

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
June 2009



SCIENCE A
Unit Biology B1b (Evolution and Environment)

BLY1BP

BIOLOGY
Unit Biology B1b (Evolution and Environment)

Monday 22 June 2009 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

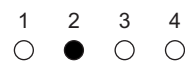
Instructions

- 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

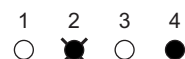
- Use a **black ball-point pen**.

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

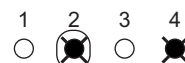


- Do **not** extend beyond the circles.

- 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**.

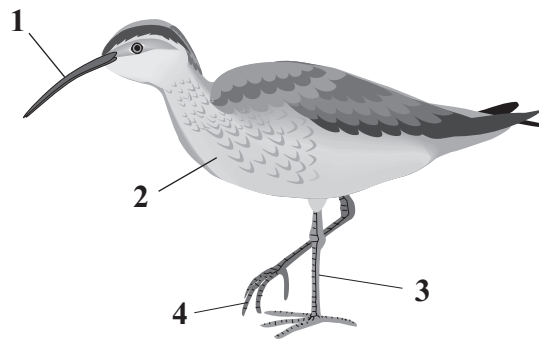
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The picture shows a bird which lives on sandy beaches. It feeds on animals that burrow into the sand.



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

- A** wide, to stop the bird from sinking into the sand
- B** long, to reach animals buried deep in the sand
- C** long, to help the bird to see predators approaching
- D** thick, to provide an insulating layer

QUESTION TWO

There are many ways in which we can help the environment.

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

- A** increasing the amount of glass and metal recycled
- B** increasing the amount of paper recycled
- C** improving insulation in homes
- D** extending the railway network

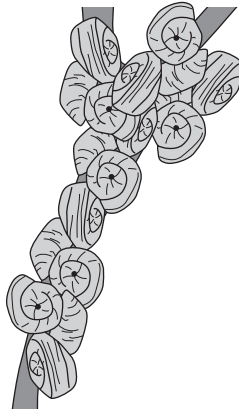
	Impact on the environment
1	fewer forests are cut down
2	fewer quarries are dug to provide raw materials
3	fewer car journeys are made
4	less electricity is used

Turn over for the next question

Turn over ►

QUESTION THREE

Banded snails live in woodland and grassland.



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

- A** evolution
- B** mutation
- C** selection
- D** variation

Banded snails have a wide range of different colours on their shells.

This wide range of colours is an example of . . . **1**

A change in a gene that gives a different colour is caused by . . . **2**

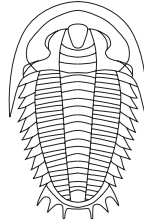
Birds only eat certain coloured snails. This is an example of . . . **3**

Over a long period of time, new species of snails develop. This is an example of . . . **4**

