

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2008

SCIENCE A
Unit Biology B1b (Evolution and Environment)

BLY1BP



BIOLOGY
Unit Biology B1b (Evolution and Environment)

Monday 23 June 2008 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

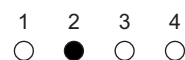
Instructions

- 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

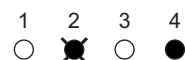
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:

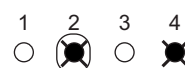


- Do **not** extend beyond the circles.

- 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:



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 14 of this booklet.

FOUNDATION TIER

SECTION ONE

Questions **ONE** to **SIX**.

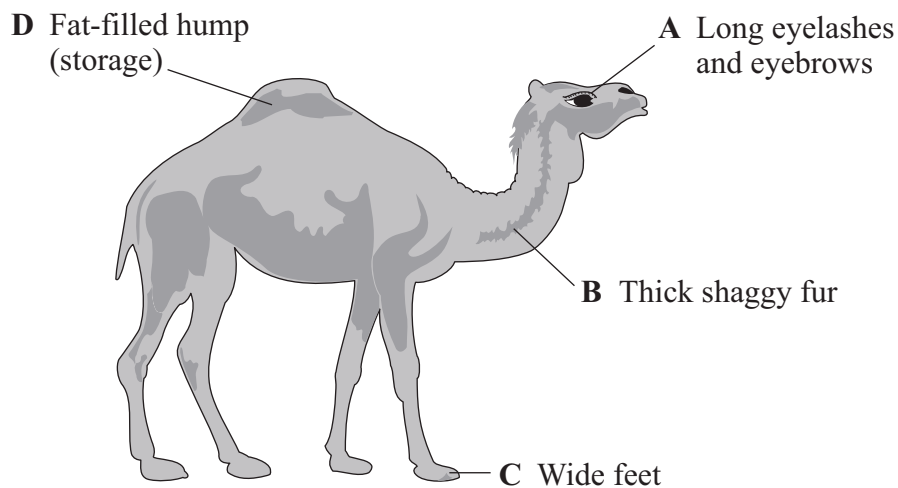
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

Wild camels often live in desert areas which are hot during the day and cold at night. They may have to manage without a supply of food or water for several days and travel great distances over soft sand to find some.



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

1	stops camel sinking into the sand
2	enables survival without food or water for several days
3	helps protect the body from temperature changes at night and during the day
4	keeps out sand that is being blown about

QUESTION TWO

This question is about pollutants.

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

- A** acid rain
- B** pesticide
- C** methane
- D** sulfur dioxide

1	produced by growing rice
2	given off by factories burning coal
3	results from chemicals dissolving in water
4	sprayed on crops by farmers

Turn over for the next question

Turn over ►

QUESTION THREE

This question is about producing new animals and plants.

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

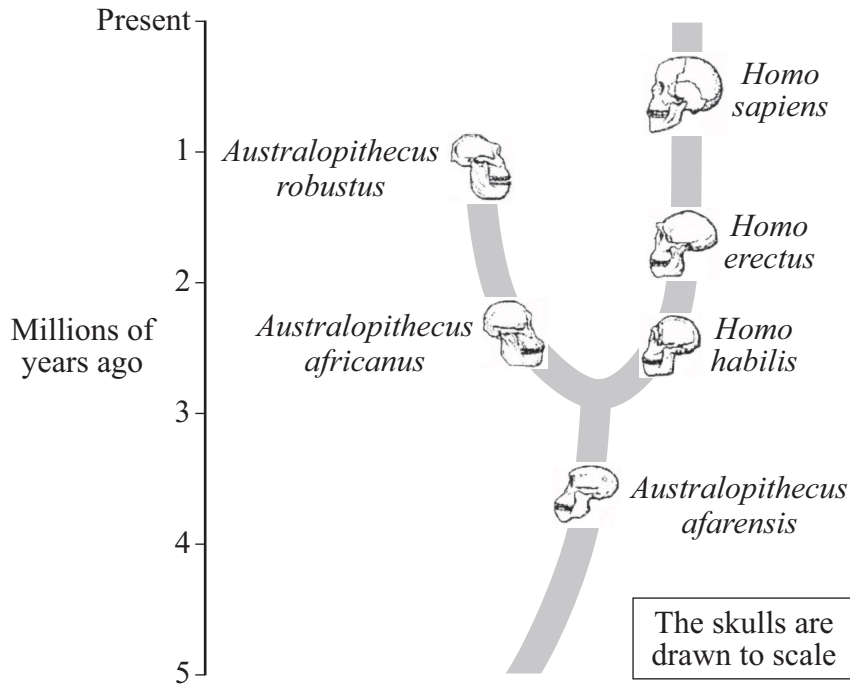
- A** sexual reproduction
- B** taking cuttings
- C** tissue culture
- D** transplanting embryos

