



EXAM PAPERS PRACTICE

# Variation and evolution

Level: GSCE AQA 8461

Subject: Biology

Exam Board: Suitable for all boards

Topic: Variation and evolution

Level: Medium

This is to be used by all students preparing for AQA Biology 8461 foundation or higher tier but it is also suitable for students of other boards

**Q1.** Darwin's theory of evolution states that all species of living things have evolved from simple life forms.

Darwin's theory was published in 1859.

(a) Give **two** reasons why Darwin's theory was only slowly accepted.

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**(2)**

(b) Darwin observed birds called finches on the Galapagos Islands, 1000 km from the coast of South America.

He saw that the birds were similar to, but not the same as, birds he had seen on the mainland of South America.

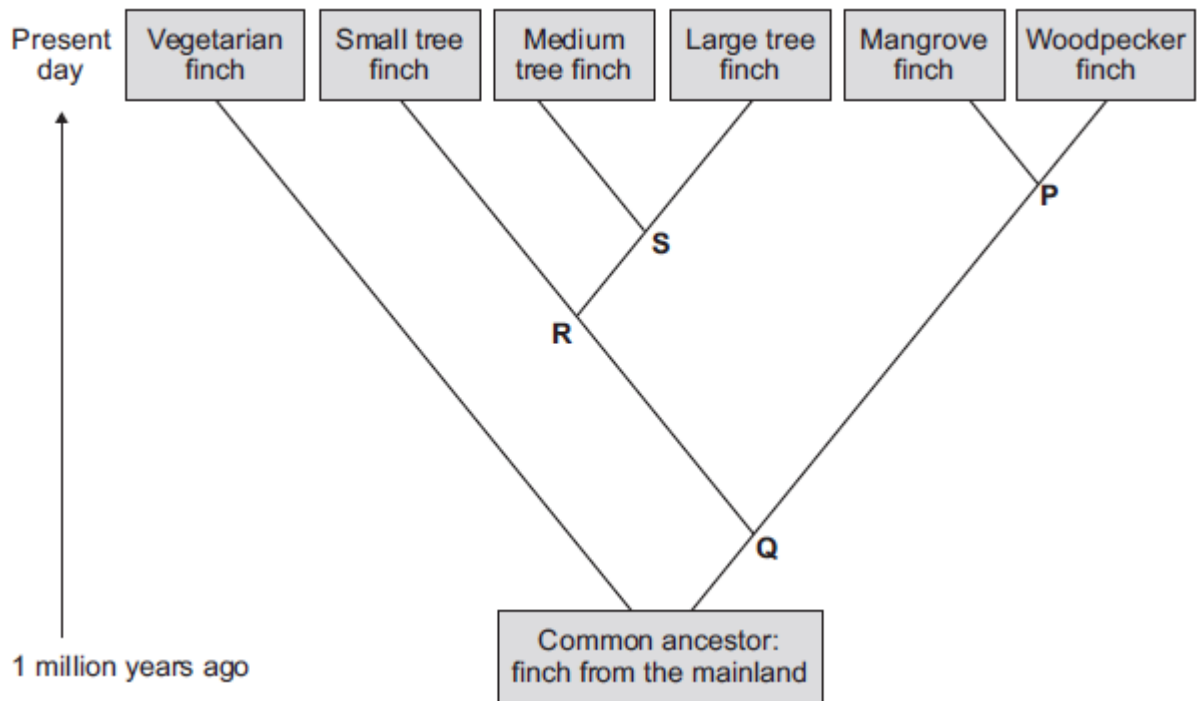
Recent evidence suggests that 13 different species of finch on the islands evolved from 1 species of finch that arrived from the mainland about 1 million years ago.

Describe how a new finch species may have evolved from the original species of finch that arrived from the mainland.

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**(4)**

(c) The diagram below shows the evolutionary tree for some Galapagos finches.



(i) Which type of present-day finch is **least** closely related to all the others?

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(1)

(ii) Which branching point, **P**, **Q**, **R** or **S**, on the diagram above shows the most recent common ancestor of all the **tree finches**?

Write the correct answer in the box.

(1)

(iii) Which **two** finches have the most recent common ancestor?

1 .....

2 .....

(1)

(Total 9 marks)

**Q2.** Many different types of animals are produced using selective breeding.

Some cats are selectively bred so that they do not cause allergies in people.

(a) Suggest **two other** reasons why people might selectively breed cats.

1 .....

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2 .....

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**(2)**

(b) Selective breeding could cause problems of inbreeding in cats.

Describe **one** problem inbreeding causes.

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**(1)**

(c) Many people have breathing problems because they are allergic to cats.

The allergy is caused by a chemical called Fel D1.

Different cats produce different amounts of Fel D1.

A cat has been bred so that it does not produce Fel D1.

The cat does **not** cause an allergic reaction.

Explain how the cat has been produced using selective breeding.

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(4)  
(Total 7 marks)

**Q3.**The diagram shows part of a DNA molecule.



(a) (i) In which part of an animal cell is DNA found?

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(1)

(ii) Complete the following sentence.

The letters **A**, **C**, **G** and **T** in the diagram represent four different compounds called .....

