AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.3.4

Evidence for evolution

Past-paper questions

Tier	**Higher**
Question groups	**35**
Available paper years	**2007–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

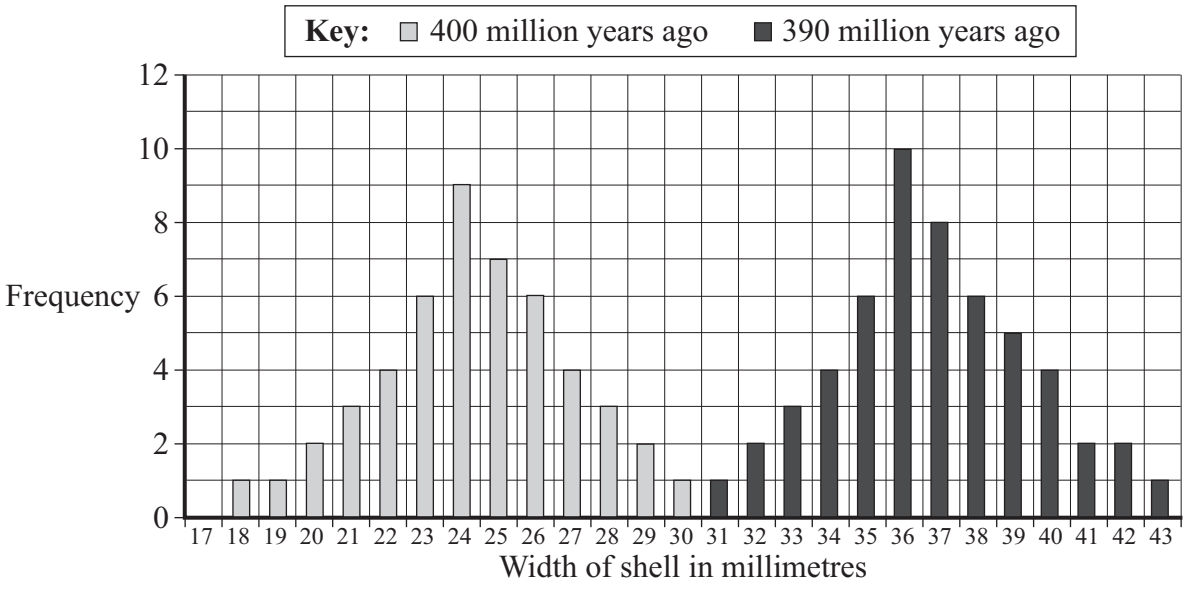
4.6.3.4 Evidence for evolution

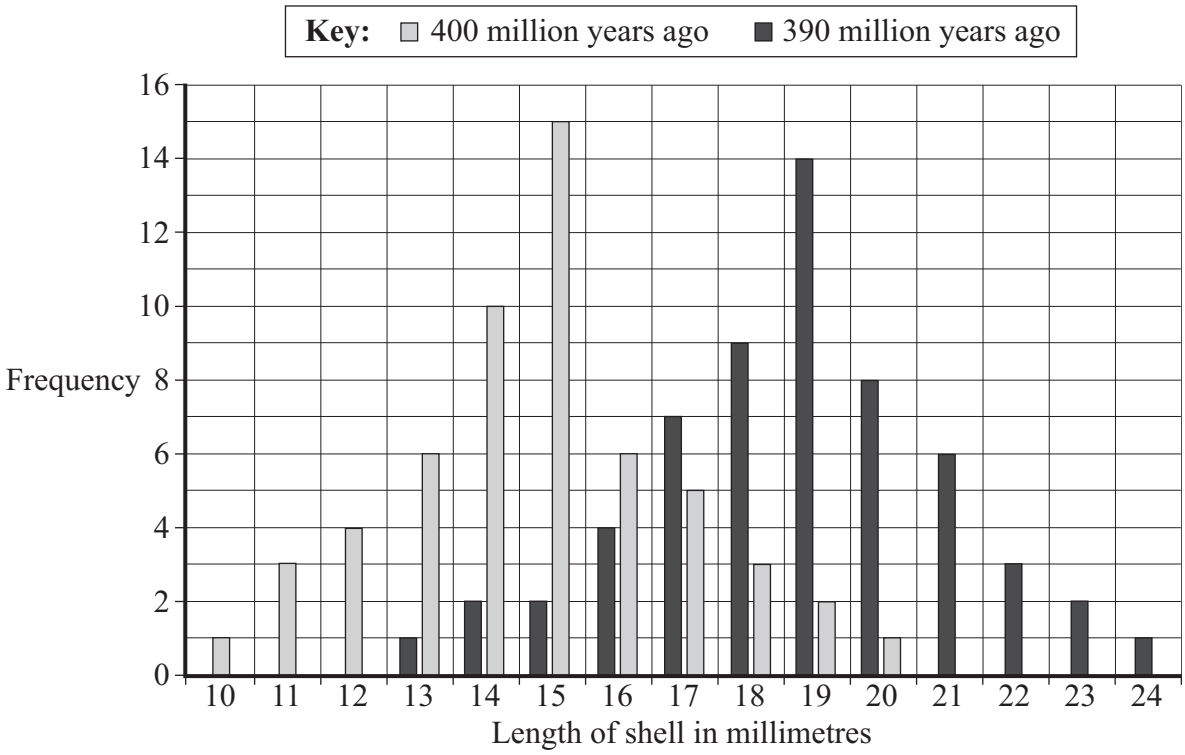
Question 01

March 2007 | BLY1B | Original Q7 | Legacy

QUESTION SEVEN

The bar charts give some information about the width and length of the shells of fossil snails.





4.6.3.4 Evidence for evolution

Question 01 · continued

7A What conclusion can be drawn from these data?

1 More than half of the younger fossil shells are greater than 18 mm in length.

2 None of the older fossil shells are both longer and narrower than younger fossil shells.

3 All of the younger fossil shells are both shorter and wider than the older fossil shells.

4 None of the younger fossil shells are greater than 30 mm in width.

7B Which of the following statements is supported by these data?

1 As the snails evolved they became shorter.

2 As the snails evolved they became wider.

3 Snails with shells less than 18 mm wide did not exist before 400 million years ago.

4 Snails with shells shorter than 13 mm died out 400 million years ago.

7C Modern species of snail of similar types are much like those living 390 million years ago.

A likely reason for this is that . . .

1 mutations do not occur in these snail species.

2 snails have only a small number of genes.

3 snails have no predators.

4 the environment in which they live has changed very little.

7D The close similarity of some modern species to those living 390 million years ago suggests that . . .

1 Darwin's theory of evolution was incorrect.

2 natural selection does not take place in burrowing animals.

3 shells do not evolve.

4 some species evolve more slowly than others.

4.6.3.4 Evidence for evolution

Question 02

March 2007 | BLY1B | Original Q8 | Legacy

QUESTION EIGHT

Read the passage.

EVOLUTION

Charles Darwin proposed his theory of evolution in 1859.

His theory of evolution by natural selection was only gradually accepted.

Other theories at the time included Lamark's theory. This stated that organisms inherited characteristics that had been developed during the lifetime of their parents.

8A Which of the following best describes Darwin's theory of evolution?

1 Individuals with characteristics suited to their environment are more likely to survive and reproduce.

2 Only individuals with characteristics suited to their environment will survive.

3 Species become extinct if they do not match the environment in which they live.

4 Species survive only if they have similar characteristics to their parents.

8B One reason why Darwin's theory of evolution by natural selection was only gradually accepted could have been because . . .

1 at that time scientists did not know how characteristics were inherited.

2 Darwin had not carried out any experiments.

3 Darwin was not an accepted scientist.

4 there was no scientific evidence to support the theory.

8C Darwin's and Lamark's theories are similar in that they both . . .

1 depend on information about the characteristics of organisms being passed from parent to offspring.

2 rely on parents being able to alter the characteristics of their offspring.

3 state that evolution depends on changes in the environment.

4 state that evolution happens very rapidly.

4.6.3.4 Evidence for evolution

Question 02 · continued March 2007 | BLY1B | Original Q8 | Legacy

8D When it was first put forward, the theory of evolution by natural selection was based on . . .

1 a series of controlled experiments.

2 hearsay.

3 observations of the natural world.

4 unreliable evidence.

Turn over for the next question

4.6.3.4 Evidence for evolution

Question 03

June 2007 | BLY1B | Original Q3 | Legacy

QUESTION THREE

One theory of evolution states that all different species of living organisms alive today have evolved from much simpler life forms. These simpler life forms first appeared more than three billion years ago.

The remains of extinct animals and plants may form fossils that can be found in rocks.

Fossils are studied to find out how present-day species have changed from earlier species.

3A The presence of fossils supports the theory of evolution because . . .

1 fossil organisms are found in different layers of rocks.

