

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

ASSESSMENT AND QUALIFICATIONS ALLIANCE

**General Certificate of Secondary Education
Foundation Tier and Higher Tier
June 2010**

Science A

Unit Biology B1b (Evolution and Environment)

Biology

Unit Biology B1b (Evolution and Environment)

BLY1BP

Monday 28 June 2010 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 plus your additional time allowance.

At the top of the page write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

INSTRUCTIONS

- **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:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
- Do **NOT** extend beyond the circles.
- If you want to change your answer, **YOU MUST** cross out your original answer, as shown:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
- 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:

1	2	3	4
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

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.

DO NOT TURN OVER UNTIL TOLD TO DO SO

You must do ONE TIER only, EITHER the Foundation Tier OR the Higher Tier.

The Higher Tier starts on page 25 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

Beavers live in slow-moving water and use sticks to build dams.

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

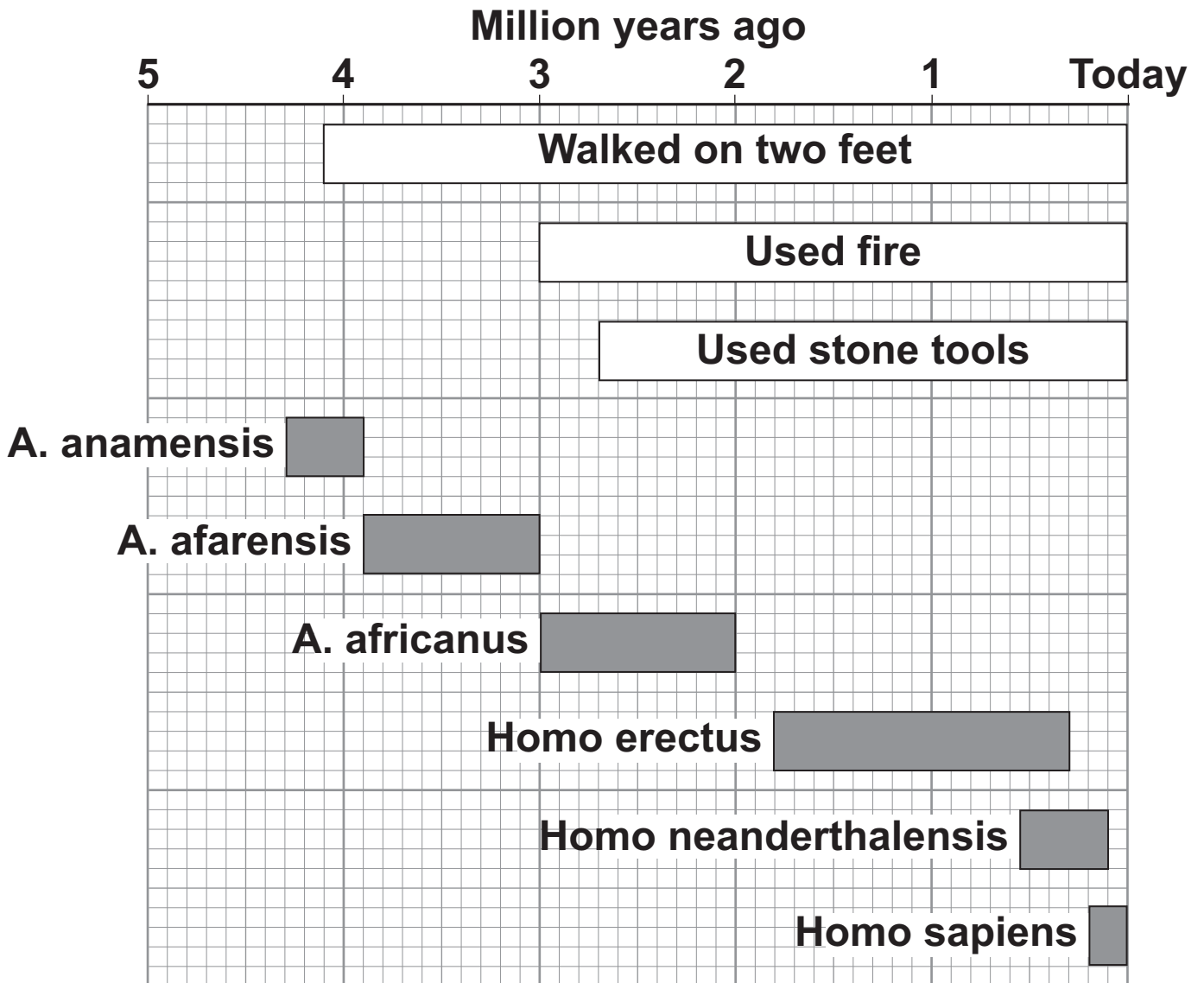
- A thick fur coat**
- B large front teeth**
- C muscular flat tail**
- D clear coverings over each eye**

1	used to cut sticks from trees
2	helps the beaver to steer through the water
3	keeps the beaver warm in the cold water
4	allows the beaver to see underwater

[Turn over for the next question]

QUESTION TWO

The diagram shows a timeline for the evolution of humans.



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

A A. anamensis

B A. africanus

C Homo erectus

D Homo sapiens

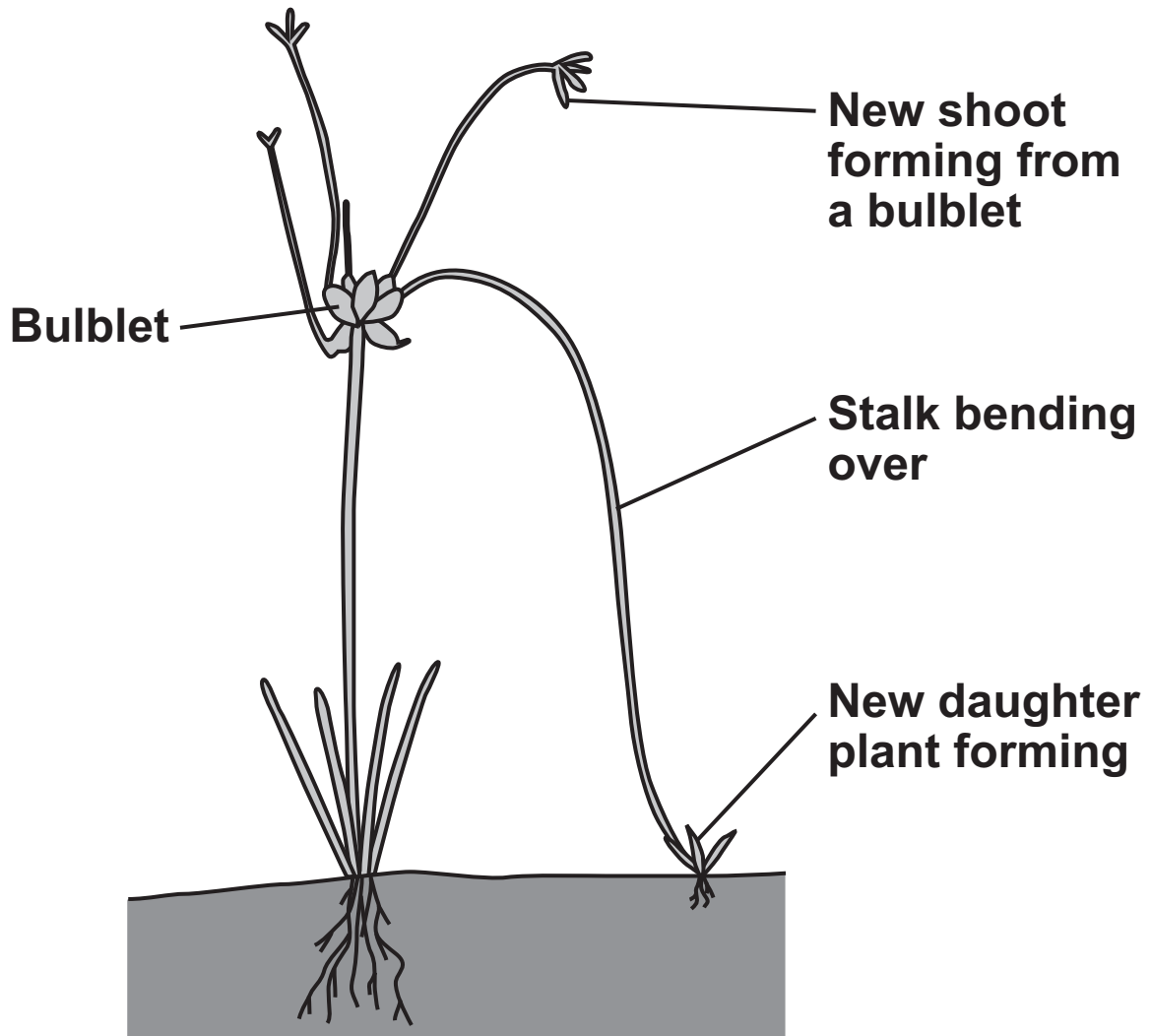
1	is still alive today
2	survived for the longest time
3	first human to walk on two feet
4	first human to walk on two feet, to use fire and to use stone tools