1	involves the joining of gametes
2	used to produce plants quickly and cheaply
3	involves host mothers
4	involves using small groups of cells

QUESTION FOUR

The diagram shows a possible evolutionary tree for humans (*Homo sapiens*).

All the organisms except *Homo sapiens* are extinct.



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

- A** *Homo sapiens*
- B** *Australopithecus robustus*
- C** *Australopithecus afarensis*
- D** *Homo habilis*

1	the first organism to evolve
2	the direct ancestor of modern humans that evolved $2\frac{1}{2}$ million years ago
3	the organism with the largest brain
4	the organism that became extinct most recently

Turn over ►

QUESTION FIVE

This question is about evolution.

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

A extinction

B natural selection

C mutation

D variation

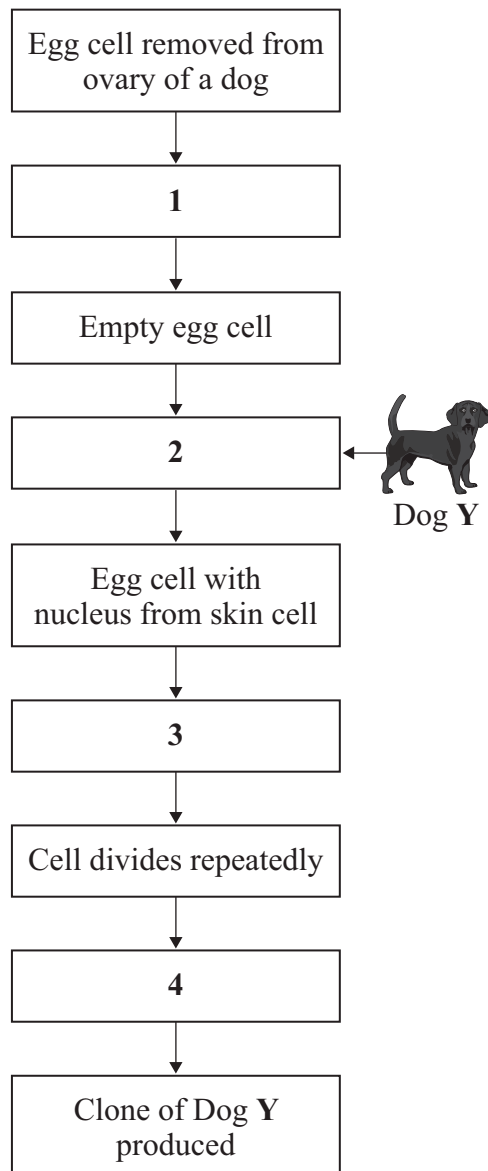
1	a theory put forward by Darwin
2	differences shown by individuals in the same species
3	a change in a gene
4	may be caused by new predators

QUESTION SIX

This question is about adult cell cloning.

Match stages, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram to explain how clones of dogs can be produced.

- A** nucleus transferred from skin cell of Dog Y
- B** electric shock applied
- C** ball of cells inserted into womb of female
- D** nucleus removed from egg cell



Turn over ►

SECTION TWO

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

Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION SEVEN

An investigation was carried out to find out the best conditions for growing grass.

The diagram shows a lawn divided into four equal-sized plots. Nutrients and weedkiller were added to the plots as shown in **Figure 1**. Each plot was left for 2 weeks.

The growth of the grass in each plot was recorded as a score out of 5 as shown in **Figure 2**. 5 is the best growth.

Figure 1

Lawn treatments

Plot W Nutrients and weedkiller	Plot X Nutrients only
Plot Y Neither nutrients nor weedkiller	Plot Z Weedkiller only

Figure 2

Score

Plot W 5	Plot X 4
Plot Y 2	Plot Z 3

7A Which plot acted as a control in this investigation?

