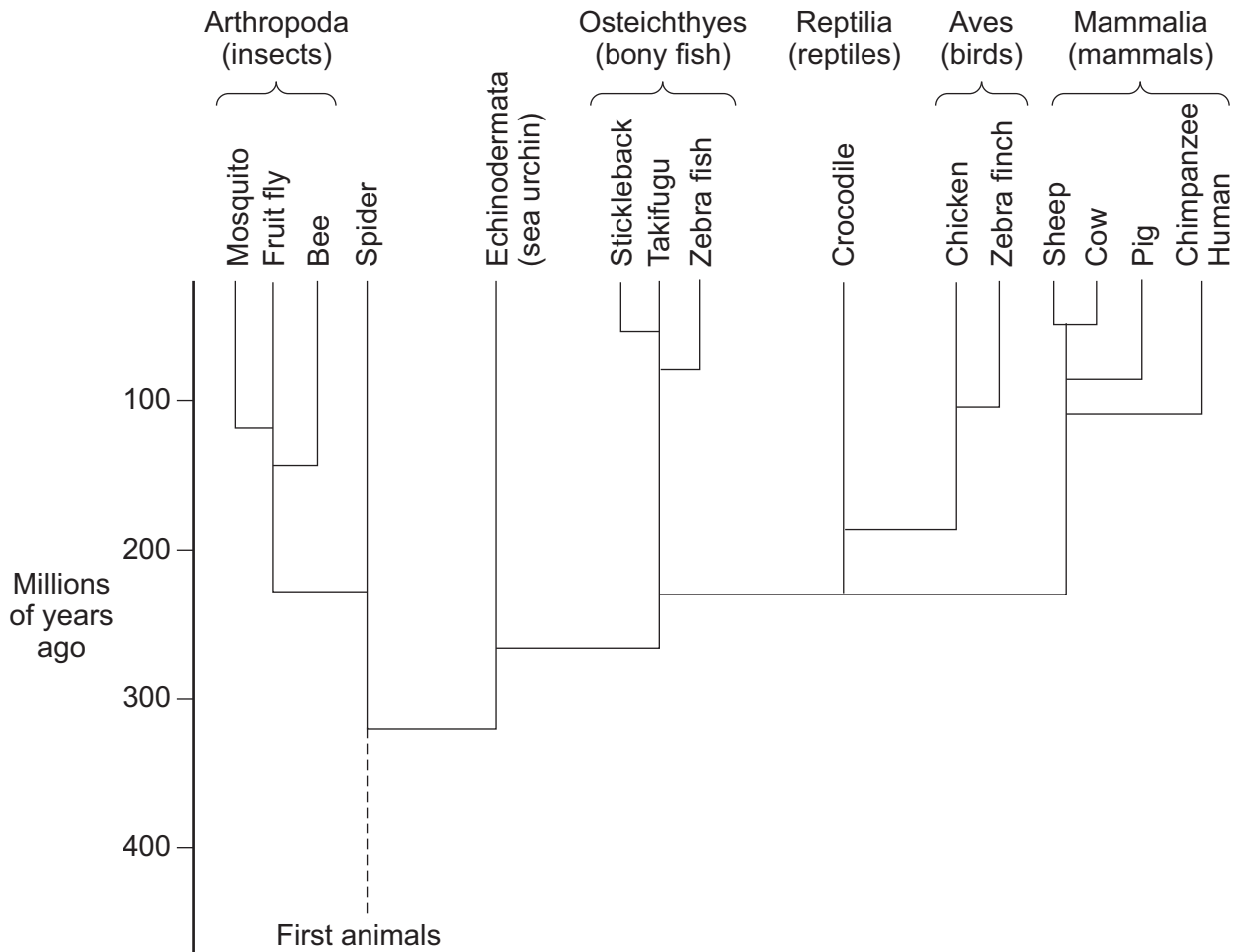
Match pollutants, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

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

	Feature
1	spread on land to help crop growth
2	chemical sprayed on crops to kill insects
3	produced by tractors
4	pollutes river water directly

QUESTION TWO

The diagram shows an evolutionary tree for some groups of animals.