[Turn over for the next question]

QUESTION THREE

Walking onion plants grow a bunch of bulblets (tiny bulbs).

The bulblets start to grow and the stalks bend over with the weight of the new growth. This makes the onion plant seem to walk across the garden.



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

A bulblet

B clone

C gamete

D parent

Producing plants in this way is called asexual reproduction.

Asexual reproduction needs only one . . . 1

Asexual reproduction does NOT involve production of a . . . 2

The daughter plant is formed from a . . . 3

The daughter plant is identical to the parent plant so it is called a . . . 4

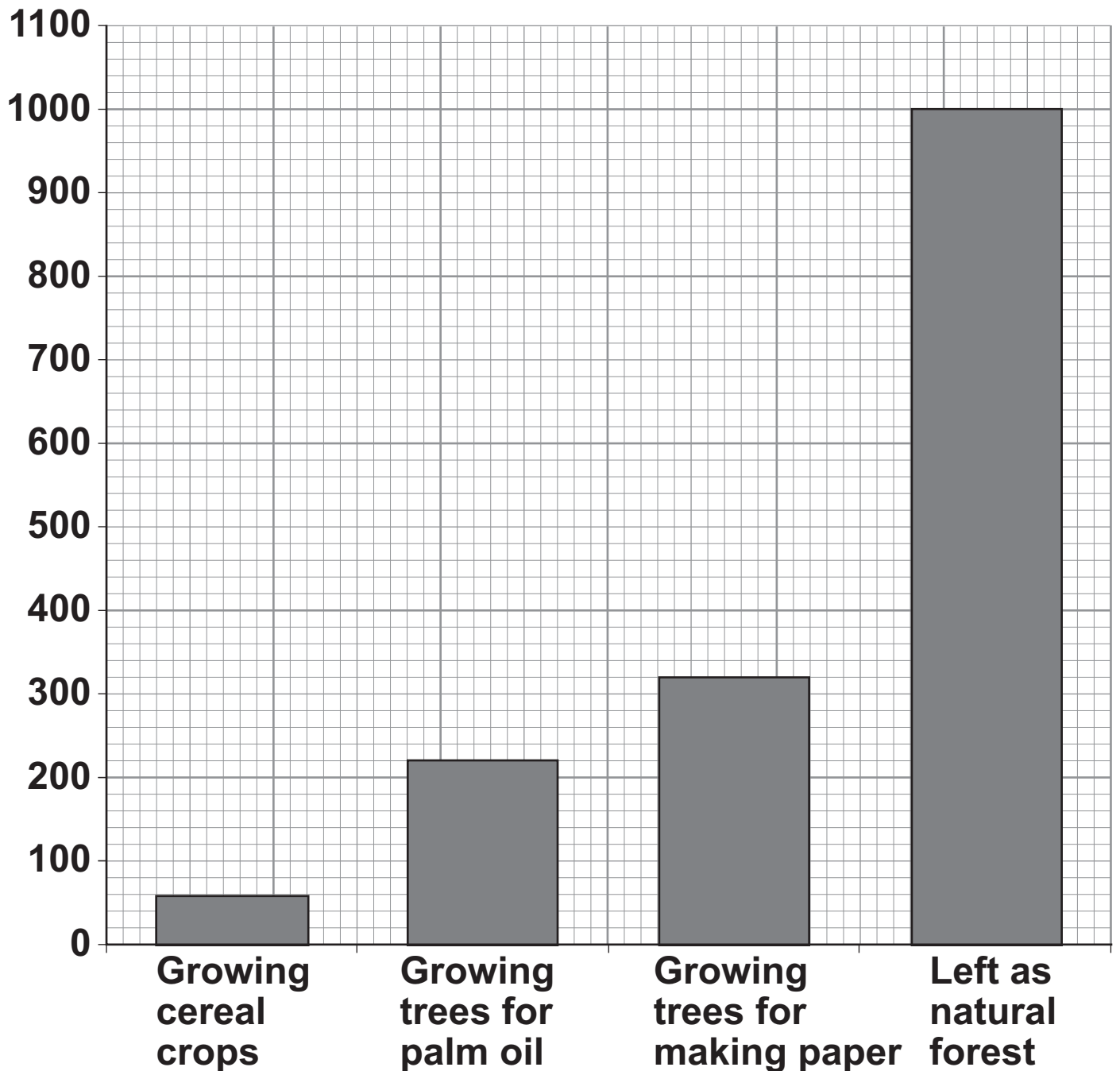
[Turn over for the next question]

QUESTION FOUR

Tropical forests are being cut down and the cleared land used for other purposes.

The bar chart shows how tropical forest areas are now being used in one Asian country.

Area in
thousands
of hectares



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

A 60 000 hectares

B 320 000 hectares

C 540 000 hectares

D 1 000 000 hectares

1	area of forest cleared for growing cereals
2	total area planted with trees for palm oil and making paper
3	area with the largest biodiversity
4	area which could be reduced by recycling

[Turn over for the next question]

QUESTION FIVE

This question is about pollution and greenhouse gases.

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

A trees

B rice plants

C lichens

D invertebrates

	These organisms can . . .
1	be used as an indicator of air pollution.
2	be used as an indicator of water pollution.
3	'lock up' carbon dioxide for many years.
4	release methane into the atmosphere.

SECTION TWO

Questions SIX to NINE.

Each of these questions has four parts.