- 1 plot **W**
- 2 plot **X**
- 3 plot **Y**
- 4 plot **Z**

7B Which of the following would have been the best way of measuring the growth of the grass?

- 1 measuring the height of the tallest grass plant in each plot
- 2 measuring the squares carefully
- 3 cutting and weighing the grass in each plot after 2 weeks
- 4 seeing which plot had the greenest grass

7C Which treatment resulted in the best growth of grass?

- 1 nutrients and weedkiller
- 2 nutrients only
- 3 weedkiller only
- 4 neither nutrients nor weedkiller

7D Grass and weeds do **not** compete for . . .

- 1 sunlight.
- 2 nutrients.
- 3 water.
- 4 weedkiller.

Turn over for the next question

Turn over ►

QUESTION EIGHT

Limpets can be found attached to rocks on beaches around Britain.

A group of students on a field trip measured the height and width of 10 limpets on a shore exposed to strong waves, then a further 10 limpets on a very sheltered shore.

The tables show their results.

Limpets from an exposed shore											
	1	2	3	4	5	6	7	8	9	10	Mean
Height in cm	1.7	0.9	1.4	1.7	1.2	1.9	1.7	1.2	1.9	0.9	1.5
Width in cm	2.4	1.9	2.8	3.1	2.1	2.2	3.1	2.4	3.1	1.9	2.5

Limpets from a sheltered shore											
	1	2	3	4	5	6	7	8	9	10	Mean
Height in cm	1.7	1.4	1.4	2.0	2.3	1.9	2.0	3.2	2.7	3.0	2.2
Width in cm	2.8	2.1	2.8	2.3	2.6	1.9	2.5	2.6	2.5	2.9	2.5

8A The students wanted to draw a graph or chart to show all the data.

The best graph or chart to do this would be a . . .

- 1 bar chart.
- 2 line graph.
- 3 pie chart.
- 4 scattergram.

8B What was the range in height of the limpets from the sheltered shore?

- 1 0.9 to 1.9
- 2 1.4 to 3.2
- 3 1.4 to 2.7
- 4 1.7 to 3.2

8C The data in the table shows that . . .

- 1 the biggest limpets are the oldest.
- 2 most of the limpets on sheltered shores are taller than those on exposed shores.
- 3 on both shores the tallest limpets are the widest.
- 4 there is more food available to limpets on exposed shores.

8D From the information given, what is the most likely reason for the difference in the heights of the two populations of limpets?

- 1 On exposed shores waves are likely to dislodge taller limpets.
- 2 There is more food available to limpets on exposed shores.
- 3 There are fewer predators on sheltered shores.
- 4 By random chance students selected older limpets on sheltered shores.

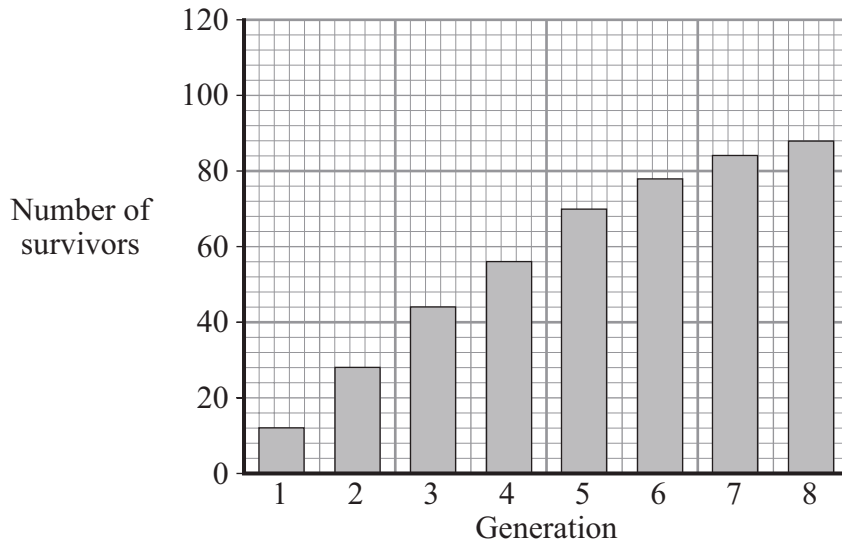
Turn over for the next question

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QUESTION NINE

Greenflies are pests that feed on plants.