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

- A** Mosquito
- B** Reptilia
- C** Osteichthyes
- D** Echinodermata

1	the first group to evolve
2	the group most closely related to Aves
3	the last of the Arthropoda to evolve
4	the group that evolved 265 million years ago

Turn over ►

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

There are two varieties of the violet plant: 'shade-loving' violets and 'sun-loving' violets.

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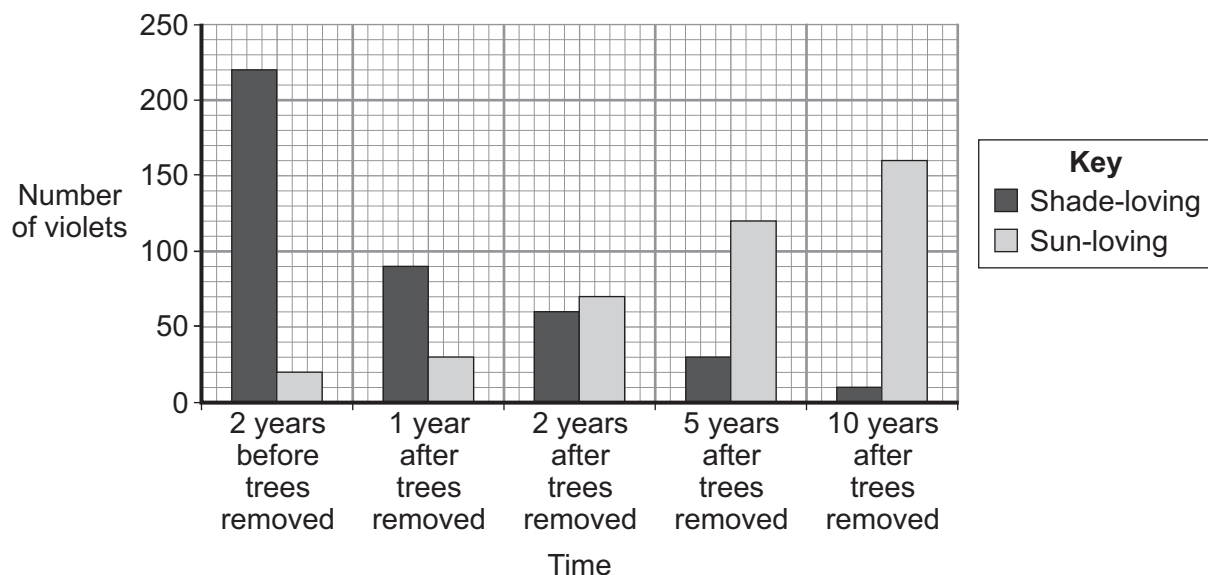
3A The number of violets was surveyed using quadrats.

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-
- 3B** How long after the trees were removed was there the smallest **total** number of violets in the wood?
- 1 1 year
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 - 3 5 years
 - 4 10 years
- 3C** Which pattern describes the change in the violet population in the area over the 12 years?
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 - 3 an increase in the total number of violets
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- 3D** What would be the most likely result if trees were allowed to regrow in the area?
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 - 3 an increased number of sun-loving violets
 - 4 a decreased number of shade-loving violets

Turn over for the next question

Turn over ►

QUESTION FOUR

The photograph shows a snake eating a cane toad.



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This increase in length is an example of natural selection.

4A The increase in the length of the red-bellied black snakes over the past 70 years is a result of . . .

- 1 changes in the temperature of the environment.
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- 3 more food.
- 4 mutations.

4B The longer red-bellied black snakes . . .

- 1 have learned not to eat cane toads.
- 2 are more likely to survive after eating cane toads.
- 3 can feed on a wider range of species.
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- 4C** The longer red-bellied black snakes . . .
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 - 2 are less easy for predators to see.
 - 3 are more likely to survive to breed.
 - 4 are less affected by changes in the environment.
- 4D** The offspring of the longer red-bellied black snakes . . .
- 1 will have the gene responsible for growing longer.
 - 2 will be more affected by the cane toad toxin.
 - 3 will avoid eating cane toads.
 - 4 will mutate to become longer.

Turn over for the next question

Turn over ►

QUESTION FIVE

Alice ate a very tasty apple from a tree in her garden. She decided to grow some more apple trees from the seeds that she found in the apple.