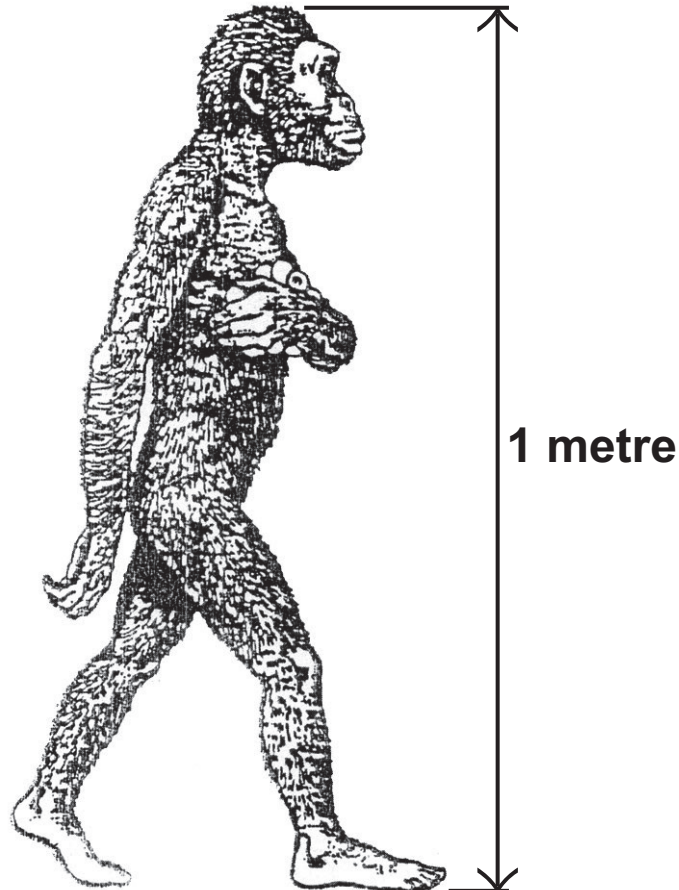
In each part choose only ONE answer.

Mark your choices on the answer sheet.

[Turn over for Question 6]

QUESTION SIX

The drawing shows what we think an extinct human-like animal looked like. The animal has been nicknamed 'Lucy'.



6A There are many differences between Lucy and modern humans.

One difference is that modern humans have . . .

- 1 shorter legs.
- 2 a more upright posture.
- 3 a more protruding jaw.
- 4 less body hair.

6B What caused the differences between Lucy and modern humans?

- 1 temperature increases in the environment**
- 2 mutations in the genes**
- 3 new diseases**
- 4 competition with each other for food**

6C Scientists have found evidence for the existence of Lucy by . . .

- 1 doing genetic engineering.**
- 2 extracting DNA from apes.**
- 3 watching modern apes.**
- 4 studying fossils.**

6D Darwin's theory of evolution states that all species of living things have evolved from simple life forms.

It took a long time for Darwin's theory of evolution to be widely accepted because . . .

- 1 books were expensive.**
- 2 Darwin was not a scientist.**
- 3 Lamarck had a better theory.**
- 4 the causes of variation were not known at that time.**

[Turn over]





QUESTION SEVEN

The cheetah is a large carnivore (meat-eating animal).



The map on page 17 shows the distribution of cheetahs in Africa.

**KEY**

 Former areas where cheetahs lived	 Medium density cheetah populations
 Low density cheetah populations	 High density cheetah populations

7A The areas where cheetahs are found have . . .





- 1 decreased.
- 2 increased.
- 3 got further apart.
- 4 not changed in shape.

[Question 7 continues on the next page]

The map is repeated from page 17.



KEY

 Former areas where cheetahs lived	 Medium density cheetah populations
 Low density cheetah populations	 High density cheetah populations

7B The change in the cheetah's territory is most probably due to . . .

- 1 a shortage of predators.
- 2 a shortage of oxygen.
- 3 a shortage of prey.
- 4 a shortage of roads in the area.

7C A high-density cheetah population in an area would result in . . .

- 1 a rapid decrease in the human population.**
- 2 female cheetahs producing larger families.**
- 3 increased use of pesticides by farmers.**
- 4 increased competition for breeding sites.**

7D A large increase in the area of land used for agriculture in Africa could cause . . .

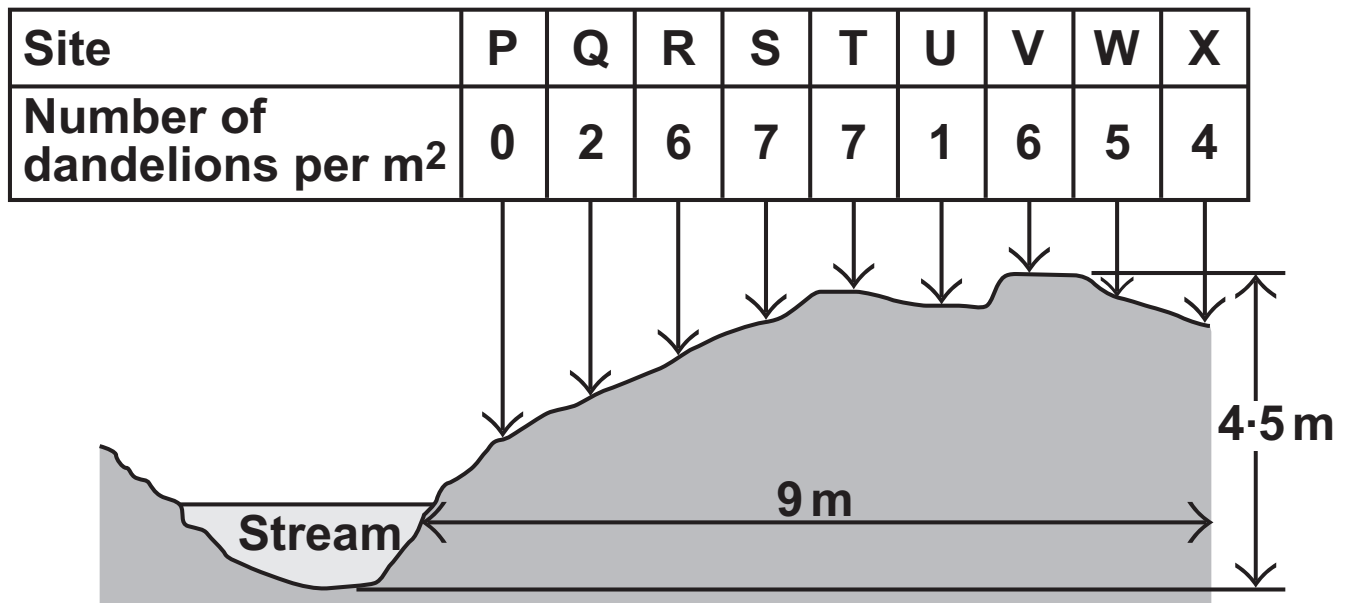
- 1 new predators to appear.**
- 2 new diseases to appear.**
- 3 mutations to occur in cheetahs.**
- 4 cheetahs to become extinct.**

[Turn over for the next question]

QUESTION EIGHT

A group of students surveyed an area of land next to a stream.

- Their aim was to find out if the stream affected where dandelion plants could grow.
- They sampled the area at the sites labelled P–X on the diagram.
- Their results are shown on the diagram.



8A Which piece of equipment would the students use to sample the number of dandelions at each site?

- 1 sensor
- 2 quadrat
- 3 pH meter
- 4 metre rule

8B Which factor is most likely to affect the distribution of dandelions in areas P–S?

