OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



EXAM QUESTION PACK

B6.1 HOW WAS THE THEORY OF EVOLUTION DEVELOPED? (HIGHER)

SCORE	PERCENTAGE
/54	%

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1. Patients in hospital can be at risk from infections such as MRSA. The bacteria that cause MRSA are resistant to a variety of antibiotics.

New antibiotics need to be developed as a result of infections such as MRSA.

Use the theory of natural selection to describe how antibiotic resistance in bacteria is increasing.

[5]

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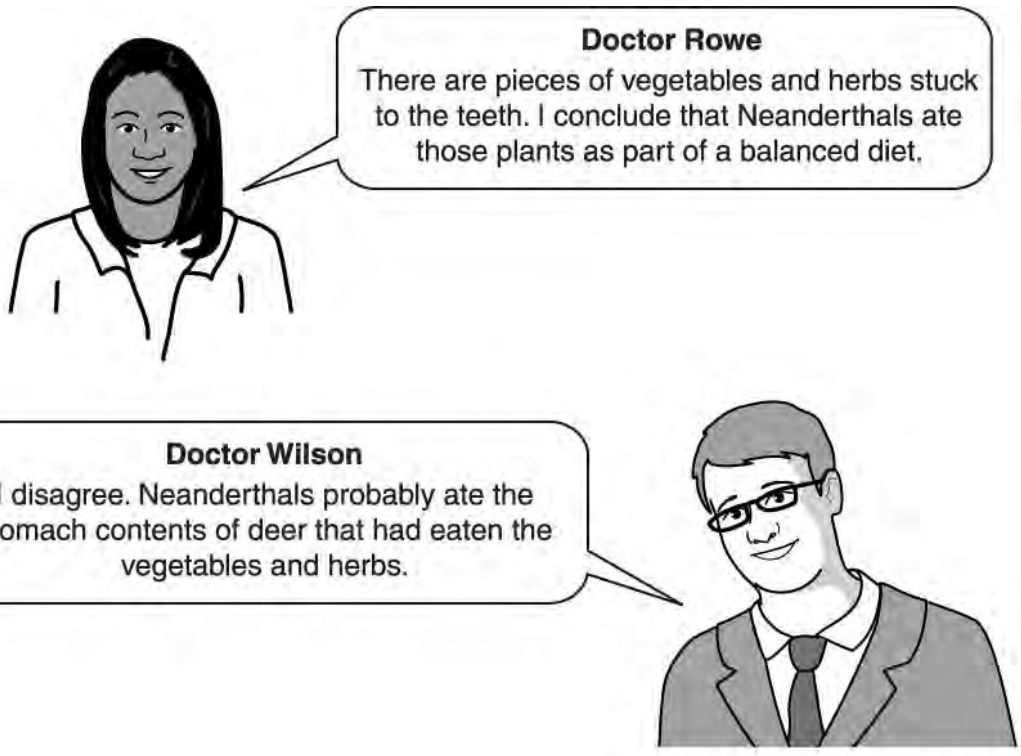
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2(a). Neanderthals are an extinct species of humans.



Fossils of Neanderthals help us investigate the evolution of humans.

Two scientists talk about fossils of Neanderthal teeth.



Both scientists looked at the same data.

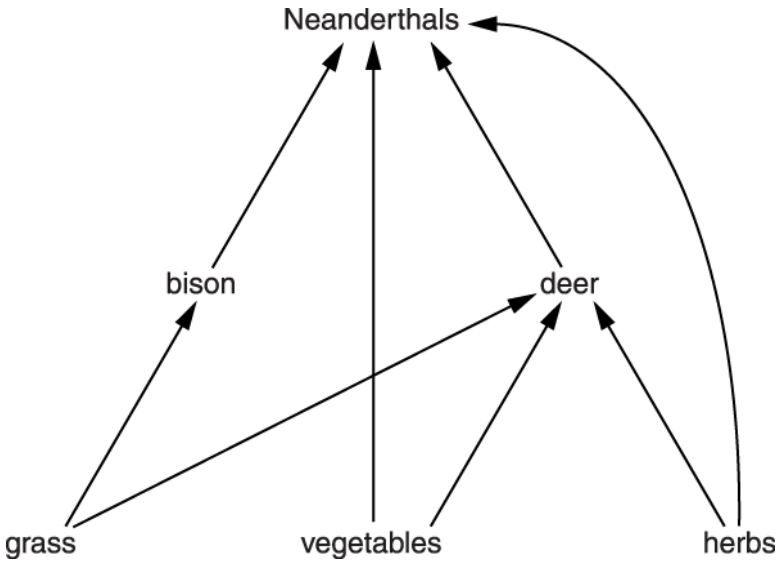
Suggest **two** reasons why they developed different explanations.

