General Certificate of Secondary Education
November 2008

SCIENCE A   **BLY1BP**
Unit Biology B1b (Evolution and Environment)

BIOLOGY
Unit Biology B1b (Evolution and Environment)

Thursday 20 November 2008   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.

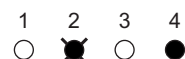**Instructions for recording answers**

- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:
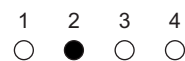
- Do **not** extend beyond the circles.

- 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
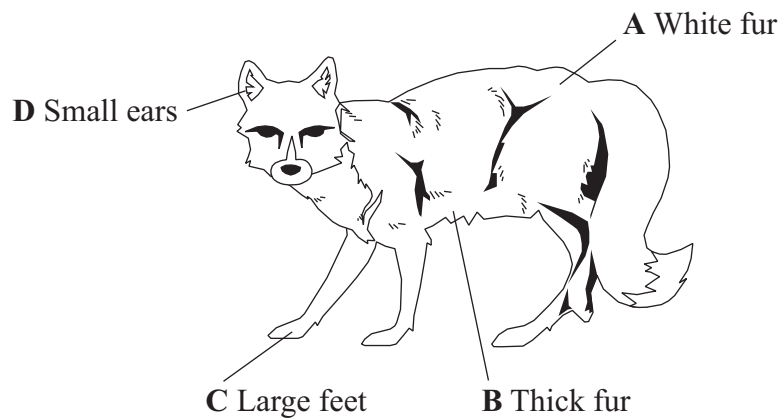
Questions **ONE** to **FIVE**.

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 drawing shows an Arctic fox.

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

1	reduces surface area to reduce heat loss
2	provides camouflage
3	allows the fox to walk easily on the snow
4	insulates the fox

QUESTION TWO

This question is about pollutants.

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

A   herbicide

B   methane

C   sulfur dioxide

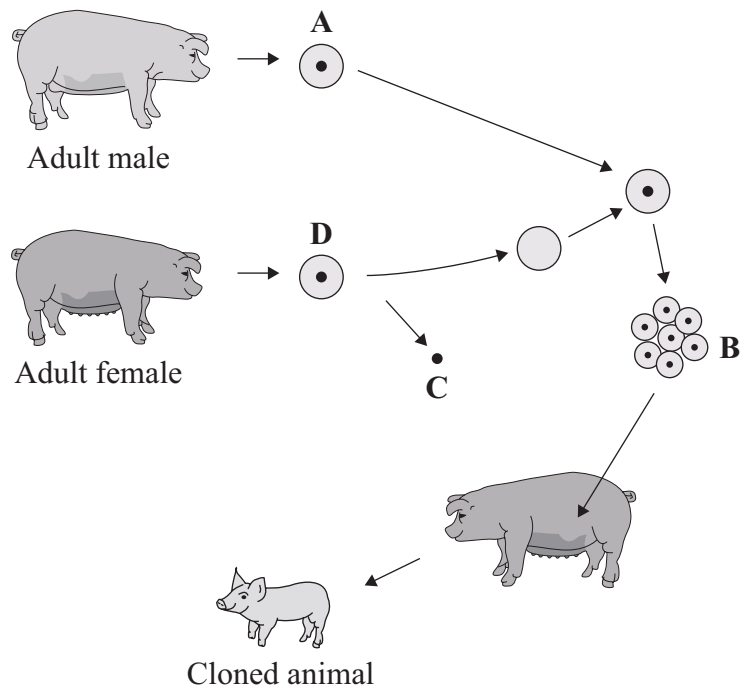**D**   carbon dioxide

1	can cause acid rain
2	a greenhouse gas produced mainly by rice and cattle
3	used by farmers to kill weeds
4	a greenhouse gas taken in by plants