(1)

(iii) One strand of the DNA, in the section labelled **X**, contains the following sequence of these compounds:

**T A T G G G T C T T C G**

How many amino acids would this section of the DNA code for?

(1)

(iv) The section of DNA described in part **(a) (iii)** is a small part of a gene.

The sequence of compounds **A**, **C**, **G** and **T** in the gene is important.

Explain why.

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(2)

(b) *Read the following information about genetic engineering.*

The caterpillar of the European Corn Borer moth feeds on the fruits of maize (sweet corn). There is a chemical called Bt-toxin which is poisonous to the corn borer caterpillar but not to humans.

Scientists carried out the following steps.

1. The Scientists made a bacterial plasmid to which they added two genes:
  - **Bt** gene, which coded for production of the Bt-toxin
  - **kan<sup>r</sup>** gene, which coded for resistance to an antibiotic called kanamycin.
2. They used this plasmid to produce genetically modified bacteria which could invade plant cells.
3. They mixed these genetically modified bacteria with pieces cut from maize leaves.
4. They placed the pieces of maize leaf on agar jelly in a Petri dish. The agar jelly contained the antibiotic, kanamycin. The kanamycin killed most of the pieces of maize leaf, but a few survived.
5. They took some cells from the surviving pieces of maize leaf and grew them in tissue culture.

The result was maize plants that now contained the **Bt** gene, as well as the **kan<sup>r</sup>** gene, in all of their cells.

(i) What is a **plasmid** (Step 1)?

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(2)

(ii) Why did the scientists add **kanamycin** to the agar jelly (Step 4)?

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(2)

(iii) The scientists grew each Bt-maize plant from a single cell which contained the **Bt** gene.

Explain why **all** the cells in the Bt-maize plant contained the **Bt** gene.

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(2)

(iv) Kanamycin is an antibiotic.

Some scientists are concerned that the gene for kanamycin resistance has been put into maize.

Suggest why.

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(2)

(Total 13 marks)



**Q4.** Charles Darwin proposed the theory of natural selection.

Many people at the time did not accept his theory.

(a) There was a different theory at the same time as Darwin's theory.

The different theory said that changes in an organism during its life could be inherited.

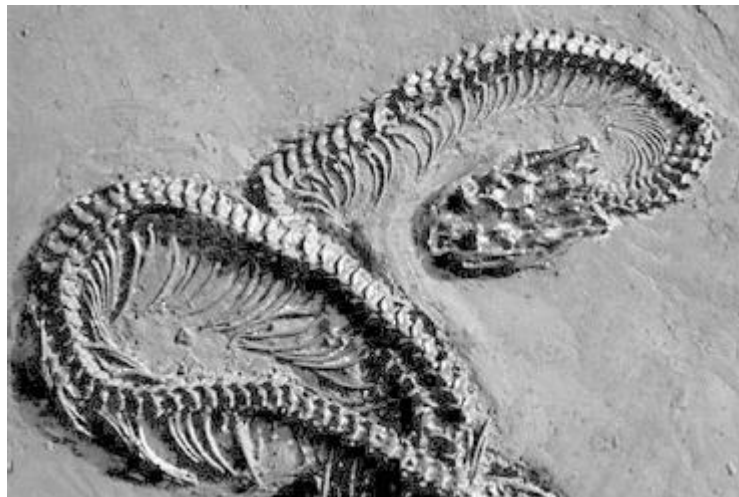
Who proposed this theory?

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**(1)**

(b) Studying fossils helps scientists understand how living things have evolved.

The diagram below shows a fossilised snake.



© Peter Menzel/Science Photo Library

Explain how the fossil in the diagram above may have formed.

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**(3)**

(c) There are many types of rat snake in the world.

The table below shows two types of rat snake.



<b>Type of snake</b>	Japanese rat snake	Texas rat snake
<b>Colour of snake</b>	Green	Pale brown
<b>Type of environment</b>	Grass	Dry and dusty

The different types of rat snake have evolved from similar ancestors.

The rat snakes have evolved to to suit their environments.

Explain how the Japanese rat snake evolved to be different from the Texas rat snake.

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(4)

(d) Many species of snake have become extinct.

Give **one** reason why a species might become extinct.

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(1)  
(Total 9 marks)

**Q5.**The photograph shows a zorse.



By Kumana @ Wild Equines [CC-BY-2.0], via Wikimedia Commons

A zorse is a cross between a male zebra and a female horse.  
The zorse has characteristics of both parents.

(a) The zorse was produced by *sexual reproduction*.

(i) What is *sexual reproduction*?

