Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

General Certificate of Secondary Education
Foundation Tier and Higher Tier
November 2011

Science A

Unit Biology B1b (Evolution and Environment)

Biology

Unit Biology B1b (Evolution and Environment)

BLY1BP

F&H

Tuesday 15 November 2011 Morning Session

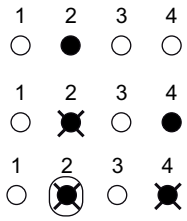
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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 '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.



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**.

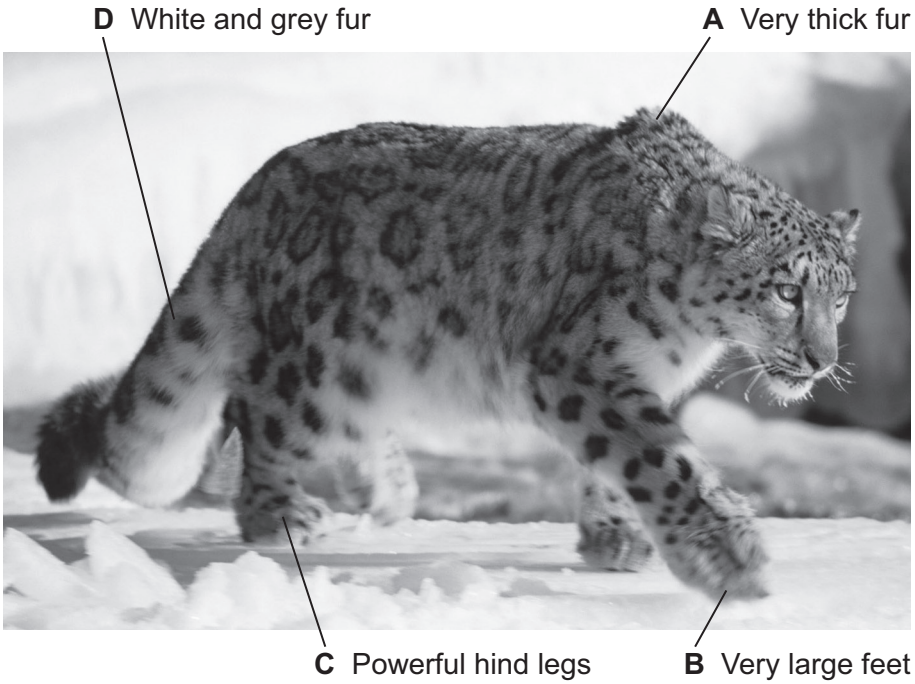
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1**–**4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The snow leopard lives in rocky areas in mountains.
The winters there are very cold and the ground is covered in snow.
The snow leopard feeds on animals such as deer.



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

1	camouflages the leopard against the snow and rocks
2	stops the leopard from sinking into snow
3	protects the leopard against very cold air temperatures
4	helps the leopard to move quickly in the mountains

QUESTION TWO

Human activities affect the environment.

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

A deforestation

B recycling waste

C less cattle farming

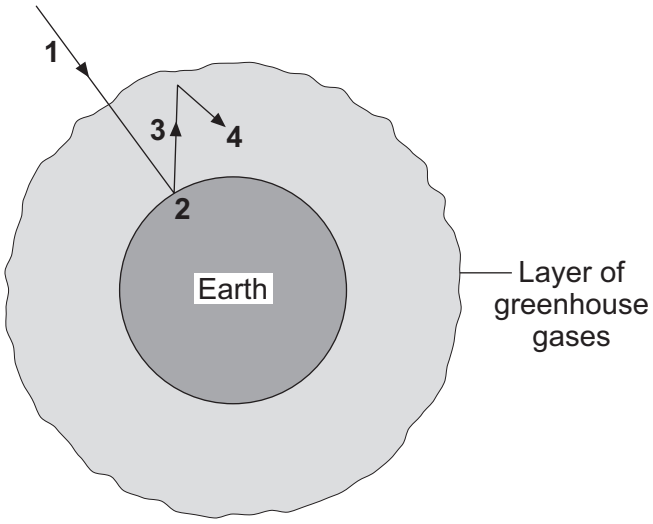
D treating sewage

	Effect on the environment
1	reduces river pollution
2	reduces the need for landfill sites
3	reduces biodiversity
4	reduces the production of methane

Turn over for the next question

QUESTION THREE

The diagram shows how the greenhouse effect works.