Turn over for the next question

Turn over ▶

QUESTION THREE

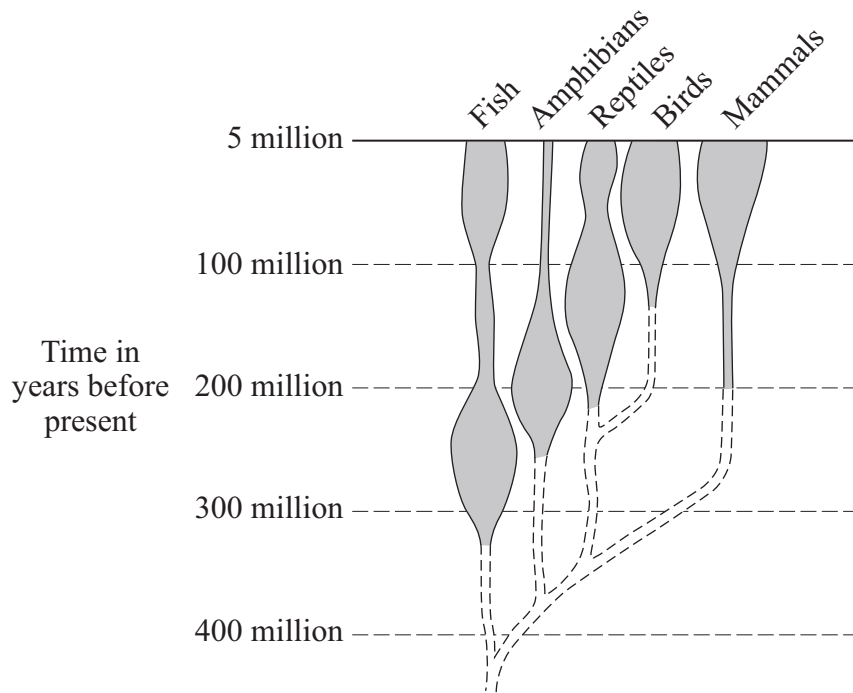The diagram shows how pigs are cloned.

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

1	body cell
2	nucleus
3	embryo
4	egg cell

QUESTION FOUR

The diagram shows how the number of species in different groups of vertebrates has changed between 400 million years ago and 5 million years ago.

The wider a block is, the more species there are.

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

A   fish

B   amphibians

C   reptiles

D   mammals

The group with most species 200 million years ago was . . . **1** . . . .

Birds are most closely related to . . . **2** . . . .

250 million years ago, the vertebrates on Earth were mainly . . . **3** . . . .

The group with most species 5 million years ago was . . . **4** . . . .

QUESTION FIVE

This question is about Darwin's and Lamarck's theories of evolution.

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

A   observed that all species change over time

B   had sufficient evidence to prove evolution

C   thought that natural selection operated on variations present at birth

D   thought that the changes that happen during an organism's lifetime are inherited by their offspring

1	only Darwin
2	only Lamarck
3	Darwin and Lamarck
4	neither Darwin nor Lamarck

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

Students investigated competition between cress seedlings.

- Five dishes of different widths were filled with soil to the same depth.
- Six cress seeds were planted, evenly spread out, in each dish.
- The dishes were kept in the same place in a laboratory and the seedlings were watered with the same amount of nutrient solution each day.

The height of each cress seedling was measured after ten days. The results are shown in the table.

Width of dish in cm	Height of cress seedlings in cm						Mean height of cress seedlings in cm
5	7.8	7.3	7.6	7.2	8.0	7.7	7.6
10	7.0	7.0	7.1	6.9	6.9	7.1	7.0
15	6.5	6.7	6.9	6.7	6.6	6.7	6.7
20	6.6	6.3	6.6	6.4	6.5	6.4	6.4
25	6.1	5.9	6.0	6.3	6.1	6.2	6.1

6A Why was the same number of cress seeds planted in each dish?

1 so that the results would be accurate

2 in order to calculate a mean

3 to make the experiment a fair test

4 so that the seeds would not be overcrowded

6B In which dish was there the greatest range of seedling heights?

    1   5 cm dish

    2   10 cm dish

    3   15 cm dish

    4   20 cm dish

6C Which pattern is supported by the data in the table?

    1   The wider the dish, the taller the cress plants.

    2   The narrower the dish, the greater the mass of the cress plants.

    3   The narrower the dish, the shorter the cress plants.

    4   The narrower the dish, the taller the cress plants.

6D The main reason for the differences in the mean heights of the seedlings was competition for . . .

    1   light.