In a controlled experiment, 1000 greenflies were sprayed with an insecticide. Those that survived were counted. The survivors were allowed to breed until the population reached 1000 again. These were then sprayed and the survivors counted. This was done for eight generations.



9A How many greenflies in **generation 7** survived the spraying?

- 1 84
- 2 85
- 3 86
- 4 88

9B What trend is shown by the data?

- 1 The number of survivors increased by the same number in each generation.
- 2 There was a greater increase in the number of survivors between earlier generations than between later generations.
- 3 There was a smaller increase in the number of survivors between earlier generations than between later generations.
- 4 There was no relationship between the number of survivors and the number of generations.

9C The number of survivors increased with each generation.

What is the most likely reason for this?

- 1 The greenflies learn to avoid the spray.
- 2 The survivors had developed a resistance to the insecticide and passed on the gene.
- 3 More greenflies were sprayed in the later generations.
- 4 A more dilute insecticide was used in order to save money.

9D Which one of the following is a disadvantage of using insecticides?

- 1 Insecticides can be applied easily to plants.
- 2 Insecticides can kill the plant as well as the greenflies.
- 3 Insecticides can be washed into streams and rivers where they can kill other animals.
- 4 Insecticides save plant producers money.

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**.

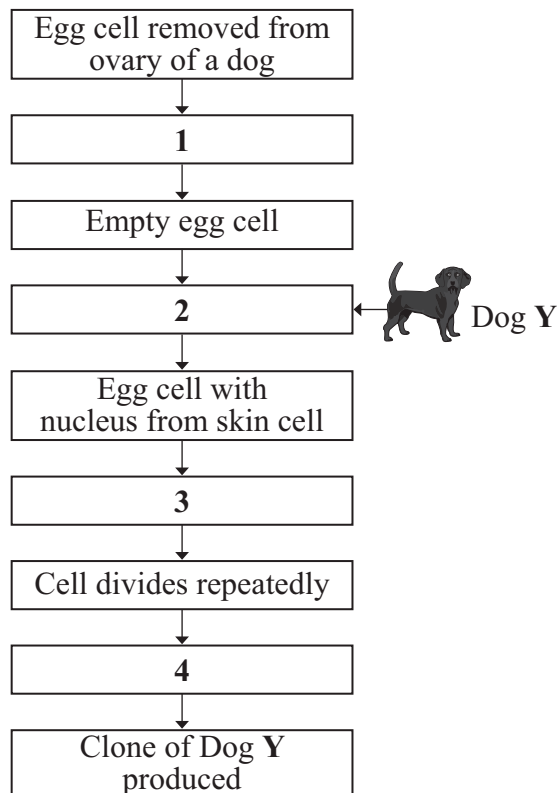
Mark your choices on the answer sheet.

QUESTION ONE

This question is about adult cell cloning.

Match stages, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram to explain how clones of dogs can be produced.

- A** nucleus transferred from skin cell of Dog **Y**
- B** electric shock applied
- C** ball of cells inserted into womb of female
- D** nucleus removed from egg cell



QUESTION TWO

This question is about evolution.

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

- A** mutation
- B** natural selection
- C** extinction
- D** variation

Evolution occurs by . . . **1**

It is a very slow process.

Individual organisms of a particular species have differences in their genes, so may show a wide . . . **2**

These organisms breed and pass on their genes to the next generation, so passing on their useful characteristics.

More rapid change in a species may result from . . . **3**

A new disease might cause . . . **4** . . . of the species.

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

Limpets can be found attached to rocks on beaches around Britain.

A group of students on a field trip measured the height and width of 10 limpets on a shore exposed to strong waves, then a further 10 limpets on a very sheltered shore.

The tables show their results.

Limpets from an exposed shore											
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Width in cm	2.8	2.1	2.8	2.3	2.6	1.9	2.5	2.6	2.5	2.9	2.5

3A The students wanted to draw a graph or chart to show all the data.

The best graph or chart to do this would be a . . .