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

A greenhouse gases re-radiate heat back to Earth

B energy directly from the Sun

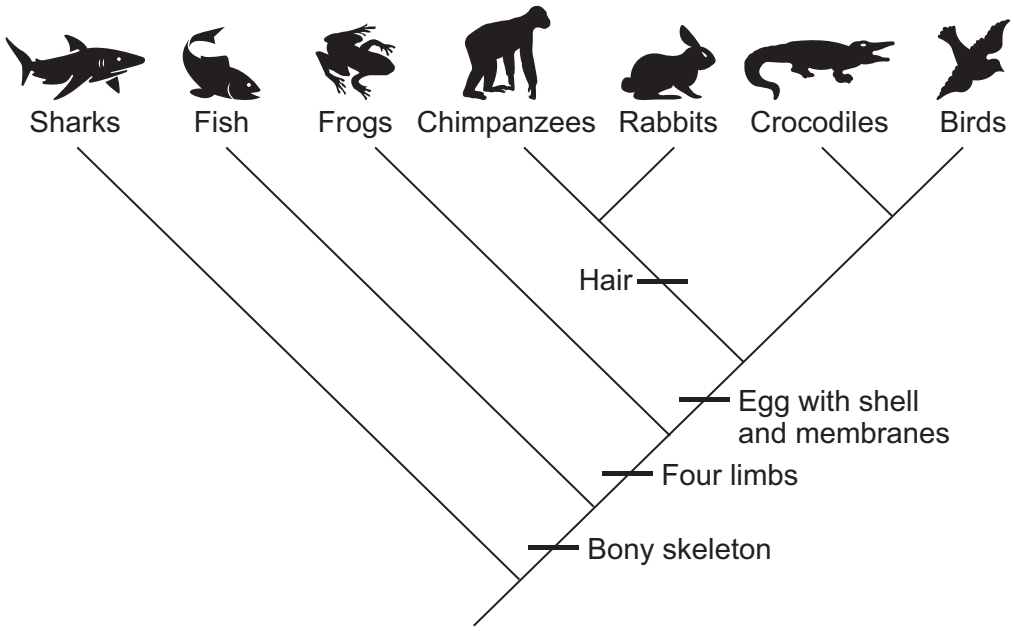
C the Earth warms up

D heat is radiated from the Earth into the atmosphere

QUESTION FOUR

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

The diagram also shows when some characteristics first evolved.



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

A birds

B chimpanzees

C fish

D sharks

1	the group most closely related to crocodiles
2	the first group to evolve
3	a group with hair
4	the group with a bony skeleton but no limbs

QUESTION FIVE

We can now produce animals and plants with the characteristics we want.

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

A adult cell cloning

B sexual reproduction

C taking cuttings

D tissue culture

	Information
1	used by gardeners to produce clones of a plant
2	the joining of one egg with one sperm
3	enables hundreds of identical individuals to be produced from a few cells from the parent
4	placing a nucleus from a skin cell into an egg cell with no nucleus

Turn over for the next question

Section Two

Questions **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

Scientists investigated the best number of plants of one crop to grow in trays in a greenhouse.

- Different numbers of plants were grown in trays with an area of 1 m^2.
- The soil in each tray was kept moist.
- The trays were kept in the same greenhouse.

The table shows the scientists' results.

Tray	Number of plants grown in each tray	Mass of all the stems in the tray in g	Mass of all the leaves in the tray in g
U	2	1.1	0.8
V	4	2.6	1.8
W	10	4.7	2.5
X	20	7.8	4.5
Y	40	16.0	8.0
Z	80	22.6	20.8

6A Which was the independent variable in this investigation?

1 mass of leaves grown

2 number of leaves grown

3 mass of plants grown

4 number of plants grown

6B What was the average (mean) mass of leaves produced per plant in tray **W**?

1 0.20 g

2 0.25 g

3 0.47 g

4 0.72 g

6C The results suggest that the more plants grown per tray, the . . .

1 greater the total mass of stems and leaves.

2 fewer plants survive.

3 shorter the plants.

4 narrower the leaves.

6D A farmer wants to grow this crop plant outside in a field.

What should the scientist do next to give the best advice to the farmer?