    2   nutrients.
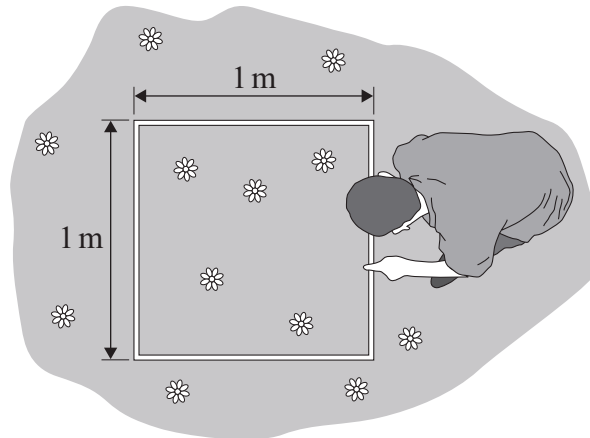
    3   space.

    4   water.

Turn over for the next question

Turn over ▶

QUESTION SEVEN

Some students wanted to see what effect people walking on a field had on the number of different plants growing there.

In order to sample the plants, they used a quadrat, as shown in the diagram.

The students investigated the numbers of daisies, dandelions, buttercups and plantains growing in areas that were walked on and areas that were not.

**7A**   Which of the following techniques would make the investigation as fair as possible?

    1   placing all the quadrats on areas that had been walked on

    2   placing all the quadrats where there were lots of plants

    3   placing all the quadrats randomly in the two different sample areas

    4   placing all the quadrats where all four types of plant were growing

7B   The students found that the mean number of dandelions in a $1\,m^2$ quadrat was 4.
The area of the field was $1000\,m^2$.

    How many dandelions were there likely to be in the whole field?

    1   about 4

    2   about 400

    3   about 1000

    4   about 4000

The bar chart shows the results.
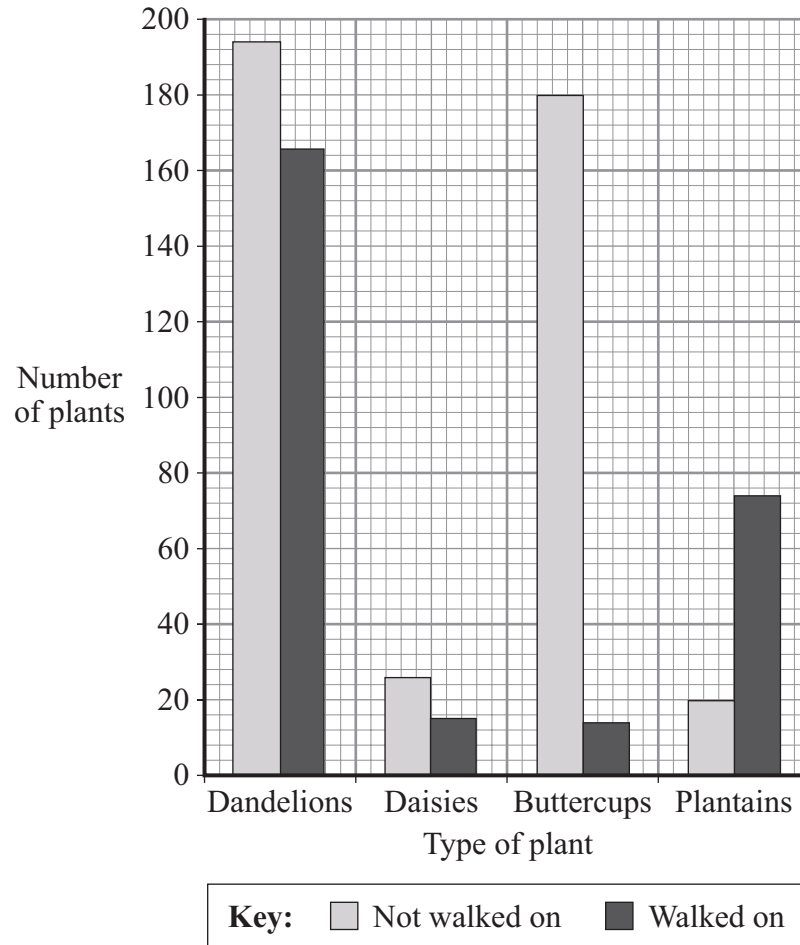
7C How many daisies grew in the area which was walked on?

1 15

2 25

3 30

4 40

7D Which type of plant grew best in areas that were walked on?

