Whales Through Time

Use fossils and DNA to investigate evolutionary change

FB.5 "Students will demonstrate an understanding of Earth's fossil record and its indication of the diversity of life over time. Investigate through research the contributions of scientists to the theory of evolution and evolutionary processes..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one fossil clue and circle the DNA finding. Number the two sentences that explain how inherited traits can become more common.

When Whales Had Legs

1 A fossil whale had sturdy legs. Fossils from different rock layers offer clues about how whale bodies changed over millions of years. Older layers generally formed before younger ones. Scientists compare fossil bones with living animals, but a sequence of fossils does not prove that each species was the direct ancestor of the next. Use the evidence below.

FOSSIL AND LIVING WHALE EVIDENCE

Species	Approximate age	Hind limbs	Inferred habitat
Pakicetus	50 million years ago	Weight-bearing legs	Land near water
Ambulocetus	48 million years ago	Large hind legs	Land and water
Basilosaurus	37 million years ago	Tiny hind limbs	Ocean
Living whales	Present	No external hind legs	Ocean

2 These species represent branches of whale history, not a single proven line of ancestors. Small hind limbs in Basilosaurus could not support its body on land, unlike the legs of Pakicetus. DNA comparisons identify hippos as the closest living relatives of whales. That does not mean whales descended from living hippos; both groups share an older ancestor.

3 Darwin proposed that inherited differences can affect survival and reproduction. In an aquatic setting, a heritable trait that improves swimming could spread if its bearers leave more offspring. Fossils show changes in whale anatomy over long periods, while DNA reveals relationships among living species. Together, these sources of evidence support evolution, though neither identifies every ancestor.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare the hind limbs and inferred habitats of Pakicetus and Basilosaurus. What change do these fossils support?

2. Does the table prove that Ambulocetus was the direct ancestor of Basilosaurus? Explain using the passage.

3. How do the fossil evidence and DNA evidence support evolution in different ways?

4. Suppose some early whale relatives inherited stronger tails that improved swimming. How could that trait become more common in an aquatic population? Name one table observation consistent with greater aquatic specialization.

3 YOUR TURN

Your own words

A newly found whale fossil is 43 million years old. It has reduced but usable hind legs and comes from coastal sediments. In four or five sentences, place it among the table entries, explain what it adds to the fossil evidence, connect it to the DNA finding, and state one limit of the evidence.

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PART 1 · READ AND MARK

Underline one fossil clue and circle the DNA finding. Number the two sentences that explain how inherited traits can become more common. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare the hind limbs and inferred habitats of Pakicetus and Basilosaurus. What change do these fossils support?	**Pakicetus had weight-bearing legs and lived on land near water. The younger Basilosaurus had tiny hind limbs and lived in the ocean, supporting a change toward aquatic bodies.**
2	Does the table prove that Ambulocetus was the direct ancestor of Basilosaurus? Explain using the passage.	**No. The fossils show different forms at different times, but the passage says a fossil sequence does not prove direct ancestry.**
3	How do the fossil evidence and DNA evidence support evolution in different ways?	**Fossils show changes in whale anatomy over time. DNA shows that whales and hippos are closely related living groups that share an older ancestor.**
4	Suppose some early whale relatives inherited stronger tails that improved swimming. How could that trait become more common in an aquatic population? Name one table observation consistent with greater aquatic specialization.	**If those animals survived and left more offspring, the inherited trait could become more common. The table shows that the ocean-dwelling Basilosaurus had tiny hind limbs, unlike the older Pakicetus.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The 43-million-year-old fossil falls between Ambulocetus and Basilosaurus in age. Its reduced but usable hind legs add another body form to the fossil record. They fit the pattern of smaller hind limbs in later whales living in water. DNA evidence that whales and hippos share an older ancestor provides a separate clue about relationships. The fossil does not prove that it was a direct ancestor of Basilosaurus.

Accept explanations that distinguish a pattern of anatomical change from proof of direct ancestry. For the open task, students should place the new fossil between 48 and 37 million years ago and treat DNA as evidence of shared ancestry, not descent from living hippos.