Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

Science A

Unit Biology B1b (Evolution and Environment)

Biology

Unit Biology B1b (Evolution and Environment)

BLY1BP

F&H

Wednesday 2 March 2011 Morning Session

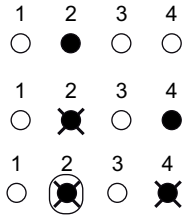
For this paper you must have:
- a black ball-point pen
- an objective test answer sheet.

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**.

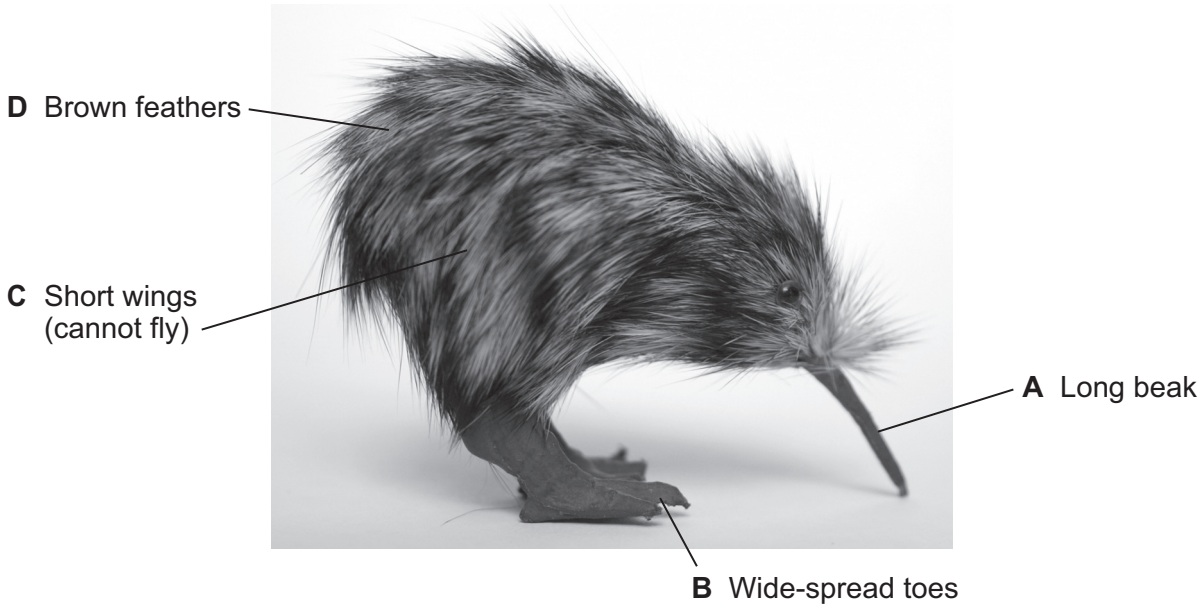
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1**–**4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The picture shows a kiwi.



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

A long beak

B wide-spread toes

C short wings

D brown feathers

1	stops the kiwi from sinking into soft ground
2	reduces the chance of predators seeing the kiwi
3	helps the kiwi to collect insects from underground
4	makes the kiwi easy for predators to catch

QUESTION TWO

Humans pollute the environment.

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

A carbon dioxide

B herbicide

C sulfur dioxide

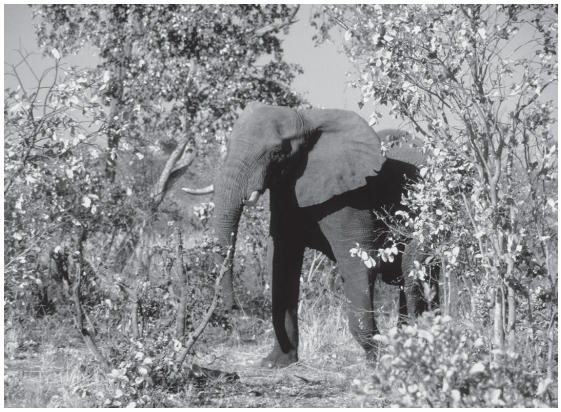
D pesticide

1	the main cause of acid rain
2	a greenhouse gas taken in by plants
3	used by farmers to kill weeds
4	used by farmers to kill insects that eat crops