1 dandelion

2 daisy

3 buttercup

4 plantain

Turn over ▶

QUESTION EIGHT

All species of living organisms have evolved from simple life forms.

8A There is very little evidence for the evolution of the earliest life forms.

This is because the remains of most early life forms . . .

1 have been destroyed by geological activity.

2 are buried under deep layers of rock.

3 are under the sea.

4 are too small to survive.

8B Scientists think that the earliest life forms first appeared on Earth . . .

1 about 1 billion years ago.

2 about 3 billion years ago.

3 about 10 billion years ago.

4 about 30 billion years ago.

The diagram shows an evolutionary tree.
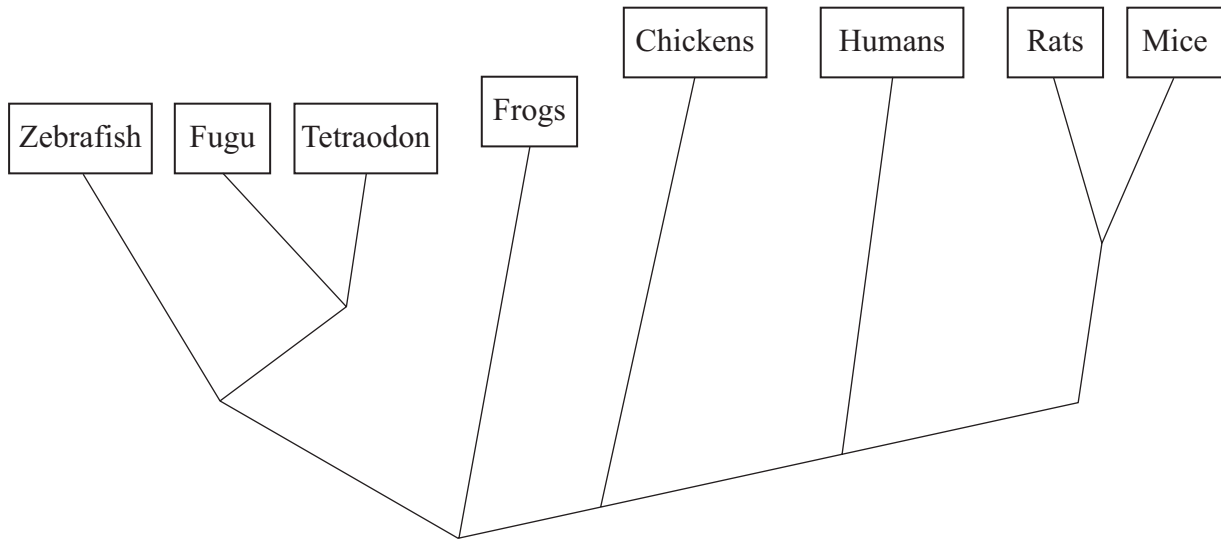
8C The evolutionary tree represents . . .

  1 facts about evolution.

  2 hearsay about evolution.

  3 predictions about evolution.

  4 a guess about evolution.

8D Differences between the rats and mice are mainly due to . . .

  1 their environment.

  2 their genes.

  3 their different diet.

  4 their ability to reproduce quickly.

Turn over for the next question

Turn over ▶

QUESTION NINE

Lichens are indicators of pollution.

9A Lichens are sensitive to . . .

1 carbon dioxide.

2 methane.

3 oxygen.

4 sulfur dioxide.

The table shows the heights of different types of lichen.

Type of lichen	Height in mm
crusty	1
scaly	3
leafy	10
fluffy	10–50

A survey of lichens found at various distances from a city centre gave the results in the table below.

Distance from city centre (km)	Main type of lichen found
0.3	none found
0.4	crusty
1.2	crusty
2.7	scaly
3.2	crusty
4.0	scaly
6.0	leafy
6.9	leafy

9B Which of the following best describes the relationship between the type of lichen found and the distance from the city centre?

1 Only crusty lichens are found within 3 km of the city centre.

2 The further away from the city centre, the taller the lichens.

3 Leafy lichens are found over the greatest range of distances.

4 Scaly lichens are found over the smallest range of distances.

9C The survey was carried out by two students who travelled by bus. They got off at each stop to check the lichens growing nearby.