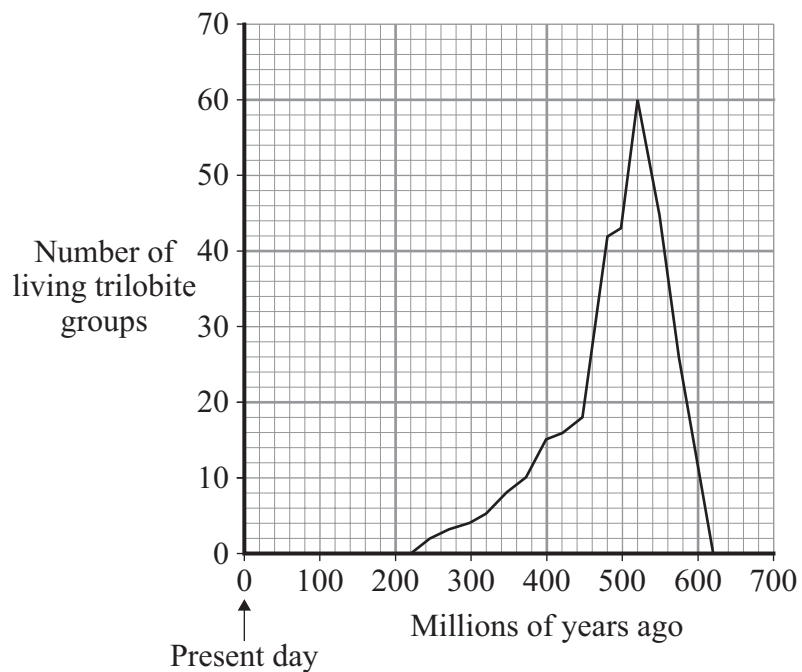
QUESTION FOUR

Trilobites are an extinct family of animals.

The drawing shows one species of trilobite.



The graph shows how the number of different groups of trilobites has changed over time.



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

- A** when trilobites first appeared on the Earth
- B** when trilobites had finally become extinct
- C** when there were most groups of trilobites
- D** the beginning of the largest scale extinction of trilobite groups.

	Millions of years ago
1	220
2	480
3	520
4	620

Turn over ►

QUESTION FIVE

There are several different methods of cloning animals and plants.

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

- A** adult cell cloning
- B** embryo transplants
- C** taking cuttings
- D** tissue culture

	Description of method of cloning
1	splitting apart cells from a developing animal and transplanting them into a host mother
2	placing a nucleus from a skin cell into an egg cell with no nucleus
3	using small groups of cells from part of a plant
4	producing many new plants from old plants quickly and cheaply

Turn over for the next question

Turn over ►

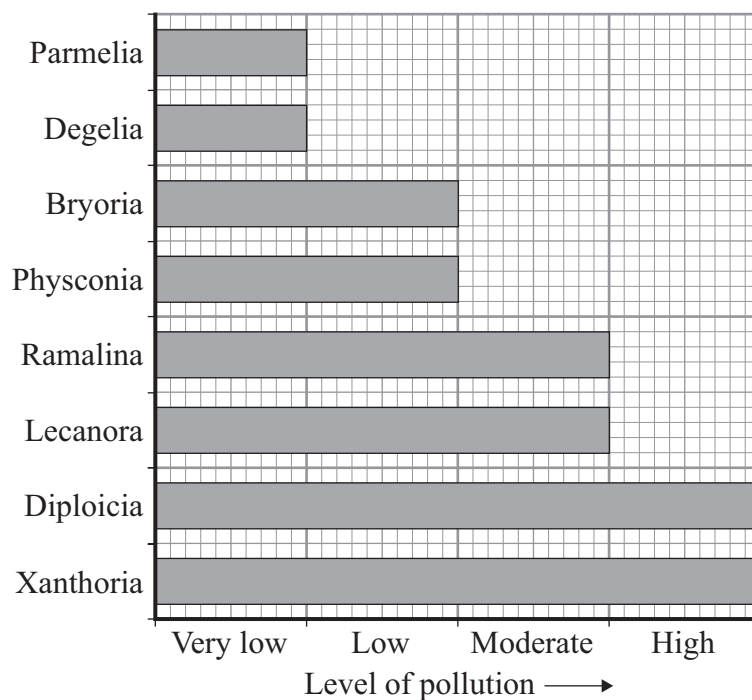
SECTION TWOQuestions **SIX** to **NINE**.

Each of these questions has four parts.

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

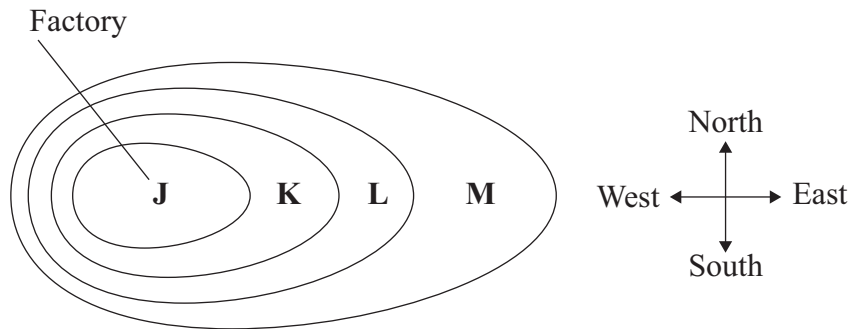
QUESTION SIX

The chart shows how much pollution different lichens can tolerate.