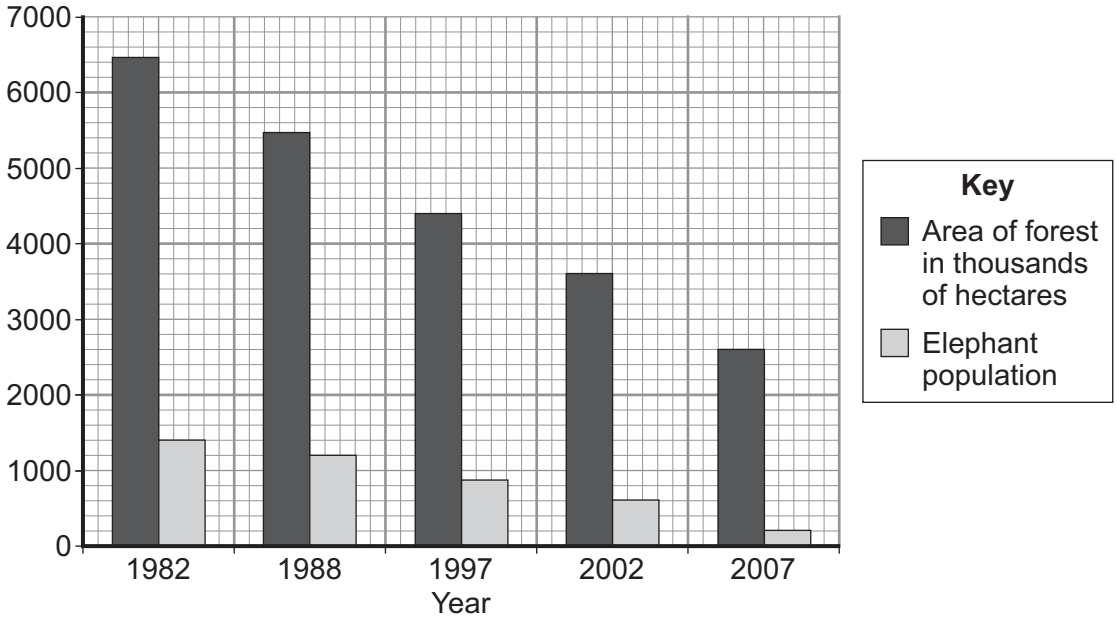
Turn over for the next question

QUESTION THREE

Asian elephants live mainly in forests.



The graph shows the effect of cutting down forests on elephant numbers in Indonesia.



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

A 160

B 1200

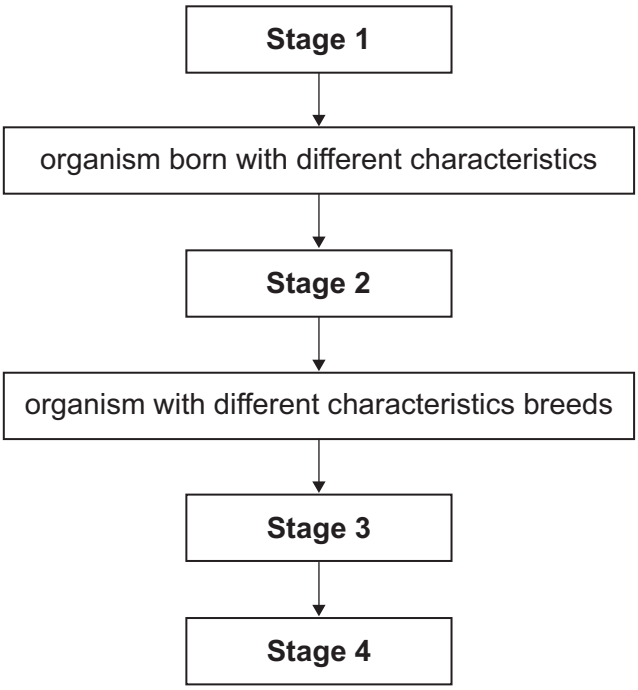
C 1400

D 2600

1	the area of the forest in 2007 in thousands of hectares
2	the highest number of elephants in any year
3	the reduction in the elephant population between 1982 and 2007
4	the average area of forest lost **each year** between 1997 and 2002 in thousands of hectares

QUESTION FOUR

The diagram shows a flow chart for evolution.



Match stages of evolution, **A**, **B**, **C** and **D**, with the stages **1**–**4** in the flow chart.

A the organism is now a better competitor

B the mutated gene is passed on to offspring

C a gene mutates

D a new species is produced

Turn over for the next question

QUESTION FIVE

We can now produce animals and plants with characteristics we prefer.

