

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Foundation Tier and Higher Tier
March 2012

Science A

Unit Biology B1b (Evolution and Environment)

Biology

Unit Biology B1b (Evolution and Environment)

BLY1BP
F&H

Thursday 1 March 2012 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

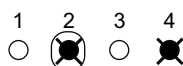
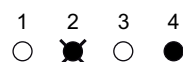
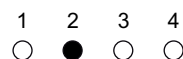
- 30 minutes

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**.

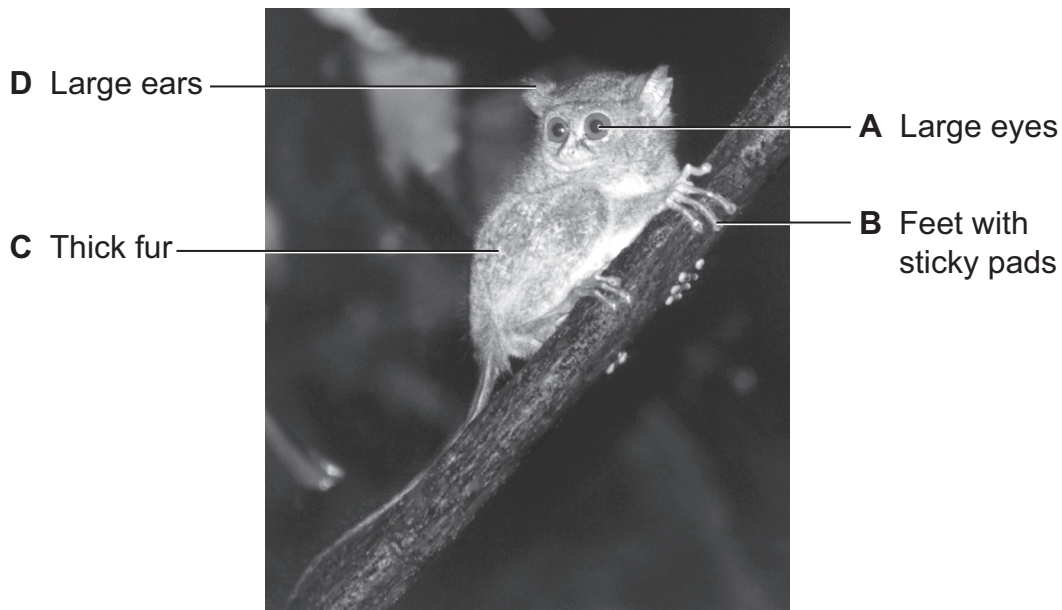
In these questions, match the letters, **A**, **B**, **C** and **D**, with the numbers **1–4**.

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

Mark your choices on the answer sheet.

QUESTION ONE

The photograph shows a tarsier. Tarsiers eat insects at night.

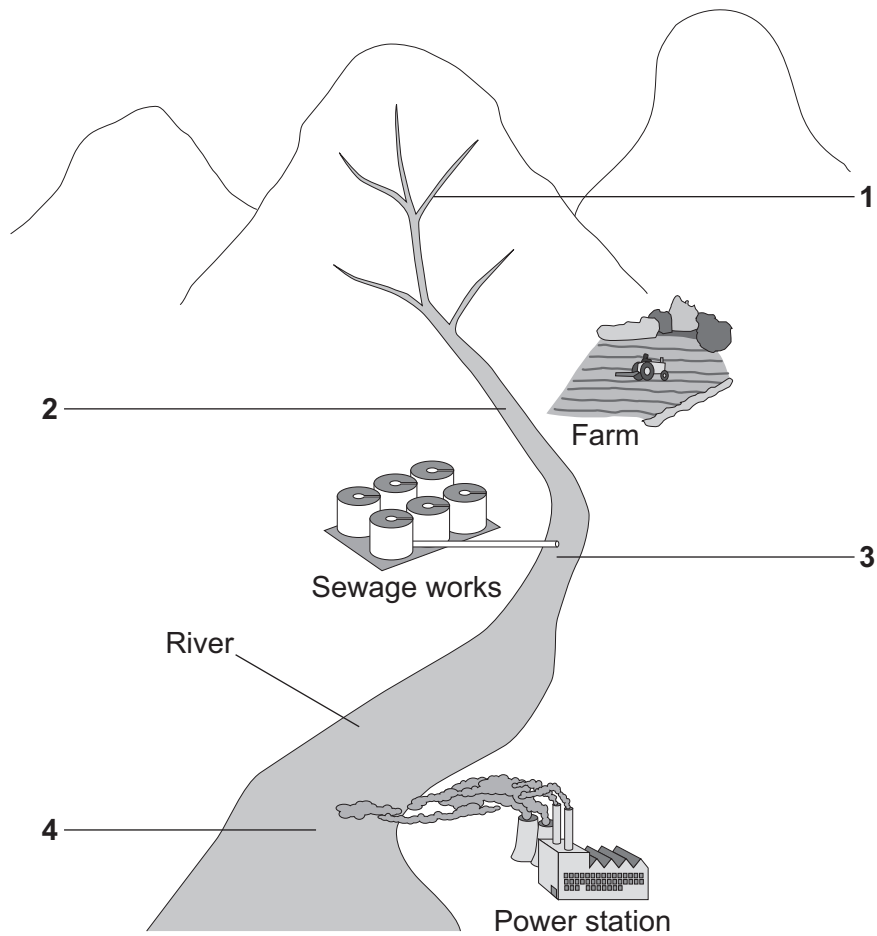


Match labels, **A**, **B**, **C** and **D**, with the adaptations **1–4** in the table.

	Adaptation
1	protects the tarsier against low temperatures at night
2	helps the tarsier to see its prey
3	helps to stop the tarsier from falling out of trees
4	helps the tarsier to find insects using the sound which the insects make

QUESTION TWO

The drawing shows a map of a river.