- 1 bar chart.
- 2 line graph.
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3B What was the range in height of the limpets from the sheltered shore?

- 1 0.9 to 1.9
- 2 1.4 to 3.2
- 3 1.4 to 2.7
- 4 1.7 to 3.2

3C The data in the table shows that . . .

- 1 the biggest limpets are the oldest.
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3D From the information given, what is the most likely reason for the difference in the heights of the two populations of limpets?

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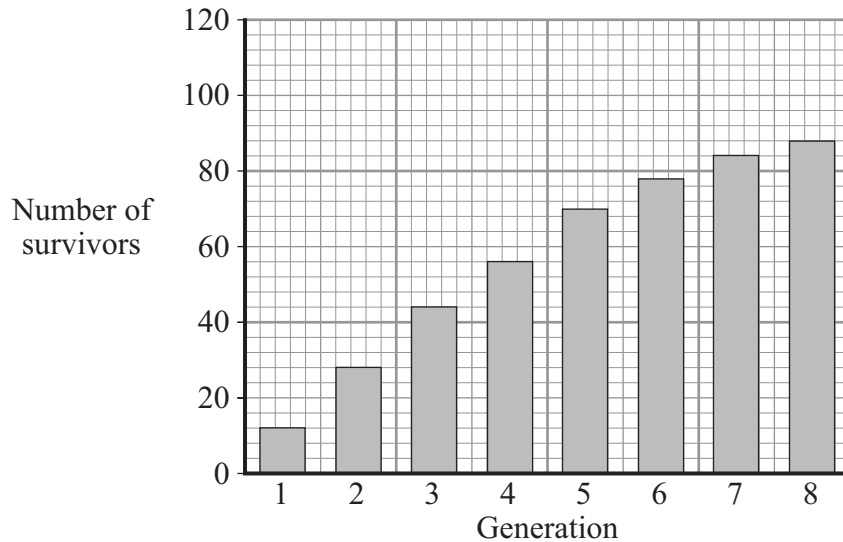
Turn over for the next question

Turn over ►

QUESTION FOUR

Greenflies are pests that feed on plants.

In a controlled experiment, 1000 greenflies were sprayed with an insecticide. Those that survived were counted. The survivors were allowed to breed until the population reached 1000 again. These were then sprayed and the survivors counted. This was done for eight generations.



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- 4 Insecticides save plant producers money.

Turn over for the next question

Turn over ►

QUESTION FIVE

Darwin and Lamarck produced different theories for the mechanism of evolution.

5A For a theory to become accepted there must be . . .

- 1 valid evidence to support it.
- 2 an investigation carried out.
- 3 agreement by all scientists.
- 4 considerable hearsay evidence.

5B For Lamarck's theory to be accepted, it would have to be established that . . .

- 1 the environment could affect the expression of the offspring's characteristics.
- 2 parents could affect the appearance of their offspring.
- 3 changes in an organism during its lifetime can be inherited.
- 4 the environment could select the characteristics of the offspring.

5C Darwin's theory for the mechanism of evolution was only gradually accepted by the general public because . . .

- 1 there was no scientific evidence to support it.
- 2 it undermined the idea that a God created all life on Earth.
- 3 it was based on hearsay evidence.
- 4 it is a religious theory.

5D Many scientists did not accept Darwin's theory because . . .

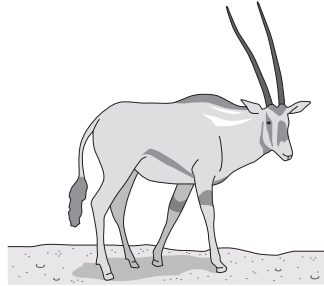
- 1 the mechanism of inheritance and variation was not known at that time.
- 2 no breeding experiments had been done.
- 3 there was no evidence of widespread variation amongst living organisms.
- 4 fossils had not yet been discovered.

Turn over for the next question

Turn over ►

QUESTION SIX

The picture shows an oryx. Oryx live in hot, dry deserts.



6A Oryx have very light coloured skin with short hairs.

How might their skin help to prevent oryx from overheating?

- 1 The light colour camouflages them.
- 2 The light colour reflects heat.
- 3 The short hairs trap heat.
- 4 The short hairs prevent sweat from evaporating.