2 fossil organisms have features in common with present-day organisms.

3 present-day organisms have evolved from fossil organisms.

4 adaptation to the environment by fossil organisms caused the development of new species.

3B Which of the following is **not** a cause of extinction?

1 changes in the environment

2 mutation

3 new diseases

4 new predators

4.6.3.4 Evidence for evolution

3C Darwin's theory of evolution via natural selection was only gradually accepted because . . .

1 books were expensive.

2 Darwin was not a scientist.

3 Lamark had a better theory.

4 the causes of variation were not known at that time.

3D Scientists are uncertain about the origin of life on Earth because . . .

1 fossils last for only a few million years.

2 humans evolved later than most other organisms.

3 new competitors caused the extinction of the earliest organisms.

4 the earliest organisms had soft bodies.

Turn over for the next question

4.6.3.4 Evidence for evolution

Question 04

November 2007 | BLY1B | Original Q3 | Legacy

QUESTION THREE

Rabbits and hares are closely related species.

They are thought to have descended from a common ancestor that is now extinct.

3A Extinction may be caused by . . .

1 an increase in variation.

2 a lack of new competitors.

3 fossilisation.

4 changes in the environment.

3B The evidence that rabbits and hares have evolved from a common ancestor would be shown by . . .

1 comparing modern rabbits and hares with other related species.

2 studying the fossil record of rabbits and hares.

3 studying the fossils of predators of rabbits and hares.

4 comparing the behaviour of rabbits and hares.

3C Rabbits and hares both feed on plants and have teeth adapted for this.

Which one of the following is **not** a possible factor for the development of the specialised teeth of rabbits and hares?

1 adaptation to the environment

2 changes in the environment

3 evolution of predators

4 natural selection

4.6.3.4 Evidence for evolution

3D What is a mutation?

1 a change in the physical appearance of an organism

2 a change in a gene

3 a form of natural selection

4 a change in the environment

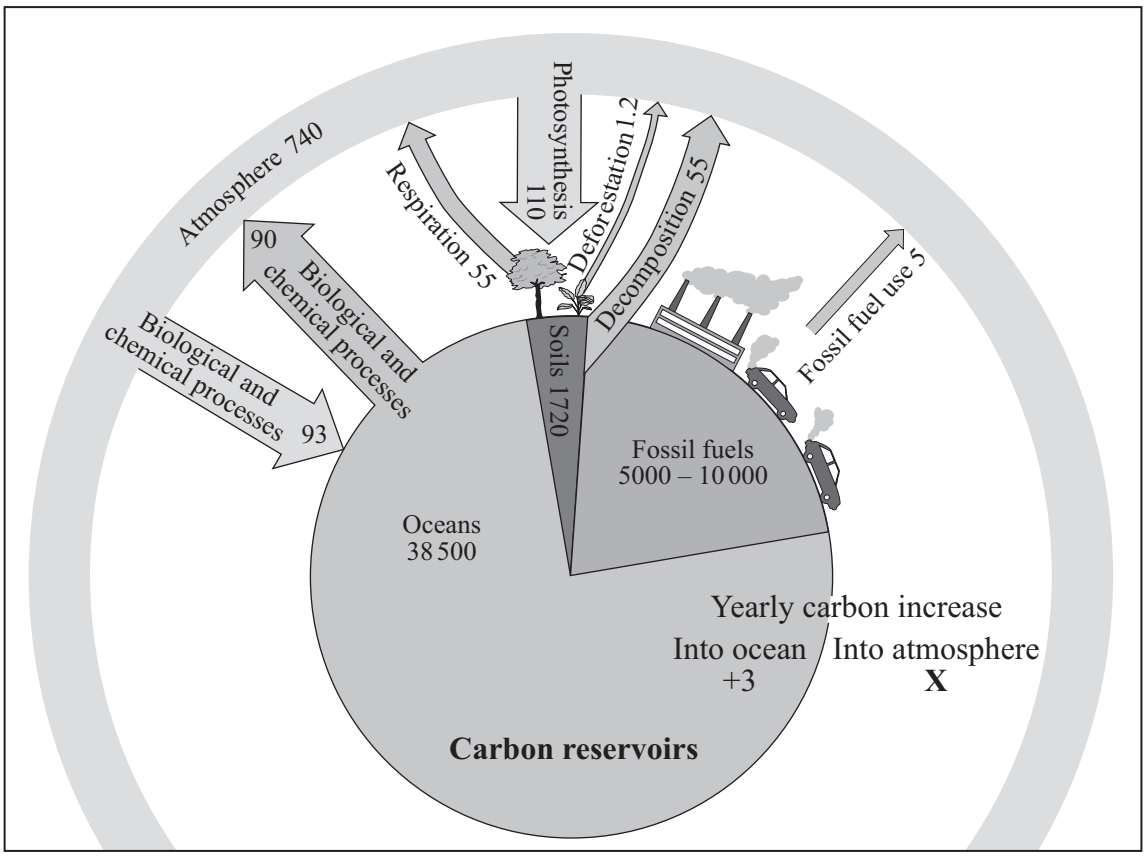
Turn over for the next question

4.6.3.4 Evidence for evolution

Question 05

January 2008 | BLY1H | Original Q6 | Legacy

6 The diagram shows the mass of carbon exchanged between carbon reservoirs and the atmosphere. The pie chart in the diagram shows the mass of carbon in three reservoirs: oceans, soils and fossil fuels. The figures are in billions of tonnes of carbon per year.



(a) Calculate **X** (the yearly carbon increase into the atmosphere).

Show all your working.

.....

.....

.....

.....

X = ... billion tonnes of carbon
(2 marks)

4.6.3.4 Evidence for evolution

Question 05 · continued

BLANK

(b) Give **one** reason why deforestation increases the carbon dioxide concentration of the atmosphere.

.....

.....

(1 mark)

(c) Explain, as fully as you can, why the increasing concentration of carbon dioxide in the atmosphere is causing global warming.

.....

.....

.....

.....

.....

.....

(3 marks)

6

4.6.3.4 Evidence for evolution

Question 06

March 2008 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

Darwin and Lamarck were two scientists who had different ideas about how animals and plants have changed over time.

3A The idea that animals and plants have changed over millions of years is called . . .

1 adaptation.

2 mutation.

3 evolution.

4 extinction.

3B New explanations about changes in animals and plants are called . . .

1 observations.

2 hypotheses.

3 evidence.

4 issues.

3C In Darwin's and Lamarck's lifetimes, many other scientists did not believe their explanations because of lack of . . .

1 bias.

2 hypotheses.

3 evidence.

4 issues.

4.6.3.4 Evidence for evolution

Question 06 · continued

3D Most scientists now accept Darwin's explanation because of the discovery of fossils.

This makes his explanation more . . .

1 accurate.

2 valid.

3 theoretical.

4 biased.

Turn over for the next question

4.6.3.4 Evidence for evolution

Question 07

June 2008 | BLY1BP | Original Q5 | Legacy

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.

4.6.3.4 Evidence for evolution

Question 08

November 2008 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

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

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

A observed that all species change over time

B had sufficient evidence to prove evolution

C thought that natural selection operated on variations present at birth

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

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

4.6.3.4 Evidence for evolution

Question 09

November 2008 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

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

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

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

1 have been destroyed by geological activity.

2 are buried under deep layers of rock.

3 are under the sea.

4 are too small to survive.

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

1 about 1 billion years ago.

2 about 3 billion years ago.

3 about 10 billion years ago.

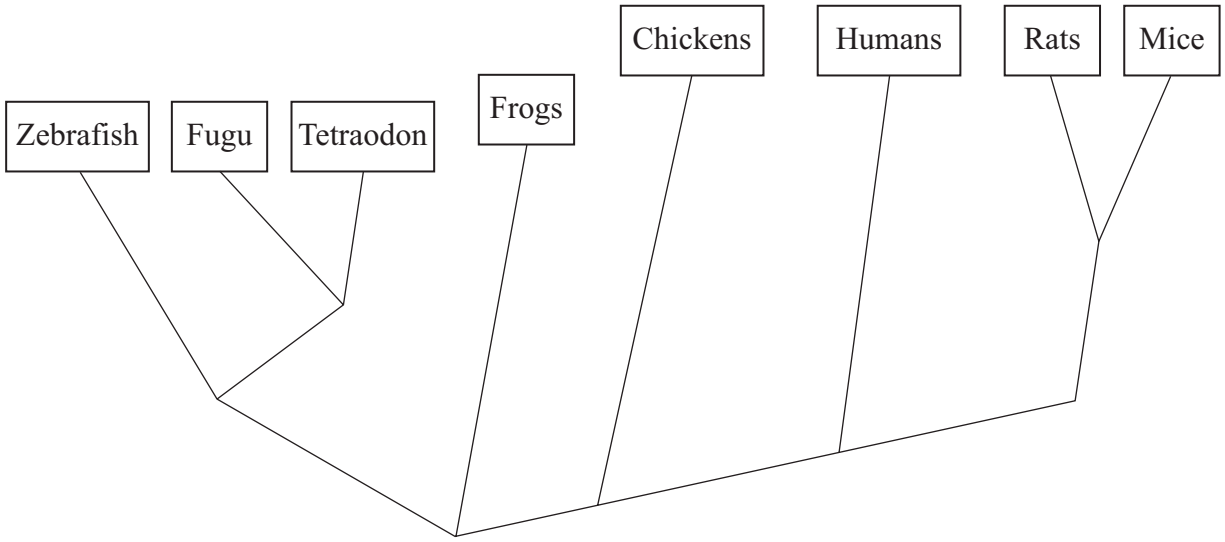
4 about 30 billion years ago.