**6A** Which of the following lichens is most sensitive to pollution?

- 1 Degelia
- 2 Diploicia
- 3 Physconia
- 4 Ramalina

The diagram shows the distribution of lichens around a factory which burns coal.



6B In which direction does the wind blow the pollution?

- 1 towards the north
- 2 towards the east
- 3 towards the south
- 4 towards the west

6C Which row in the table shows a correct distribution of lichens?

	Lichen in area J	Lichen in area K	Lichen in area L	Lichen in area M
1	Xanthoria	Diploicia	Parmelia	Ramalina
2	Ramalina	Degelia	Bryoria	Physconia
3	Degelia	Bryoria	Lecanora	Xanthoria
4	Xanthoria	Lecanora	Bryoria	Parmelia

6D Lichens can be used to estimate levels of pollution from . . .

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

Turn over ►

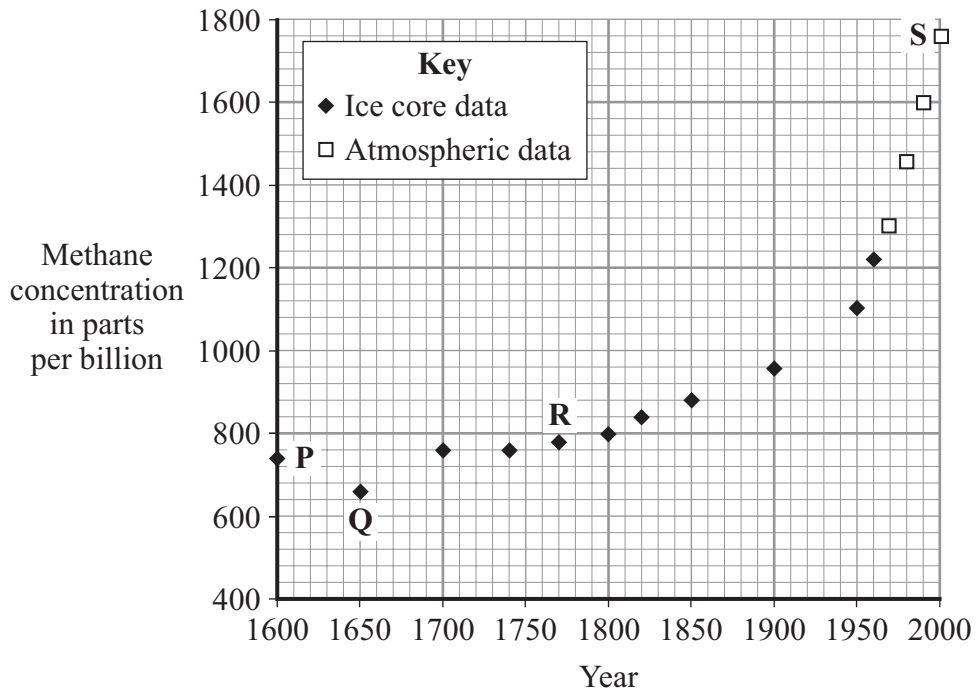
QUESTION SEVEN

Methane is a greenhouse gas.

7A The methane in the atmosphere is produced mainly by . . .

- 1 grass fields.
- 2 rice fields.
- 3 forests.
- 4 oceans.

The graph shows how the concentration of methane in the atmosphere changed between 1600 and 2000.



7B Which data point on the graph seems to be anomalous?

- 1 P
- 2 Q
- 3 R
- 4 S

7C Between 1600 and 2000, the concentration of methane in the atmosphere . . .