- 1 air temperature**
- 2 light intensity**
- 3 moisture content of the soil**
- 4 availability of carbon dioxide**

8C At which site is there most probably an anomalous result?

- 1 P**
- 2 Q**
- 3 U**
- 4 X**

8D The survey would have been more valid if . . .

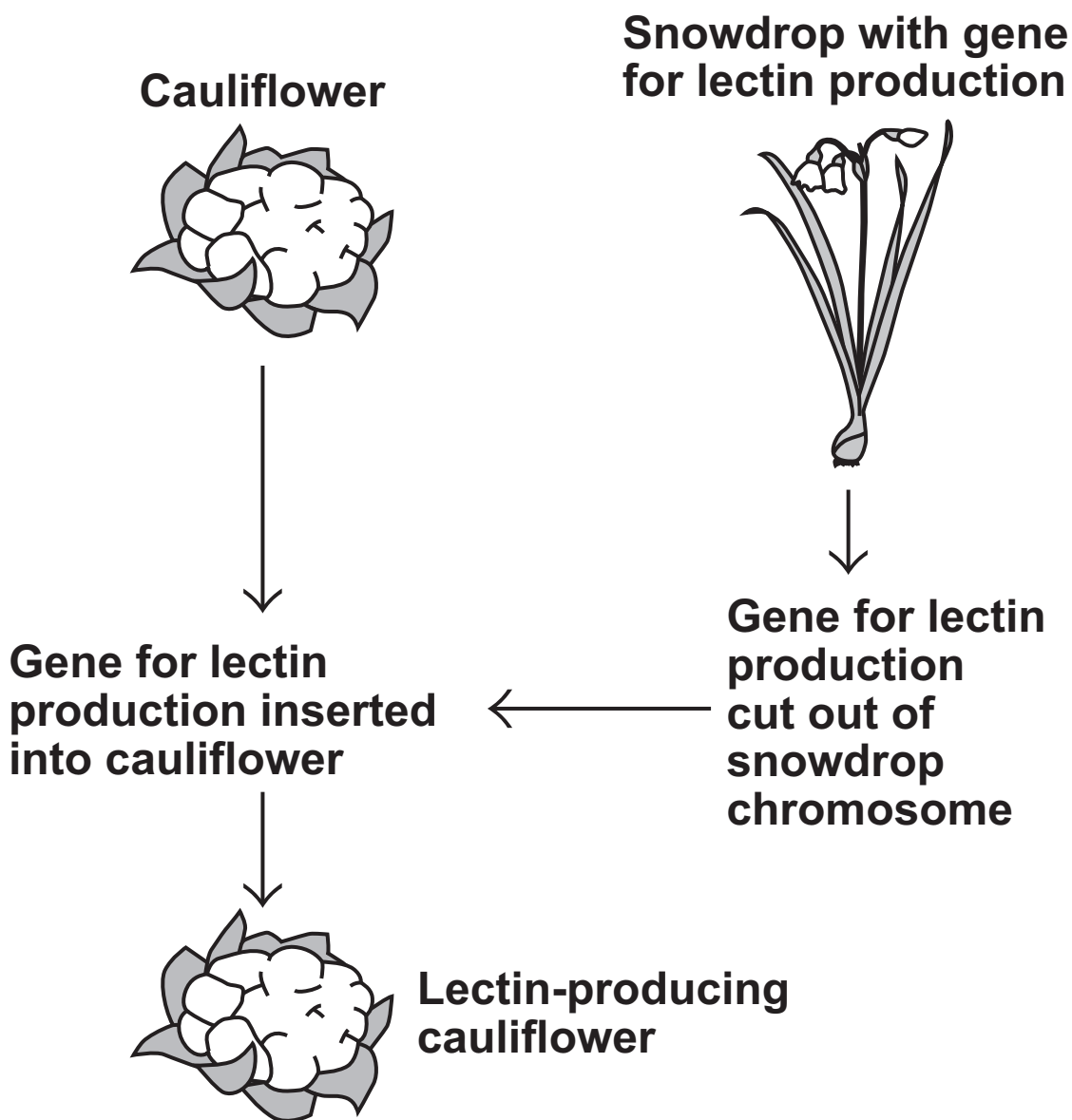
- 1 only sites P, R, T and X had been used.**
- 2 sites V, W and X had not been used.**
- 3 only the area where there were the most dandelions had been surveyed.**
- 4 the other side of the stream had also been surveyed.**

[Turn over]

QUESTION NINE

Up to 40% of cauliflower crops may be eaten by insects. Snowdrops can survive attacks by insects because they produce a substance called lectin. Lectin interferes with the insect's digestive system.

The diagram shows one method of introducing the gene for lectin production into cauliflowers.



- 9A** The gene for lectin production is cut from the snowdrop chromosome using . . .
- 1** lectin.
 - 2** a herbicide.
 - 3** an enzyme.
 - 4** an electric shock.
- 9B** The technique used to transfer the gene from the snowdrop to the cauliflower is called . . .
- 1** biodiversity.
 - 2** embryo transplant.
 - 3** cloning.
 - 4** genetic engineering.
- 9C** What is the main benefit to the environment of farmers growing lectin-producing cauliflowers?
- 1** More snowdrops will survive.
 - 2** Less pesticide will be used.
 - 3** Insects will eat something else.
 - 4** Less fertiliser will be needed.

[Question 9 continues on the next page]

9D An ethical concern about this technique is that . . .

- 1 it will make farmers richer.**
- 2 it will increase biodiversity.**
- 3 it is interfering with nature.**
- 4 it is sustainable.**

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.

[Turn over for Question 1]

QUESTION ONE

This question is about pollution and greenhouse gases.

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

A trees

B rice plants

C lichens

D invertebrates

	These organisms can . . .
1	be used as an indicator of air pollution.
2	be used as an indicator of water pollution.
3	'lock up' carbon dioxide for many years.
4	release methane into the atmosphere.

QUESTION TWO

There are several methods of cloning animals and plants.

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

- A** a common garden plant
- B** a very rare endangered plant
- C** a well-loved family cat
- D** a common farm animal

	Best method of cloning
1	small groups of cells are grown on a special jelly
2	unspecialised embryo cells are separated and put into a host
3	cuttings are taken
4	adult cell cloning

[Turn over for the next question]

SECTION TWO

Questions THREE to NINE.

Each of these questions has four parts.