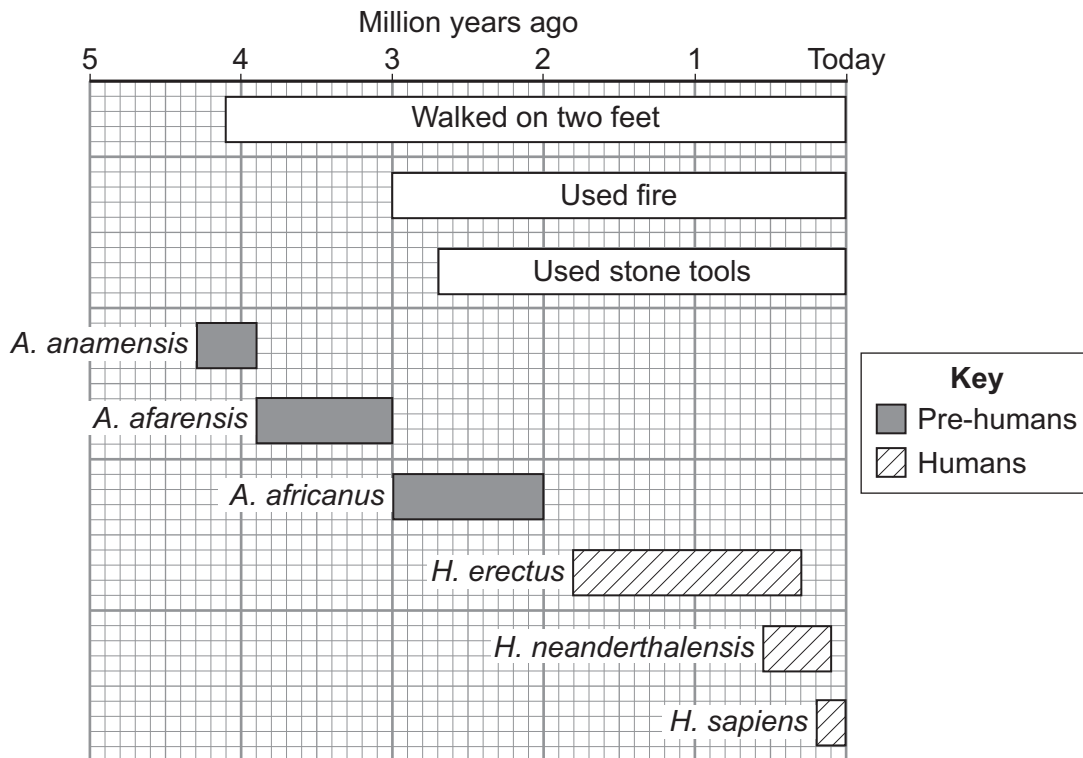
Match statements, **A**, **B**, **C** and **D**, with the labels **1–4** on the drawing.

- A** where water becomes polluted by pesticide
- B** where water contains very little oxygen
- C** where there are no lichens growing on trees near the river
- D** where the water is least polluted

Turn over ►

QUESTION THREE

The diagram shows a timeline for the evolution of humans.



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

- A** 1.5
- B** 2.7
- C** 3.0
- D** 4.3

The first pre-human appeared . . . **1** . . . million years ago.

A. afarensis became extinct . . . **2** . . . million years ago.

H. erectus was alive on earth for . . . **3** . . . million years.

Stone tools were first used . . . **4** . . . million years ago.

QUESTION FOUR

Evolution occurs as a result of natural selection.

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

A characteristics

B mutations

C genes

D survival

Individuals in a species show a wide range of . . . **1**

This range is because of differences in their . . . **2**

These differences are caused by . . . **3**

Those individuals most suited to the environment are likely to have a better chance of . . . **4**

Turn over for the next question

Turn over ►

QUESTION FIVE

There are several methods of reproduction.

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

- A** asexual reproduction
- B** adult cell cloning
- C** genetic engineering
- D** sexual reproduction

	Description
1	replacing the nucleus of an unfertilised egg with the nucleus from a different cell
2	removing a gene for insulin from human cells and inserting this gene into a bacterium
3	producing offspring naturally with a mixture of genetic information from two parents
4	producing identical offspring from only one parent

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

Students investigated competition between marigold seedlings and zinnia seedlings.

- They filled four similar plant pots, **W**, **X**, **Y** and **Z**, with the same mass of soil.
- They planted different numbers of seeds in each pot, as shown in **Table 1**.

Table 1

Pot	Number of seeds planted	
	Marigold	Zinnia
W	5	5
X	5	50
Y	50	5
Z	50	50

- They left the pots on a window ledge in the laboratory for six weeks.
- On every school day, they gave each pot the same volume of water.
- After six weeks, they removed the seedlings from the pots and weighed the seedlings.

6A One of the independent variables in this investigation was . . .

- 1 the size of a pot.
- 2 the mass of the soil.
- 3 the volume of water.
- 4 the number of seeds planted.

Table 2 shows the results of the investigation.

Table 2

Pot	Total mass of seedlings after six weeks in g	
	Marigold	Zinnia
W	9.46	13.8
X	5.02	56.76
Y	42.13	4.28
Z	29.06	27.19

6B The greatest mass of seedlings in a pot was the mass of . . .

- 1 marigold seedlings in pot **Y**.
- 2 zinnia seedlings in pot **X**.
- 3 marigold seedlings in pot **Z**.
- 4 zinnia seedlings in pot **Z**.

6C The smallest total mass of seedlings was in pot **W**.

This was because . . .

- 1 there was most competition in pot **W**.
- 2 pot **W** received least light.
- 3 pot **W** received least water.
- 4 there were the fewest seeds planted in pot **W**.

6D Which one of the following is the best conclusion from this investigation?

- 1 The lower the number of seedlings per pot, the bigger each seedling grows.
- 2 Zinnia seedlings always grow bigger than marigold seedlings.
- 3 50 seedlings in a pot each grow bigger than 5 seedlings in a pot.
- 4 Zinnia is always a better competitor than marigold.