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

A embryo transplants

B sexual reproduction

C taking cuttings

D tissue culture

1	a quick and cheap way of reproducing a plant
2	produces clones of an animal
3	produces offspring using small groups of cells from a plant
4	produces offspring with a variety of different characteristics

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

Fishermen catch shellfish from the sea. Some fishermen noticed that the shells of the shellfish were getting thinner. Scientists believe that high levels of carbon dioxide in the sea water cause the sea to become more acidic.

The acidic sea water may dissolve the shells.

6A Which row in the table identifies what the fishermen noticed and what the scientists believe?

	What the fishermen noticed	**What the scientists believe**
1	hypothesis	observation
2	observation	hypothesis
3	hearsay	hypothesis
4	observation	hearsay

A group of students investigated the effect of different strengths of acid on the shells of shellfish.

- The students collected four types of shell from the beach.
- The students weighed each shell.
- The students put the shells into different strengths of the same acid for a week.
- The students then dried the shells and reweighed the shells.

The table shows their results.

Type of shell	**pH of acid** (the lower the number, the stronger the acid)	**Mass at start in g**	**Mass after one week in g**
Mussel	6.8	8.7	7.8
Cockle	6.6	7.4	6.0
Limpet	6.4	5.8	4.8
Oyster	6.2	11.3	8.6

6B The students could have improved this investigation.

The best way of improving the investigation would be to . . .

1 test more types of shell.

2 use live shellfish, rather than collecting empty shells.

3 use a more precise balance to weigh the shells.

4 test each type of shell with each strength of acid.

6C Which shell lost least mass during the week?

1 mussel

2 cockle

3 limpet

4 oyster

6D The oyster shell lost the most mass during the investigation.

What is the most likely explanation for this?

1 The oyster shell had the smallest surface area.

2 The shells of oysters are the least resistant to acid.

3 The oyster shell started off lighter than the other shells.

4 The oyster shell was placed in the weakest acid.

Turn over for the next question

QUESTION SEVEN

The picture shows a crocodile.

7A The crocodile can keep most of its body underwater for a long time.

Which row in the table shows all the features of the crocodile that help it to stay underwater for a long time?

	Nostrils at the tip of the nose	Sharp teeth	Transparent eyelid	Eyes at top of the head	Scaly skin
1	✓	✓	✓		
2				✓	✓
3		✓	✓		
4	✓		✓	✓	

Female crocodiles lay up to 80 eggs in a large nest on land and then cover the nest with vegetation. The vegetation rots and produces heat. The heat incubates the eggs.

Scientists investigated how the temperature at which the eggs are kept affects the sex of the young crocodile. The table below shows their results.

Temperature at which eggs are kept in °C	30.8	31.2	31.6	32.0	32.4
Percentage of eggs that hatch as males	14	48	88	42	16

7B What pattern is shown by the data?

1 There is an ideal temperature for the eggs to hatch as males.

2 The lower the temperature at which the eggs are kept, the more eggs hatch as males.

3 The higher the temperature at which the eggs are kept, the more eggs hatch as males.

4 There is no relationship between temperature and the number of eggs that hatch as males.

7C Which is the best estimate of the percentage of eggs that would hatch as males if the eggs were kept at 31.0 °C?

1 30 %

2 58 %

3 70 %

4 84 %

7D Scientists predict that the temperature of the atmosphere will increase by up to 1 °C in the next 50 years.

What effect will the 1 °C increase have on the population of crocodiles?

1 no effect

2 decrease the percentage of eggs that hatch as females

3 increase the total number of eggs that hatch

4 we cannot tell from the data

Turn over for the next question

QUESTION EIGHT

The picture shows part of a forest burning in Mexico.

8A The main reason for burning forests like this is to . . .

1 reduce the need for fertilisers.

2 use the land for agriculture.

3 use the land for roads.

4 reduce the 'greenhouse effect'.

8B Many scientists believe that large-scale deforestation has led to an increase in the carbon dioxide concentration in the atmosphere.

Which row in the table shows the effects of deforestation?

	Amount of carbon dioxide locked up in wood	Amount of carbon dioxide released by burning	Amount of carbon dioxide released by microorganisms
1	increases	decreases	increases
2	decreases	increases	increases
3	increases	increases	increases
4	decreases	decreases	decreases

8C Deforestation affects biodiversity.

What does the biodiversity of a habitat measure?