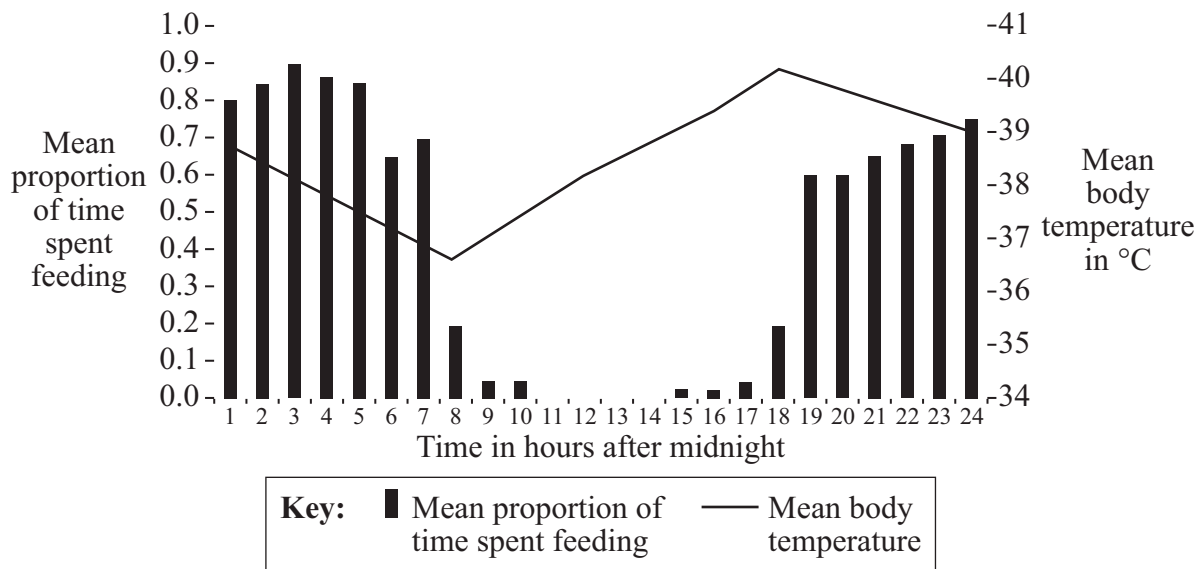
6B Oryx have a layer of fat under their skin.

How might this layer of fat help to prevent oryx from overheating?

- 1 It reduces the amount of heat absorbed into the body from the skin.
- 2 It increases the amount of heat radiated by the skin.
- 3 It increases the surface area of the skin.
- 4 It prevents sweat from rising to the surface of the skin.

Oryx spend part of their time resting in shade and the remainder of the time feeding.

The graph shows data from a group of 14 oryx.



6C This data shows that . . .

- 1 low body temperature increases the mean proportion of time spent feeding.
- 2 feeding causes the body temperature of oryx to rise.
- 3 feeding causes body temperature to rise during the day and to fall during the night.
- 4 there is no causal relationship between feeding and body temperature.

6D Most mammals maintain their body temperature constant at about 37°C.

The body temperature of oryx is allowed to rise to about 40°C during the day.

This helps oryx to survive in the hot, dry desert by . . .

- 1 allowing them to be more active during the day.
- 2 increasing the amount of heat lost via radiation.
- 3 enabling their food to be digested faster.
- 4 reducing the amount of water lost via sweating.

Turn over ►

QUESTION SEVEN

Corn borer insects damage corn crops. Genetically modified (GM) corn plants produce a poison which kills the corn borer insects. Experts say that corn borer insects will develop resistance to the poison within 3 to 4 years.

7A The first GM corn plant was produced by inserting genes from bacteria into the cells of an embryo corn plant.

These genes were ‘cut out’ from the bacteria by using . . .

- 1 enzymes.
- 2 gametes.
- 3 hormones.
- 4 chromosomes.

7B One advantage of using GM corn plants rather than normal corn plants is that . . .

- 1 insects will become resistant.
- 2 biodiversity is reduced.
- 3 less money is spent on pesticides.
- 4 all the offspring will be identical.

7C One disadvantage of using GM corn plants is that . . .