Turn over ►

QUESTION SEVEN

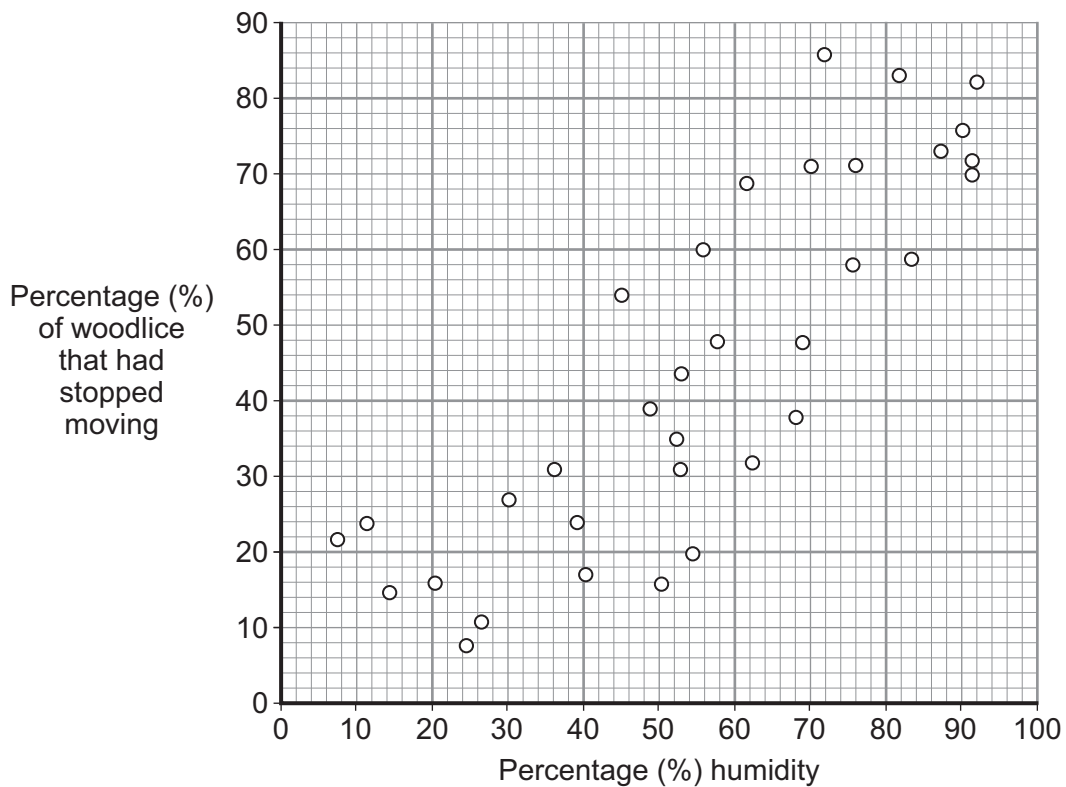
Woodlice are small animals that are usually found under stones.

A scientist investigated the idea that woodlice need a high humidity (large amount of water vapour in the atmosphere) to survive.

The scientist used apparatus in which the humidity could be changed.

- She put 50 woodlice in the apparatus, then placed the apparatus in a dark place.
- She waited for 15 minutes, then counted the number of woodlice that had stopped moving.
- She repeated the above procedure at a range of different humidities.

Her results are shown below.



7A The data is plotted as a . . .

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

7B At what percentage humidity had 60 % of the woodlice stopped moving after 15 minutes?

- 1 20 %
- 2 56 %
- 3 71 %
- 4 86 %

7C The data shows that . . .

- 1 there is an association between humidity and movement in the woodlice.
- 2 there is a direct relationship between humidity and movement in the woodlice.
- 3 there is no relationship between humidity and movement in the woodlice.
- 4 the higher the humidity, the faster the woodlice move.

7D Living under stones . . .

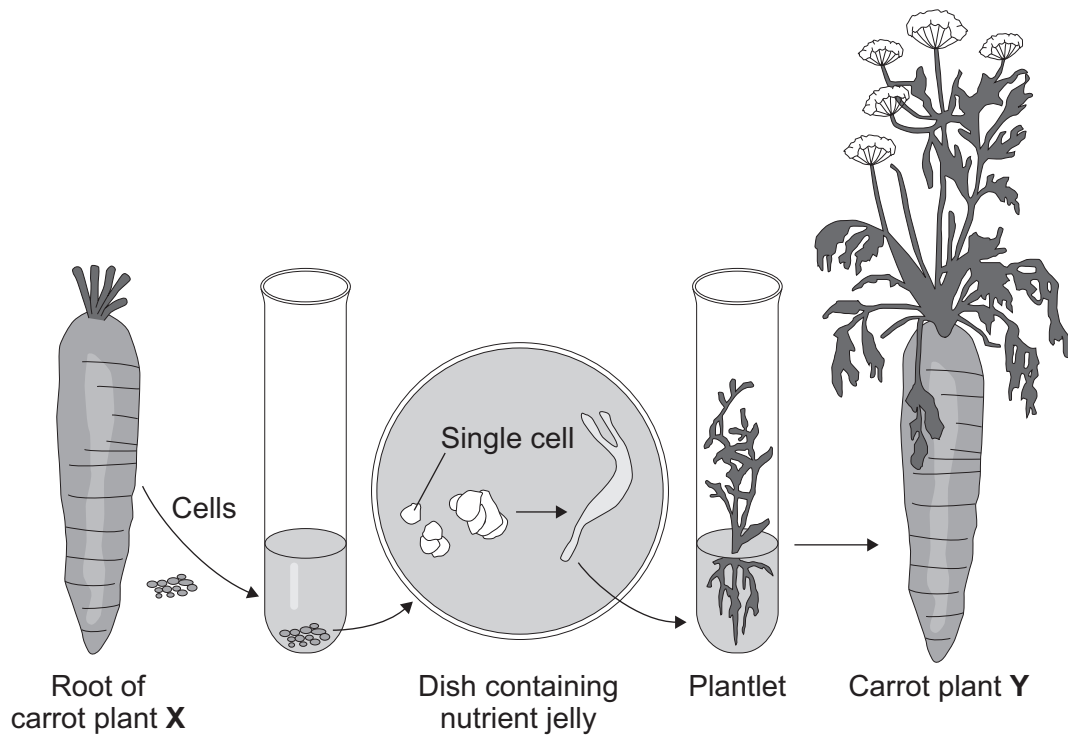
- 1 helps the woodlice to find food.
- 2 protects the woodlice from predators.
- 3 helps the woodlice to dry out.
- 4 helps the woodlice to have a wide territory.

Turn over for the next question

Turn over ►

QUESTION EIGHT

The drawing shows one way in which scientists can produce carrot plants.



8A This method of producing carrot plants involves . . .

- 1 splitting apart embryos.
- 2 taking cuttings.
- 3 tissue culture.
- 4 fusing gametes.

8B Carrot plants X and Y are known as . . .

- 1 chromosomes.
- 2 clones.
- 3 embryos.
- 4 gametes.

8C The orange colour of a carrot is a . . .

- 1 characteristic.
- 2 chromosome.
- 3 gene.
- 4 nucleus.

8D A new variety of carrot could be produced by . . .

