AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.6.2.2

Evolution

Past-paper questions

Tier	**Higher**
Question groups	**6**
Available paper years	**2018–2025**

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.

4.6.2.2 Evolution

Question 01

June 2018 | 8464/B/2H | Original Q2

0 2 *Pseudomonas* bacteria cause infections in hospital patients.

A new strain of *Pseudomonas* bacteria has evolved. This new strain can only be killed by one antibiotic called fluroquinolone.

Scientists want to prevent the new strain of *Pseudomonas* from spreading in the human population.

Explain the advice doctors should be given to prevent the spread of the new strain.

[6 marks]

6

4.6.2.2 Evolution

Question 02

0 4 Animals have adaptations to survive in their environment.

These adaptations may be structural, behavioural or functional.

0 4 . 1 Draw **one** line from each animal adaptation to the type of adaptation it is.

[2 marks]

Animal adaptation	Type of adaptation
 Male palm cockatoos use sticks to beat on hollow branches to attract females.	Structural
 The harmless hornet moth has black and yellow stripes to look like a bee or wasp.	Behavioural
 Sea spiders have automatic muscle contractions that move oxygen around their bodies.	Functional

4.6.2.2 Evolution

Question 02 · continued

Plants also have adaptations.

There are more than 28 000 known species of orchid plants.

0 4 . 2 Many orchid plants:

- grow attached to other types of plants
- have brightly coloured flowers
- produce large quantities of pollen
- produce thousands of tiny, light seeds.

Describe how these adaptations help orchid plants to survive and compete.

[4 marks]

Question 4 continues on the next page

4.6.2.2 Evolution

Question 02 · continued

A rare orchid has been found in the mountains in China.

The orchid has pale yellow flowers.

DNA analysis of the genome shows that it is an ancestral species.

All other present day orchids evolved from this ancestral species millions of years ago.

0 4 . 3 One present day species has bright purple flowers.

Describe how an orchid with bright purple flowers may have evolved from the ancestral species which has pale yellow flowers.

[4 marks]

0 4 . 4 The DNA code determines the sequence of amino acids which are joined together to form a specific protein.

Table 3 shows part of the amino acid sequence for the colour pigment protein in five orchid species.

The rest of the amino acid sequence is the same for all the species.

Table 3

Species	Amino acid sequence	Flower colour
Ancestral species	ala-leu-gly-isoleu-tyr-gly-ala-leu-gly-ala	pale yellow
Species **A**	ala-isoleu-gly-ala-tyr-gly-ala-tyr-gly-ala	pale yellow
Species **B**	ala-leu-ala-isoleu-tyr-gly-ala-tyr-gly-ala	pink
Species **C**	ala-isoleu-gly-ala-gly-tyr-gly-leu-gly-ala	bright red
Species **D**	ala-leu-gly-isoleu-tyr-tyr-ala-leu-gly-ala	purple

Key:
ala = alanine
gly = glycine
isoleu = isoleucine
leu = leucine
tyr = tyrosine

Suggest which orchid species is most closely related to the ancestral species.

Give a reason for your answer.

[2 marks]

Species _____

Reason _____

_____

12

4.6.2.2 Evolution

Question 03

November 2021 | 8464/B/2H | Original Q4

0 4 **Figure 3** shows one species of bird on a bird feeder.