She planted the seeds in the same part of her garden.

She was very disappointed to find that the apples did not taste like the apple she had eaten.

5A The apple seeds that Alice planted were produced after the fusion of gametes.

This process is known as . . .

- 1 cloning.
- 2 asexual reproduction.
- 3 genetic engineering.
- 4 sexual reproduction.

5B Why did Alice's apple trees produce apples with a different taste?

- 1 Her apple trees received different amounts of light.
- 2 Her apple trees received different combinations of genes.
- 3 Her apple trees received different amounts of minerals from the soil.
- 4 Her apple trees were all clones of the original apple tree.

5C What is the advantage to apple trees of producing offspring that are **not** identical to their parents?

- 1 They may produce apples which will not be eaten.
- 2 They may produce offspring that will grow well in the same environmental conditions as the parents.
- 3 They may produce some offspring that are able to survive better in changing environmental conditions.
- 4 They will produce offspring which will not compete with the parent trees.

- 5D** What would be the quickest and cheapest way of growing trees that always produce the same types of apple as a parent?
- 1 breeding the parent tree with a different type of apple tree
 - 2 taking cuttings from the original tree
 - 3 using genetic engineering techniques
 - 4 using tissue culture methods

Turn over for the next question

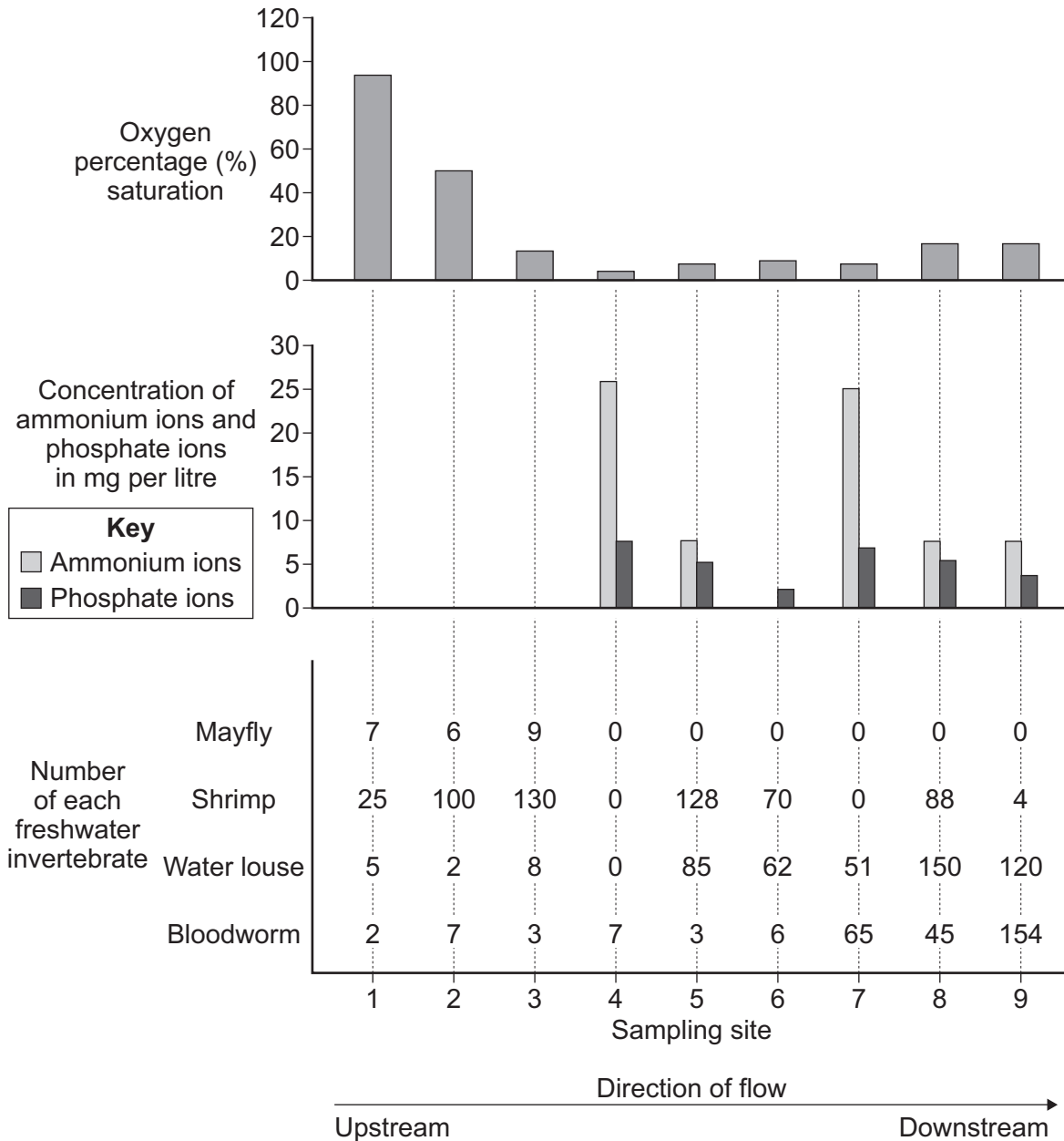
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QUESTION SIX