4.6.3.4 Evidence for evolution

Question 09 · continued

November 2008 | BLY1BP | Original Q3 | Legacy

The diagram shows an evolutionary tree.



3C The evolutionary tree represents . . .

1 facts about evolution.

2 hearsay about evolution.

3 predictions about evolution.

4 a guess about evolution.

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

1 their environment.

2 their genes.

3 their different diet.

4 their ability to reproduce quickly.

4.6.3.4 Evidence for evolution

Question 10 March 2009 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

There are several theories for the way in which evolution may have happened.

9A Lamarck's theory of evolution was based on the idea that . . .

1 organisms pass on the advantages that they acquire during their lifetime.

2 organisms acquire genes from their parents which may give them advantages.

3 the characteristics that organisms have are controlled by God.

4 offspring have a mixture of their parents' features.

9B In the 1860s there was much opposition to Darwin's theory of evolution.

Which of the following was **not** a reason for this opposition?

1 The theory conflicted with deeply held religious views.

2 Darwin did **not** have sufficient evidence to support his ideas.

3 Darwin was unable to make his ideas known to other scientists.

4 Nobody knew how inheritance worked.

9C When a new island is formed by volcanic action, the environment continues to undergo rapid change for many years. At first there will be no living things present.

A plant seed may be blown to the island by the wind. When this seed begins to grow, the plant may reproduce asexually.

What is the disadvantage of asexual reproduction to the plant species in this case?

1 Only one individual is needed for reproduction.

2 All the offspring will be genetically identical.

3 New plants will be produced quickly.

4 Dense groups of this species will reduce competition from other species.

4.6.3.4 Evidence for evolution

Question 10 · continued

9D Darwin's theory of evolution through natural selection was based on a number of events.

These events are outlined below.

- **P** Those individuals which are most suited to the environment survive.
- **Q** There is an increase in variation between members of the species.
- **R** Genes that improve survival chances are passed on to the next generation.
- **S** Mutation results in new forms of genes.

Which is the correct sequence for these events?

1 **P → R → S → Q**

2 **Q → R → P → S**

3 **S → Q → P → R**

4 **R → S → Q → P**

END OF TEST

4.6.3.4 Evidence for evolution

Question 11

June 2009 | BLY1BP | Original Q2 | Legacy

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** . . . .

4.6.3.4 Evidence for evolution

Question 12

June 2009 | BLY1BP | Original Q6 | Legacy

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	✓	✓		✓

4.6.3.4 Evidence for evolution

Question 12 · continued June 2009 | BLY1BP | Original Q6 | Legacy

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

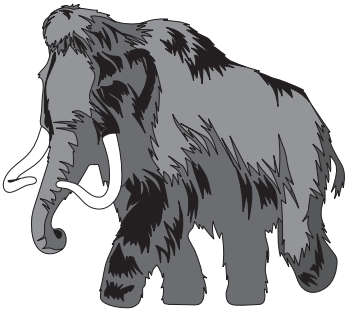
4.6.3.4 Evidence for evolution

Question 13

November 2009 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

Woolly mammoths are extinct mammals that are related to modern elephants.



3A There are several possible reasons for the extinction of the woolly mammoth.

Which one of these was the most likely cause of their extinction?

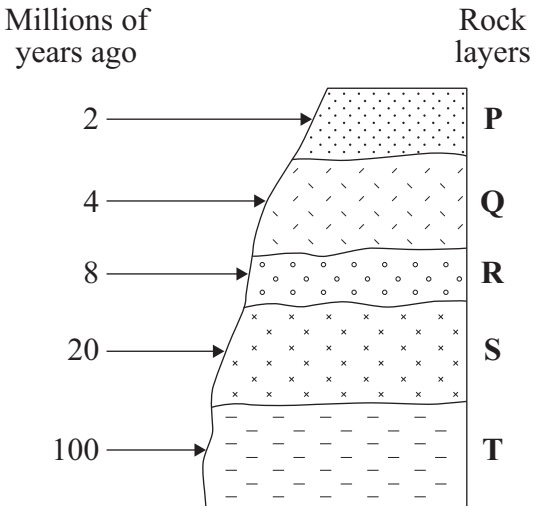
1 continents moving apart

2 an increase in the number of plant species

3 formation of new mountain ranges

4 an increase in the temperature of the Earth

The diagram shows the rocks in a cliff, which were exposed when other rocks wore away.
The times when these rocks were formed are shown.



4.6.3.4 Evidence for evolution

Question 13 · continued November 2009 | BLY1BP | Original Q3 | Legacy

3B Woolly mammoths lived on Earth between 4.8 million years ago and 4 thousand years ago.

In which layers of rock could woolly mammoth fossils be found?

1 **T** and **S** only

2 **Q** only

3 **R**, **S** and **T** only

4 **P** and **Q** only

3C Living things are thought to have developed over 3 billion years ago. We cannot be sure what these living things looked like.

This is because . . .

1 no rocks were being formed 3 billion years ago, so there are no fossils.

2 geological activity has destroyed many of the fossils.

3 there are no records because humans had not evolved then.

4 scientists are unable to agree on their appearance.

3D Recently, a pregnant female woolly mammoth was discovered preserved in ice. The cells of this mammoth are still in good condition. Scientists plan to transfer the nucleus from a mammoth skin cell into an elephant egg cell from which the nucleus has been removed. After the cell is given an electric shock, it will be transferred to the womb of a female elephant.

What term is used to describe this process?

1 tissue culture

2 sexual reproduction

3 adult cell cloning

4 taking cuttings

4.6.3.4 Evidence for evolution

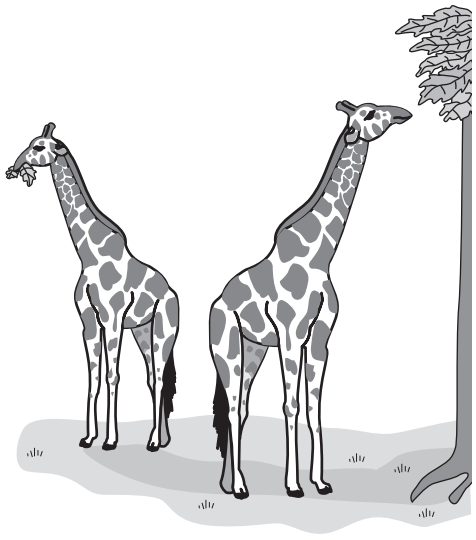
Question 14

November 2009 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Different people have different views about why giraffes have long necks.

The drawing shows giraffes feeding on tree leaves.



You will need to refer to statements **E1** to **E6** to answer the questions.

E1 According to Lamarck (1809), giraffes grew longer necks during their lifetime to reach foliage high up in trees during food shortages, and the longer neck developed was then passed on to offspring.

E2 According to Darwin (1872), some giraffes were born with longer necks than others and they could feed at higher levels than other animals. These survived best and reproduced, passing on the long neck feature to their offspring.

E3 Some research (in Africa) has shown that female giraffes spend up to 75% of their grazing time bent down eating low level bushes during food shortage in periods of dry conditions.

E4 Male giraffes fight with their necks. The ones with the biggest necks dominate other males.

E5 The dominant males mate most frequently with female giraffes.

E6 No fossils of short necked giraffes have yet been found.

Question 14 · continued

9A The theory that long necks evolved through a process of natural selection is supported by . . .

1 **E1** and **E2**.

2 **E2**, **E4** and **E5**.

3 **E3**, **E4** and **E5**.

4 **E6**.

9B The information quoted in **E3** directly contradicts . . .

1 **E2**.

2 **E4**.

3 **E5**.

4 **E6**.

9C The piece of evidence given in **E6** . . .

1 proves that no short-necked giraffes have ever existed.

2 casts doubts on both Darwin's and Lamarck's theories.

3 could be used to support Darwin's theory.

4 could be used to support Lamarck's theory.

9D Lamarck's theory in **E1** is not a correct explanation.