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[2]

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(b). The diagram shows part of the Neanderthals' food web.



Use the food web to explain why the sizes of the bison population and the deer population are interdependent.

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[3]

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(c). Neanderthals and modern humans are different species.

Scientists think both species evolved from a common ancestor called Heidelberg Man.

Choose words from the list to complete the explanation of how two different species evolved from Heidelberg Man.

Each word may be used once, more than once or not at all.

competition **isolation** **mutation** **selection** **variation**

The Heidelberg Man population split into two groups. The two groups lived in _____.

There was genetic _____ in both groups, caused by _____ of individuals' genes.
This gave the individuals in each group different characteristics.
Each group became adapted to its own environment because of the natural _____ of individuals with beneficial characteristics.

[3]

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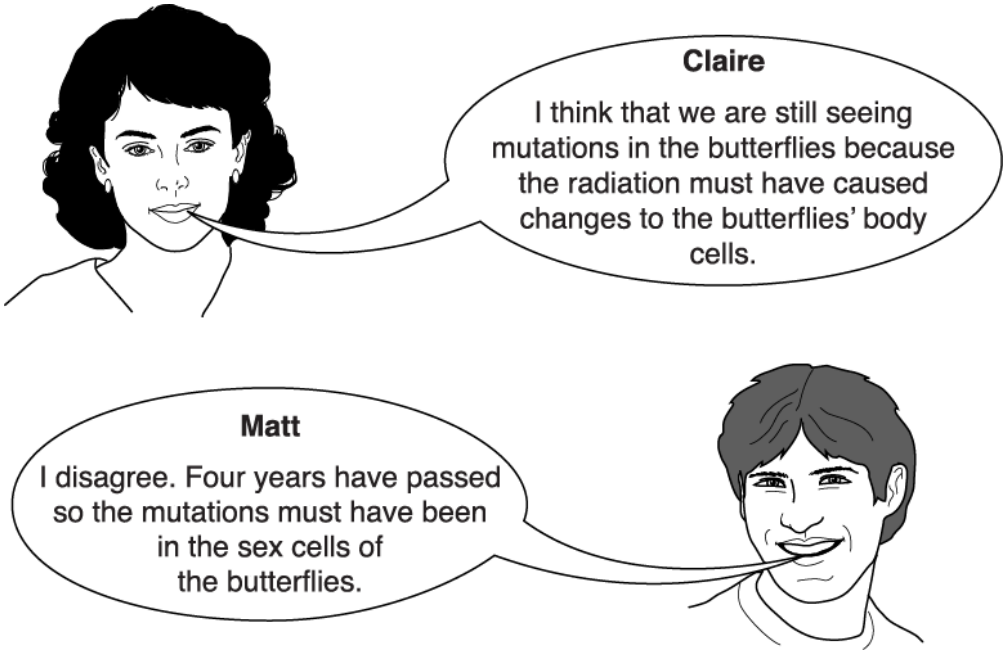
3(a). In 2011, a huge earthquake in Japan caused a radiation leak from a nuclear power station.

Two months later, butterflies were collected from different areas near the power station.

Some of the butterflies had much smaller wings than normal butterflies, and irregular shaped eyes.

Some scientists believe that the radiation caused a random change in the genes of butterflies.

Claire and Matt are discussing the possible mutations in the butterflies four years after the radiation leak.



Who do you agree with?

Give a reason for your answer.