1 Do the investigation at different temperatures.

2 Get a different group of scientists to do the investigation.

3 Repeat the investigation, using more plants per tray.

4 Do the investigation in the farmer's field.

Turn over for the next question

QUESTION SEVEN

Climate change is affecting an American national park.

- Temperatures are rising and winters are becoming less severe (less cold).
- Severe winters normally kill insects which eat pine trees in the national park.
- Many pine trees are now dying.

7A The most likely reason for the increase in the death rate of the pine trees is that . . .

1 more insects are being killed by severe winters.

2 pine trees are being killed by severe winters.

3 more insects are surviving winter.

4 pine trees prefer drier conditions.

7B Pine trees produce lots of pine seeds.

The seeds are food for squirrels and nutcracker birds.

The less severe winters result in . . .

1 less competition between squirrels for mates.

2 more competition between young pine trees.

3 increased numbers of nutcracker birds.

4 increased competition for pine seeds between squirrels and nutcracker birds.

7C When the pine trees die, gaps develop in the forest.

More small plants are now able to grow in the gaps on the forest floor because there is . . .

1 more competition for water.

2 less competition for light.

3 more competition for growing space.

4 less competition for mates.

7D The long-term result of the less severe winters could be that some species of animal in the forest will become extinct.

Extinction means that . . .

1 there will be a decrease in the number of squirrels in the forest.

2 there will be a decrease in the number of pine trees in the forest.

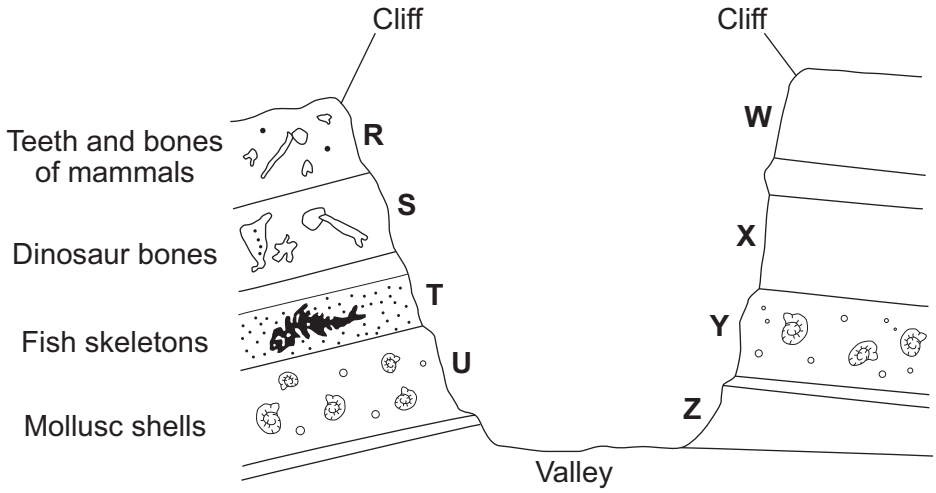
3 some animal species will die out.

4 no animals will be left in the forest.

Turn over for the next question

QUESTION EIGHT

The diagram shows a section through rock layers containing fossils.



8A Which layers of rock are probably the same age?

1 **R** and **W**

2 **S** and **X**

3 **T** and **Z**

4 **U** and **Y**

8B Which of these statements about rocks and fossils is true?

1 Older fossils are usually found in deeper rocks.

2 Rocks of the same age in a particular area will contain fossils of totally different life forms.

3 The deeper the rock, the more different types of fossil are found.

4 Fossils are never found in surface layers of rocks.

8C There are few fossils of the earliest organisms on Earth.

This is because . . .

1 fossils last for only a few million years.

2 the organisms had soft bodies.

3 the organisms quickly became extinct.

4 new predators ate the organisms.

8D The fossils in the rock layers support the theory of evolution because . . .

1 the same 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 the environment caused the changes in the fossil organisms.

Turn over for the next question

QUESTION NINE

Scientists use genetic engineering to produce genetically modified (GM) plants.

9A Which row in the table shows the correct order of sizes of structures involved in genetic engineering?

	Largest →			**Smallest**
1	chromosome →	cell →	gene →	nucleus
2	nucleus →	cell →	chromosome →	gene
3	cell →	gene →	nucleus →	chromosome
4	cell →	nucleus →	chromosome →	gene

Seeds from crops of oil-seed rape are used to produce biofuels.