Which of the following might explain why there were no fluffy lichens?

1 The survey sites were all near the road.

2 The survey sites were not chosen at random.

3 The bus stops were not at equal distances from the city centre.

4 The students were not expecting to find fluffy lichens.

9D The students also used a meter to measure the level of pollutants in the air near to each bus stop.

Their lichen survey could be a better indicator of pollution than the meter survey because . . .

1 the lichens were not affected by the pollution they had absorbed.

2 the lichens had sampled the air over a long period of time.

3 meters are difficult to read.

4 meters cannot detect low levels of pollutants.

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

This question is about Darwin's and Lamarck's theories of evolution.

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

A observed that all species change over time

B had sufficient evidence to prove evolution

C thought that natural selection operated on variations present at birth

D thought that the changes that happen during an organism's lifetime are inherited by their offspring

1	only Darwin
2	only Lamarck
3	Darwin and Lamarck
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QUESTION TWO

The plants shown in drawings **1–4** are adapted in different ways for survival.

1

2

3

4
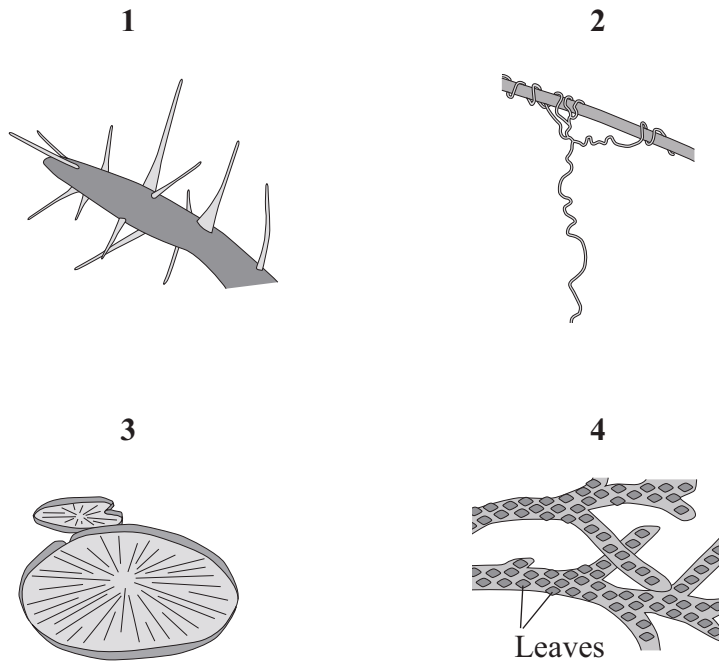
Leaves

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

The plant has leaves adapted . . .

A   for floating.

B   to deter predators.

C   for climbing.

D   for reducing water loss.

Turn over for the next question

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

All species of living organisms have evolved from simple life forms.

**3A**   There is very little evidence for the evolution of the earliest life forms.

This is because the remains of most early life forms . . .

1   have been destroyed by geological activity.

2   are buried under deep layers of rock.

3   are under the sea.

4   are too small to survive.

3B   Scientists think that the earliest life forms first appeared on Earth . . .

1   about 1 billion years ago.

