

Speciation

4.6.3.2 · Inheritance, variation and evolution · revision notes

The work of Alfred Russel Wallace and how new species form. This is in GCSE Biology only, not in Combined Science. Expect recall questions about Wallace and Darwin and 4 to 6 mark 'describe how a new species could form' questions about populations that have been separated.

Key facts

- Wallace independently proposed evolution by natural selection
- Wallace is best known for warning colouration in animals and his theory of speciation
- 1858: joint writings with Darwin → 1859: Darwin published *On the Origin of Species*
- Species = organisms that can interbreed to produce fertile offspring

Notes

Alfred Russel Wallace

- Alfred Russel Wallace** independently proposed the theory of evolution by natural selection.
- He published **joint writings with Darwin in 1858**, which prompted Darwin to publish *On the Origin of Species* (1859) the following year.
- Wallace worked worldwide gathering evidence for evolutionary theory. He is best known for his work on **warning colouration** in animals and his theory of **speciation**.
- Warning colouration: bright colours on animals that are poisonous or dangerous warn predators to leave them alone, so these colours can be favoured by natural selection.
- Wallace did much pioneering work on speciation, but more evidence over time has led to our current understanding of the theory of speciation.

The impact of Darwin and Wallace

- Their theory explains how the huge variety of living things evolved from common ancestors, and it is the basis of how biologists study and classify living things today.
- Scientific ideas such as the theory of speciation are changed and improved as more evidence is gathered.

How to answer each type of question

Recall the work of Wallace

1 to 3 marks

Grade 5

1. Wallace independently proposed natural selection.
2. Joint writings with Darwin in 1858; *On the Origin of Species* in 1859.
3. He is best known for warning colouration and speciation.

Example. (a) Give one area of biology that Alfred Russel Wallace is best known for.
(b) Explain how Wallace's work affected when Darwin published *On the Origin of Species*. [3 marks]

Model answer. (a) Warning colouration in animals / speciation (1)
(b) Wallace and Darwin published joint writings in 1858 (1), which prompted Darwin to publish *On the Origin of Species* the following year, in 1859 (1).

Don't lose marks

- ✗ Leaving out the word 'fertile'. Horses and donkeys can breed, but their offspring (mules) are infertile, so they are different species.
- ✗ Missing the isolation step, or not saying that the populations cannot interbreed.
- ✗ Saying the organisms 'changed to suit the new environment'. Natural selection acts on variation caused by mutations.
- ✗ Saying Wallace copied Darwin. Wallace proposed the theory independently, and they published joint writings in 1858.

More tips

Memory tricks

- Speciation steps: Isolation, Variation, Different conditions, Natural selection, Species can't interbreed ('I Very Definitely Need Sleep').
- Wallace = Warning colours (W for W).
- 1858 joint writings, then 1859 *On the Origin of Species*.

Exam technique

- Use the information in the question (the barrier, and how the conditions differ) in your steps.
- Include the key words: isolated, variation, mutation, natural selection, alleles, fertile offspring.
- Give the steps in order; a 5-mark answer needs all five.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3

State what Wallace independently proposed

Wallace independently proposed the theory of evolution by natural selection.

Grade 4

Recall what Wallace is best known for

His work on warning colouration in animals and his theory of speciation.

Grade 5

Describe how Wallace influenced Darwin

Their joint writings in 1858 prompted Darwin to publish *On the Origin of Species* in 1859.

Grade 5

Define a species

A group of organisms that can interbreed to produce fertile offspring.

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