Farmers spray their fields with herbicide before planting a crop of oil-seed rape.

GM oil-seed rape was developed to be resistant to the herbicide.

9B The GM oil-seed rape has most probably been developed by . . .

1 spraying herbicide on oil-seed rape plants over several generations.

2 taking cuttings from other species that are resistant to herbicides.

3 transferring genes from other species into oil-seed rape plants.

4 producing mutations in non-GM varieties of oil-seed rape.

9C In trials of the GM crop, four field trials were set up.

Which trial will produce the **smallest** yield of oil-seed rape crop?

1 spraying with herbicide before planting non-GM crops

2 spraying with herbicide during growth of a non-GM crop

3 spraying with herbicide before planting a GM crop

4 spraying with herbicide during growth of a GM crop

9D The main concern about planting a GM oil-seed rape crop is that the gene for herbicide resistance might spread to . . .

1 wild plants.

2 other oil-seed rape crops.

3 insects.

4 humans.

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

We can now produce animals and plants with the characteristics we want.

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

A adult cell cloning

B sexual reproduction

C taking cuttings

D tissue culture

	Information
1	used by gardeners to produce clones of a plant
2	the joining of one egg with one sperm
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4	placing a nucleus from a skin cell into an egg cell with no nucleus

QUESTION TWO

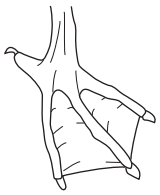
Some birds have feet adapted to their lifestyle.

Match adaptations, **A**, **B**, **C** and **D**, with the drawings of birds' feet labelled **1**–**4**.

1

2

3



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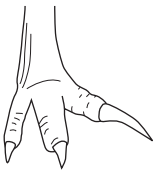


A used for swimming

B holds animal prey strongly and tightly

C used to wade through deep mud in lakes

D used to dig for food in hard soil

Turn over for the next question

Section Two

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

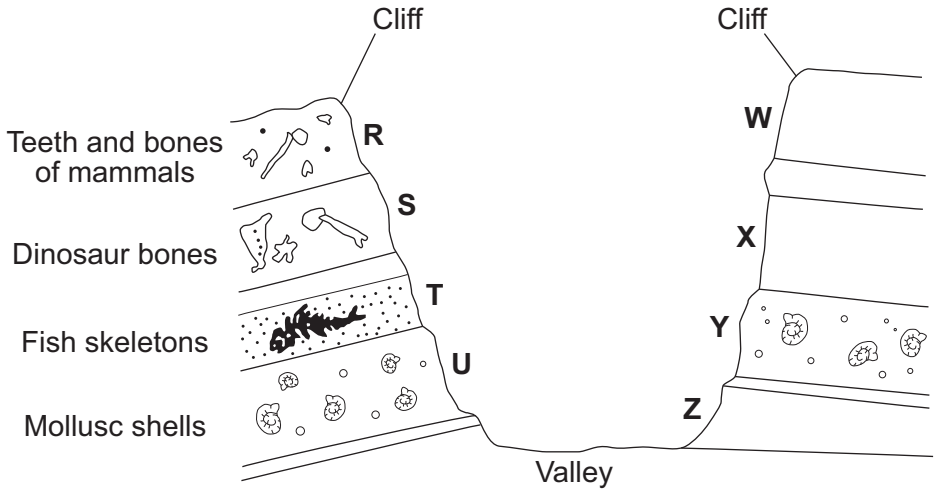
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

The diagram shows a section through rock layers containing fossils.



3A Which layers of rock are probably the same age?

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3B Which of these statements about rocks and fossils is true?

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3C There are few fossils of the earliest organisms on Earth.

This is because . . .

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3 present-day organisms have evolved from fossil organisms.

4 the environment caused the changes in the fossil organisms.

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QUESTION FOUR

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4C In trials of the GM crop, four field trials were set up.

Which trial will produce the **smallest** yield of oil-seed rape crop?

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3 spraying with herbicide before planting a GM crop

4 spraying with herbicide during growth of a GM crop

4D The main concern about planting a GM oil-seed rape crop is that the gene for herbicide resistance might spread to . . .

1 wild plants.

2 other oil-seed rape crops.

3 insects.

4 humans.

Turn over for the next question

QUESTION FIVE

Scientists investigated populations of grey squirrels and black squirrels in a large park.