1 the total number of all living things in the habitat

2 the number of animal and plant species that have become extinct in the habitat

3 the number of different species in the habitat

4 the total number of animals of the most common species in the habitat

8D Sometimes cattle may be kept on areas that have been deforested.

Which gas in the atmosphere is produced in large amounts by cattle but not by humans?

1 carbon dioxide

2 methane

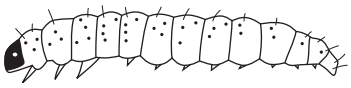
3 oxygen

4 sulfur dioxide

Turn over for the next question

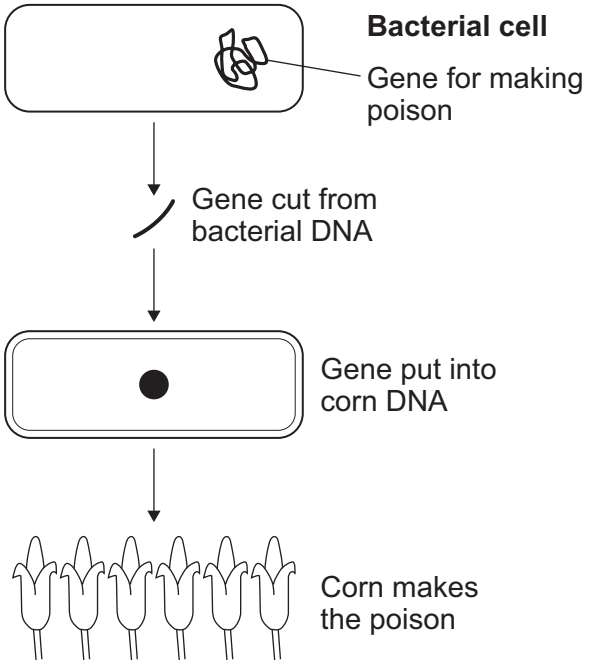
QUESTION NINE

The drawing shows a European corn borer. European corn borers eat and destroy corn stems.



It is possible to produce corn plants that produce a poison which kills the corn borer if it eats any part of the plant.

The gene for making the poison is cut from the genetic material of a bacterial cell. The gene is then inserted into the cells of a corn plant. The corn plant then produces the poison.



9A Transferring genes from one organism to another is called . . .

1 cloning.

2 evolution.

3 genetic engineering.

4 tissue culture.

9B One economic benefit of producing this type of corn is that . . .

1 more people will want to buy this type of corn.

2 there will be fewer pests.

3 the farmer will need to use less fertiliser.

4 the farmer will produce more corn.

9C An environmental concern about growing this type of corn is that . . .

1 more chemicals will have to be used on the land.

2 it is against some people's religious beliefs.

3 the bacterial gene may get transferred to wild plant species.

4 this type of corn will be much more expensive.

9D Scientists think that this type of corn is not harmful for people to eat.

This is very difficult to prove because . . .

1 people will not volunteer to be part of a trial.

2 the human diet contains a wide variety of foods.

3 scientists are not allowed to carry out experiments on humans.

4 animals that eat this corn appear to be healthy.

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 characteristics we prefer.

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

A embryo transplants

B sexual reproduction

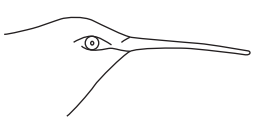
C taking cuttings

D tissue culture

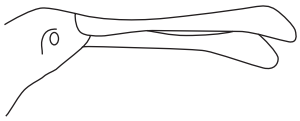
1	a quick and cheap way of reproducing a plant
2	produces clones of an animal
3	produces offspring using small groups of cells from a plant
4	produces offspring with a variety of different characteristics

QUESTION TWO

Birds have beaks which are adapted to the way the birds feed.

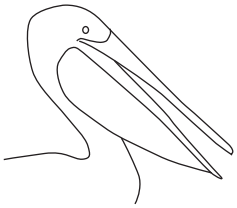


1



2

3



4

Match feeding methods, **A**, **B**, **C** and **D**, with the birds **1**–**4**.

A catches fish and carries them inside its lower beak

B sucks nectar from deep inside a flower

C shovels up the mud at the bottom of water to find food

D rips animal prey to pieces

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 picture shows part of a forest burning in Mexico.

3A The main reason for burning forests like this is to . . .

1 reduce the need for fertilisers.

2 use the land for agriculture.

3 use the land for roads.

4 reduce the 'greenhouse effect'.

3B Many scientists believe that large-scale deforestation has led to an increase in the carbon dioxide concentration in the atmosphere.