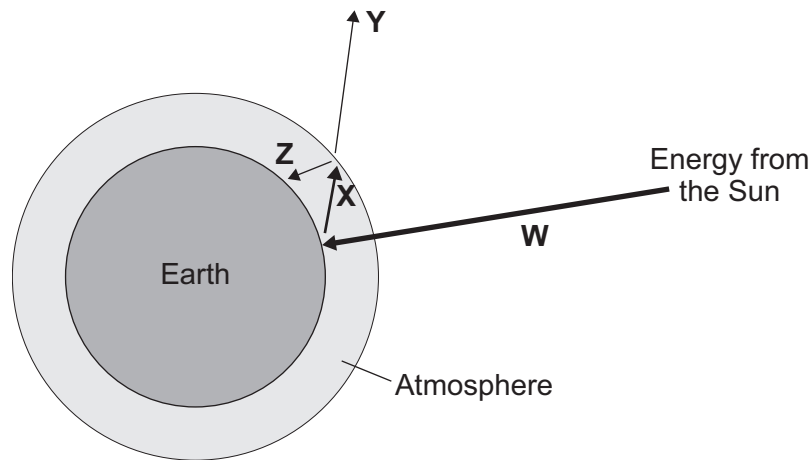
- 1 adult cell cloning.
- 2 asexual reproduction.
- 3 sexual reproduction.
- 4 taking cuttings.

Turn over for the next question

Turn over ►

QUESTION NINE

This diagram shows what happens to energy from the Sun when the energy reaches the Earth.



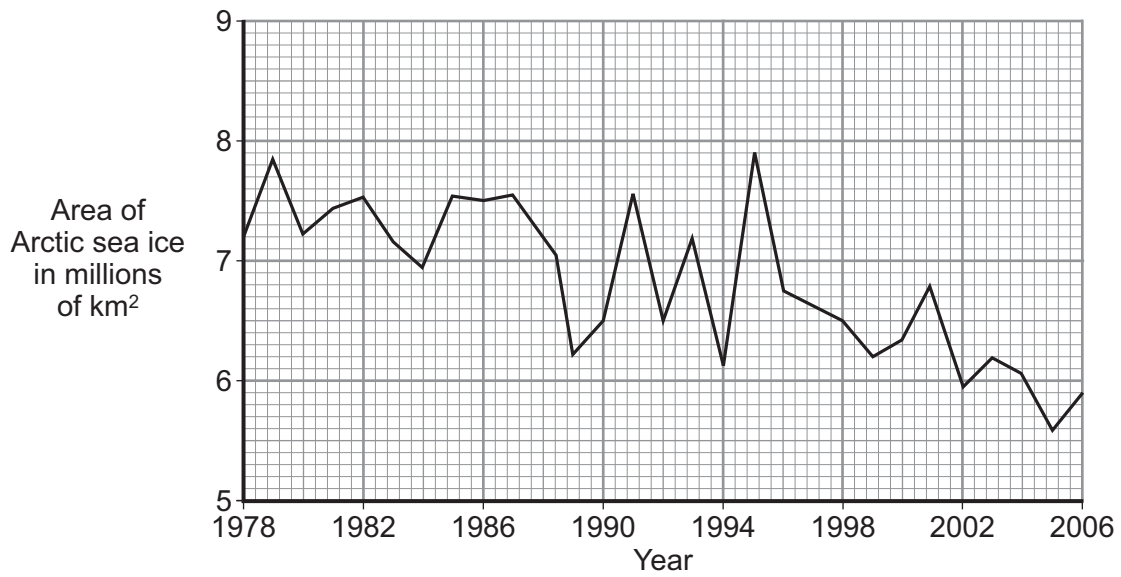
9A Which line shows energy re-radiated back to Earth?

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

9B As the amount of greenhouse gases in the atmosphere increases, the amount of energy labelled Y . . .

- 1 increases because less energy is absorbed by the atmosphere.
- 2 decreases because more energy is absorbed by the atmosphere.
- 3 increases because more energy is absorbed by the atmosphere.
- 4 decreases because less energy is absorbed by the atmosphere.

The graph shows changes in the area of Arctic sea ice between 1978 and 2006.



9C The reduction in the area of Arctic sea ice between 1978 and 2006 was . . .

- 1 1.3 million km²
- 2 1.8 million km²
- 3 2.1 million km²
- 4 2.4 million km²

9D Loss of Arctic sea ice is directly caused by . . .

- 1 increasing sea temperatures.
- 2 increasing levels of carbon dioxide in the atmosphere.
- 3 changes in the Earth's climate.
- 4 rising sea level.

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 methods of reproduction.

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

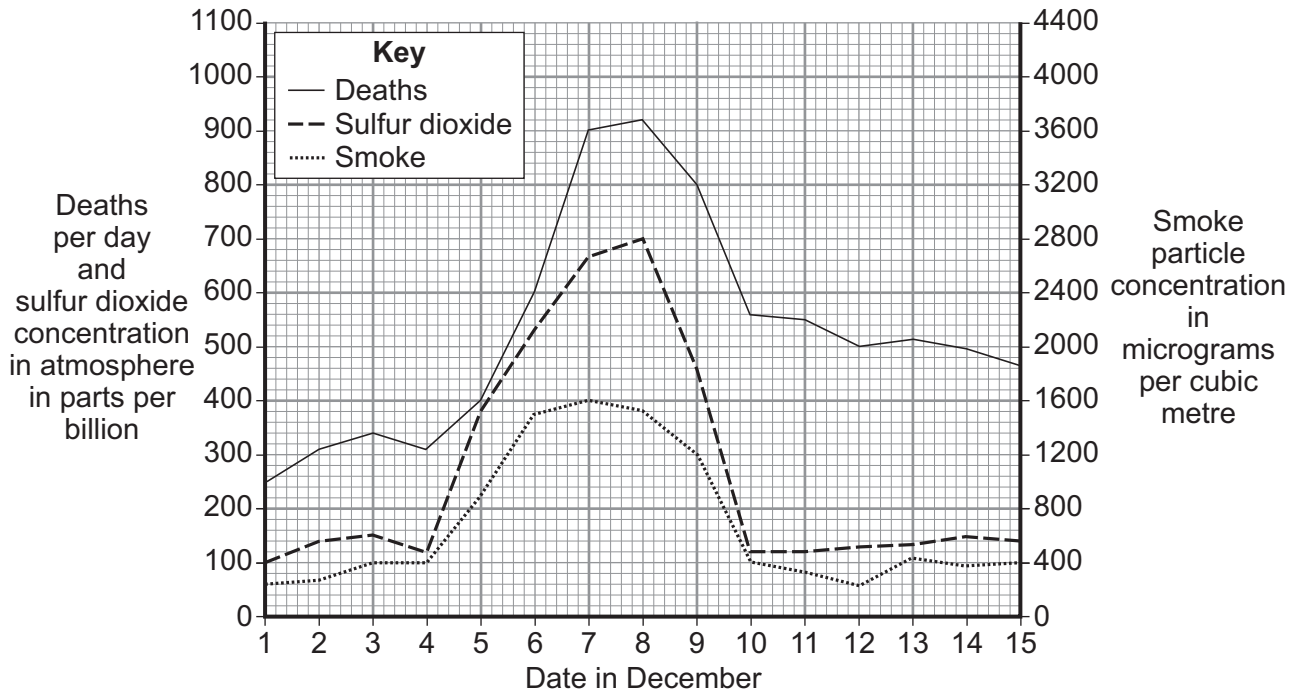
- A** asexual reproduction
- B** adult cell cloning
- C** genetic engineering
- D** sexual reproduction

	Description
1	replacing the nucleus of an unfertilised egg with the nucleus from a different cell
2	removing a gene for insulin from human cells and inserting this gene into a bacterium
3	producing offspring naturally with a mixture of genetic information from two parents
4	producing identical offspring from only one parent

QUESTION TWO

Thick, polluted fog caused many deaths in London in December 1952. The fog lasted from 4 December to 10 December.