We know this because . . .

1 both parent giraffes would need to have the longer necks for the feature to be inherited by their offspring.

2 characteristics acquired during an animal's lifetime cannot be passed on in its genes to its offspring.

3 male giraffes are about 1 metre taller than females of the same age.

4 the shape of animals cannot alter during their lifetime.

END OF TEST

4.6.3.4 Evidence for evolution

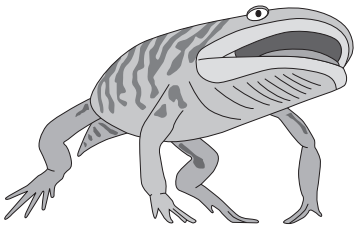
Question 15

March 2010 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

A new fossil find may be an evolutionary missing link in the amphibian family tree.

The drawing shows an artist's impression of a frogamander.



The 290 million year old fossil, nicknamed 'frogamander', was first collected in Texas by a scientist in the mid-1990s. It was rediscovered in a museum in 2004.

'It had a look of both frogs and salamanders', said the scientist who led a new study of the fossil. 'But I also recognised some primitive features, and I thought that this would be a critical piece of evidence in trying to work out the origins of modern amphibians.'

5A The frogamander needed pools of fresh water in order to breed. It is now extinct.

Which is the most likely cause of its extinction?

1 It was a small animal.

2 It could not run very fast.

3 It fed on small insects.

4 The climate became warmer.

5B Frogs and salamanders are different types of living amphibians.

The different characteristics of frogs and salamanders are directly due to . . .

1 new competitors.

2 changes to the diseases that affect them.

3 changes in their genes.

4 new predators.

4.6.3.4 Evidence for evolution

Question 15 · continued March 2010 | BLY1BP | Original Q5 | Legacy

5C Evolution is brought about by natural selection.

Natural selection always involves the survival of the . . .

1 oldest individuals.

2 most intelligent individuals.

3 individuals most suited to the environment.

4 individuals who can eat the widest range of food.

5D Scientists have not completed the evolutionary tree for amphibians yet because . . .

1 frogamanders have primitive features.

2 no-one has ever seen a frogamander.

3 there is not enough fossil evidence.

4 scientists do not know the mechanism of inheritance in amphibians.

4.6.3.4 Evidence for evolution

Question 16

June 2010 | BLY1BP | Original Q6 | Legacy

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.

4.6.3.4 Evidence for evolution

Question 16 · continued

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 for the next question

4.6.3.4 Evidence for evolution

Question 17

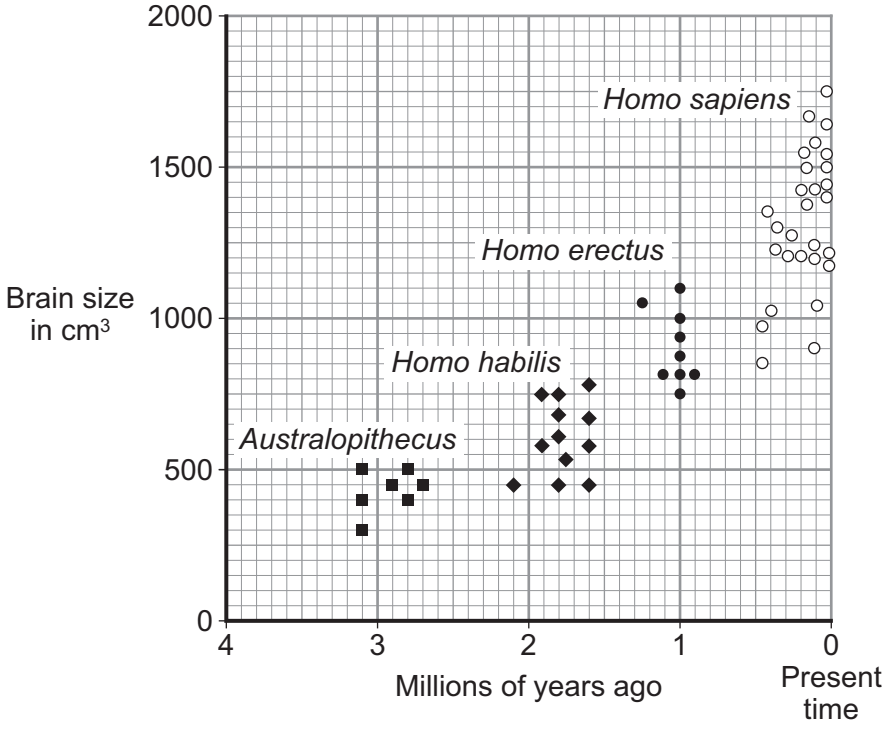
June 2010 | BLY1BP | Original Q7 | Legacy

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 cm^3

2 250 cm^3

3 300 cm^3

4 1000 cm^3

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.

4.6.3.4 Evidence for evolution

Question 17 · continued

7C Which one of the following is correct?

The fossil data for . . .

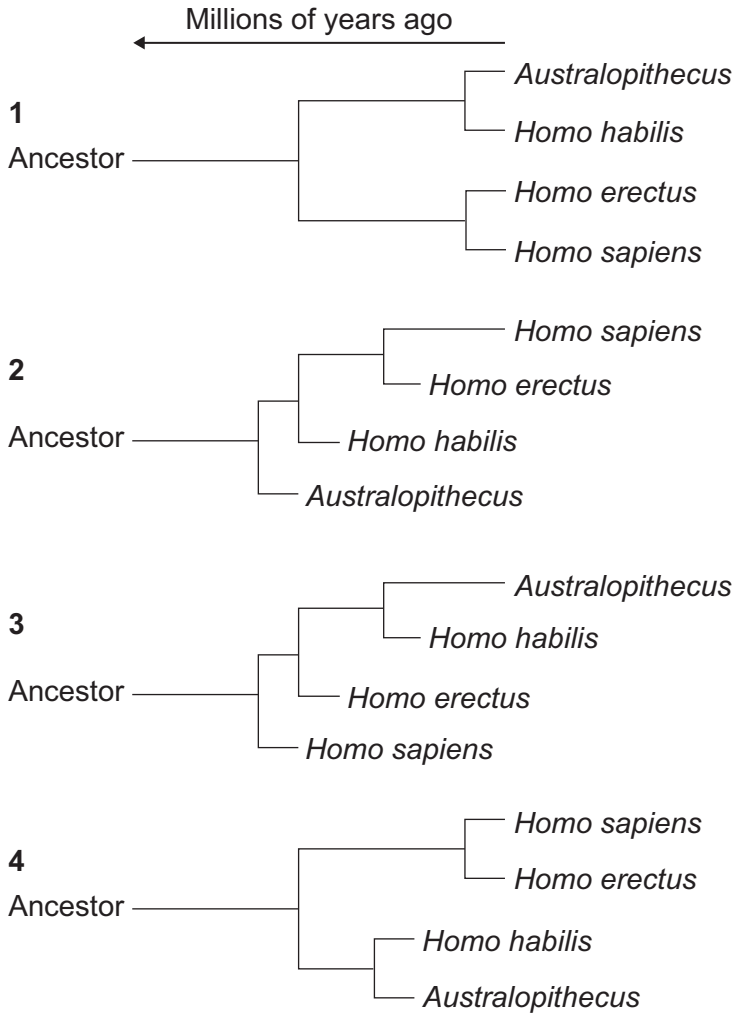
1 *Australopithecus* can be considered least reliable because the fewest number of skulls have been found.

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?



4.6.3.4 Evidence for evolution

Question 18

June 2010 | BLY1BP | Original Q8 | Legacy

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.

4.6.3.4 Evidence for evolution

Question 18 · continued

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

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

4.6.3.4 Evidence for evolution

Question 19

November 2010 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

The drawings show two different species of butterfly.



Amauris



Hypolimnas

Many types of bird can eat both species.

- *Amauris* is poisonous to birds.
- *Hypolimnas* is **not** poisonous to birds.

There are many other examples of 'pairs' of poisonous species and non-poisonous species that look similar.

9A The most likely explanation for the similarity between poisonous and non-poisonous butterflies is that . . .

1 different species interbreed over many generations. This is how different species evolve.

2 the products of asexual reproduction can have slight differences. Environmental variation causes these differences.

3 non-poisonous species look like the poisonous species, and so the non-poisonous butterflies are more likely to survive and breed.

4 poisonous butterflies have evolved a defence mechanism against predators.

9B In the nineteenth century, some people did not accept Darwin's theory of natural selection.

Which of the following was **not** a reason to reject the theory?

1 It undermined the idea that God made all animals and plants.

2 There was insufficient fossil evidence to convince some scientists.

3 The mechanism of inheritance was not known at the time.

4 Lamarck's theory that organisms can inherit acquired characteristics was already well established.

4.6.3.4 Evidence for evolution

Question 19 · continued

9C Fossils of early life-forms are not discovered very often because . . .