Which row in the table shows the effects of deforestation?

	Amount of carbon dioxide locked up in wood	Amount of carbon dioxide released by burning	Amount of carbon dioxide released by microorganisms
1	increases	decreases	increases
2	decreases	increases	increases
3	increases	increases	increases
4	decreases	decreases	decreases

3C Deforestation affects biodiversity.

What does the biodiversity of a habitat measure?

1 the total number of all living things in the habitat

2 the number of animal and plant species that have become extinct in the habitat

3 the number of different species in the habitat

4 the total number of animals of the most common species in the habitat

3D Sometimes cattle may be kept on areas that have been deforested.

Which gas in the atmosphere is produced in large amounts by cattle but not by humans?

1 carbon dioxide

2 methane

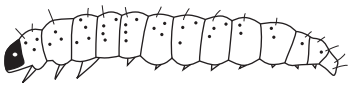
3 oxygen

4 sulfur dioxide

Turn over for the next question

QUESTION FOUR

The drawing shows a European corn borer. European corn borers eat and destroy corn stems.



It is possible to produce corn plants that produce a poison which kills the corn borer if it eats any part of the plant.

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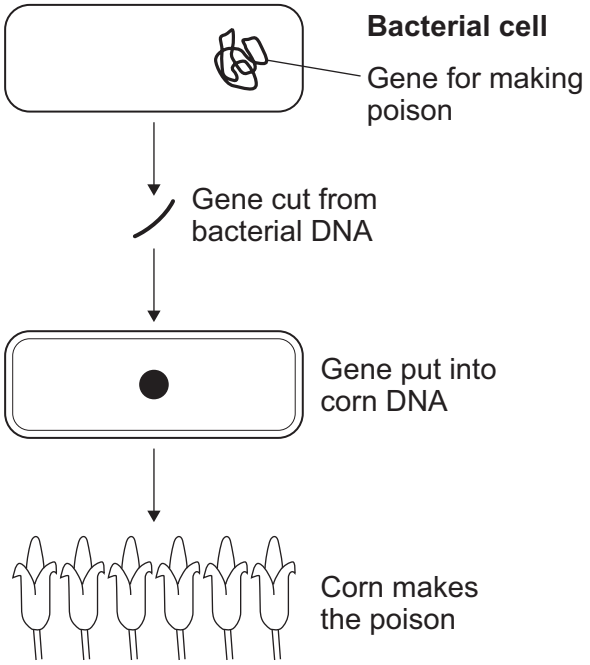


4A Transferring genes from one organism to another is called . . .

1 cloning.

2 evolution.

3 genetic engineering.

4 tissue culture.

4B One economic benefit of producing this type of corn is that . . .

1 more people will want to buy this type of corn.

2 there will be fewer pests.

3 the farmer will need to use less fertiliser.

4 the farmer will produce more corn.

4C An environmental concern about growing this type of corn is that . . .

1 more chemicals will have to be used on the land.

2 it is against some people's religious beliefs.

3 the bacterial gene may get transferred to wild plant species.

4 this type of corn will be much more expensive.

4D Scientists think that this type of corn is not harmful for people to eat.

This is very difficult to prove because . . .

1 people will not volunteer to be part of a trial.

2 the human diet contains a wide variety of foods.

3 scientists are not allowed to carry out experiments on humans.

4 animals that eat this corn appear to be healthy.

Turn over for the next question

QUESTION FIVE

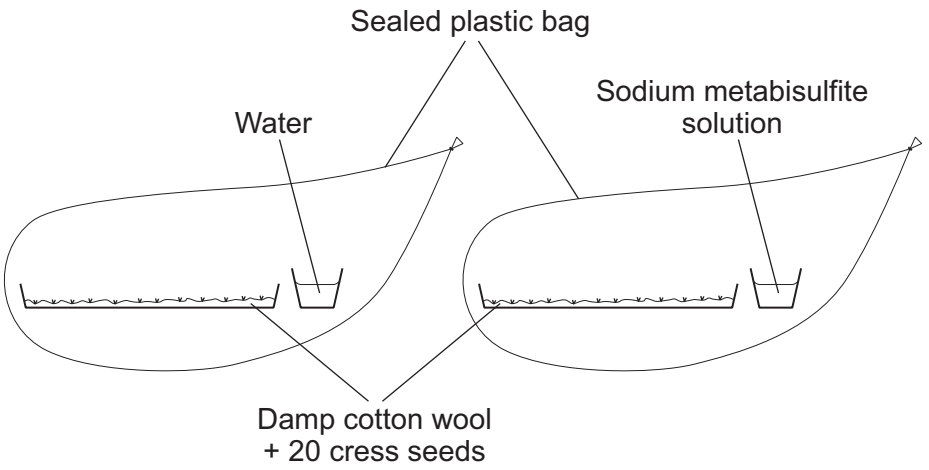
Sulfur dioxide is a pollutant gas.