The graph shows the relationship between these deaths and the amounts of smoke and sulfur dioxide in the atmosphere.



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

- A** 300
- B** 550
- C** 700
- D** 1600

1	the concentration of smoke particles on 7 December in micrograms per cubic metre
2	the maximum concentration of sulfur dioxide in parts per billion
3	the increase in the number of deaths per day between 1 December and 9 December
4	the average number of deaths per day on the days before the fog

Turn over ►

Section TwoQuestions **THREE** to **NINE**.

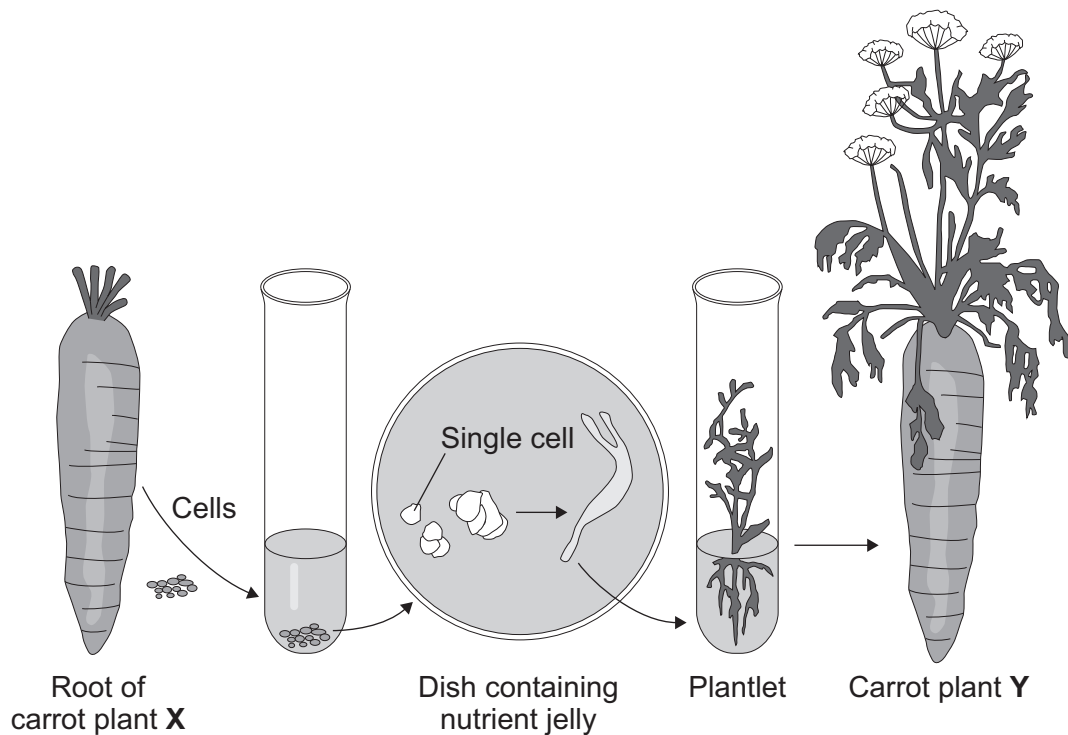
Each of these questions has four parts.

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

Mark your choices on the answer sheet.

QUESTION THREE

The drawing shows one way in which scientists can produce carrot plants.

**3A** This method of producing carrot plants involves . . .

- 1 splitting apart embryos.
- 2 taking cuttings.
- 3 tissue culture.
- 4 fusing gametes.

3B Carrot plants **X** and **Y** are known as . . .

- 1 chromosomes.
- 2 clones.
- 3 embryos.
- 4 gametes.

3C The orange colour of a carrot is a . . .

- 1 characteristic.
- 2 chromosome.
- 3 gene.
- 4 nucleus.

3D A new variety of carrot could be produced by . . .

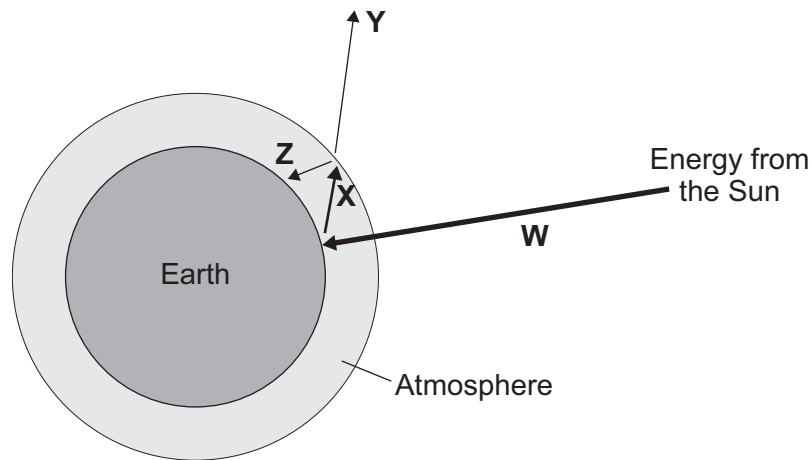
- 1 adult cell cloning.
- 2 asexual reproduction.
- 3 sexual reproduction.
- 4 taking cuttings.

Turn over for the next question

Turn over ►

QUESTION FOUR

This diagram shows what happens to energy from the Sun when the energy reaches the Earth.