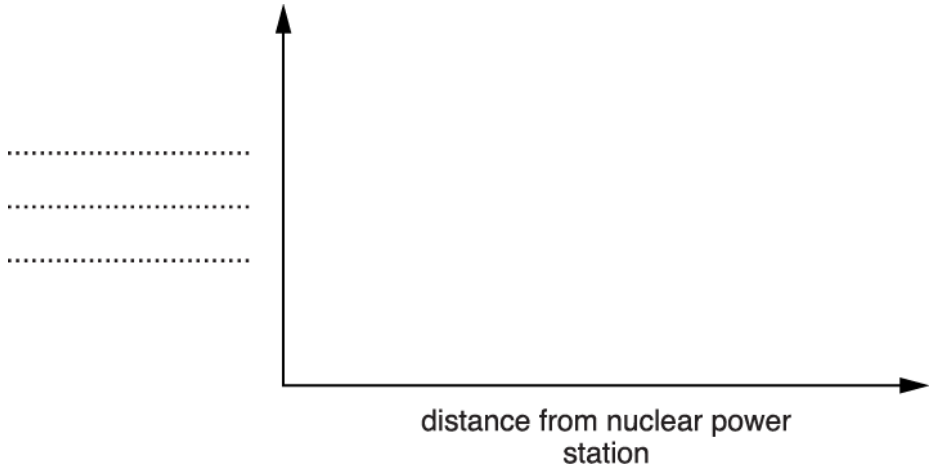
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[1]

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(b). Butterflies collected closer to the power station had more genetic changes than those collected further away.

Scientists start to draw a graph to show their results.



(i) On the graph:

- complete the axis label
- draw a line to show the relationship between the distance from the nuclear power station and the number of genetic changes.

[2]

(ii) The graph does not prove that the radiation leak from the nuclear power station caused the mutations in the butterflies.

Suggest what evidence scientists would need to be more certain of the cause.

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[2]

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4. There is a huge variation of life on Earth.

The processes of natural selection and selective breeding have been involved in producing this variation.

Compare natural selection and selective breeding.

Include the similarities and differences between the two processes.

The quality of written communication will be assessed in your answer.

[6]

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5. The process of evolution has produced many new species.

Explain how evolution produces new species.



The quality of written communication will be assessed in your answer.

[6]

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6. Plants can be infected by diseases caused by pathogens.

The plant disease ash dieback was first recorded in the early 1990s in Poland.

Since then, many thousands of trees in northern Europe have become infected.



Ash dieback was first found in eastern parts of Great Britain (GB) in 2012, and has been spreading across the country ever since.

The British outbreak of ash dieback started in woodland in Norfolk.

Much of the woodland has died, but one ash tree has shown tolerance to the disease. This tree was named 'Betty' by scientists. Tolerant trees have also been found in mainland Europe.

(i) Explain how scientists could use selective breeding to produce ash trees with improved tolerance.

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[3]

(ii) New woodland could be planted using cuttings from Betty.

Explain why this could be a **disadvantage** during a future outbreak of plant disease.

[2]

(iii) Explain how gene technology could be used to produce ash trees with improved tolerance.

[4]

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7. The female mosquito *Aedes aegypti* is responsible for the transmission of diseases such as Zika virus.

In May 2015, Zika virus was reported in Brazil and began to spread rapidly.

The mosquito feeds mainly on human blood. The virus is spread when a female *Aedes aegypti* mosquito bites an infected human and then bites an uninfected human.

(i) The mosquito responsible for the spread of Zika has become resistant to some of the insecticides used to kill it.

Explain how a population of mosquitos could have become resistant to an insecticide.

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[3]

(ii) One way scientists tried to solve the problem was to make genetically engineered mosquitoes that had a 'kill switch' gene. This gene caused the mosquitoes' offspring to die.
Describe the steps a scientist would use when genetically engineering a mosquito to have the 'kill switch' gene.

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[3]

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(iii) The ‘kill switch’ gene codes for the production of a protein called tTAV.

The tTAV protein blocks the transcription of other genes essential for mosquito survival.

When breeding the mosquitos in the laboratory a chemical called tetracycline is used.
Tetracycline binds to the tTAV protein and deactivates it.