- 1 rose then fell.
- 2 rose at a constant rate.
- 3 rose slowly at first, then more rapidly.
- 4 rose rapidly at first, then more slowly.

7D The data for the years before 1970 is from air bubbles trapped in the ice in Antarctica.

The most likely reason that scientists use this data is because . . .

- 1 before 1970, scientists did not measure atmospheric methane concentration.
- 2 global warming did not begin until 1970.
- 3 Antarctica has been polluted in recent years, so measurements are no longer reliable.
- 4 it is more difficult to measure small concentrations of methane than large concentrations.

Turn over for the next question

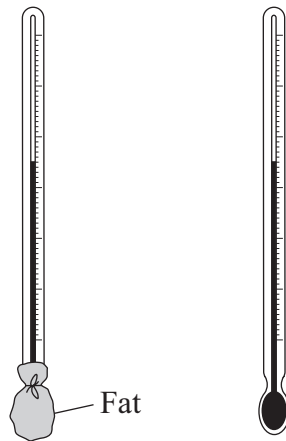
Turn over ►

QUESTION EIGHT

A student investigated fat as an insulator:

- he used two thermometers
- he wrapped fat around one thermometer
- the other thermometer had no fat wrapped around it
- he left both thermometers in a freezer set at -20°C .

The drawing shows the two thermometers before being put in the freezer.



The table shows his results.

	Temperature before placing in freezer in $^{\circ}\text{C}$	Temperature after being in freezer in $^{\circ}\text{C}$
Thermometer with no fat	20	-20
Thermometer wrapped in fat	20	7

8A Which idea was the student testing in this investigation?

- 1 Animals that live in the Arctic are better insulated.
- 2 Fat reduces heat loss.
- 3 The thicker the layer of fat, the better the insulation.
- 4 Animals with fat can survive lower temperatures.

8B The student wanted to calculate the rate of temperature change of the two thermometers.

To do this, he would also need to measure . . .

- 1 the temperature of the room.
- 2 the mass of the piece of fat.
- 3 the length of time that the thermometers were in the freezer.
- 4 the temperature of the freezer.

8C A scientist decided to investigate whether there was a link between where polar bears live and the thickness of their body fat.

To obtain reliable results, the scientist should survey . . .

- 1 polar bears of the same age.
- 2 polar bears and brown bears.
- 3 only polar bears living in the coldest temperatures.
- 4 polar bears at different times of the year.

8D Which one of the following would you expect the scientist to find in this survey?

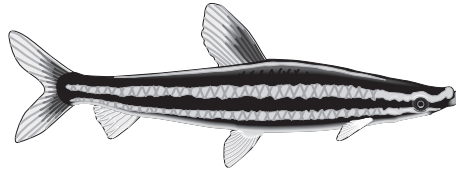
- 1 There is no link between thickness of body fat and environmental temperature.
- 2 Lower environmental temperatures cause polar bears to put on weight.
- 3 The colder the environmental temperature, the thicker the layer of fat.
- 4 The warmer the environmental temperature, the thicker the layer of fat.

Turn over for the next question

Turn over ►

QUESTION NINE

Zebra fish are small freshwater fish that can tolerate a wide range of environmental conditions. Scientists want to use zebra fish as an indicator species for different types of water pollution.



9A Scientists have extracted ‘glow’ genes from a jellyfish and transferred them into the eggs of a zebra fish.

What term describes this process?

- 1 cloning
- 2 genetic engineering
- 3 tissue culture
- 4 embryo transplant

9B Genes from jellyfish are transferred into zebra fish eggs by . . .

- 1 using a small pair of sharp scissors.
- 2 using enzymes.
- 3 mixing the gametes of jellyfish and zebra fish.
- 4 taking cytoplasm from a jellyfish egg and placing it into a zebra fish egg.

Zebra fish created by this process would glow with different colours, depending on the type of chemical pollution in the water. The table shows how this would work.