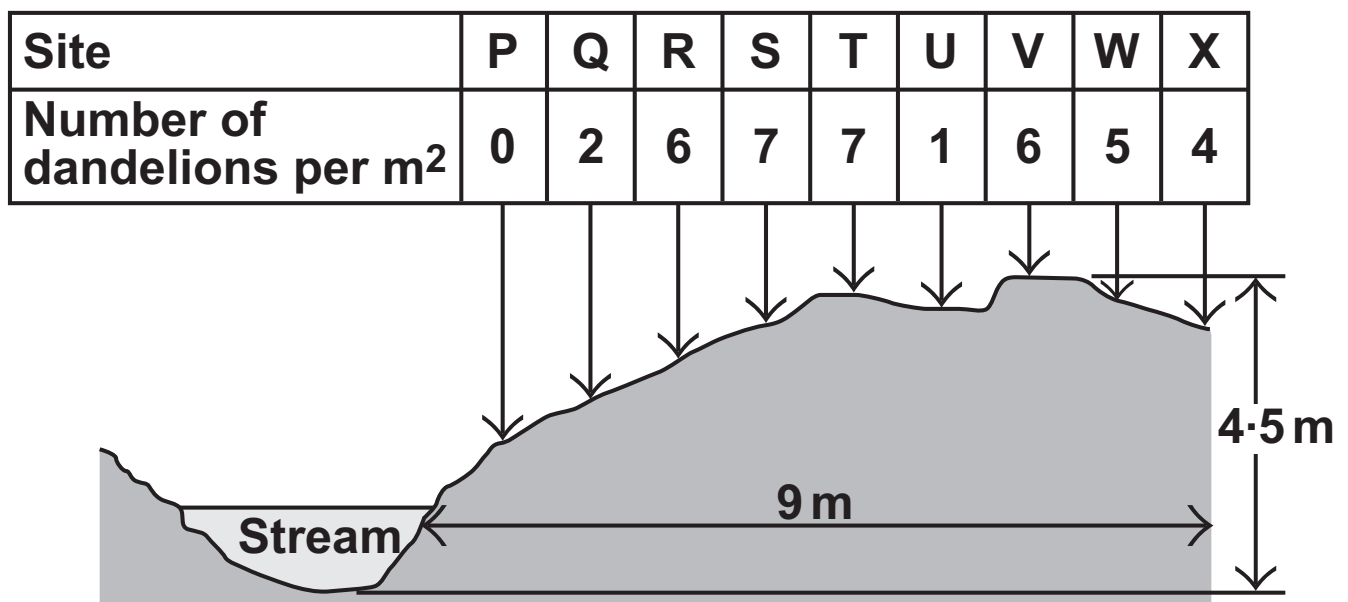
In each part choose only ONE answer.

Mark your choices on the answer sheet.

QUESTION THREE

A group of students surveyed an area of land next to a stream.

- Their aim was to find out if the stream affected where dandelion plants could grow.
- They sampled the area at the sites labelled P–X on the diagram.
- Their results are shown on the diagram.



3A Which piece of equipment would the students use to sample the number of dandelions at each site?

- 1 sensor
- 2 quadrat
- 3 pH meter
- 4 metre rule

3B Which factor is most likely to affect the distribution of dandelions in areas P–S?

- 1 air temperature
- 2 light intensity
- 3 moisture content of the soil
- 4 availability of carbon dioxide

3C At which site is there most probably an anomalous result?

- 1 P
- 2 Q
- 3 U
- 4 X

[Question 3 continues on the next page]

3D The survey would have been more valid if . . .

- 1 only sites P, R, T and X had been used.**
- 2 sites V, W and X had not been used.**
- 3 only the area where there were the most dandelions had been surveyed.**
- 4 the other side of the stream had also been surveyed.**

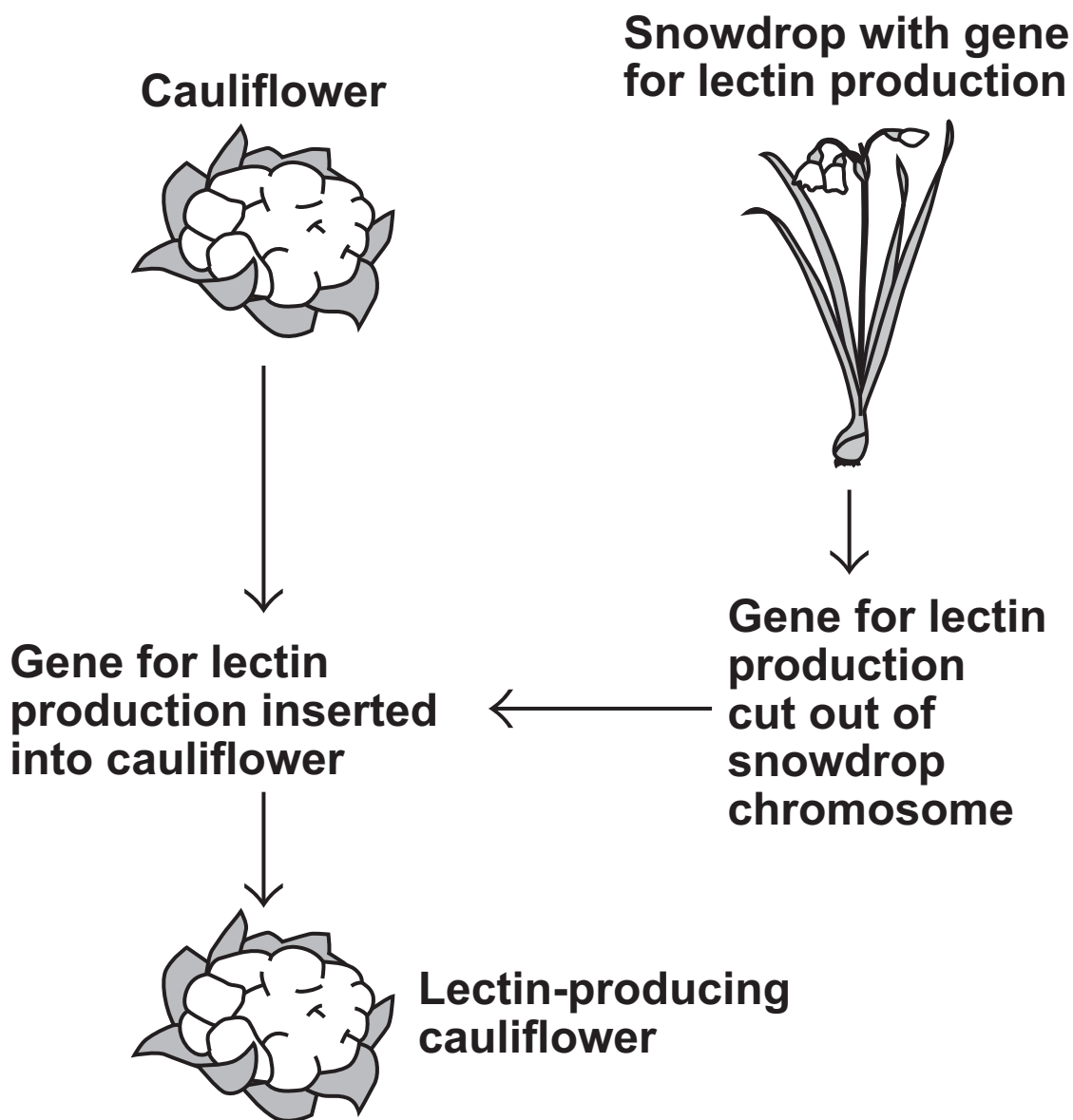
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TURN OVER FOR THE NEXT QUESTION

QUESTION FOUR

Up to 40% of cauliflower crops may be eaten by insects. Snowdrops can survive attacks by insects because they produce a substance called lectin. Lectin interferes with the insect's digestive system.

The diagram shows one method of introducing the gene for lectin production into cauliflowers.



- 4A The gene for lectin production is cut from the snowdrop chromosome using . . .**
- 1 lectin.**
 - 2 a herbicide.**
 - 3 an enzyme.**
 - 4 an electric shock.**
- 4B The technique used to transfer the gene from the snowdrop to the cauliflower is called . . .**
- 1 biodiversity.**
 - 2 embryo transplant.**
 - 3 cloning.**
 - 4 genetic engineering.**
- 4C What is the main benefit to the environment of farmers growing lectin-producing cauliflowers?**
- 1 More snowdrops will survive.**
 - 2 Less pesticide will be used.**
 - 3 Insects will eat something else.**
 - 4 Less fertiliser will be needed.**

[Question 4 continues on the next page]

4D An ethical concern about this technique is that . . .