- 1 the corn borer will pass the gene on to other insects.
- 2 all insects which feed on the corn will become resistant.
- 3 corn borer predators might become extinct.
- 4 the corn plants cannot be eaten.

- 7D** Which of the following best describes how the corn borer insects might develop resistance?
- 1** A mutation in the corn plant allows the corn borer insects to eat the corn and survive to reproduce.
 - 2** An enzyme is produced which breaks down the poison.
 - 3** Resistant corn borer insects only mate with other resistant corn borer insects.
 - 4** Some corn plants become resistant to the predators of the corn borer insect.

Turn over for the next question

Turn over ►

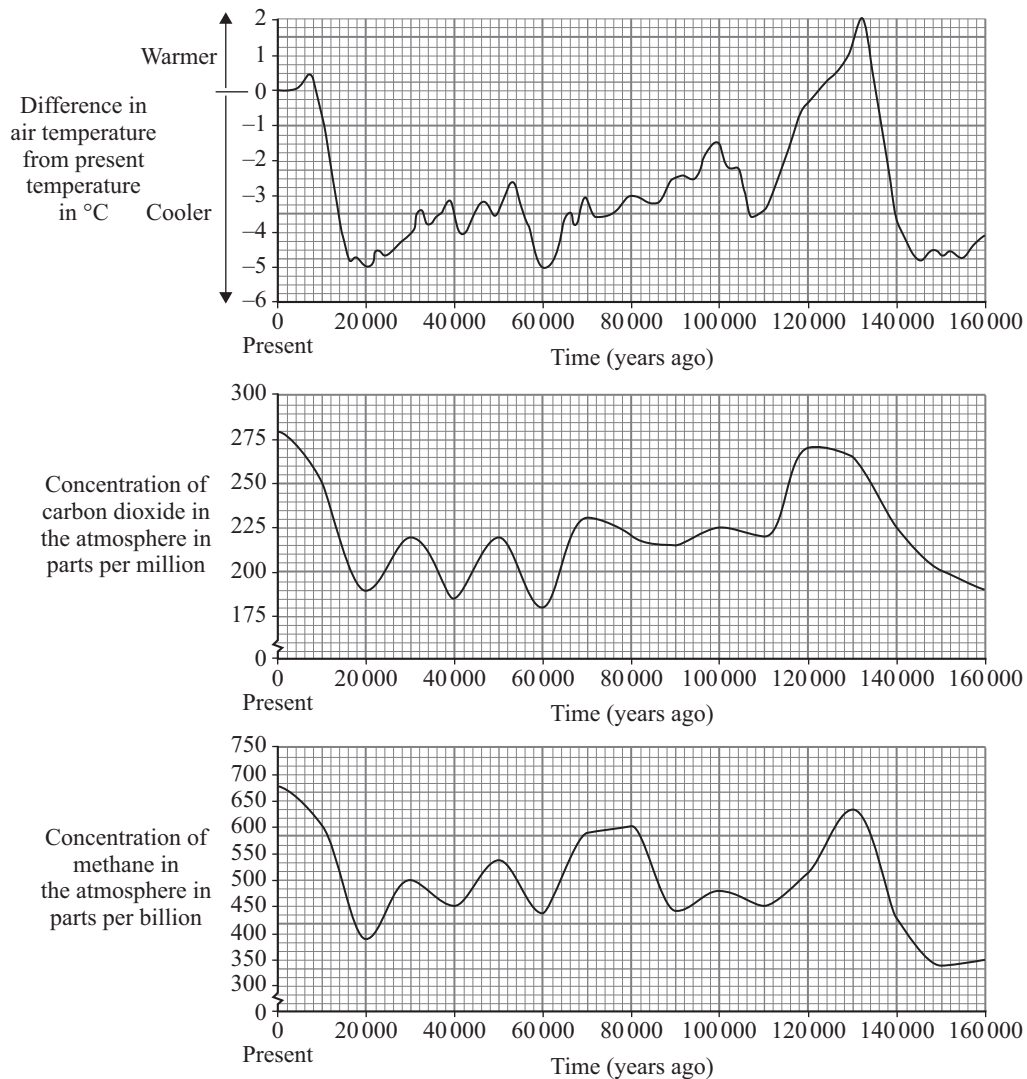
QUESTION EIGHT

This question is about pollution.