5A Which row in the table shows activities that can release sulfur dioxide into the atmosphere?

	Burning coal	Planting rice	Farming cattle	Driving cars
1	✓	✓	✓	
2	✓	✓		✓
3	✓		✓	
4	✓			✓

The diagram shows an experiment to investigate the effect of sulfur dioxide gas on the germination of cress seeds.

Sodium metabisulfite solution gives off sulfur dioxide gas.



Both bags were left in the same warm laboratory for several days. Then the number of seeds that germinated was counted.

Five different groups of students did the experiment.

5B Which row in the table shows the correct variables?

	Number of cress seeds in dish	Number of cress seeds that germinated	Sodium metabisulfite solution
1	dependent	control	independent
2	independent	dependent	control
3	control	dependent	independent
4	control	independent	dependent

The table shows the results for the five groups of students **R**–**V**.

Group	Number of seeds that germinated	
	Bag containing water	Bag containing sodium metabisulfite solution
R	17	5
S	15	8
T	15	5
U	16	8
V	17	9

5C What is the best conclusion that can be drawn from these results?

1 Sodium metabisulfite solution kills cress seeds.

2 Sulfur dioxide stops the germination of cress seeds.

3 Sulfur dioxide has a negative effect on the germination of cress seeds.

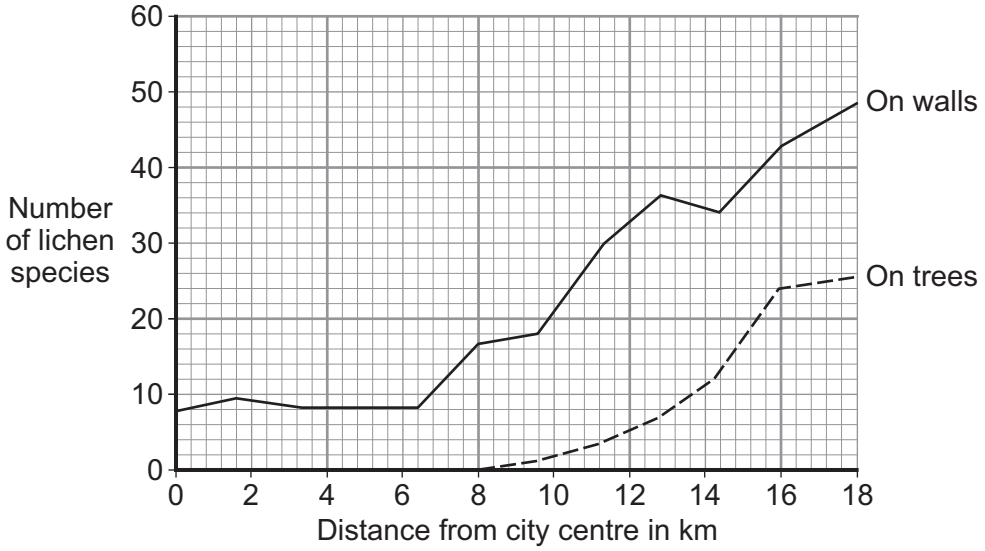
4 Water is toxic to a small number of cress seeds.

Question 5 continues on the next page

5D Scientists counted the lichen species found on the walls and the trees in a city.

The table and graph show the effect of sulfur dioxide on the number of lichen.

Distance from city centre in km	Sulfur dioxide concentration in the air in g per m^3
0	200
2.5	160
8	65
90	65



What is the best conclusion that can be drawn from this information?