1 the early life-forms are all now extinct because of evolution.

2 the soft bodies of the early life-forms did not fossilise well.

3 the early life-forms have all evolved into more complex species.

4 the early life-forms are in rocks too deep in the Earth's crust and cannot be found.

9D Which of the following would **not** be a reason for the extinction of a species of butterfly?

1 the evolution of a new predator

2 the evolution of a disease organism

3 mutation in one individual butterfly

4 a 2°C rise in atmospheric temperature

END OF TEST

4.6.3.4 Evidence for evolution

Question 20

March 2011 | BLY1AP | Original Q7 | Legacy

QUESTION SEVEN

Some infections can be treated using antibiotics.

7A Antibiotics can . . .

1 relieve the symptoms of infectious diseases by acting as painkillers.

2 kill viruses inside body cells.

3 cause white blood cells to produce antibodies.

4 kill some strains of bacteria.

Often, a doctor will prescribe antibiotics for an ear infection the first time a child goes to the doctor with earache.

Scientists investigated 240 young children with earache to see if the antibiotic was really needed. Some of the children were given the antibiotic. Other children were given a placebo.

The results are shown in the table.

	Children given an antibiotic	Children given a placebo
Average time for which the child had a fever	2 days	3 days
Average time for which the child had severe pain	3 days	3 days
Average amount of painkilling medicine given in the first 10 days	2.3 doses	4.1 doses
Difference in the redness of the infected eardrum after 4 days	No difference between the two groups	
Difference in the redness of the infected eardrum after 11 days	No difference between the two groups	

7B Compared with the children given the placebo, the children given the antibiotic had . . .

1 fever and severe pain for a shorter time.

2 severe pain and painkilling medicine for a longer time.

3 less redness of the eardrum after 11 days.

4 no difference in the redness of the eardrum after 4 days and the period of severe pain.

4.6.3.4 Evidence for evolution

Question 20 · continued

March 2011 | BLY1AP | Original Q7 | Legacy

7C The best conclusion that can be drawn from these results is that children with ear infections . . .

1 should always be prescribed antibiotics.

2 recover from all symptoms more quickly if given antibiotics.

3 should be given a placebo on the first visit to a doctor.

4 do **not** really need to be prescribed an antibiotic on the first visit to a doctor.

7D Doctors are concerned that antibiotic resistance is increasing in some bacteria.

The increase is because . . .

1 antibiotics cause bacteria to mutate into resistant forms of bacteria.

2 bacteria mutate spontaneously, then antibiotics do not kill the resistant forms of the bacteria.

3 the strongest bacteria mutate into resistant forms of bacteria.

4 after being in contact with antibiotics, bacteria decide to mutate.

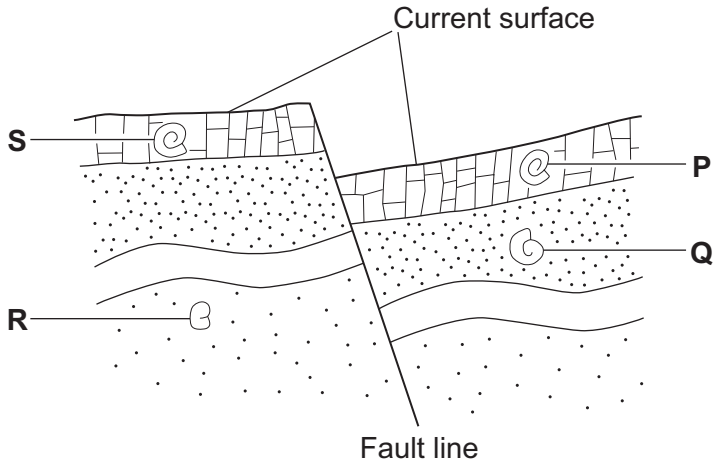
4.6.3.4 Evidence for evolution

Question 21

March 2011 | BLY1BP | Original Q6 | Legacy

QUESTION SIX

The diagram shows where fossils have been found in layers of rock.



6A Which fossil in the diagram shows the organism that developed first?

1 **P**

2 **Q**

3 **R**

4 **S**

6B Scientists think that the ancestors of fossil **P** were like fossil **Q** but they cannot be certain.

Which of the following is the most likely reason why the scientists cannot be certain?

1 Other fossils showing the evolutionary sequence have not yet been found.

2 Some scientists do not believe in evolution.

3 Fossils can form only in swamps.

4 Fossil **P** has many different features from fossil **Q**.

4.6.3.4 Evidence for evolution

Question 21 · continued

6C The thickness of the shell of each of the fossils discovered in these rocks was measured.

First the scientists would write the hypothesis.

Then the scientists would write . . .

1 a conclusion.

2 an evaluation.

3 a prediction.

4 a theory.

6D What is needed for a new characteristic in an organism to be produced?

1 a constant environment

2 mutations in genes

3 changes in acquired characteristics

4 diseases to kill off some of the species

4.6.3.4 Evidence for evolution

Question 22

March 2011 | BLY1BP | Original Q7 | Legacy

QUESTION SEVEN

Algae are small plants that live in water. Algae photosynthesise to gain energy to grow. An alga that grows off the coast of Hawaii makes a high proportion of vegetable oils in its cells.

A fuel company is planning to farm this alga to produce biodiesel fuel from the vegetable oils. The company says that the plans will result in sustainable development.

7A What does the company mean by *sustainable development* (for producing biodiesel)?

1 The algae will always grow in the sea around Hawaii.

2 The biodiesel will be produced using fossil fuels.

3 The biodiesel will be produced without affecting future generations.

4 The company can keep making the biodiesel for a long time.

7B Which of the following statements is the most important reason for promoting the algae as a sustainable source of biodiesel?

1 The trial growth project is in the sea around Hawaii where conditions are best for the algae farming.

2 The cost of the biodiesel produced is 8 times greater than diesel produced from fossil fuels.

3 The algae absorb carbon dioxide from the atmosphere, which increases the 'greenhouse effect'.

4 Using food crops to produce biodiesel may lead to starvation in some poor countries.

7C Some people say that burning fossil fuels adds to global warming.

Why does burning fossil fuels add to global warming?

1 Burning fossil fuels releases heat.

2 Burning fossil fuels releases carbon dioxide.

3 Fossil fuels are easily available.

4 Carbon in fossil fuels did not come from plants.

4.6.3.4 Evidence for evolution

Question 22 · continued

7D Methane contributes to global warming because methane . . .

1 traps heat radiation from the Earth and re-radiates it out to space.

2 traps heat radiation from the Earth and re-radiates it back to the Earth.

3 traps heat radiation directly from the Sun and re-radiates it back to the Earth.

4 reflects heat radiation from the Sun back out to space.

Turn over for the next question

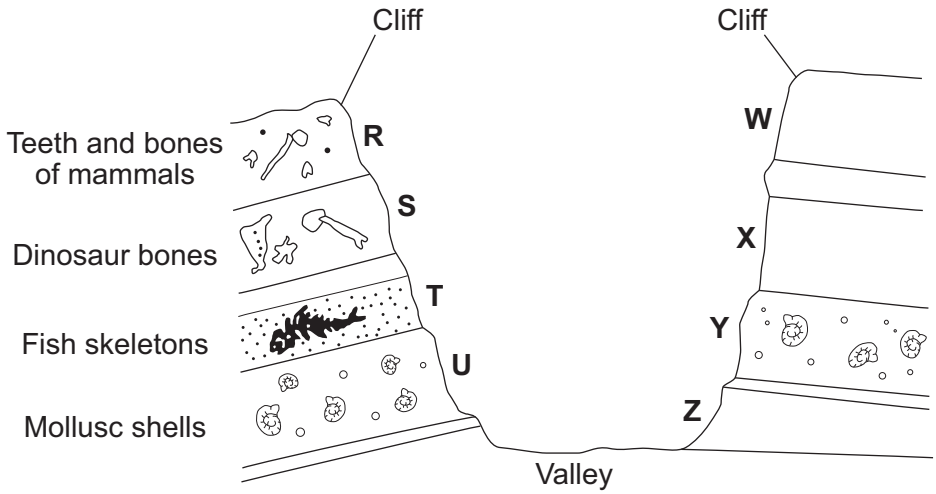
4.6.3.4 Evidence for evolution

Question 23

November 2011 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

The diagram shows a section through rock layers containing fossils.



3A Which layers of rock are probably the same age?

1 **R** and **W**

2 **S** and **X**

3 **T** and **Z**

4 **U** and **Y**

3B Which of these statements about rocks and fossils is true?