- 1 it will make farmers richer.**
- 2 it will increase biodiversity.**
- 3 it is interfering with nature.**
- 4 it is sustainable.**

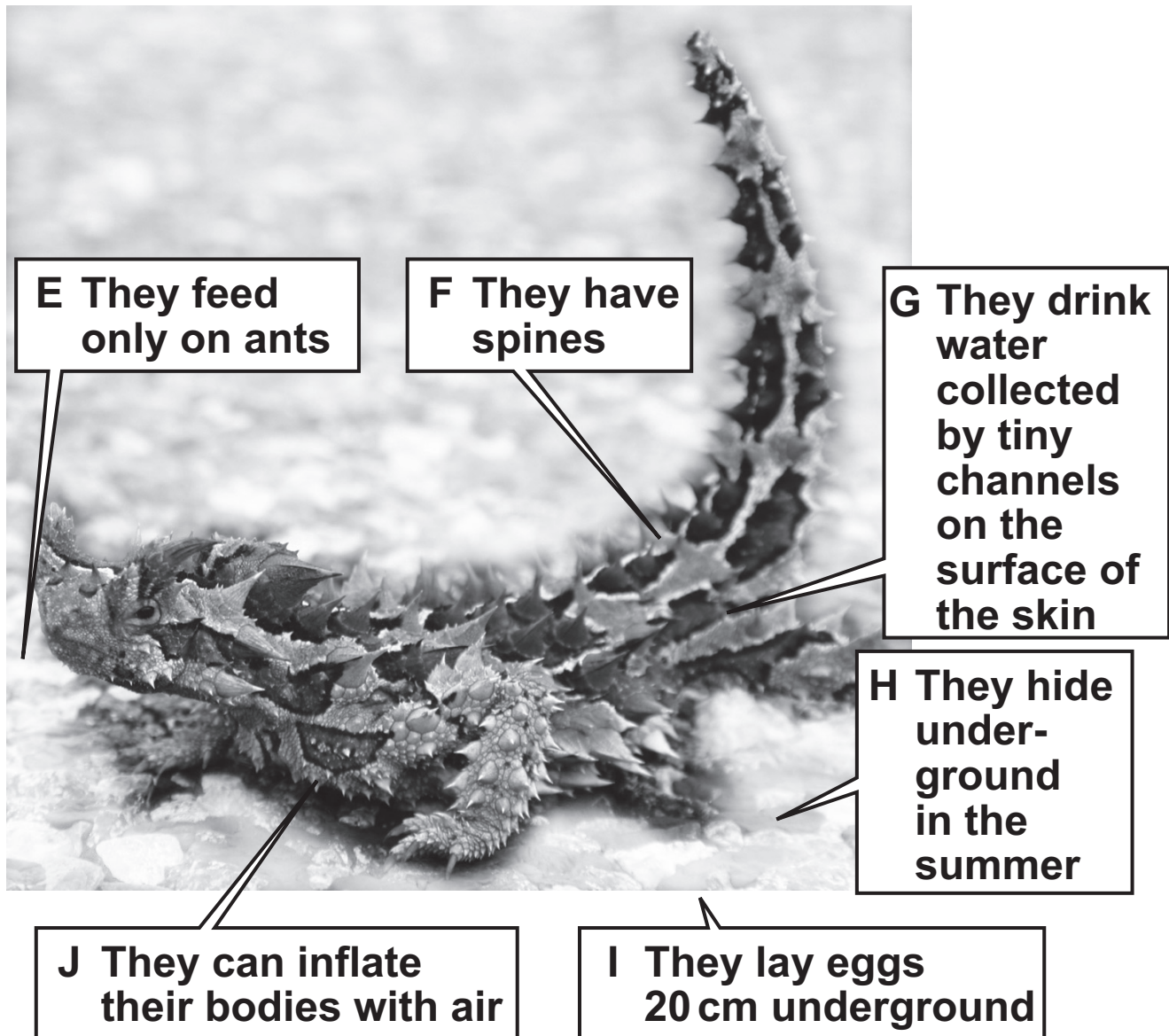
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TURN OVER FOR THE NEXT QUESTION

QUESTION FIVE

The photograph shows an animal that lives only in the Australian desert. It is called a moloch.

Some of its features are labelled E–J.



5A Which of the features are adaptations to survival in a dry environment?

1 G, H and I

2 E, F and J

3 F, G and H

4 E, G and I

5B Which of the features are adaptations to protect the moloch from being eaten?

1 E, F and H

2 F, H and J

3 G, H and I

4 E, F and G

5C Which feature might lead to the moloch becoming extinct if there was a change in the environment?

1 E

2 F

3 H

4 I

[Question 5 continues on the next page]

5D Local people say that the moloch lays its eggs on the cooler side of small hills.

How might scientists test this hearsay?

- 1 keep equal numbers of molochs captive on each side of a hill**
- 2 watch where females spend most of their time**
- 3 survey each side of hills in areas where molochs live**
- 4 check the internet for opinions from other scientists**

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TURN OVER FOR THE NEXT QUESTION

QUESTION SIX

Read the passage about sticklebacks.

Small fish called sticklebacks originated in the oceans, but began populating freshwater lakes and streams about 20 000 years ago. Sticklebacks that live in freshwater have lost their body 'armour' over the past 20 000 years.

Scientists have identified a mutant gene in sticklebacks that prevents the growth of 'armour'. This mutant gene is very common in freshwater sticklebacks, but is found in only about 1 % of seawater sticklebacks. Sticklebacks with the mutant gene are significantly longer than those without it.

The scientists carried out an investigation in which they moved 200 seawater sticklebacks into freshwater. After a few years the frequency of the mutant gene in the offspring of these fish had increased significantly.

6A The mutant gene that prevents the growth of 'armour' is . . .

- 1 a strong gene.
- 2 a weak gene.
- 3 a changed gene.
- 4 a stable gene.

6B The change in the frequency of the mutant gene in sticklebacks which live in freshwater is a result of . . .

- 1** the greenhouse effect.
- 2** natural selection.
- 3** new diseases.
- 4** changes in the composition of freshwater.

6C Because they do not produce 'armour', the freshwater sticklebacks can . . .

- 1** produce more muscles and bones.
- 2** camouflage themselves.
- 3** move into deeper water.
- 4** move back into seawater.

6D The evidence from this investigation . . .

- 1** proves the theory of evolution.
- 2** supports the theory of evolution.
- 3** disproves the theory of evolution.
- 4** leads to an observation about the theory of evolution.