Suggest why scientists use tetracycline when breeding the genetically engineered mosquitos.

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[1]

(iv) Scientists thought using genetically engineered mosquitos was a better solution than using insecticide.

Do you agree?

Explain your reasons.

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[3]

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8. The Galapagos Islands are a group of 13 islands found in the Pacific Ocean.

Charles Darwin visited the Galapagos Islands during the 19th century.

He collected samples and made observations.

This work helped Darwin to develop a new explanation for the evolution of species.

(i) Which of the following are observations made by Darwin?

Tick (✓) **two** boxes.

There are differences between fossils and living examples of similar organisms. ☐

Pea plants with red flowers can produce offspring with white flowers. ☐

There is usually extensive variation within a population of a species. ☐

Some bacteria have become resistant to antibiotics. ☐

Isolated populations of the same species living in different places have different characteristics. ☐

[2]

(ii) Darwin suggested a theory to explain his observations.

Write down the name of the theory he suggested.

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[1]

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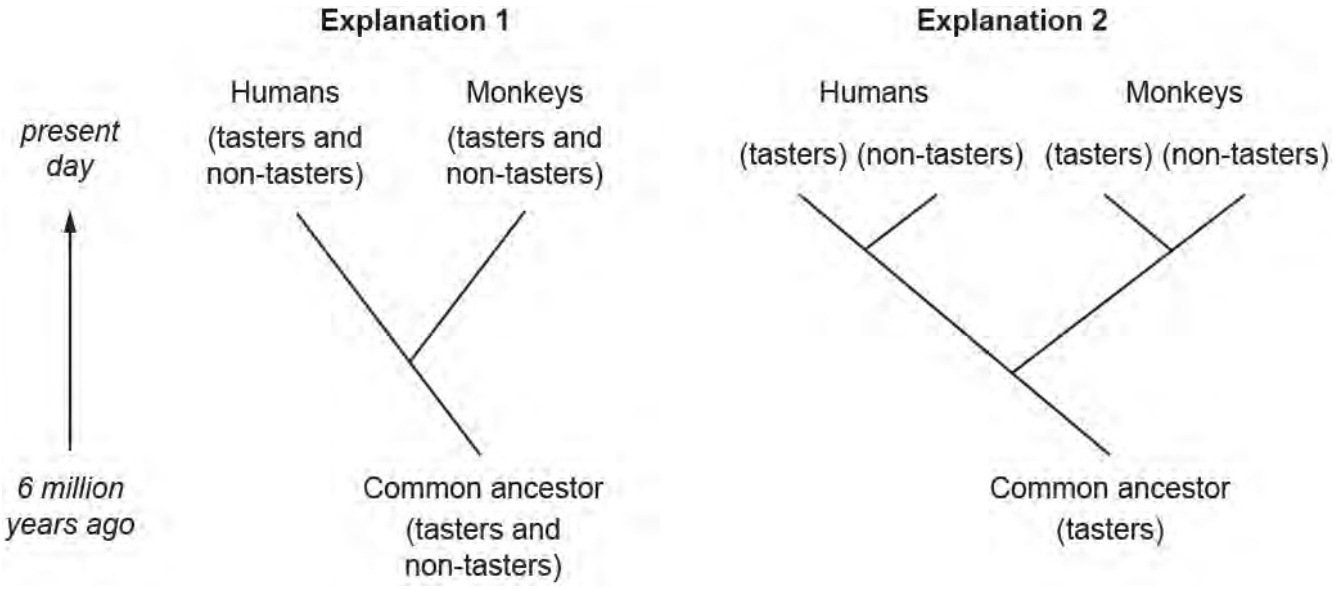
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9. Amaya reads an article in a magazine which explains that genes code for the production of a taste receptor on the tongue.

Taste receptors are proteins.

Monkeys also have different variants of the gene that affects how they taste bitterness.

Scientists have proposed two explanations for how the non-tasting variants could have evolved in humans and monkeys.



Scientists have discovered that the non-tasting variants in humans and monkeys have different DNA sequences, even though they have the same effect.

Which explanation of how they evolved is most likely to be correct?

Explain your answer.

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[2]

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