1 No lichens can survive at concentrations between 160 and 200 g per m^3.

2 Lichens growing on walls are less tolerant of sulfur dioxide than lichens growing on trees.

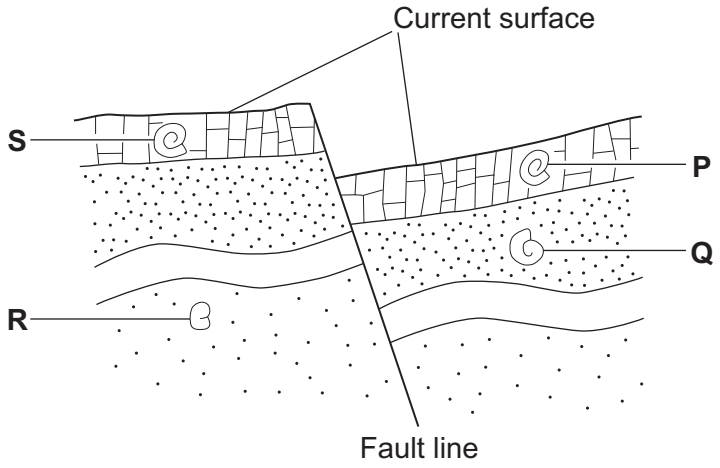
3 Lichens that grow on trees cannot tolerate sulfur dioxide concentrations above 65 g per m^3.

4 Lichens that grow on walls cannot tolerate sulfur dioxide concentrations above 200 g per m^3.

Turn over for the next question

QUESTION SIX

The diagram shows where fossils have been found in layers of rock.



6A Which fossil in the diagram shows the organism that developed first?

1 **P**

2 **Q**

3 **R**

4 **S**

6B Scientists think that the ancestors of fossil **P** were like fossil **Q** but they cannot be certain.

Which of the following is the most likely reason why the scientists cannot be certain?

1 Other fossils showing the evolutionary sequence have not yet been found.

2 Some scientists do not believe in evolution.

3 Fossils can form only in swamps.

4 Fossil **P** has many different features from fossil **Q**.

6C The thickness of the shell of each of the fossils discovered in these rocks was measured.

First the scientists would write the hypothesis.

Then the scientists would write . . .

1 a conclusion.

2 an evaluation.

3 a prediction.

4 a theory.

6D What is needed for a new characteristic in an organism to be produced?

1 a constant environment

2 mutations in genes

3 changes in acquired characteristics

4 diseases to kill off some of the species

Turn over for the next question

QUESTION SEVEN

Algae are small plants that live in water. Algae photosynthesise to gain energy to grow. An alga that grows off the coast of Hawaii makes a high proportion of vegetable oils in its cells.

A fuel company is planning to farm this alga to produce biodiesel fuel from the vegetable oils. The company says that the plans will result in sustainable development.

7A What does the company mean by *sustainable development* (for producing biodiesel)?

1 The algae will always grow in the sea around Hawaii.

2 The biodiesel will be produced using fossil fuels.

3 The biodiesel will be produced without affecting future generations.

4 The company can keep making the biodiesel for a long time.

7B Which of the following statements is the most important reason for promoting the algae as a sustainable source of biodiesel?

1 The trial growth project is in the sea around Hawaii where conditions are best for the algae farming.

2 The cost of the biodiesel produced is 8 times greater than diesel produced from fossil fuels.

3 The algae absorb carbon dioxide from the atmosphere, which increases the 'greenhouse effect'.

4 Using food crops to produce biodiesel may lead to starvation in some poor countries.

7C Some people say that burning fossil fuels adds to global warming.

Why does burning fossil fuels add to global warming?

1 Burning fossil fuels releases heat.

2 Burning fossil fuels releases carbon dioxide.

3 Fossil fuels are easily available.

4 Carbon in fossil fuels did not come from plants.

7D Methane contributes to global warming because methane . . .

1 traps heat radiation from the Earth and re-radiates it out to space.

2 traps heat radiation from the Earth and re-radiates it back to the Earth.

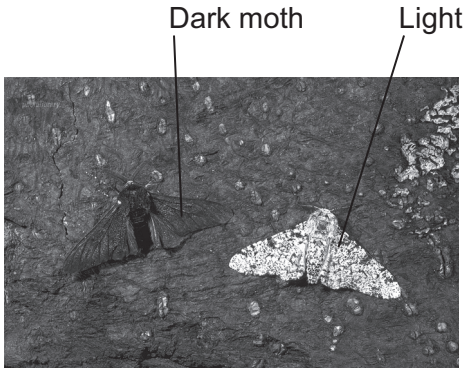
3 traps heat radiation directly from the Sun and re-radiates it back to the Earth.

4 reflects heat radiation from the Sun back out to space.