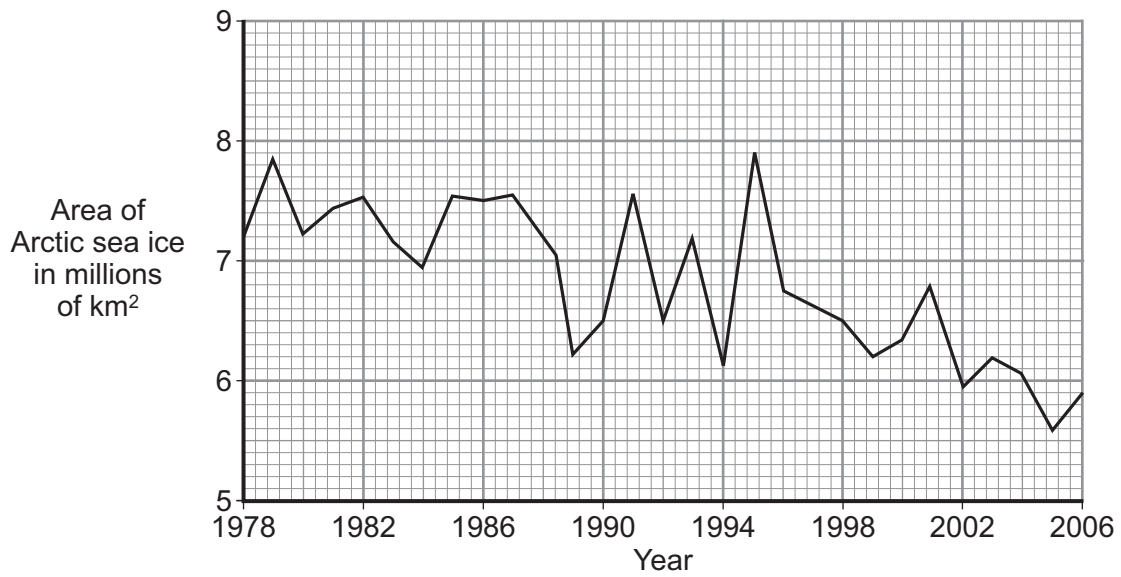
4A Which line shows energy re-radiated back to Earth?

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

4B As the amount of greenhouse gases in the atmosphere increases, the amount of energy labelled Y . . .

- 1 increases because less energy is absorbed by the atmosphere.
- 2 decreases because more energy is absorbed by the atmosphere.
- 3 increases because more energy is absorbed by the atmosphere.
- 4 decreases because less energy is absorbed by the atmosphere.

The graph shows changes in the area of Arctic sea ice between 1978 and 2006.



4C The reduction in the area of Arctic sea ice between 1978 and 2006 was . . .

- 1 1.3 million km²
- 2 1.8 million km²
- 3 2.1 million km²
- 4 2.4 million km²

4D Loss of Arctic sea ice is directly caused by . . .

- 1 increasing sea temperatures.
- 2 increasing levels of carbon dioxide in the atmosphere.
- 3 changes in the Earth's climate.
- 4 rising sea level.

Turn over ►

QUESTION FIVE

On a field trip to a rocky seashore, students saw a limestone ledge. No seaweed was growing on the limestone ledge. Seaweed grows well on the rest of the shore. The students were asked to suggest explanations for the lack of seaweed on the limestone ledge.

Their ideas included:

- The seaweed cannot grow on the ledge because of wave action.
- The ledge is slightly higher and drier than the rest of the shore.
- The limpets (snail-like animals) living on the ledge eat the seaweed.
- Seaweed cannot grow on limestone.

5A The students' ideas about the seaweed are examples of . . .

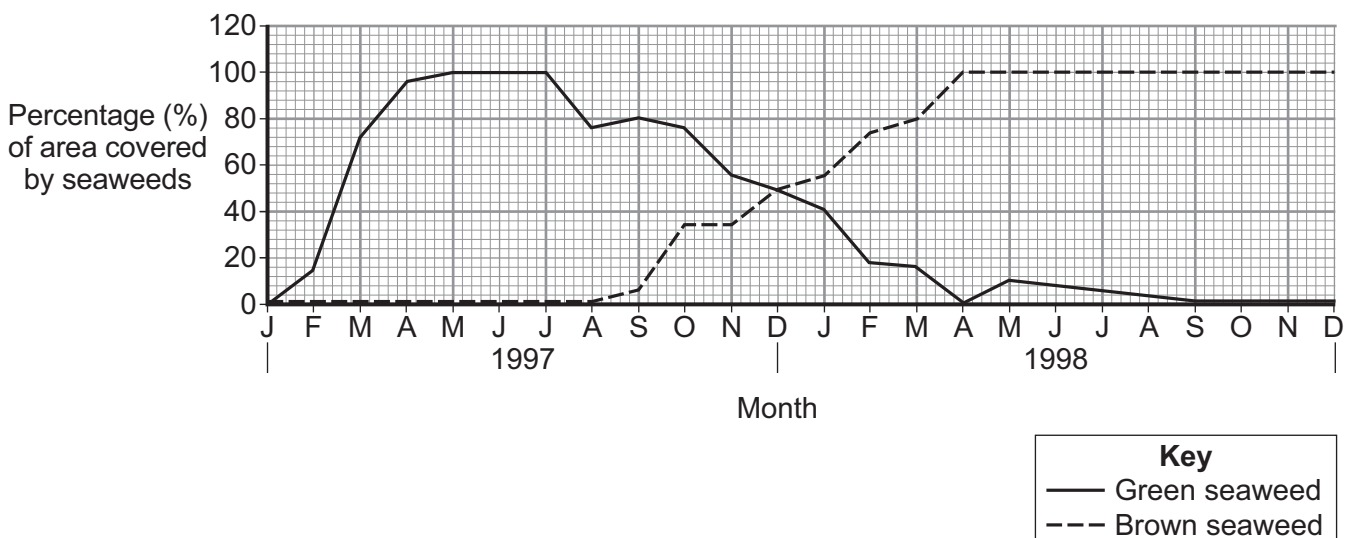
- 1 conclusions.
- 2 hypotheses.
- 3 predictions.
- 4 theories.

A student investigated one of the ideas.

The student:

- fenced off a 0.25m^2 area on the limestone ledge in January
- took all the limpets from the fenced-off area
- recorded the area the seaweeds covered each month until December in the following year.

The graph shows the student's results.



5B Which statement best describes changes in the area covered by the green seaweed?

- 1 The area covered increased rapidly then decreased slowly.
- 2 The area covered increased slowly then decreased rapidly.
- 3 The area covered did not increase for seven months, then increased rapidly.
- 4 The area covered stayed constant for seven months then decreased.

5C The green seaweed grows flat on the rock.
The brown seaweed grows tall and upright.

From this information and the data in the graph, the brown seaweed is the more successful competitor for . . .

- 1 light.
- 2 nutrients.
- 3 oxygen.
- 4 water.

5D Which of the students' ideas does the data in the graph support?

