

Bone Clues Across Time

Use anatomical evidence to infer evolutionary relationships.

MS-LS4-2 "Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each anatomical similarity and circle each anatomical difference in the passage. In the margin, number two places where the evidence supports an evolutionary relationship.

Structures Tell a Story

- ① Scientists compare body structures to investigate how organisms may be related. A structure can be similar in overall arrangement even when it has a different job. For example, a seal flipper, a bat wing, and a human arm each contain one upper bone, two lower bones, wrist bones, and digits. The bones differ in length and shape. A bat's long digits support a wing membrane, while a seal's shorter, broader bones help push through water. This shared basic pattern is evidence that these mammals inherited it from a common ancestor.
- ② Fossils can add evidence because they preserve structures from organisms that lived long ago. Archaeopteryx, a fossil from about 150 million years ago, had feathers and wings like modern birds. It also had teeth, clawed fingers on its wings, and a long bony tail. Most modern birds have toothless beaks, no clawed wing fingers, and short tails with fused bones. These similarities and differences support the idea that birds and Archaeopteryx share an ancestor, but their lineages changed over many generations. The fossil has a mix of features seen in different groups.
- ③ Whale fossils show another pattern of anatomical change. Early whale fossils, such as Pakicetus, had four weight-bearing legs and skull features found in whales. Later whale fossils had shorter hind limbs and stronger tails for swimming. Modern whales have front flippers with the same basic limb bones as other mammals and tiny pelvic bones that no longer support walking legs. Comparing these structures suggests that whales are related to land mammals and that whale bodies changed as descendants became more adapted to water.

2 ANSWER WITH EVIDENCE Use the passage

- 1 The seal flipper and bat wing do different jobs. How does their shared bone arrangement support an evolutionary relationship?

- 2 Give one anatomical similarity and one anatomical difference between Archaeopteryx and most modern birds. What relationship does this evidence support?

- 3 Archaeopteryx has traits seen in different groups. Explain why this mix of traits helps scientists infer change in related lineages.

- 4 Use the whale evidence to explain why scientists infer that modern whales are related to land mammals.

3 YOUR TURN Your own words

Use this evidence to write exactly three sentences that name which modern organism Fossil Shoretail is more closely related to, cite at least two anatomical similarities, and explain one difference as change over time. Fossil Shoretail had feathered wings, toothy jaws, clawed wing fingers, and a long bony tail. A modern gull has feathered wings, a toothless beak, no clawed wing fingers, and a short tail. A modern lizard has no feathers or wings, teeth, a long bony tail, and clawed toes.

PART 1 • READ AND MARK

Underline each anatomical similarity and circle each anatomical difference in the passage. In the margin, number two places where the evidence supports an evolutionary relationship. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	The seal flipper and bat wing do different jobs. How does their shared bone arrangement support an evolutionary relationship?	Their shared pattern of upper and lower bones, wrist bones, and digits suggests that seals and bats inherited the pattern from a common ancestor.
2	Give one anatomical similarity and one anatomical difference between Archaeopteryx and most modern birds. What relationship does this evidence support?	Both had feathers and wings. Archaeopteryx had teeth, clawed wing fingers, and a long bony tail, unlike most modern birds. The evidence supports that they share an ancestor but changed over generations.
3	Archaeopteryx has traits seen in different groups. Explain why this mix of traits helps scientists infer change in related lineages.	Its birdlike feathers and wings, along with teeth, clawed fingers, and a long bony tail, show that related lineages can share an ancestor while their structures change over time.
4	Use the whale evidence to explain why scientists infer that modern whales are related to land mammals.	Early whales had weight-bearing legs, and modern whales still have mammal-like limb bones and tiny pelvic bones. These structures suggest that whales descended from land-mammal ancestors and became adapted to water.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Shoretail is more closely related to the modern gull than to the modern lizard because both Shoretail and the gull have feathers and wings. Shoretail has teeth, clawed wing fingers, and a long bony tail, while the gull has a toothless beak, no clawed wing fingers, and a short tail. These differences suggest that their lineages changed from a shared ancestor over many generations.

Accept other accurate similarities or differences from the passage. Responses should use anatomical evidence to support an inference about shared ancestry or change over time, not simply list traits.