1 Older fossils are usually found in deeper rocks.

2 Rocks of the same age in a particular area will contain fossils of totally different life forms.

3 The deeper the rock, the more different types of fossil are found.

4 Fossils are never found in surface layers of rocks.

4.6.3.4 Evidence for evolution

Question 23 · continued

3C There are few fossils of the earliest organisms on Earth.

This is because . . .

1 fossils last for only a few million years.

2 the organisms had soft bodies.

3 the organisms quickly became extinct.

4 new predators ate the organisms.

3D The fossils in the rock layers support the theory of evolution because . . .

1 the same fossil organisms are found in different layers of rocks.

2 fossil organisms have features in common with present-day organisms.

3 present-day organisms have evolved from fossil organisms.

4 the environment caused the changes in the fossil organisms.

Turn over for the next question

4.6.3.4 Evidence for evolution

Question 24

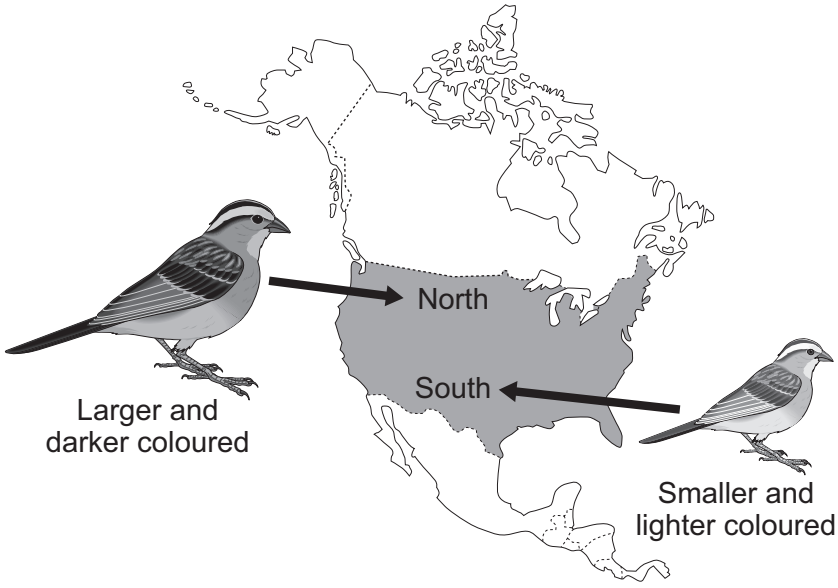
November 2011 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

House sparrows arrived in North America from Europe in the nineteenth century. Since then, sparrows have spread to inhabit most of the continent.

House sparrows in the north of America are larger and darker coloured than house sparrows in the south of America.

The drawing shows where the two types of sparrow live.



9A The differences between the sparrows have been caused directly by changes in . . .

1 the environment.

2 the sparrows' predators.

3 the sparrows' genes.

4 human activities.

9B Being larger than the southern sparrow helps the northern sparrow to . . .

1 see prey from greater distances.

2 be less easily seen by predators.

3 live in a greater range of habitats.

4 conserve more heat.

4.6.3.4 Evidence for evolution

Question 24 · continued

9C The two sparrow populations have become distinctly different because they do **not** . . .

1 eat the same prey.

2 have the same predators.

3 interbreed.

4 have the same types of tree to nest in.

9D The information in this question . . .

1 proves that natural selection takes place.

2 shows that some acquired characteristics are inherited.

3 provides evidence for evolution.

4 shows that one of the types of sparrow is likely to become extinct in the near future.

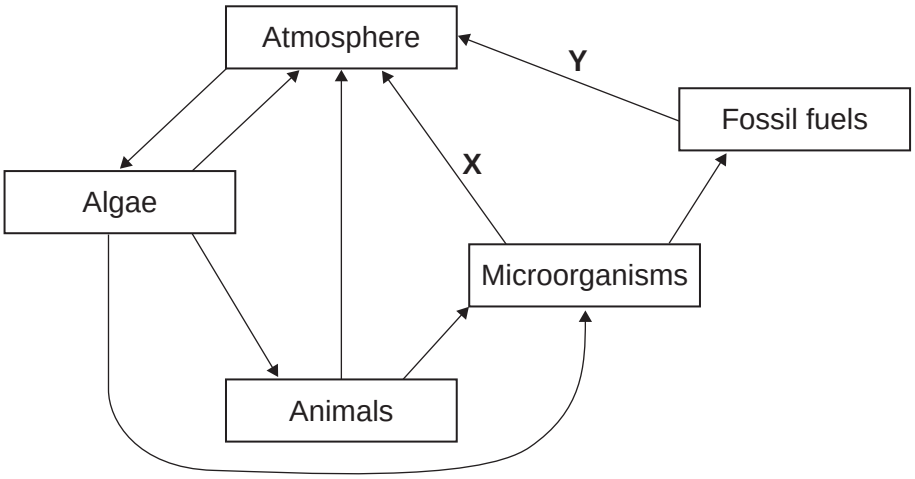
END OF TEST

4.6.3.4 Evidence for evolution

Question 25

June 2012 | BL1HP | Original Q2 | Legacy

2 The diagram shows part of a carbon cycle in a habitat.



2 (a) Name the processes shown by arrows **X** and **Y**.

X .....

Y .....

(2 marks)

2 (b) Describe the part played by algae in this carbon cycle.

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(3 marks)

2 (c) In tropical rainforests process **X** is much faster than in most other habitats.

Suggest why.

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(2 marks)

7

4.6.3.4 Evidence for evolution

Question 26

June 2012 | BL2HP | Original Q6 | Legacy

6 (a) How do fossils provide evidence that species alive today have evolved from simpler organisms?

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(3 marks)

6 (b) The photographs show two species of gull.

Herring gull (*Larus argentatus*)



Photograph: © John Howard/Science Photo Library

Lesser black-backed gull (*Larus fuscus*)



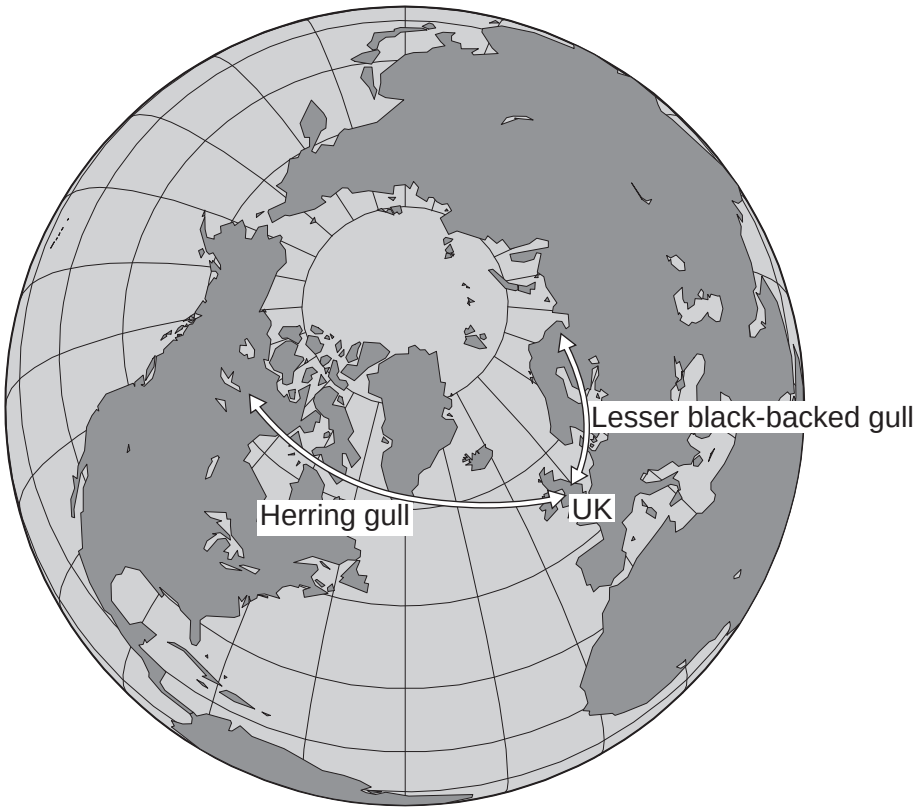
Photograph: © John Devries/Science Photo Library

Both species are now found in the UK but the two species cannot interbreed with each other. Scientists believe that these two species have evolved from a common ancestor.

The map on the next page shows a view of the Earth from above the North Pole.
The map also shows where these two species are found.

4.6.3.4 Evidence for evolution

Question 26 · continued



6 (b) Suggest an explanation for the development of these different species.