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The diagram shows an evolutionary tree.
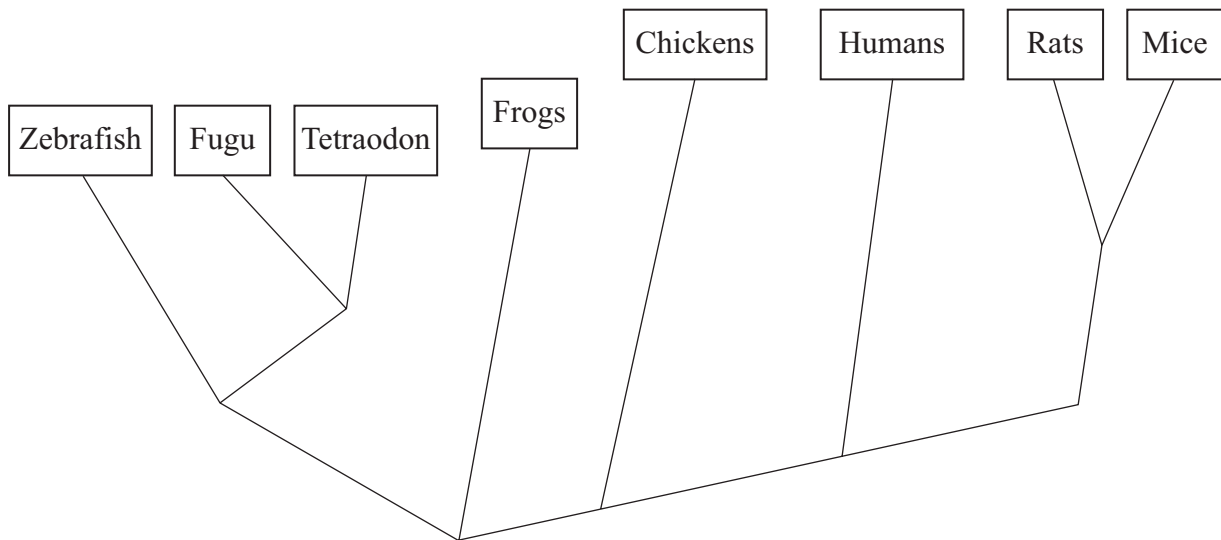
3C The evolutionary tree represents . . .

   1   facts about evolution.

   2   hearsay about evolution.

   3   predictions about evolution.

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3D Differences between the rats and mice are mainly due to . . .

   1   their environment.

   2   their genes.

   3   their different diet.

   4   their ability to reproduce quickly.

Turn over for the next question

Turn over ▶

QUESTION FOUR

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6.9	leafy

4B   Which of the following best describes the relationship between the type of lichen found and the distance from the city centre?

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2   The further away from the city centre, the taller the lichens.

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4   Scaly lichens are found over the smallest range of distances.

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Their lichen survey could be a better indicator of pollution than the meter survey because . . .

1   the lichens were not affected by the pollution they had absorbed.

2   the lichens had sampled the air over a long period of time.

3   meters are difficult to read.

4   meters cannot detect low levels of pollutants.

Turn over for the next question

Turn over ▶

QUESTION FIVE

The table gives information about the number of species of organisms in the world today.

	Total number of known species
plants	400 000
animals	1 400 000
species which live in tropical rainforests	720 000

5A The rate of extinction of species in tropical rainforests is currently 0.5% per year. This rate is predicted to increase to 5% per year.

How many species will become extinct next year if the predicted rate takes place?

1 3600

2 20 000

3 36 000

4 70 000

5B What is the main cause of the extinction of rainforest species?

1 pollution

2 loss of habitat

3 overcrowding

4 increase in sustainable development

5C Deforestation also damages the environment because . . .

1 less oxygen is released into the atmosphere.

2 less carbon dioxide is released into the atmosphere.

3 less carbon is 'locked-up' in timber.

4 more methane is released into the atmosphere.

5D One reason often given for clearing forests is that it provides an income for the local population.

Which of the following is **not** an economic reason for deforestation?

1 The forest could be developed for tourism.

2 Some plants in the forest may be sources of useful drugs.

3 The local people can conserve the forest for future generations.

4 Some trees in the forest may be valuable.

Turn over for the next question

Turn over ▶

QUESTION SIX

Read the passage.

> Trials of genetically-modified (GM) maize crops have been carried out.
> A gene, giving resistance to herbicides, was removed from a bacterium and
> transferred to maize plants.
>
> The trials involved growing fields of the GM maize next to fields of non-GM
> maize.
>
> The scientists recorded the number and species of organisms in the fields.
> It was found that in the fields with the GM crops there were fewer species, while in
> the fields without GM crops the number and species of organisms had increased.

6A   The gene giving resistance to herbicides would be removed from bacteria by using . . .

  1   small scissors.

  2   a chromosome from the bacterium.

  3   an enzyme.

  4   a nucleus.

6B   In the trial, the non-GM maize was used . . .

  1   so that the number of organisms could be counted easily.

  2   because different species of plants and animals were found in the fields where the two
         types of maize were grown.

  3   to make the results accurate.

  4   as a control.

6C   Many groups of people are opposed to growing GM crops.

  Which of the following is likely to be the main reason for this opposition?