Colour	Type of chemical pollution			
	Pesticides	Fertilisers	Acidity	Herbicides
Red	✓			
Green			✓	
Yellow		✓		
Orange				✓

9C Zebra fish would glow green because of . . .

- 1 an increase in the sulfur dioxide content of the atmosphere.
- 2 a reduction in the carbon dioxide content of the atmosphere.
- 3 an increase in the methane content of the atmosphere.
- 4 an increase in the amount of chemicals used in agriculture.

9D In one river, different zebra fish glow red and orange.

This indicates that the river is polluted by . . .

- 1 chemicals released from industry.
- 2 smoke released from power stations.
- 3 chemicals washed off farmland.
- 4 sewage leaking from drains.

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

There are several different methods of cloning animals and plants.

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

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	Description of method of cloning
1	splitting apart cells from a developing animal and transplanting them into a host mother
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QUESTION TWO

There are several theories of how new species of plants and animals have developed.

The statements below outline four of these theories.

- **Creationism:** Each organism is made independently.
Evolution does not occur.
Gaps in the fossil record support this idea.
- **Intelligent Design:** Living things work in too complex a way for them to have evolved by chance.
A higher being has designed all living things.
- **Lamarckism:** Changes occur during the lifetime of an individual.
These changes can be passed on to offspring.
- **Darwinism:** Variation exists between members of a population.
Only the organisms best suited to a habitat survive.
Survivors pass on their advantages to their offspring.

Use the above information and your own knowledge and understanding to answer this question.

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

A Creationism

B Intelligent Design

C Lamarckism

D Darwinism

The idea that Manx cats, which have no tails, are the offspring of a cat which originally lost its tail in an accident could be used to support . . . **1**

Unsuccessful competitors die and so do not reproduce, is part of the theory of . . . **2**

The complicated way in which cells work can be used to support . . . **3**

The observation that fossils of all the different kinds of animals appear suddenly in the rocks, with no evidence of ancestors, supports . . . **4**

Turn over ►

SECTION TWO

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

Each of these questions has four parts.

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

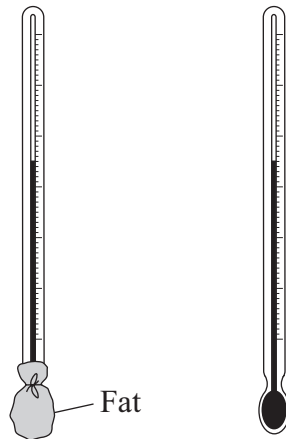
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QUESTION THREE

A student investigated fat as an insulator:

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3A Which idea was the student testing in this investigation?

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3B The student wanted to calculate the rate of temperature change of the two thermometers.

To do this, he would also need to measure . . .

- 1 the temperature of the room.
- 2 the mass of the piece of fat.
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3C A scientist decided to investigate whether there was a link between where polar bears live and the thickness of their body fat.

To obtain reliable results, the scientist should survey . . .

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- 4 polar bears at different times of the year.

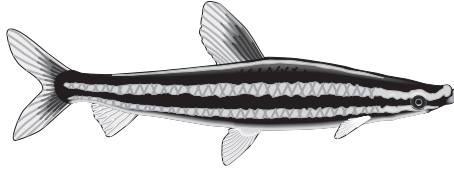
3D Which one of the following would you expect the scientist to find in this survey?

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Turn over ►

QUESTION FOUR

Zebra fish are small freshwater fish that can tolerate a wide range of environmental conditions. Scientists want to use zebra fish as an indicator species for different types of water pollution.



4A Scientists have extracted 'glow' genes from a jellyfish and transferred them into the eggs of a zebra fish.

What term describes this process?

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4B Genes from jellyfish are transferred into zebra fish eggs by . . .

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Green			✓	
Yellow		✓		
Orange				✓

4C Zebra fish would glow green because of . . .

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- 3 an increase in the methane content of the atmosphere.
- 4 an increase in the amount of chemicals used in agriculture.