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(1)

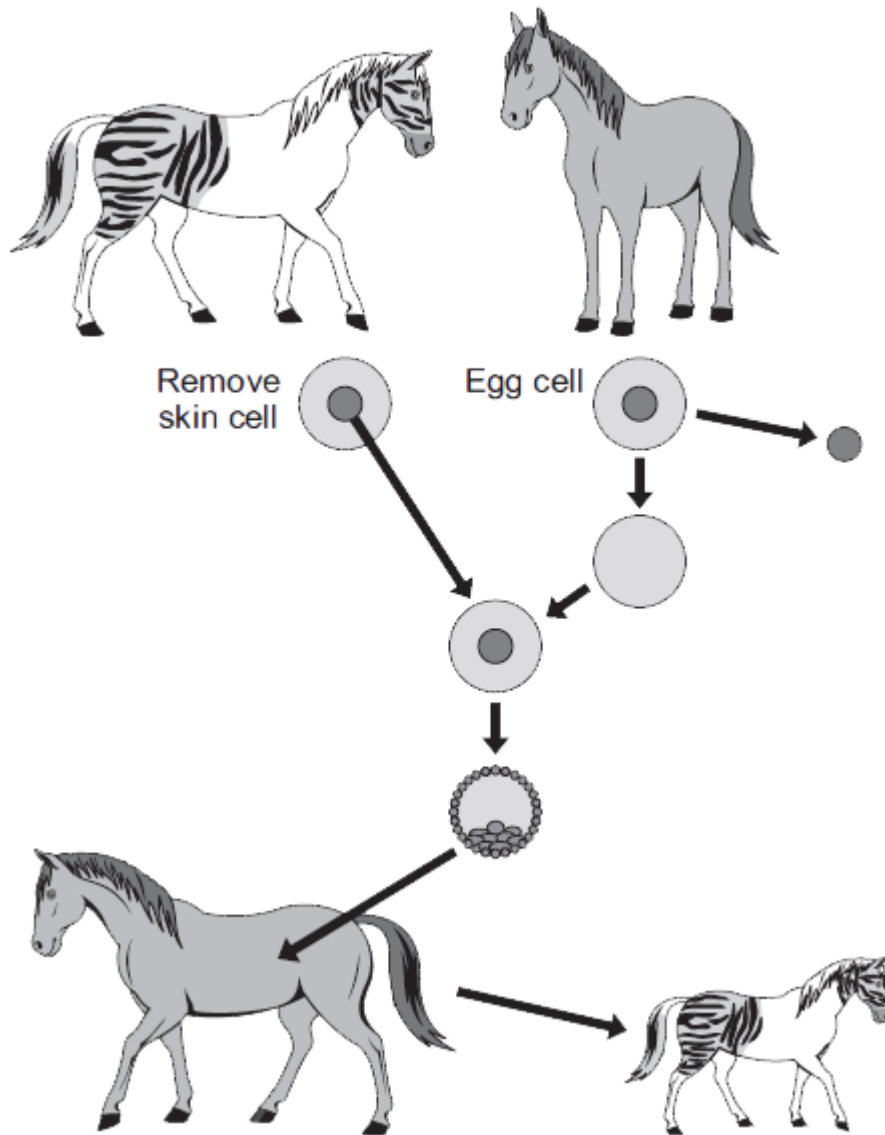
(ii) The zorse has characteristics of a zebra and a horse.  
Why?

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(2)

- (b) Zorses are **not** able to breed.  
Scientists could produce more zorses from this zorse by adult cell cloning.

The diagram shows how the scientists might clone a zorse.



*In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Use information from the diagram and your own knowledge to describe how adult cell cloning could be used to clone a zorse.

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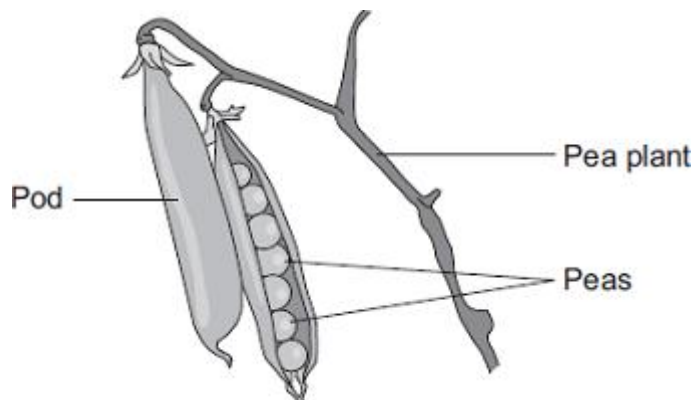
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(6)  
(Total 9 marks)

**Q6.**Peas grow in pods on pea plants.



A gardener grew four varieties of pea plants, **A** , **B** , **C** and **D** , in his garden. The gardener counted the number of peas in each pod growing on each plant.

The table shows his results.

Variety	Range of number of peas in each pod	Mean number of peas in each pod
<b>A</b>	2–6	4
<b>B</b>	3–7	5
<b>C</b>	3–8	6
<b>D</b>	6–8	7

- (a) Give **one** environmental factor and **one other** factor that might affect the number of peas in a pod.

Environmental factor.....

Other factor.....

(2)

- (b) The gardener thinks that he will get the largest mass of peas from his garden if he grows variety **D**.

Why is the gardener **not** correct?

Suggest **one** reason.

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(1)

(c) It is important that carbon is cycled through living things.

After he has picked the peas, the gardener puts the dead pea plants onto a compost heap.

Over the next few months, the carbon in the carbon compounds from the pea plants is returned to the air.

Describe how.

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(4)

(Total 7 marks)