Scientists investigated the following values at nine sites along a river:

- the percentage saturation of oxygen in the water
- the concentration of ammonium ions and phosphate ions from fertilisers
- the numbers of four different freshwater invertebrate species.

The scientists' results are shown in the charts.



6A Which freshwater invertebrate can survive in water with the lowest saturation of oxygen?

- 1 bloodworm
- 2 mayfly
- 3 shrimp
- 4 water louse

6B Which freshwater invertebrate is the best indicator of a high concentration of ammonium ions?

- 1 mayfly, because only a high ammonium concentration kills mayflies
- 2 shrimp, because the only place shrimps are not found is in a high concentration of ammonium ions
- 3 water louse, because there are more water lice in places with a high ammonium ion concentration
- 4 bloodworm, because there are more bloodworms in a low oxygen saturation

Decomposition causes low oxygen saturation.

6C When sewage enters a river, microorganisms multiply and lower the percentage saturation of oxygen in the water.

What evidence supports the hypothesis that after site 3, sewage pollutes the water?

There is a change, downstream of site 3, in the number of . . .

- 1 bloodworms.
- 2 mayflies.
- 3 shrimps.
- 4 water lice.

6D No water lice were found at site 4.

This could have been because of . . .

- 1 a random error.
- 2 a systematic error.
- 3 not enough accuracy.
- 4 not enough sensitivity.

Turn over ►

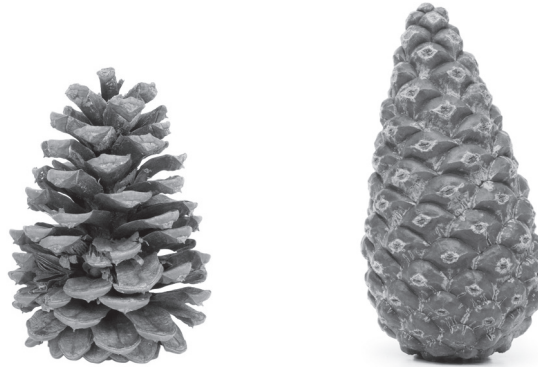
QUESTION SEVEN

Read the information about co-evolution. Co-evolution happens when two species evolve in response to each other.

In most of the Rocky Mountains, red squirrels eat pine cones. Red squirrels collect pine cones from the trees and store the cones through the winter. Pine trees have evolved a defence method against squirrels. In areas with large numbers of squirrels, pine trees have much wider, heavier cones. Squirrels find it difficult to eat these heavy cones.

In a few isolated areas, there are no red squirrels. Here, crossbill birds feed on pine seeds. In these isolated areas, the pine trees have evolved light, narrow cones. Crossbills have more difficulty getting seeds from these light, narrow cones. However, some crossbills have evolved shorter, less curved beaks. These shorter, less curved beaks are adapted for getting seeds from the light, narrow cones.

The photographs show the two types of pine cone.



Heavy, wide cone

Light, narrow cone

7A Some scientists think that the above data might indicate co-evolution.

What the scientists think is an example of . . .