4D In one river, different zebra fish glow red and orange.

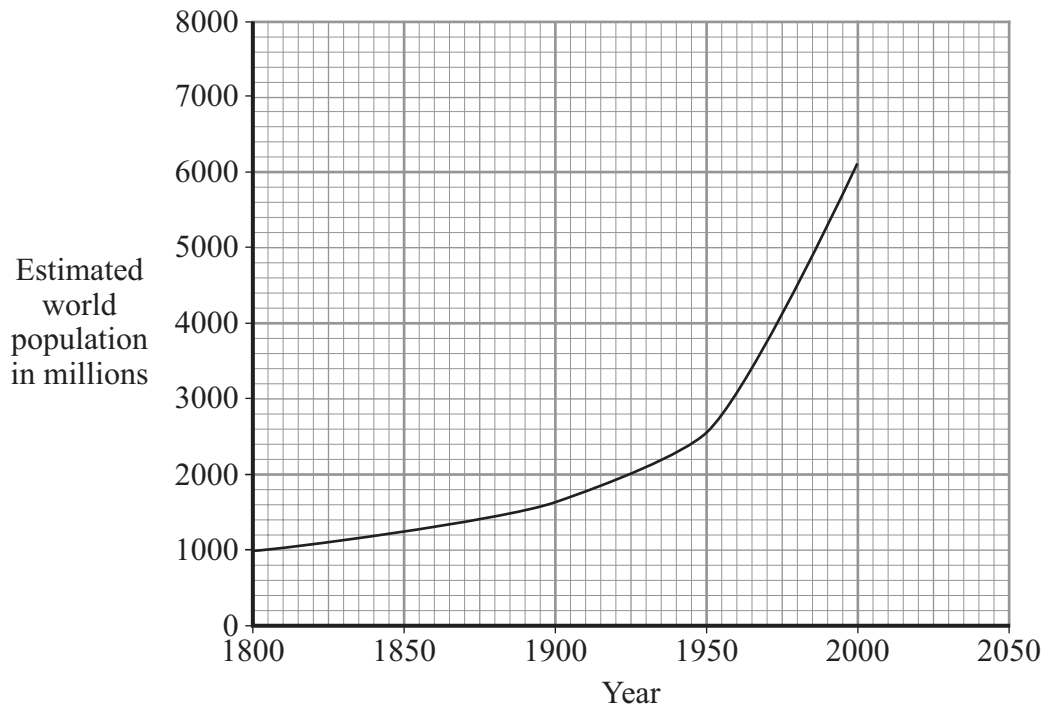
This indicates that the river is polluted by . . .

- 1 chemicals released from industry.
- 2 smoke released from power stations.
- 3 chemicals washed off farmland.
- 4 sewage leaking from drains.

Turn over ►

QUESTION FIVE

The graph shows changes in the estimated population of the world between 1800 and 2000.



5A During which time period was the growth in the human population most rapid?

- 1 1840 to 1880
- 2 1880 to 1920
- 3 1920 to 1960
- 4 1960 to 2000

5B One scientist suggested that if the population continued to increase at this rate, by 2025 it would be 8000 million.

This is an example of . . .

- 1 a conclusion.
- 2 a hypothesis.
- 3 a prediction.
- 4 evidence.

5C As the human population increases, more food is required.

To improve crop production, farmers may use herbicides on their crops.

What are herbicides used for?

- 1 to kill insects
- 2 to improve the quality of the soil
- 3 to provide nutrients for the crop plants
- 4 to kill weeds

5D We need to provide enough food for the increasing population of the world without damaging the environment and compromising future generations.

This is an example of . . .

- 1 intensive farming.
- 2 organic farming.
- 3 sustainable development.
- 4 genetic engineering.

Turn over for the next question

Turn over ►

QUESTION SIX

Read the extract from a newspaper.