Figure 3

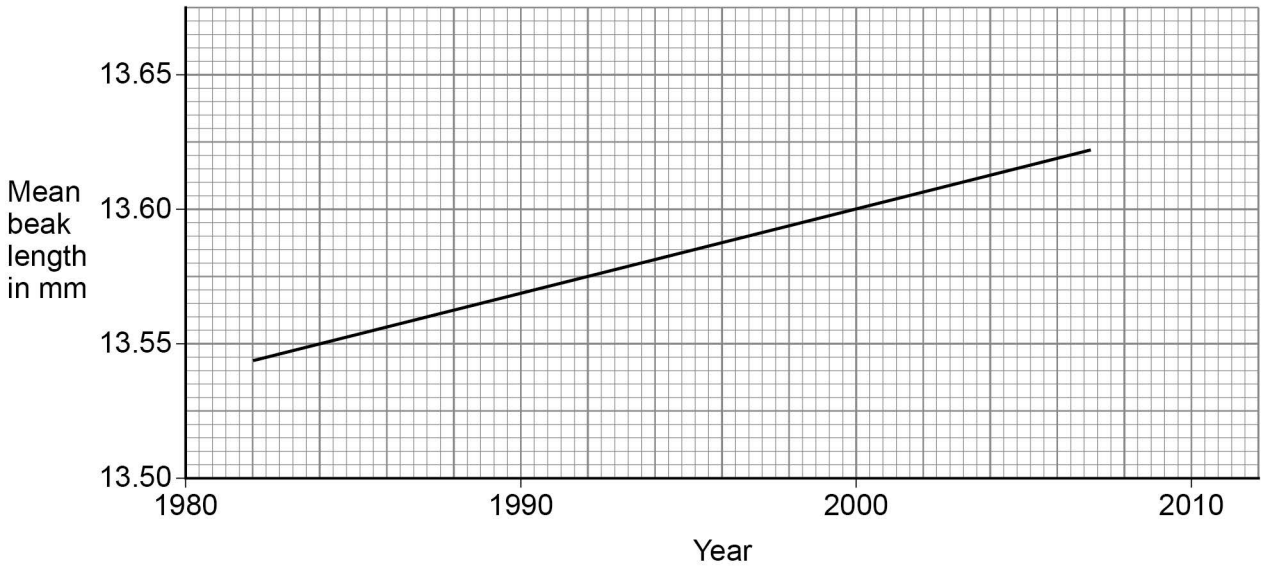


The birds use their beaks to reach nuts inside the bird feeder.

Figure 4 shows the mean beak length of this species of bird in the UK.

This species of bird often visits bird feeders.

Figure 4



4.6.2.2 Evolution

Question 03 · continued

0 4 . 1 Determine the rate of change in beak length from 1984 to 2000.

Use **Figure 4**.

[3 marks]

Rate of change = _____ mm/year

0 4 . 2 Explain the process of evolution that could cause the trend in **Figure 4**.

[6 marks]

4.6.2.2 Evolution

Question 03 · continued

0 4 . 3 Birds of this species:

- live for about 3 years
- produce up to 24 eggs every year.

Explain why evolution is easier to study in this species of bird than in humans.

[3 marks]

0 4 . 4 Birds of this species are found in different parts of the world.

Describe evidence that would show two individual birds are the same species.

[3 marks]

15

4.6.2.2 Evolution

Question 04

0 2 It is estimated that 99.9% of all species that have ever existed are now extinct.

0 2 . 1 Why is the percentage of species that are extinct only an estimate?

[1 mark]

Tick (✓) **one** box.

All individuals of one species have the same genes. ☐

Extinction is always caused by humans. ☐

Humans have not found evidence of every species. ☐

0 2 . 2 What evidence is used to study species that have become extinct?

[1 mark]

4.6.2.2 Evolution

Question 04 · continued

0 2 . 3 A bacterium called *Clostridioides difficile* (*C. difficile*) can infect the human digestive system.

C. difficile can multiply and produce toxins. The toxins cause diarrhoea.

Doctors are concerned that new strains of *C. difficile* may evolve. Antibiotics may **not** be able to kill these new strains.

Explain how the evolution of antibiotic resistant *C. difficile* can be slowed down.

[6 marks]

8

4.6.2.2 Evolution

Question 05

0 4 Rat populations can increase rapidly.

When rat populations are large there is competition between rats.

0 4 . 1 When rats compete, the basal metabolic rate of the rats increases.

Basal metabolic rate is controlled in the same way in humans and in rats.

Describe how basal metabolic rate is increased.

[2 marks]

Question 4 continues on the next page

0 4 . 2 The size of a rat population can increase quickly.