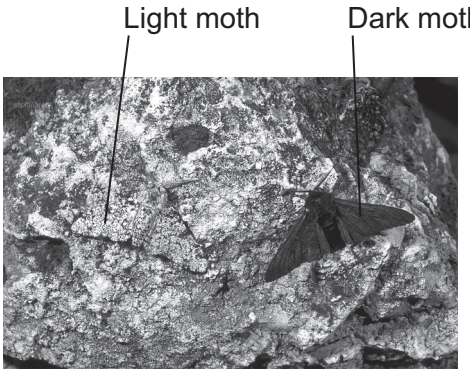
Turn over for the next question

QUESTION EIGHT

The peppered moth has two colour forms, dark and light. The moths can be camouflaged against a similar coloured background, so a predator is less likely to see the moths.



Dark tree



Light tree

8A Scientists surveyed the number of light and dark coloured moths in woods in which the trees had either mainly light or mainly dark (polluted) coloured trunks. Their results are shown in **Table 1**.

Table 1

Wood	Percentage of each type of moth found (%)	
	Light moths	Dark moths
Wood with mainly light tree trunks	95	5
Polluted wood with mainly dark tree trunks	10	90

This data provides evidence for . . .

1 artificial selection.

2 extinction.

3 inheritance of acquired characteristics.

4 survival of the fittest.

A scientist investigated the survival rates of the moths that were released in two different types of woodland areas which had trees:

- with the same colour background as the moth colour
- with a different colour background from the moth colour.

The two areas of woodland were enclosed to stop the moths from flying out of them. Birds that are predators of moths were present in both areas.

The moths were released in the morning. The surviving moths were recaptured early the next night, when they normally fly about.

Table 2 shows the results.

Table 2

	Number of moths released	Moths lost or eaten by birds	% decrease in numbers of moths
Area which had trees with same colour background as moth colour	751	128	17.0
Area which had trees with different colour background from moth colour	53	17	32.1

8B The scientist did not use the same number of moths in each area.

Because of this, . . .

1 the results are not valid.

2 the scientist had to calculate the percentage change in moth numbers.

3 the number of predators cannot be calculated.

4 the survival rate for each moth colour cannot be calculated.

8C Which of the following is the best conclusion from the data in **Table 2**?

1 Moths released into a contrasting coloured background were more likely to be eaten by predators.

2 All the non-recaptured moths were eaten by birds.

3 The colour of the moth did not affect the chance of being eaten by predators.

4 More moths were eaten by birds when released in areas with similar background colours.

Bats eat moths and the bats fly at night. The moths are active at night, but not during the day. A scientist released both colours of moths into areas where the bats were flying at night.

Table 3 shows the results.

Table 3

Colour of moths	Number of moths released	Number of moths eaten by bats
Light coloured	164	53
Dark coloured	157	47

8D Using information from **Tables 1**, **2** and **3**, which of the moth predators chose their prey by colour?

1 bats only

2 birds only

3 bats and birds

4 neither bats nor birds

QUESTION NINE

Read the information about rice growing.

- Rice growing can contribute to global warming.
- Most rice is grown in wetland areas, where other crops cannot grow.
- Methane is produced by bacteria which live in soil water that has very little oxygen in it.
- Rice can be grown on drier land, but yields are reduced.
- Other crops are more profitable in these drier areas.
- Allowing the soil to dry out for a short time increases the amount of oxygen in the soil and increases rice yields.

9A In wetland areas, rice is a very important crop for people's diet and for the economy of these areas.

For people who live in these wetland areas, the best way of reducing methane in the atmosphere is . . .

1 to invest money in new drainage systems.

2 to stop producing rice in wetland areas.

3 to grow more rice in drier areas.

4 to grow other crops in wetland areas.

9B Over its growing period, a rice crop will . . .

1 reduce the amount of carbon dioxide in the atmosphere.

2 reduce the amount of oxygen in the atmosphere.

3 reduce the amount of methane in the atmosphere.

4 have no effect on the composition of the atmosphere.

9C Some varieties of rice plant cause 30 % less methane to be released into the atmosphere. However, these rice plants produce less rice.

Which of the following might produce a high yielding rice plant **and** release less methane?

1 cloning

2 embryo transplantation

3 sexual reproduction

4 tissue culture

9D A new strain of rice has been genetically modified to produce extra vitamins.

The final decision whether to allow this strain of rice to be grown on a large scale should be taken by . . .

1 farmers.

2 industrialists.

3 politicians.

4 scientists.

END OF TEST

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