Huge chunks of polar ice shelf breaking up

A chunk of ice the size of the Isle of Man has started to break away from Antarctica in what scientists say is further evidence of a warming climate.

6A The British Antarctic Survey (BAS) monitors the Antarctic ice shelves.

In 1993, a scientist predicted that this area of the ice shelf would be lost within 30 years if global temperatures continued to rise. He now says that it is happening more quickly than he expected.

What is the most likely reason for his inaccurate prediction?

- 1 He was biased.
- 2 He did not have enough evidence.
- 3 He made many errors when recording his data.
- 4 He did not want to alarm the public.

6B Which row in the table correctly indicates the human activities that contribute to global warming?

	Burning fossil fuels	Deforestation	Increasing the number of cattle reared for food	Increased recycling of paper
1	✓		✓	✓
2	✓	✓	✓	
3		✓	✓	✓
4	✓	✓		✓

6C What is the cause of global warming?

- 1 The Sun is getting hotter.
- 2 The hole in the ozone layer is letting more heat in.
- 3 Gases in the atmosphere absorb heat and radiate it back to Earth.
- 4 More heat is being released from power stations.

6D An increase in the Earth's temperature by only a few degrees will cause . . .

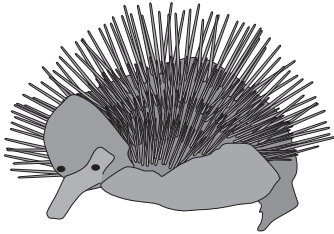
- 1 more volcanic eruptions.
- 2 more earthquakes.
- 3 more acid rain.
- 4 widespread flooding.

Turn over for the next question

Turn over ►

QUESTION SEVEN

The pictures show an echidna and a hedgehog.

Echidna**Hedgehog**

Read the information about echidnas and hedgehogs.

- Echidnas and hedgehogs look similar, but they are unrelated species.
- Echidnas live in Australia; hedgehogs live in many countries, including Britain.
- Both echidnas and hedgehogs are covered with sharp spines.
- Echidnas lay eggs; hedgehogs give birth to live babies.
- There is no evidence that echidnas have ever lived in Britain.
- There is no evidence that hedgehogs have ever lived in Australia.

7A The information above indicates that echidnas and hedgehogs . . .

- 1 have a similar diet.
- 2 have a similar life expectancy.
- 3 evolved from the same ancestor.
- 4 evolved spines completely independently of each other.

7B The information above suggests that echidnas and hedgehogs . . .

- 1 are adapted to similar environments.
- 2 have spines of the same length.
- 3 are the same colour.
- 4 have bodies that allow them to curl up into a ball.

7C The outer covering of echidnas and hedgehogs is an adaptation for . . .

- 1 attracting mates.
- 2 camouflage.
- 3 defence.
- 4 insulation.

7D The outer covering of the echidna and the hedgehog developed initially . . .

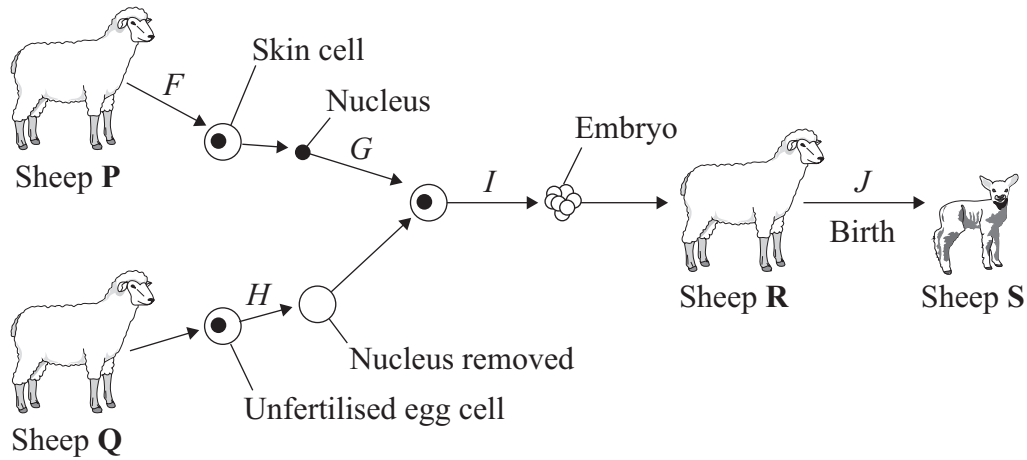
- 1 in response to changes in their environments.
- 2 as a result of being attacked by predators.
- 3 as a result of mutations.
- 4 as a result of variation.