  1   GM crops have only been developed for economic reasons.

  2   The effect of eating GM crops on human health is not known.

  3   There is no evidence that GM crops have better nutritional value.

  4   GM crops are resistant to disease.

6D   Which process would be used to produce large numbers of the new GM maize plants?

1   sexual reproduction

2   the continued transfer of genes to new maize plants

3   asexual reproduction

4   crossing GM maize with non-GM maize

**Turn over for the next question**

Turn over ▶

QUESTION SEVEN

The peppered moth exists in two forms – a speckled form and a black form. Both forms are found on tree bark. They are eaten by birds which pick them off the tree.

From 1840 onwards, the colour of the tree bark changed from light grey-green to black as a result of pollution in the air.

The graph shows the changes in the populations of speckled and black moths in a wood from 1840 to 1880.
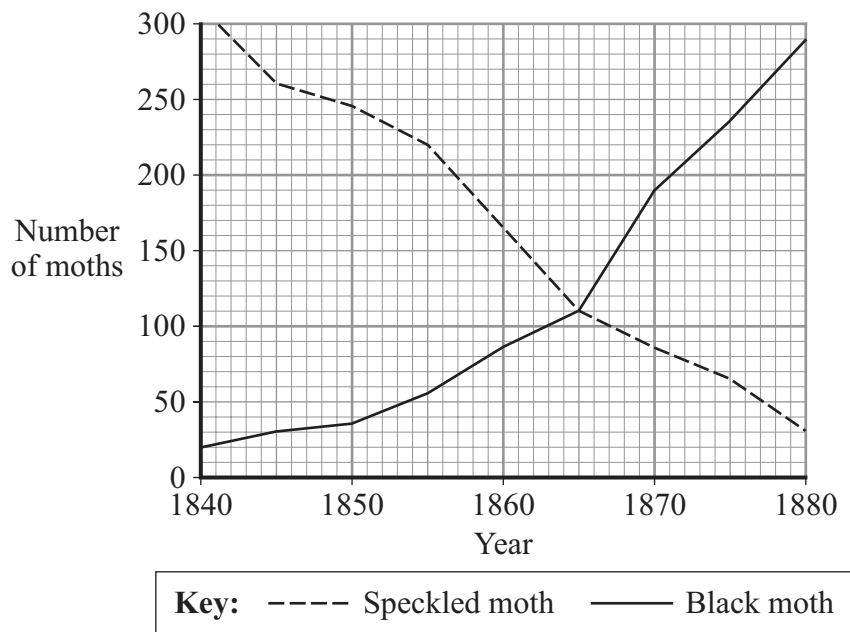
7A   What proportion of the moths in the wood were speckled in 1865?

1   0.02

2   0.1

3   0.3

4   0.5

7B What conclusion can be drawn from this data?

1 The number of black moths was directly proportional to time.

2 The rate of increase in the black moth population was approximately equal to the rate of decrease in the speckled moth population.

3 Air pollution was the direct cause of the fall in the speckled moth population.

4 The peppered moth population would be wiped out by 1890.

The Clean Air Act was passed in 1950. This resulted in a large decrease in air pollution.

7C How might the proportions of the two types of moth in the wood change between 1950 and 1980?

	Speckled moth	**Black moth**
1	increase	increase
2	increase	decrease
3	decrease	increase
4	decrease	decrease