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(6 marks)

9

4.6.3.4 Evidence for evolution

Question 27

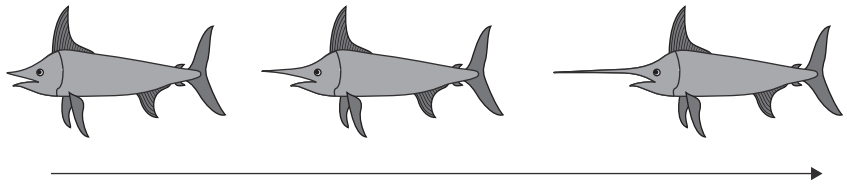
June 2013 | BL1HP | Original Q8 | Legacy

8 The picture shows a modern swordfish.



Ancestors of swordfish had short swords. Modern swordfish have long swords. Swordfish use their swords to injure prey. The injured prey are easier to catch.

The information in the box shows one theory of how the length of the sword of swordfish changed.

> The sword grew longer as each swordfish used its sword more and more.
> Each time a swordfish reproduced, the longer sword was passed on to its offspring.
>
> 
>

8 (a) Which scientist suggested the theory shown in the box?

.....

(1 mark)

4.6.3.4 Evidence for evolution

Question 27 · continued

8 (b) (i) Darwin suggested that evolution is a result of natural selection.

Describe how natural selection could result in modern swordfish with long swords developing from ancestors with short swords.

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(4 marks)

8 (b) (ii) Scientists in the 1800s accepted both the theory shown in the box, and Darwin's theory.

Now most scientists only accept Darwin's theory.

Give **one** reason why.

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(1 mark)

6

4.6.3.4 Evidence for evolution

Question 28

June 2014 | BL2HP | Original Q7 | Legacy

7 (a) Fossils provide evidence for what early life forms were like. From the evidence, scientists think that life began on Earth more than 3 billion years ago.

Many early life forms were soft-bodied.
Explain why this makes it difficult for scientists to be certain about what these early life forms were like.

[2 marks]

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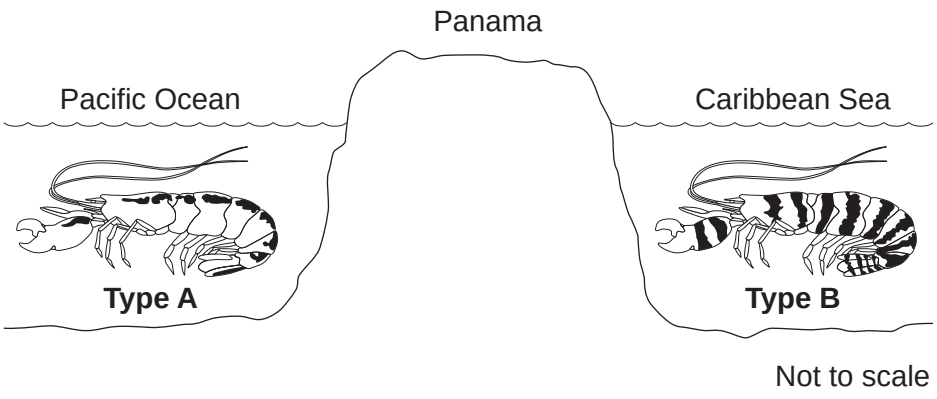
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7 (b) **Figure 9** shows two types of pistol shrimp.

The shrimps live in shallow, tropical seas on opposite sides of Panama.

Figure 9



Not to scale

Scientists put one **Type A** shrimp and one **Type B** shrimp together in a tank of seawater.
The two types of shrimp snapped their claws aggressively at each other.
They did not mate.

The scientists said that this was evidence for the **Type A** and **Type B** shrimps being classified as two different species.

7 (b) (i) Give **one** reason why the scientists' opinion may be correct.

[1 mark]

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4.6.3.4 Evidence for evolution

Question 28 · continued

7 (b) (ii) Suggest **two** reasons why the scientists' opinion may **not** be correct.

[2 marks]

1 .....

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2 .....

.....

7 (c) Panama is a narrow strip of land which today joins North America and South America. It was formed by land moving up from beneath the sea. Panama has separated the Pacific Ocean and the Caribbean Sea for the past 3 million years.

Explain how two different species of pistol shrimp could have developed from an ancestral species of shrimp.

[6 marks]

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11

4.6.3.4 Evidence for evolution

Question 29

June 2015 | BL2HP | Original Q6 | Legacy

6 (a) Evidence about extinct species of animals and plants comes from fossils.

Figure 8 is a photograph of a fossil of a bird-like animal called *Archaeopteryx*. *Archaeopteryx* lived about 150 million years ago.

Figure 8



6 (a) (i) Suggest how the fossil of *Archaeopteryx* was formed.

[2 marks]

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6 (a) (ii) Scientists have found other fossils of the ancestors of modern birds, but the fossil record is very incomplete.

Suggest **two** reasons why there are gaps in the fossil record.

[2 marks]

1 .....

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2 .....

.....

4.6.3.4 Evidence for evolution

Question 29 · continued

6 (b) There are many different species of bird on the Earth today.

Describe how these different species may have evolved from an ancestor such as *Archaeopteryx*.

[4 marks]

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8

4.6.3.4 Evidence for evolution

Question 30

June 2017 | BL1HP | Original Q2 | Legacy

2 Charles Darwin developed the theory of evolution by natural selection in the 1800s.

2 (a) Describe the process of evolution by natural selection.

[3 marks]

2 (b) In the 1870s, cartoons of Darwin looking like a monkey were published in magazines.

The cartoons were published after Darwin wrote a book about his theory of evolution.

2 (b) (i) Suggest **one** reason why cartoons of Darwin looking like a monkey were drawn.

[1 mark]

2 (b) (ii) Give **two** reasons why Darwin's theory of evolution by natural selection was only gradually accepted.

[2 marks]

6

4.6.3.4 Evidence for evolution

Question 31

June 2017 | BL2HP | Original Q7 | Legacy

7 There are nearly 9 million species of organisms alive on Earth today.

7 (a) (i) What is a species?

[2 marks]

7 (a) (ii) How do fossils provide evidence that species alive today have evolved from simpler organisms?

[2 marks]

7 (b) **Figure 7** shows three species of flightless birds that are alive today.

Each of the three species lives on a different continent.

Figure 7

Rhea (South America)



Emu (Australia)



Ostrich (Africa)



4.6.3.4 Evidence for evolution

Question 31 · continued

Many scientists now believe that each of these species evolved from an ancestral species of bird that could fly. This happened after the extinction of the dinosaurs, about 65 million years ago. Many of the dinosaurs were meat eaters.

Although these three birds are different species, they have many features in common.

Suggest how these different species of flightless birds might have evolved to have many features in common.

[6 marks]

10

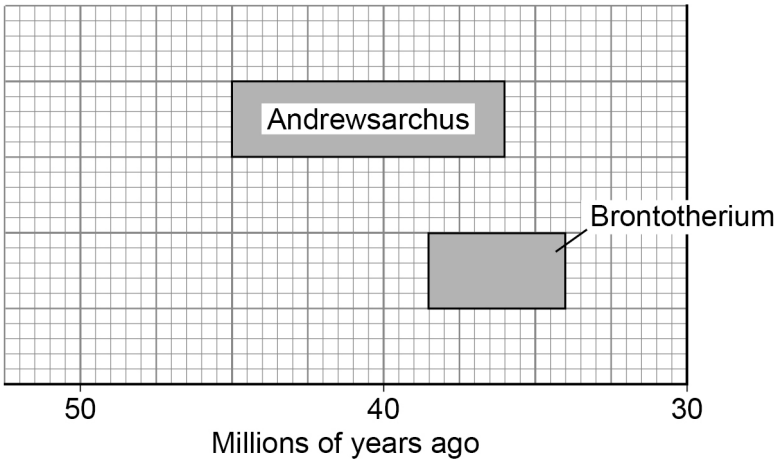
4.6.3.4 Evidence for evolution

Question 32

November 2020 | 8461/2H | Original Q8

0 8 **Figure 8** shows when two mammals existed in Asia.

Figure 8



0 8 . 1 Determine the number of years both Andrewsarchus and Brontotherium existed together.

[2 marks]

Time = _____ years

Question 32 · continued

0 8 . 2 The oldest fossils of human ancestors found in this area are 700 000 years old.

Andrewsarchus was a carnivore and Brontotherium was a herbivore.

Suggest how the extinction of Andrewsarchus could have resulted in the extinction of Brontotherium.

[3 marks]

0 8 . 3 Information about extinct animals is often **not** clear because the fossil record is incomplete.

Give **three** reasons why the fossil record is **not** clear for older species.