Turn over for the next question

Turn over ►

QUESTION EIGHT

The diagram shows one way of producing sheep with the characteristics we prefer.



8A During this process, an electric shock is used in . . .

- 1 stage *F* only.
- 2 stage *G* and stage *H* only.
- 3 stage *I* only.
- 4 stage *I* and stage *J* only.

8B This method of producing sheep involves . . .

- 1 asexual reproduction.
- 2 sexual reproduction.
- 3 taking cuttings.
- 4 tissue culture.

8C Which sheep are genetically identical?

- 1 **P** and **R**
- 2 **Q** and **S**
- 3 **P** and **S**
- 4 **Q** and **P**

- 8D** This process is not carried out on humans because . . .
- 1** it is unethical to select the characteristics with which a human is born.
 - 2** it is more expensive than treating women with hormones.
 - 3** it would reduce the number of genes in the human population.
 - 4** humans have more complicated genetic information than sheep.

Turn over for the next question

Turn over ►

QUESTION NINE

Organic foods have become popular in recent years. They are grown without the use of pesticides and artificial fertilisers. But a government report in 2007 showed that the production of some organic foods is more damaging to the environment than their non-organic equivalents. However, supporters of organic farming claim that it is better than non-organic farming in conserving biodiversity and is better for the soil.

9A Biodiversity is . . .

- 1 the ability of plants and animals to adapt to a wide variety of different environments.
- 2 the ability of two plants or animals to live alongside each other for their mutual benefit.
- 3 the existence of a wide variety of plants and animals.
- 4 the existence of two different environmental adaptations of the same species of plant.

The table compares some of the effects of non-organic and organic food production on the environment.

Environmental effect and units	Amount in kg of production on farm					
	Sheep meat		Chicken		Milk	
	Non-organic	Organic	Non-organic	Organic	Non-organic	Organic
Energy used in MJ	23	18	12	16	2.5	1.6
Global warming potential in grams of CO ₂ equivalent	17 400	10 100	4 750	6 680	1 060	1 230
Freshwater pollution by fertiliser potential in grams of phosphate equivalent	200	584	49	86	6.3	10.3
Acidification potential in grams of sulfur dioxide equivalent	380	1 510	173	264	16.2	26.4
Land use in hectares	0.0014	0.003	0.64	1.4	0.001	0.002

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9B The information in the table indicates that . . .

- 1 all organic food production uses more energy than non-organic farming methods.
- 2 changing completely to organic methods will at least double the amount of land used for food production.
- 3 organic food production improves the environment.
- 4 organic farming reduces the amount of pollution resulting from sulfur dioxide.

- 9C** A change from non-organic farming methods to the organic production of chicken and milk may . . .
- 1 contribute to an increase in acid rain.
 - 2 help to reduce pollution of freshwater.
 - 3 help to reduce global warming.
 - 4 reduce the amount of energy consumed in the production of the food.
- 9D** Which of the foods in the table is responsible for the greatest increase in environmental pollution when it is produced organically rather than non-organically?
- 1 sheep meat
 - 2 chicken
 - 3 milk
 - 4 it is impossible to tell from this data

END OF TEST

There are no questions printed on this page

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Question 9A – Data from report on “Determining the environmental burdens and resource use in the production of agricultural and historical commodities” by Cranfield University on behalf of DEFRA.

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