- 1 a conclusion.
- 2 a hypothesis.
- 3 an observation.
- 4 a prediction.

7B Evolution might occur when . . .

- 1 organisms decide to change their characteristics.
- 2 organisms decide to mutate.
- 3 organisms mutate in response to the environment.
- 4 mutations occur spontaneously.

The scientists surveyed pine tree habitats.

They found that where squirrels are the main feeders on pine cones, the trees have stronger defences against squirrels.

Where crossbills are the main feeders on pine seeds, the trees have stronger defences against crossbills.

7C The results of the survey . . .

- 1 prove the theory of natural selection.
- 2 show that acquired characteristics are inherited.
- 3 provide evidence for co-evolution.
- 4 show that squirrels have caused crossbills to evolve.

7D From the data in this question, the scientists would expect . . .

- 1 the differences between the two types of pine cone to become greater.
- 2 the differences between the two types of pine cone to become fewer.
- 3 the pine cones to stay the same mass and shape as they are now.
- 4 evolution of the pine cones to speed up.

Turn over for the next question

Turn over ►

QUESTION EIGHT

Human cloning is not allowed.

8A The process of cloning involves . . .

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

8B Which of the following statements describes a human clone produced by natural processes?

- 1 two female gametes fertilised at the same time by two different male gametes
- 2 one female gamete fertilised by one male gamete and the resulting embryo splitting into two separate embryos
- 3 the nucleus of an egg cell being replaced by the nucleus of an adult cell
- 4 a developing embryo split into a number of cells and allowed to develop in host mothers

8C By which process might a human male be cloned?

- 1 The nucleus of an embryo cell is replaced by the nucleus of the human male gamete.
- 2 The nucleus of a female gamete is replaced by the nucleus of a human male body cell.
- 3 The nucleus of an egg cell is fused with the nucleus of the human male gamete.
- 4 The nucleus of a human male body cell is fused with the nucleus of a female gamete.

8D Humans could be cloned in the same ways in which animals are cloned.

Which of the following is an ethical issue concerned with cloning humans?

- 1 The processes now used in animal cloning can be dangerous for the cloned animals.
- 2 There is a high risk of injury to host mothers in carrying the cloned embryos.
- 3 Scientists employed by commercial cloning companies do not publish their research.
- 4 A human child created by cloning would not be able to give permission for the cloning.

Turn over for the next question

Turn over ►

QUESTION NINE

Read the information about genetic engineering.

The practice of genetically modifying food plants by adding genes for different characteristics may be a disaster in the making.

Scientists are able to add genes to crop plants. These genes are for herbicide resistance, insecticide production and vitamin A production.

There is some evidence that some varieties of butterflies are disappearing, possibly because of eating pollen from genetically modified (GM) crops. There are also fears that genes may escape from the organisms in which the genes were placed by cross-breeding, creating 'super weeds' that cannot be killed.

The possible danger of eating GM foods is another worry. This could be a danger to animals and humans. The genes in GM foods may react in the body and cause long term effects not known at the moment.

- 9A** Which of the following techniques is used to produce large numbers of identical genetically modified plants?
- 1 artificial cross-breeding of the plants
 - 2 embryo transplants
 - 3 tissue culture
 - 4 transferring wanted genes to developing plant cells
- 9B** Which of the following genetic modifications is of direct benefit to human health?
- 1 herbicide resistance
 - 2 insecticide resistance
 - 3 vitamin A production
 - 4 production of different varieties of crop plants
- 9C** Which of the following concerns is supported by scientific evidence?
- 1 Crops will become weeds and overgrow the environment.
 - 2 Humans will be harmed by eating genetically modified foods.
 - 3 Pesticides will not be able to kill 'super weeds'.
 - 4 Some types of butterfly will disappear.

9D A scientist wants to find out whether a gene for herbicide resistance has transferred into weed plants.

The best way to investigate this would be to . . .

- 1 cross-breed GM herbicide resistant crop plants with weeds.
- 2 collect weeds from a number of different environments and study their genes.
- 3 measure the height of weeds from where the GM crops are grown.
- 4 grow the seeds from weeds growing near to GM crops, and spray the plants that grow from the seeds with herbicide.

END OF TEST

There are no questions printed on this page

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