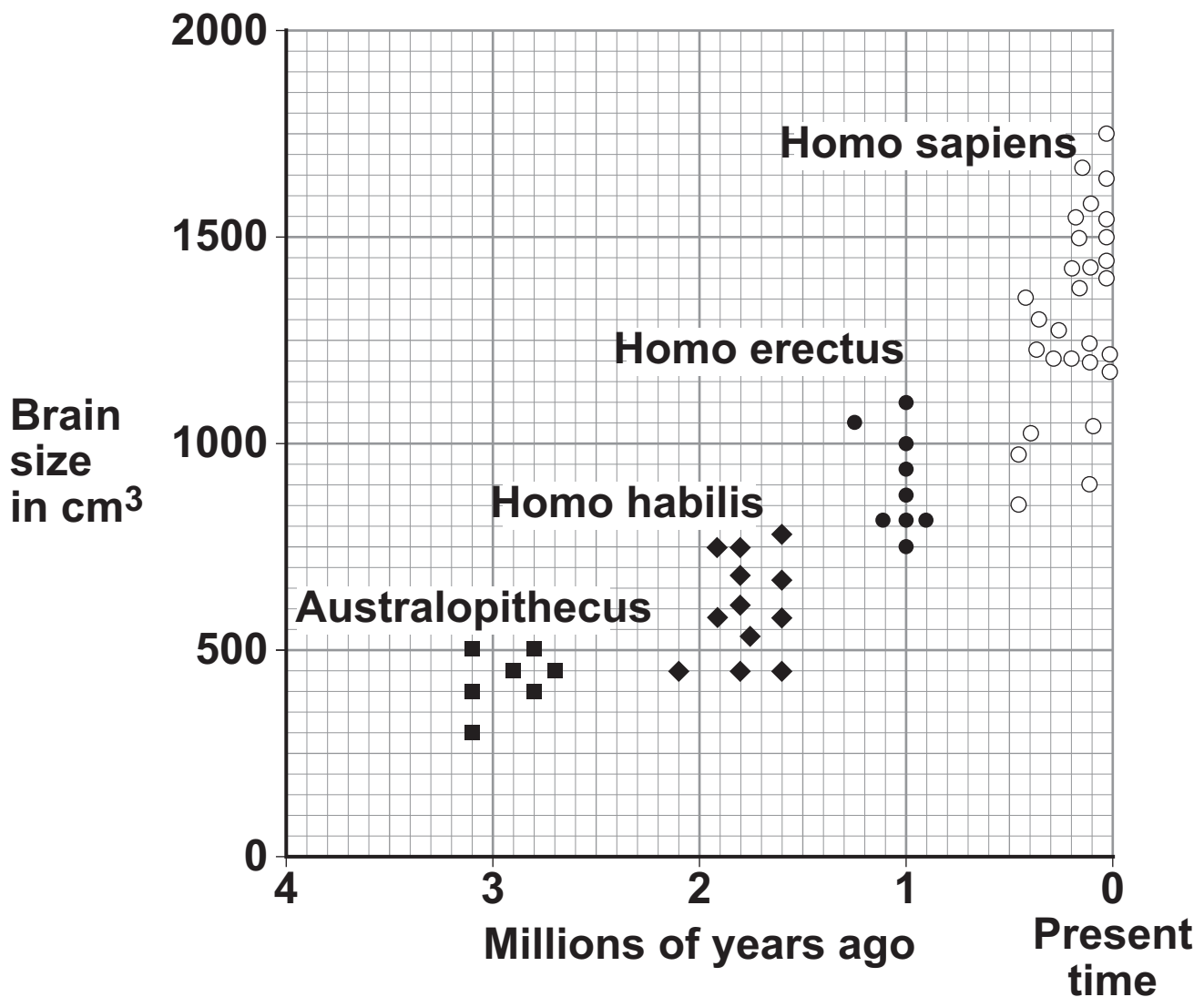
[Turn over]

QUESTION SEVEN

Modern humans belong to the species *Homo sapiens*. Many people think that modern humans evolved from more primitive species. Three of these primitive species were *Australopithecus*, *Homo habilis* and *Homo erectus*. These three species are now extinct.

Scientists investigated the brain size of several specimens from each of the species.

The graph shows their results.



7A The ranges of brain size of *Homo sapiens* and *Homo erectus* overlap by . . .

- 1 200 cm³
- 2 250 cm³
- 3 300 cm³
- 4 1000 cm³

7B From this data, the time over which *Australopithecus* existed was . . .

- 1 0.2 million years.
- 2 0.4 million years.
- 3 3.1 million years.
- 4 3.3 million years.

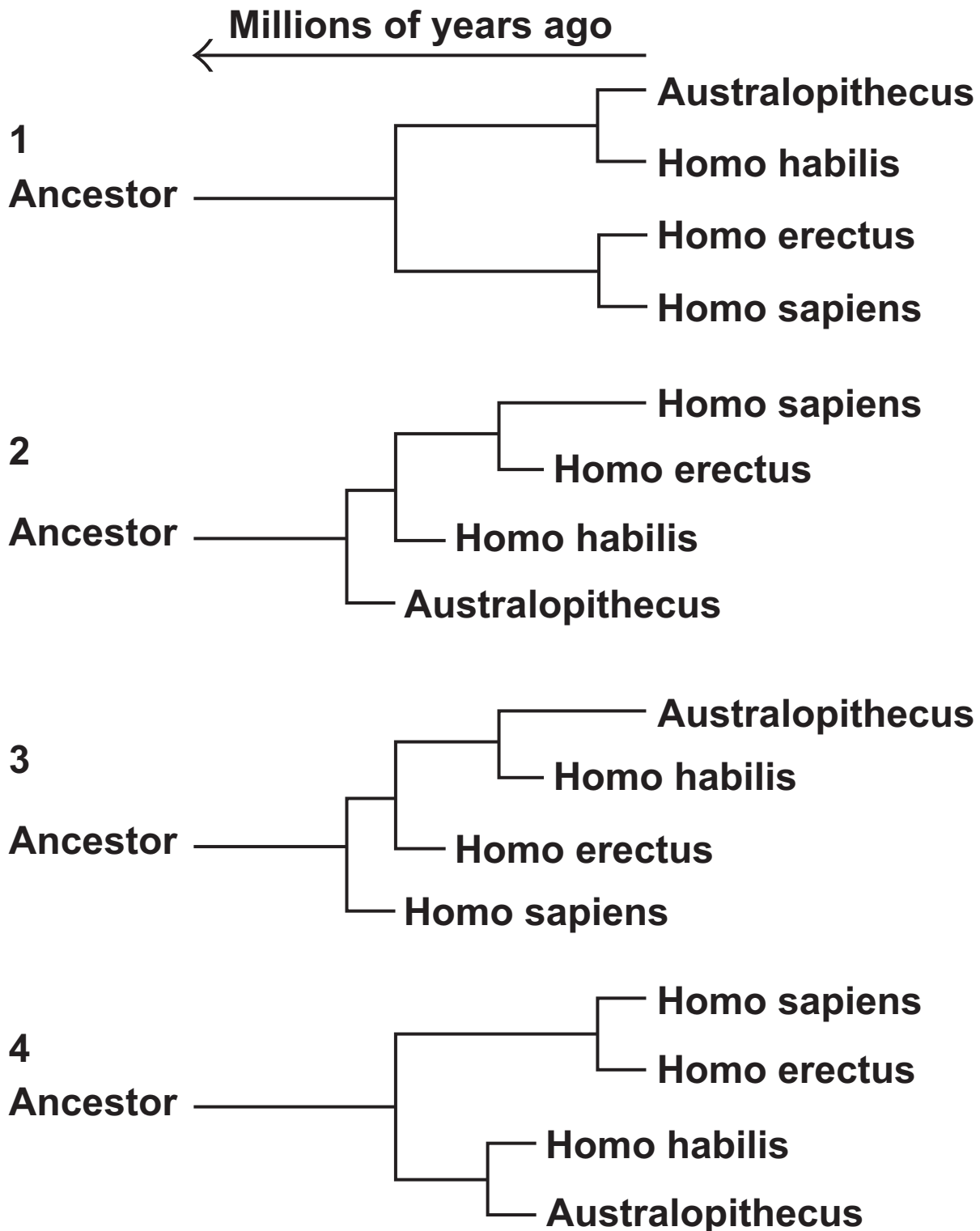
[Question 7 continues on the next page]

7C Which one of the following is correct?