7D Which of the following is a likely reason for the change in the numbers of speckled and black moths in the 50 years after the Clean Air Act?
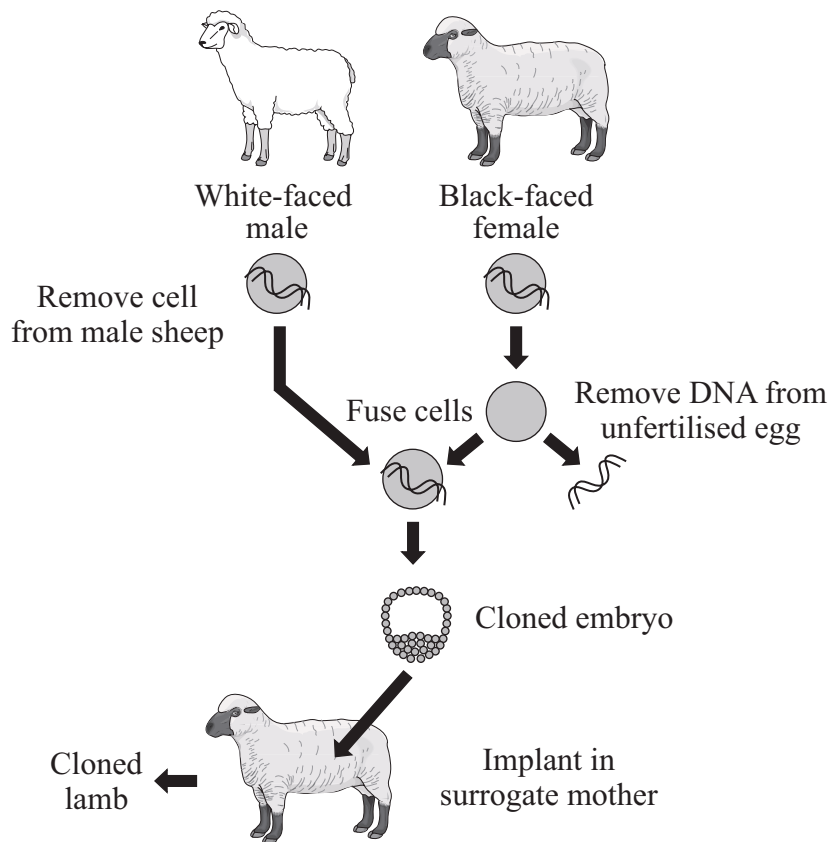
1 The colour of the tree bark changed so that the speckled moth was less easily seen by birds.

2 Pollution in the air changed the colour of the moths.

3 Speckled moths were killed by a new disease.

4 Black moths moved into the wood from other areas.

Turn over for the next question

Turn over ▶

QUESTION EIGHT

The diagram shows the method used to clone sheep.

8A This method of cloning sheep involves . . .

    1   fertilisation of an egg by a sperm.

    2   sexual reproduction.

    3   asexual reproduction.

    4   fusion of male and female gametes.

8B The clone produced would be . . .

    1   a black-faced male.

    2   a white-faced female.

    3   a black-faced female.

    4   a white-faced male.

8C   Proposals have been made to clone human embryos.

Which of the following is a reason why cloning human embryos might be allowed?

1   The cloned embryos could be used to create a 'super-race'.

2   The embryos could be stored for long periods.

3   Cloning will produce surplus embryos.

4   Cells from the embryos could be used to cure human diseases.

8D   Clones are produced naturally when . . .

1   two eggs are fertilised.

2   two eggs are fertilised by two separate sperm.

3   one egg is fertilised by one sperm and the embryo splits into two.

4   two eggs are fertilised by one sperm and the embryo splits into two.

Turn over for the next question

Turn over ▶

QUESTION NINE

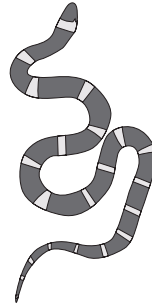**Diagram 1** shows a snake with a poisonous bite.
Diagram 2 shows a snake with a non-poisonous bite.
The two snakes live in the same area.

Diagram 1   **Diagram 2**

9A   Changes in the body patterns of snakes are caused by . . .

1   changes to their habitat.

2   changes to their genes.

3   changes to their predators.

4   changes to their characteristics.

9B   The most likely explanation for the similarity in appearance of the non-poisonous snakes to the poisonous snakes is that . . .

1   the poisonous snakes breed with the non-poisonous snakes.

2   the non-poisonous snakes copy the poisonous snakes.

3   the non-poisonous snakes, similar to poisonous ones, are more likely to survive.

4   the poisonous snakes have evolved a defence against predators.

9C   Extinction of both poisonous and non-poisonous snakes could be caused by . . .

1   a new predator evolving.

2   the non-poisonous snakes becoming different in appearance from the poisonous ones.

3   competition between predators of the non-poisonous snakes.

4   a scarcity of food in their habitat.

9D Some species of snake reproduce by parthenogenesis, which is the development of unfertilised eggs into adults.

In parthenogenesis . . .

1 no gametes are produced.

2 there is no mixing of genetic information.

3 there is great genetic variation between the offspring.

4 there are no chromosomes involved.

END OF TEST

There are no questions printed on this page