The scientists:

- recorded the number of each species of squirrel seen with the naked eye or through binoculars
- walked the same route for each set of observations
- set off at 10.00 am for each set of observations
- made observations on four different days.

The table shows the scientists' results.

Day	Number of grey squirrels	Number of black squirrels
1	10	10
2	20	5
3	16	6
4	10	7

5A What was the dependent variable in this investigation?

1 the route

2 the starting time

3 the number of days

4 the number of squirrels observed

5B What was the ratio of the total number of grey squirrels to the total number of black squirrels?

1 1 : 1

2 1 : 2

3 2 : 1

4 4 : 1

5C The scientists estimated the total number of squirrels in the park to be 1615 grey squirrels and 807 black squirrels.

The estimate is likely to be too low because . . .

1 the scientists counted squirrels at the same time each day.

2 some of the squirrels were hidden in the trees.

3 the scientists only counted the squirrels 4 times.

4 the scientists only used binoculars if the squirrels were far away.

5D The scientists wanted to find out if the ratio of grey squirrels to black squirrels is changing.

The best way of doing this would be to . . .

1 repeat the investigation in 5 years' time.

2 take six sets of observations instead of four.

3 survey a different part of the park.

4 do surveys later in the day.

Turn over for the next question

QUESTION SIX

In the past, prize bulls used to be transported around the world to mate with cows.
Cattle embryos can now be transported around the world in test tubes.

There are two methods of doing this.

Method 1

- A cow is given drugs that cause her to produce up to 80 eggs at the same time.
- The eggs are fertilised and the resulting embryos removed from the womb.
- The embryos are frozen and sent to other farms around the world.
- Each embryo can then be put into the womb of a different cow.

Method 2

- After fertilisation, one embryo is removed from a cow.
- The embryo is split into several parts.
- The parts are frozen, then sent to other farms around the world.
- Each part can be put into the womb of a cow.

6A Which row in the table describes the calves produced using the two methods?

	Method 1		**Method 2**	
	Genetically identical	**Genetically different**	**Genetically identical**	**Genetically different**
1	✓		✓	
2		✓		✓
3	✓			✓
4		✓	✓	

6B Which method of reproduction is involved in producing the embryos formed in **Method 1**?

1 embryo splitting

2 genetic modification

3 sexual reproduction

4 tissue culture

6C One advantage of the new methods of producing calves rather than by mating cows with a bull is that . . .

1 the calves will all be male.

2 there is no need for a bull.

3 there is more variation between calves.

4 greater numbers of offspring of the bull are produced.

6D One advantage of adult cell cloning over **Method 2** is that the characteristics of the calves . . .

1 are known before.

2 will all be different.

3 will all be the same.

4 can be changed.

Turn over for the next question

QUESTION SEVEN

Darwin and Lamarck both suggested theories of evolution.

7A Darwin's theory was based on . . .

1 experiments.

2 hearsay.

3 observations.

4 guesswork.

7B Which of the following best describes Darwin's theory of evolution?

1 Species survive only if they have similar characteristics to their parents.

2 Only species that can reproduce sexually survive.

3 Individuals with characteristics suited to their environment are more likely to survive and reproduce.

4 Species become extinct if they are not completely adapted to the environment in which they live.

7C Darwin's theory of evolution by natural selection was only gradually accepted.

One reason why Darwin's theory was not fully accepted at that time was that . . .

1 he could not explain how characteristics were inherited.

2 he was not religious.

3 he was not an accepted scientist.

4 he did not produce any scientific evidence to support the theory.

7D One way in which Darwin's and Lamarck's theories are similar is that both theories state that . . .

1 parents change the characteristics of their offspring.

2 evolution depends on changes in the environment.

3 evolution happens very quickly.

4 some characteristics are passed from parent to offspring.