[3 marks]

1

2

3

Question 8 continues on the next page

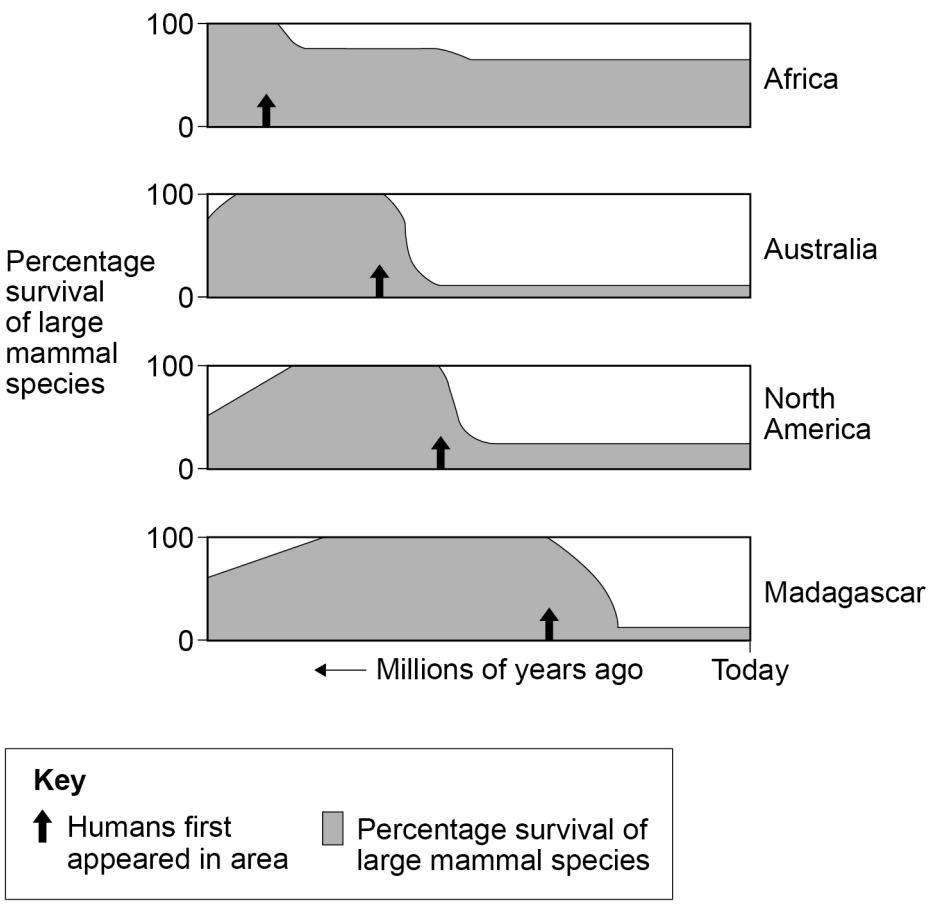
4.6.3.4 Evidence for evolution

Question 32 · continued

Figure 9 shows the percentage (%) survival of large mammal species in four areas of the world.

The time at which humans first appeared in each of the four areas is also shown.

Figure 9



4.6.3.4 Evidence for evolution

Question 32 · continued

A mass extinction is a rapid decrease in biodiversity on Earth.

0 8 . 4 A student stated:

'The data in **Figure 9** shows that humans caused mass extinctions.'

Evaluate the student's statement.

[6 marks]

Question 8 continues on the next page

4.6.3.4 Evidence for evolution

Question 32 · continued

November 2020 | 8461/2H | Original Q8

0 8 . 5 Give **one** disadvantage and **one** advantage of mass extinction events.

Answer in terms of evolution.

[2 marks]

Disadvantage _____

_____

Advantage _____

_____

16

4.6.3.4 Evidence for evolution

Question 33

June 2023 | 8461/2H | Original Q9

0 9 A wide variety of species exists on Earth.

Most scientists accept Darwin's theory of evolution by natural selection as the explanation for this variety of species.

Explain how our understanding of evolution has developed due to:

- fossil evidence
- increased understanding of the mechanisms of genetics.

[6 marks]

6

4.6.3.4 Evidence for evolution

Question 34

0 6 This question is about pathogens.

A scientist investigated antibiotic resistance in bacteria.

0 6 . 1 Name **one** antibiotic.

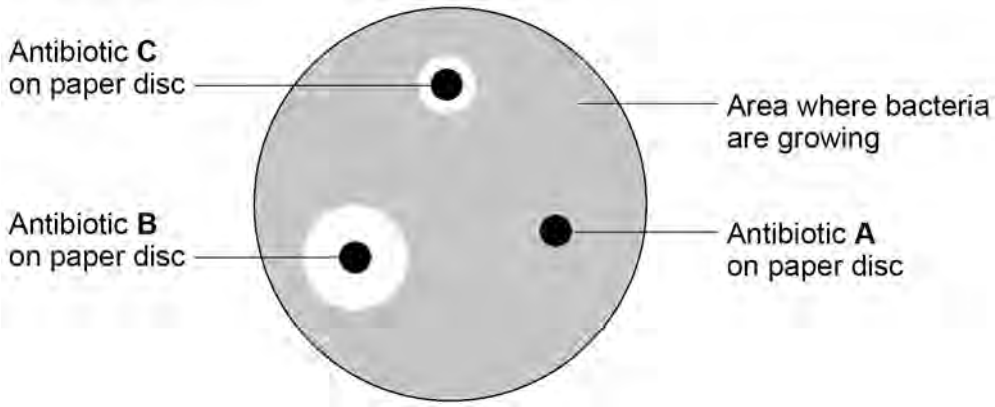
[1 mark]

The scientist grew one type of bacterium on agar in a Petri dish.

The scientist placed paper discs each containing a different antibiotic on the agar.

Figure 5 shows the appearance of the Petri dish after 2 days.

Figure 5



4.6.3.4 Evidence for evolution

Question 34 · continued

0 6 . 2 A student said:

‘The bacterium is resistant to antibiotic **C**.’

Explain how the results in **Figure 5** show that the student is **not** correct.

[2 marks]

0 6 . 3 Suggest why doctors are concerned about antibiotic resistance.

[2 marks]

Question 6 continues on the next page

4.6.3.4 Evidence for evolution

Question 34 · continued

Diseases caused by viruses **cannot** be treated using antibiotics.

0 6 . 4 Suggest why viruses **cannot** be grown on agar.

[1 mark]

0 6 . 5 Why is it difficult for scientists to develop drugs to destroy viruses?

[1 mark]

0 6 . 6 Which disease is caused by a virus that damages white blood cells?

[1 mark]

Tick (✓) **one** box.

- AIDS ☐
- Gonorrhoea ☐
- Measles ☐
- Salmonella ☐

8

4.6.3.4 Evidence for evolution

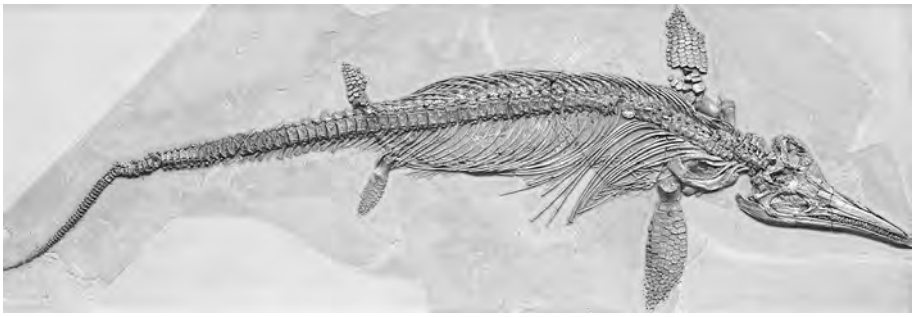
Question 35

June 2025 | 8461/2H | Original Q1

0 1 Ichthyosaurs are reptiles that lived in the sea millions of years ago.

Figure 1 shows the fossilised remains of an ichthyosaur.

Figure 1



0 1 . 1 Suggest how the fossil in **Figure 1** was formed after the ichthyosaur died.

[2 marks]

0 1 . 2 The length of the image of the ichthyosaur in **Figure 1** is 120 mm.

The real length of the ichthyosaur was 17 times longer than the image in **Figure 1**.

Calculate the real length of the ichthyosaur.

Give your answer in metres.

[3 marks]

Real length of ichthyosaur = _____ metres

4.6.3.4 Evidence for evolution

Question 35 · continued

0 1 . 3 **Table 1** gives the classification of the ichthyosaur in **Figure 1**.

Table 1

Classification group	Name
Kingdom	Animalia
	Chordata
Class	Reptilia
Order	Ichthyosauria
	Ichthyosauridae
Genus	Ichthyosaurus
Species	intermedius

Complete **Table 1**.

[2 marks]

Choose answers from the box.

Community	Family	Mammal	Phylum	Population

0 1 . 4 Ichthyosaurs were predators.

Ichthyosaurs are now extinct.

Scientists think that extinction of the ichthyosaurs was caused by increased competition with other predators for food.

Suggest **two other** possible causes of extinction of the ichthyosaurs.

[2 marks]

1 _____

_____

2 _____

_____

9