8A Which one of the following is **not** part of the greenhouse effect?

- 1 Greenhouse gases in the atmosphere trap some of the energy radiated by the Earth.
- 2 Most of the Sun's energy entering the Earth's atmosphere is trapped by greenhouse gases.
- 3 Some energy from the Earth's surface is radiated into the atmosphere.
- 4 Some of the radiation from the Sun is absorbed by the Earth's surface.

The graph shows the changes in the temperature of the Earth's atmosphere and the concentration of carbon dioxide and methane in the atmosphere over the last 160 000 years.



8B Which of the following is true of this data?

- 1 Every 20 000 years the concentration of carbon dioxide in the atmosphere increases by more than 50 parts per million.
- 2 Air temperature changed by 2°C between 60 000 and 80 000 years ago.
- 3 The air temperature rose between 0 and 20 000 years ago.
- 4 Between 120 000 and 130 000 years ago the concentration of methane fell by more than 50 parts per billion.

8C Which of the following conclusions can be drawn from this data?

- 1 An increase in carbon dioxide concentration causes an increase in the air temperature.
- 2 An increase in the air temperature causes an increase in the concentration of methane in the atmosphere.
- 3 There may be a link between air temperature and the concentration of carbon dioxide in the atmosphere.
- 4 There is no link between air temperature and the concentration of methane in the atmosphere.

8D Some scientists disagree about the causes of global warming.

What is the most likely reason for this?

- 1 They have not compared their data with that of other scientists.
- 2 They disagree about where in the world the data has been collected.
- 3 They have interpreted the data differently.
- 4 The instruments used to collect the data are not accurate enough.

Turn over for the next question

Turn over ►

QUESTION NINE

Before the mid-nineteenth century, almost all peppered moths in England were light coloured and were not easy to spot as they rested on light-coloured tree bark and lichens.

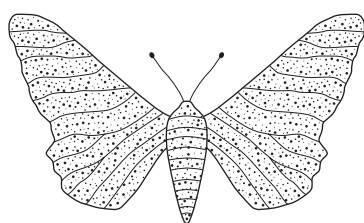
The burning of coal during the Industrial Revolution produced gases that killed many of the lichens and blackened the environment with soot.

It was during this period that the first sighting of the dark-coloured peppered moths were reported in 1848.

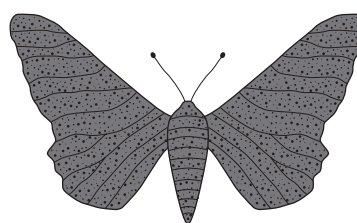
By 1895, the percentage of dark-coloured moths in industrial cities such as Manchester had risen from about 2% to around 95%.

Birds are the main predators for both types of moth.

The picture below shows the two forms of peppered moth.



Pale form
(light-coloured)



Dark form
(dark-coloured)

9A The most likely reason for the increase in the proportion of dark moths compared with pale moths in cities was . . .

- 1 better resistance to poisonous gases produced by burning coal.
- 2 birds preferred to eat the paler form.
- 3 good camouflage when resting on a blackened surface.
- 4 pollutants caused a reduction in the number of birds that eat moths.

9B In the past, some scientists have suggested that moths become darker in colour as a result of exposure to certain pollutants.

This is an example of . . .

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

- 9C** Scientists agree that the observed changes in the most common colour of the moths is an example of the process of natural selection.

This means that . . .

- 1 male moths in polluted areas select the colour of the female whose eggs they fertilise.
- 2 the darker moths have a better chance of survival in polluted areas and will be more common in the next generation.
- 3 the moths can select which colour to display in polluted areas to make themselves least visible.
- 4 the moths choose the colour of the trees that they rest on.

- 9D** Some scientists suggested that the darker moths had migrated (moved) into cities from the countryside.

To find out if this is correct we would need to know the numbers of . . .

- 1 dark moths that lived in the cities and in the countryside at the start of the Industrial Revolution and later in the nineteenth century.
- 2 pale and dark moths that lived in the cities at the start of the Industrial Revolution and later in the nineteenth century.
- 3 pale moths that lived in the countryside at the start of the Industrial Revolution.
- 4 pale moths that lived in the cities at the start of the Industrial Revolution and later in the nineteenth century.

END OF TEST

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