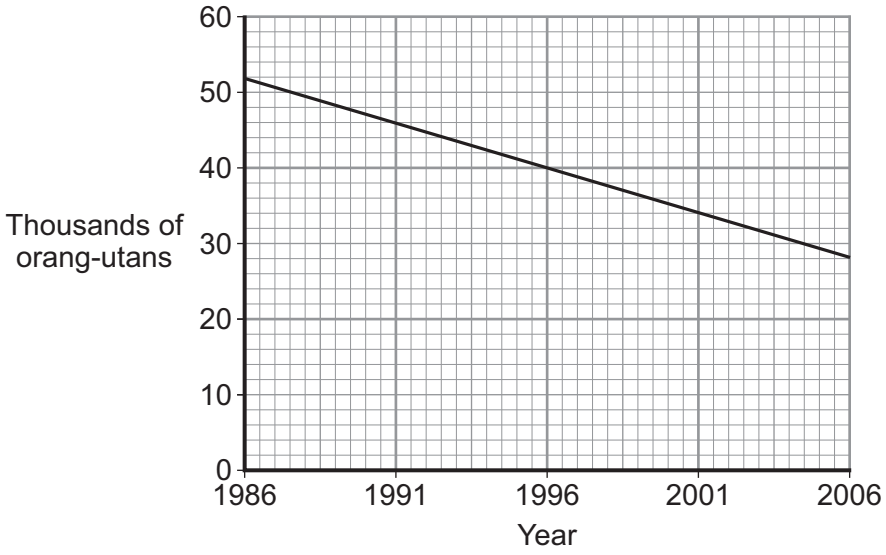
Turn over for the next question

QUESTION EIGHT

The decrease in the total area of tropical rainforest on Earth is reducing biodiversity and affecting the climate.

Scientists surveyed the numbers of orang-utans in Borneo.

Their results are shown in the graph.



8A What was the annual rate of decrease in orang-utan numbers between 1986 and 2006?

1 1200 per year

2 2400 per year

3 2800 per year

4 5200 per year

8B Biodiversity is . . .

1 the number of different species living in a habitat.

2 the number of individuals living in a habitat.

3 the maintenance of tropical rainforests.

4 the number of endangered species in a habitat.

8C Forests in Borneo are being 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.

8D How does an increase in the amount of 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.

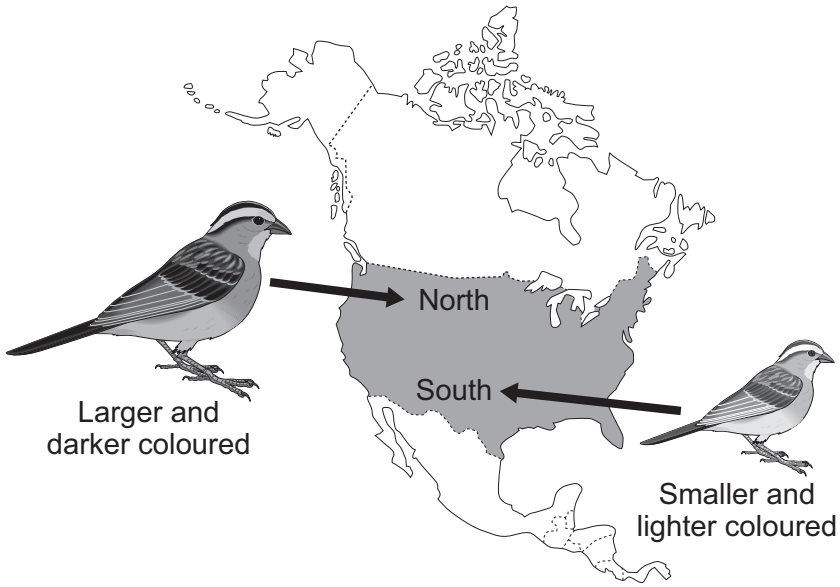
Turn over for the next question

QUESTION NINE

House sparrows arrived in North America from Europe in the nineteenth century. Since then, sparrows have spread to inhabit most of the continent.

House sparrows in the north of America are larger and darker coloured than house sparrows in the south of America.

The drawing shows where the two types of sparrow live.



9A The differences between the sparrows have been caused directly by changes in . . .

1 the environment.

2 the sparrows' predators.

3 the sparrows' genes.

4 human activities.

9B Being larger than the southern sparrow helps the northern sparrow to . . .

1 see prey from greater distances.

2 be less easily seen by predators.

3 live in a greater range of habitats.

4 conserve more heat.

9C The two sparrow populations have become distinctly different because they do **not** . . .

1 eat the same prey.

2 have the same predators.

3 interbreed.

4 have the same types of tree to nest in.

9D The information in this question . . .

1 proves that natural selection takes place.

2 shows that some acquired characteristics are inherited.

3 provides evidence for evolution.

4 shows that one of the types of sparrow is likely to become extinct in the near future.

END OF TEST

There are no questions printed on this page

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