- 1 The seaweed cannot grow on the ledge because of wave action.
- 2 The ledge is slightly higher and drier than the rest of the shore.
- 3 The limpets living on the ledge eat the seaweed.
- 4 Seaweed cannot grow on limestone.

Turn over for the next question

Turn over ►

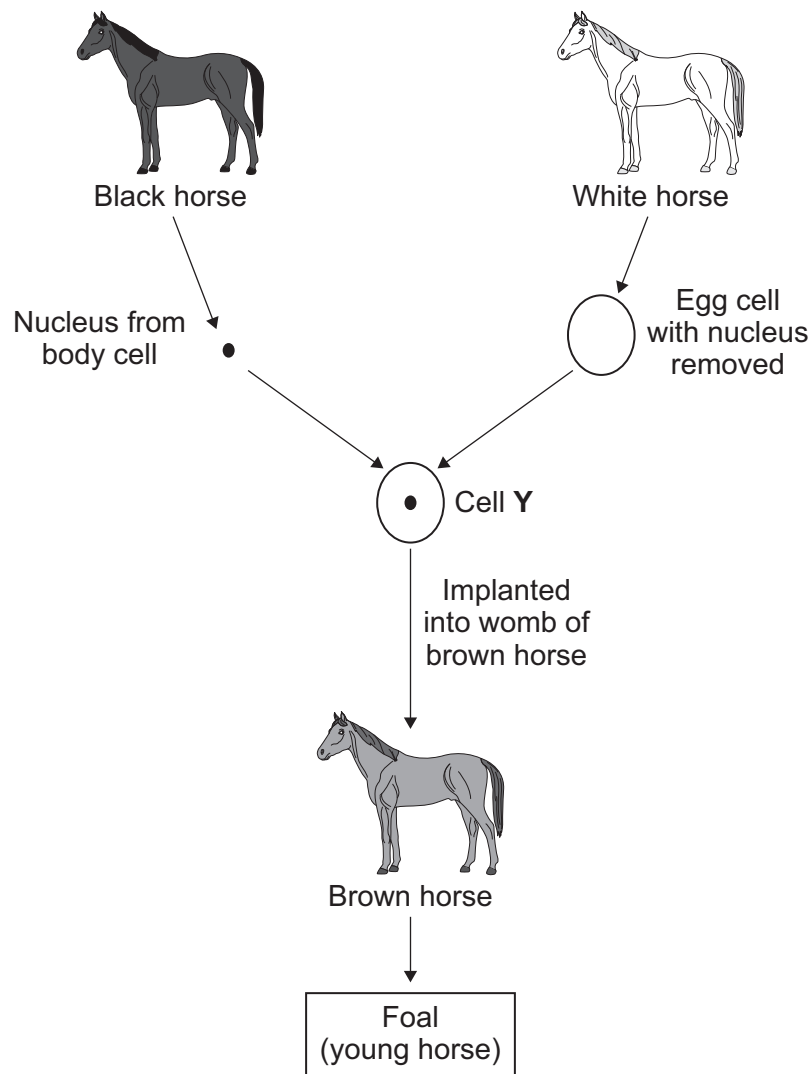
QUESTION SIX

In horses, coat colour is an inherited characteristic.

6A The inheritance of coat colour in horses is controlled by . . .

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

The diagram shows one way of reproducing horses.



6B To complete this process, cell **Y** must receive special treatment.

The special treatment involves . . .

- 1 adding hormones.
- 2 giving an electric shock.
- 3 cutting out genes using enzymes.
- 4 heat.

6C Cell **Y** first divides to form . . .

- 1 egg cells.
- 2 embryo cells.
- 3 nerve cells.
- 4 skin cells.

6D What colour will the coat of the foal be?