One female rat and one male rat can produce 20 offspring every 2 months.

Warfarin is a poison that has been used to control rat populations.

Rat populations can become resistant to warfarin by the process of evolution.

A population of rats was given warfarin for 4 months.

Table 1 shows information about resistance to warfarin in the rat population for a year after warfarin was first given.

Table 1

Number of months since warfarin was first given	Was warfarin being given?	Percentage (%) of rat population resistant to warfarin
0	Yes	1
2	Yes	24
4	Yes	81
6	No	99
8	No	92
10	No	85
12	No	70

4.6.2.2 Evolution

Question 05 · continued

Rats with resistance to warfarin have a smaller mean mass than rats that are **not** resistant to warfarin.

Smaller rats are often at a disadvantage when competing against larger rats.

Explain the trends in the data when warfarin was being given and when warfarin was no longer given.

Use **Table 1**.

[6 marks]

8

4.6.2.2 Evolution

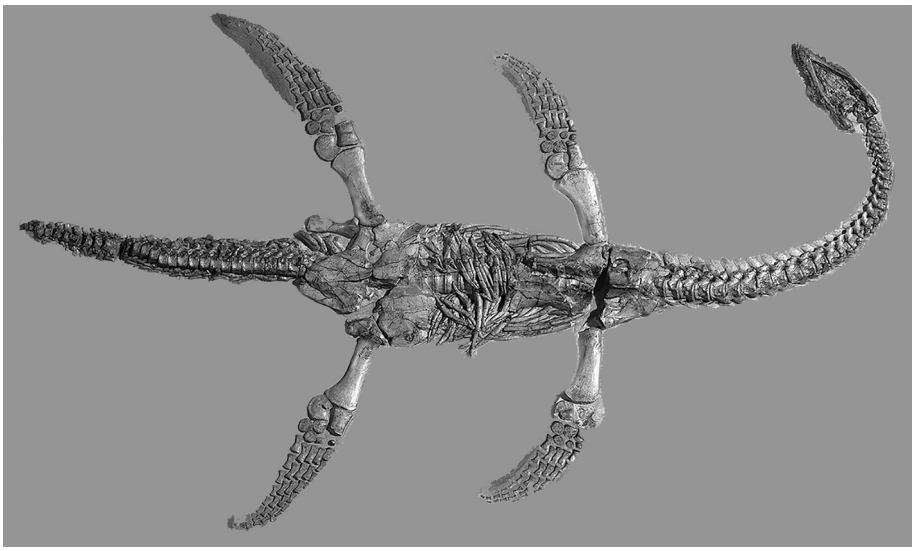
Question 06

June 2025 | 8464/B/2H | Original Q5

0 5 Plesiosaurs are extinct reptiles that lived in the ocean.

Figure 5 shows a fossil of a plesiosaur.

Figure 5



0 5 . 1 Plesiosaurs may have moved rapidly upwards to hold their heads above the water surface to search for prey.

What **type** of adaptation was the rapid upwards movement?

[1 mark]

0 5 . 2 Give **two biotic** factors that may have caused the extinction of plesiosaurs.

[2 marks]

1

2

4.6.2.2 Evolution

Question 06 · continued

0 5 . 3 Describe how the plesiosaur fossil in **Figure 5** could have been formed.

[3 marks]

0 5 . 4 Scientists use fossils to study evolution.

Suggest **two** reasons why scientists **cannot** study the mutations involved in the evolution of plesiosaurs.

Do **not** refer to extinction in your answer.

[2 marks]

1

2

4.6.2.2 Evolution

Question 06 · continued

0 5 . 5 **Table 1** shows part of the classification of a plesiosaur.

Complete **Table 1**.

[2 marks]

Table 1

Classification group	Name
Domain	
Kingdom	Animalia
	Chordata
Class	Reptilia
	Plesiosaur
	Cryptoclididae
Genus	Cryptoclidus
Species	eurymerus

0 5 . 6 Give the binomial name of the plesiosaur in **Table 1**.

[1 mark]

_____

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