

Evidence Converges

Trace how several kinds of evidence support evolutionary explanations.

HS-LS4-1 "Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline observations that scientists can measure or observe. In the margin, number the different lines of evidence 1 through 4, then box the sentence that states the shared conclusion.

A Whale's Family History

- ① Whales live entirely in water, yet their ancestry is recorded in evidence from several fields. Fossils show that early whales, such as *Pakicetus*, had four weight-bearing limbs and could move on land. In younger rock layers, whale fossils have shorter hind limbs, stronger tails, and nostrils positioned farther back on the skull. Modern whales retain tiny pelvic bones, although these bones no longer support walking. This ordered fossil pattern documents change through time and links living whales with extinct land-dwelling mammals rather than placing all forms in a single unchanged group.
- ② DNA provides an independent test of this relationship. Scientists compare the order of DNA bases in the same genes from different species. Whales and hippos share many DNA sequence similarities, and their similarities are greater than those between whales and more distantly related mammals, such as horses. Their bodies also share inherited anatomical features. Both groups have the same basic mammal limb bones, even though a whale flipper and a hippo leg perform different jobs. Matching DNA patterns and homologous structures are expected when species inherited traits from a common ancestor.
- ③ Embryological development adds another line of evidence. Early whale embryos form small hind-limb buds, even though adult whales do not develop external hind limbs. These temporary structures reflect developmental genetic instructions inherited from ancestors with functional legs. No single observation proves every detail of evolutionary history. However, the fossil sequence, DNA comparisons, shared anatomy, and embryological development point to the same explanation: whales and hippos share a common mammalian ancestor, and whale populations changed over many generations. Scientists strengthen this conclusion because different kinds of measurable evidence converge.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What two fossil observations show that whale populations changed over time? Explain how the order of the fossils supports evolution.

2 Why are DNA comparisons and shared limb-bone patterns two different lines of evidence for common ancestry?

3 How do whale embryos provide evidence that relates to their ancestors?

4 In two sentences, state a claim about whale evolution and support it with one DNA observation and one fossil observation from the passage.

3 YOUR TURN _____ Your own words

Write a 65 to 85 word museum label explaining why whale evolution is supported. State a claim, use evidence from three different lines in the passage, and explain why combining evidence makes the claim stronger.

PART 1 • READ AND MARK

Underline observations that scientists can measure or observe. In the margin, number the different lines of evidence 1 through 4, then box the sentence that states the shared conclusion. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What two fossil observations show that whale populations changed over time? Explain how the order of the fossils supports evolution.	Early whales such as Pakicetus had four weight-bearing limbs and could move on land, while younger whale fossils had shorter hind limbs, stronger tails, and nostrils farther back on the skull. Their ordered appearance in rock layers shows change through time.
2	Why are DNA comparisons and shared limb-bone patterns two different lines of evidence for common ancestry?	DNA comparisons examine the order of bases in genes, while anatomy examines inherited body structures such as limb bones. These different types of evidence both support inheritance from a common ancestor.
3	How do whale embryos provide evidence that relates to their ancestors?	Early whale embryos form hind-limb buds that do not become external hind limbs in adults. The temporary buds reflect inherited developmental instructions from ancestors with functional legs.
4	In two sentences, state a claim about whale evolution and support it with one DNA observation and one fossil observation from the passage.	Whales and hippos share a common mammalian ancestor, and whales evolved over generations. Whales and hippos have greater DNA sequence similarity than whales and horses, while fossils show a sequence from four-limbed land-moving early whales to later forms with shorter hind limbs and stronger tails.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Whales evolved from land-dwelling mammal ancestors and share ancestry with hippos. Fossils show a time-ordered shift from walking limbs to powerful tails and relocated nostrils. DNA sequences place whales closer to hippos than to horses. Whale embryos briefly form hind-limb buds, and adult pelvic bones remain. These separate observations come from rocks, molecules, anatomy, and development, so together they support the evolutionary explanation more strongly than any one observation could.

Accept equivalent claims that accurately connect common ancestry and evolutionary change to evidence from the passage. For the museum label, require a clear claim, accurate evidence from at least three distinct lines, and an explanation that converging evidence strengthens the conclusion.