**The fossil record**



Scientists have found many thousands of fossils over the years.

Together, all the fossils are known as the **fossil record**.

The fossil record is a source of evidence. Scientists make conclusions from the evidence.

Draw straight lines to join each piece of **evidence** to the **conclusion** you could make from it.

One has been done for you.

|  |  |  |
| --- | --- | --- |
| **Evidence**  **from the fossil record** |  | **Conclusion**  **that you could make**  **from the evidence** |
| Fossils and living organisms of the same species have different features. |  | The species has adapted to a new habitat. |
|  |  |  |
| Fossils and living organisms of the same species are found in different locations. |  | Many species have become extinct. |
|  |  |  |
| Many fossils are of species that no longer exist. |  | The order in which adaptations evolved. |
|  |  |  |
| Older fossils do not have features seen in newer fossils. |  | New species have evolved gradually from older species. |
|  |  |  |
| Some fossils have features of both older and newer species. |  | The characteristics of organisms in a species change over time. |

*Biology > Big idea BVE: Variation, adaptation and evolution > Topic BVE3: Evolution > Key concept BVE3.1: Explaining evolution*

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| **Diagnostic question** |
| **The fossil record** |

**Overview**

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| Learning focus: | The characteristics of a species can change over generations as advantageous adaptations become more common; this is evolution, and can be explained by a process of natural selection. |
| Observable learning outcome: | Explain how the fossil record provides evidence that species change over time. |
| Question type: | Linking ideas |
| Key words: | fossils, evolution, adaptation |

**What does the research say?**

School biology curricula in various countries expect students to develop understanding from an early age that fossils provide evidence from which inferences about organisms that lived and died long ago can be made (e.g. AAAS Project 2061, 2009; Department for Education, 2013). Borgerding and Raven (2018) found that children as young as 6 years old commonly understood that inferences about body shape and size can be made from fossils, and that the locations in which fossils are found can allow inferences about the habitats of the fossilised organisms to be made.

**Ways to use this question**

Students should complete the question individually. This could be a pencil and paper exercise, or you could use the presentation with an electronic voting system or mini white boards.

*Differentiation*

You may choose to read the options to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Expected answers**

|  |  |  |
| --- | --- | --- |
| Fossils and living organisms of the same species have different features. |  | The species has adapted to a new habitat. |
|  |  |  |
| Fossils and living organisms of the same species are found in different locations. |  | Many species have become extinct. |
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| Older fossils do not have features seen in newer fossils. |  | New species have evolved gradually from older species. |
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| Some fossils have features of both older and newer species. |  | The characteristics of organisms in a species change over time. |

**How to respond - what next?**

If there is a range of answers, you may choose to respond through structured class discussion. Ask one student to explain why they gave the answer they did; ask another student to explain why they agree with them; ask another to explain why they disagree, and so on. This sort of discussion gives students the opportunity to explore their thinking and for you to really understand their learning needs. Responses often work best when the activities involve paired or small group discussions, which encourage social construction of new ideas (meaning making) through dialogue.

If students struggle to understand how evidence from fossils could suggest that species change over time, it may be helpful to respond by looking at a sequence of fossils that clearly show changes in a species over time. The example of how fossilised bones, teeth and hooves illustrate the evolution of the horse is widely used, and many potentially useful resources are available online. One example of a resource that is aimed at younger children and explains the story using videos and a comic strip is available via the STEM Learning e-Library at: <https://www.stem.org.uk/resources/elibrary/resource/35546/evolution-horse>

If students have persistent misunderstandings about fossils and what evidence they can provide about how species and their habitats change over time, or if students have misunderstandings about geological/evolutionary time scales, BEST key concept BVE1.2: Changes in species over time - fossil evidence provides diagnostic questions and response activities to further probe and develop their understanding.

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