The fossil data for . . .

- 1 Australopithecus can be considered least reliable because the fewest number of skulls have been found.**
- 2 Homo habilis can be considered to be most reliable because they were fossilised over the longest period of time.**
- 3 Homo erectus can be considered most reliable because they were fossilised over the shortest period of time.**
- 4 Homo sapiens can be considered least reliable because they were fossilised most recently.**

7D Which evolutionary tree is supported by the evidence in the graph?



[Turn over]

QUESTION EIGHT

Many scientists are concerned about global warming.

One way to reduce global warming is to replace fossil fuels with biofuels, such as ethanol.

Forests are being cut down to grow crops that are used to produce ethanol.

8A When biofuels are burned, . . .

- 1 the volume of carbon dioxide they give off is about equal to the volume of carbon dioxide the plants take in.**
- 2 the volume of carbon dioxide they give off is larger than the volume of carbon dioxide the plants take in.**
- 3 the volume of methane they give off is equal to the volume of carbon dioxide the plants take in.**
- 4 the volume of carbon dioxide they give off is equal to the volume of methane the plants take in.**

8B One effect of cutting down forests is that . . .

- 1 more paper is recycled.**
- 2 less renewable energy is used.**
- 3 there may be a reduction in biodiversity.**
- 4 less land is available for food production.**

The table shows the yield of ethanol from four biofuel crops.

Plant material	Volume of ethanol produced in litres per kg of plant material	Volume of ethanol produced in litres per m ² of land
Cassava	0.18	0.4
Maize	0.36	0.2
Sugar cane	0.07	1.2
Sweet potato	0.12	0.5

8C Which of the plant materials would result in the least amount of deforestation to produce 1000 litres of fuel?

- 1 Cassava
- 2 Maize
- 3 Sugar cane
- 4 Sweet potato

[Question 8 continues on the next page]

8D Global warming means that the average temperature of the Earth's atmosphere is gradually increasing.

What causes this increase in temperature?

- 1 more energy from the Sun entering the Earth's atmosphere**
- 2 more energy being produced by human activity**
- 3 more energy being radiated by the Earth**
- 4 more energy being re-radiated back to Earth**

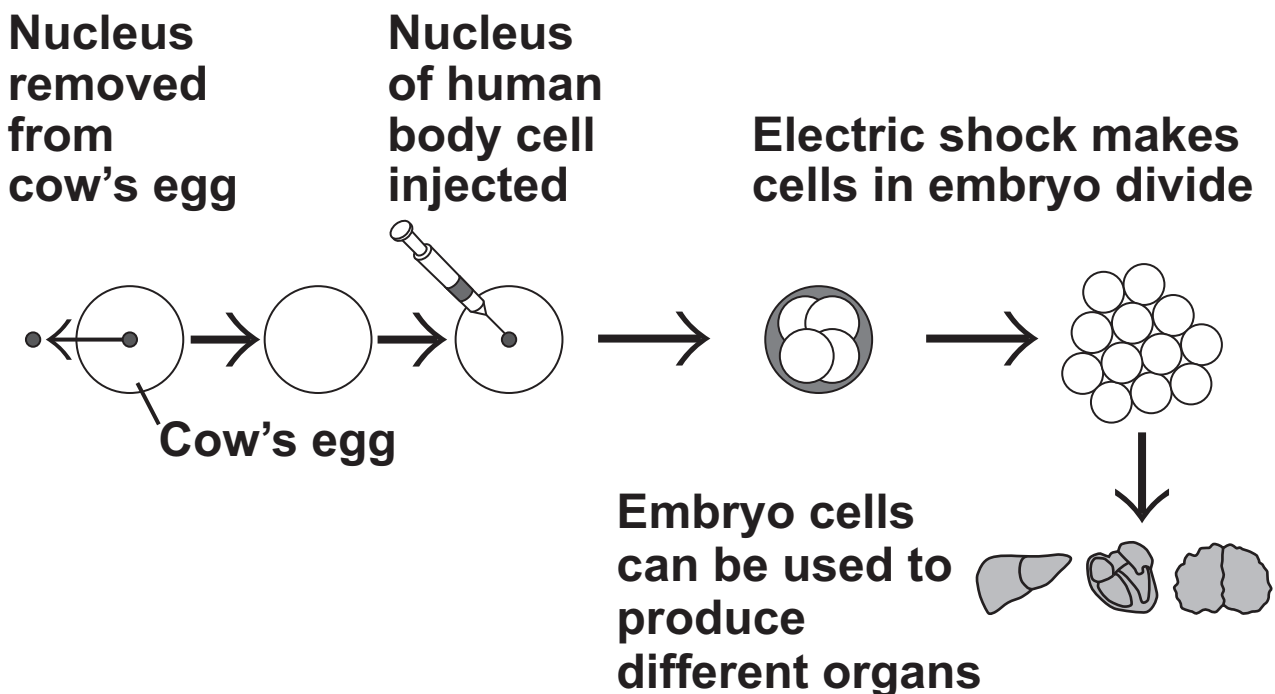
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TURN OVER FOR THE NEXT QUESTION

QUESTION NINE

‘Human-animal’ Embryo Given Green Light
Regulators have agreed in principle to allow human-animal embryos to be created and used for research.

The diagram shows how a human-animal embryo can be created.



9A The technique shown in the diagram is an example of . . .

- 1** adult cell cloning.
- 2** embryo transplanting.
- 3** taking cuttings.
- 4** tissue culture.

9B The genetic information in each embryo cell nucleus is . . .

- 1** identical to that of the cow's egg nucleus.
- 2** identical to the human cell nucleus.
- 3** a mixture of genetic information from the nuclei of the cow and the human.
- 4** different from one embryo cell nucleus to another.

[Question 9 continues on the next page]

Scientists want to create hybrid embryos so that they can extract cells which are able to become any tissue. The embryos would then be destroyed within 14 days.

At the moment, scientists have to rely on human eggs left over from fertility treatment. These new cells are in short supply and are not always of good quality.

A scientist said: ‘The creation of hybrid embryos is excellent news. It is a positive outcome not just for our work but for the progress of British science in general. We hope that this will lead to new technologies to benefit everyone. It’s not our intention to create any bizarre cow–human hybrid.’

9C What was the main motive for the scientists to create the hybrid cells?

- 1 The embryos can be destroyed within 14 days.**
- 2 The egg cells left over from fertility treatment are in short supply.**
- 3 The creation of the hybrids is a positive outcome for British science.**
- 4 The scientists are interested in the difference between hybrid cells and human cells.**

9D Many people are opposed to this technique for ethical reasons.

Which of the following is an ethical reason for opposition to the technique?

- 1 Humans with some cow features will be produced.**
- 2 The scientists are proud of their work.**
- 3 The embryos created are destroyed.**
- 4 There needs to be an increase in women to supply the eggs.**

END OF TEST

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