- 1 black
- 2 brown
- 3 white
- 4 a mixture of black, brown and white

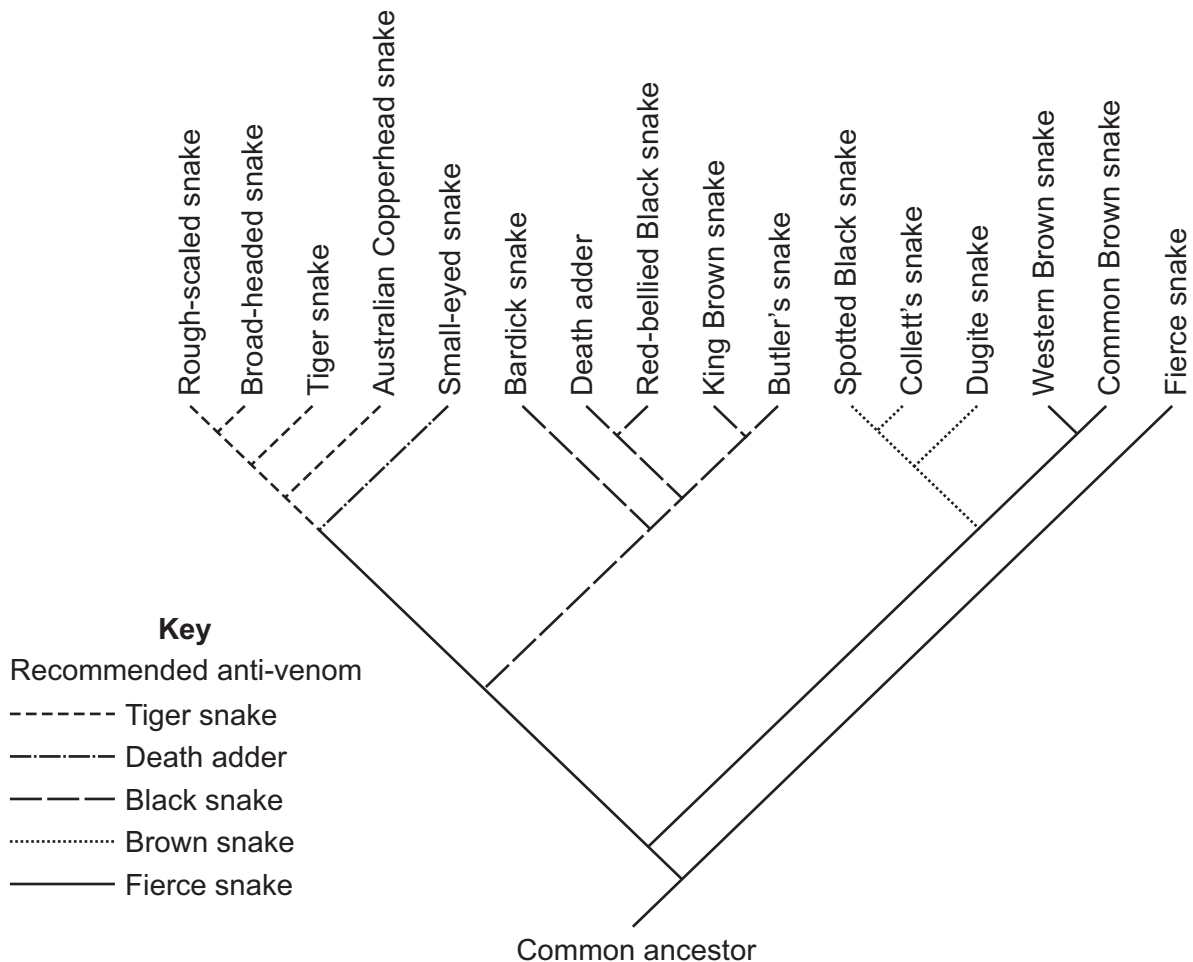
Turn over for the next question

Turn over ►

QUESTION SEVEN

There are many species of poisonous snakes in Australia. The poison a snake produces is called venom. Scientists have found that some anti-venoms are effective against the venoms of several different snake species.

The evolutionary tree below includes information on the anti-venoms recommended for treating bites of different snake species.



7A This evolutionary tree . . .

- 1 proves that evolution has happened.
- 2 shows that natural selection is happening.
- 3 shows the relationships between species.
- 4 disproves Lamarck's theory.

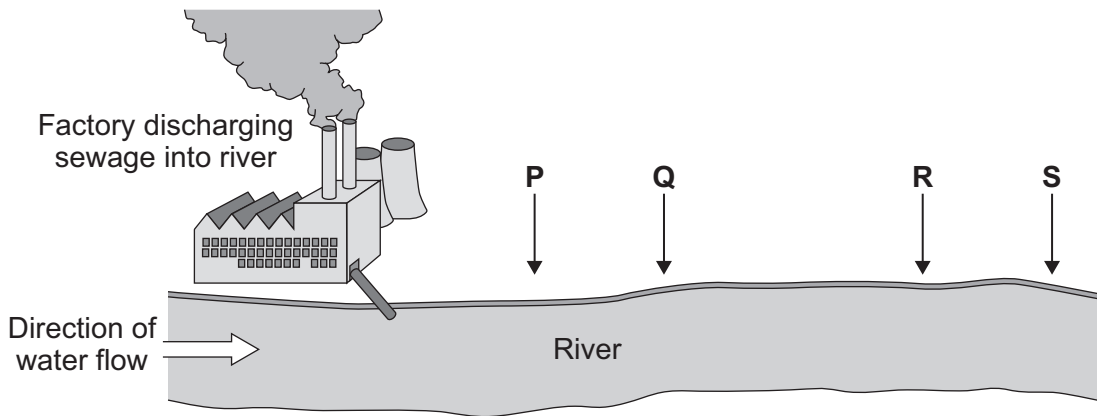
- 7B** The most primitive snake species in this evolutionary tree is the . . .
- 1 Butler's snake.
 - 2 Fierce snake.
 - 3 Rough-scaled snake.
 - 4 Western Brown snake.
- 7C** The data in the evolutionary tree provides evidence for . . .
- 1 common ancestry amongst snakes.
 - 2 inheritance of acquired characteristics by snakes.
 - 3 rapid changes in snake species.
 - 4 ecological relationships between snakes.
- 7D** The anti-venom that is effective against the venom of the largest number of snake species is produced by . . .
- 1 Black snakes.
 - 2 Brown snakes.
 - 3 Fierce snakes.
 - 4 Tiger snakes.

Turn over for the next question

Turn over ►

QUESTION EIGHT

The diagram shows a river. At sites **P**, **Q**, **R** and **S**, samples of invertebrates were taken from the river.



The table gives the results.

Number of invertebrates found at different points down the river				
	P	Q	R	S
Tubifex	325	124	0	0
Midge larvae	6	23	16	3
Hog lice	0	2	10	12
Shrimps	0	0	15	35
Stoneflies	0	0	7	15
Mayflies	0	0	0	3

8A Which invertebrate is found only in water with high concentrations of oxygen?

- 1 mayflies
- 2 midge larvae
- 3 shrimps
- 4 tubifex

8B Which sample showed the greatest biodiversity?

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

8C The evidence from this survey suggests that as the concentration of oxygen increases, . . .

- 1 the total number of individual invertebrates decreases.
- 2 the total number of individual invertebrates increases.
- 3 biodiversity decreases.
- 4 biodiversity increases.

8D Some invertebrates have a red pigment in their blood. The red pigment helps the blood to pick up and store oxygen.

Which of the invertebrates is most likely to have this red pigment?

- 1 mayflies
- 2 stoneflies
- 3 shrimps
- 4 tubifex

Turn over for the next question

Turn over ►

QUESTION NINE

Read the passage about the evolution of Europeans.

A new study of fossilised bone samples states that Europeans were unable to digest cows' milk as recently as 7000 years ago. Today, more than 90 % can digest cows' milk.

A group of scientists suggested that when Europeans became able to digest cows' milk, they were able to take in more nutrients. Nourishment from seasonal crops is not available all the year round, but milk from cows is available all year. Parasites do not contaminate milk so milk is safer to drink than stream water.

Low levels of sunlight in northern Europe during winter months meant that people had lower levels of vitamin D in their bodies. Low vitamin D levels meant that the Europeans had difficulty absorbing calcium. Milk solved this problem because milk provides both calcium and some vitamin D.

9A Scientists believe that humans originated in Africa and then migrated to other parts of the world, including Europe.

From the information in the passage, the first Europeans probably had difficulty in surviving because . . .

- 1 the land was unsuitable for growing crops.
- 2 they needed to make houses.
- 3 there was not enough food.
- 4 European seasons and African seasons were very different from each other.

9B The scientists' suggested idea is probably based on . . .

- 1 evidence from crops grown 7000 years ago.
- 2 parasites in fossil human remains.
- 3 the amount of calcium in fossil human bones.
- 4 fossils of domesticated cows.

9C Humans use enzymes to digest food.

The enzymes that first appeared 7000 years ago to allow Europeans to digest cows' milk were the result of changes in the humans' . . .

- 1 bones.
- 2 diet.
- 3 environment.
- 4 genes.

9D The high proportion of Europeans able to digest milk today is because of . . .

- 1 inheritance of acquired characteristics.
- 2 better agricultural methods.
- 3 natural selection.
- 4 pasteurising milk or sterilising milk.

END OF TEST

There are no questions printed on this page

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