Embryo Clues

Compare embryo diagrams to infer patterns of relatedness.

MS-LS4-3 "Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Read the hypothetical six-animal example below. Underline its shared features and circle its differences. Mark the limit on inferring relatedness. Then inspect the real human and mouse images your teacher supplies for Your Turn; the written example alone is not pictorial evidence.

What Embryo Displays Reveal

1. Scientists can learn about relationships by comparing embryo diagrams from several species. An embryo is an organism in an early stage of development. Imagine a simplified classroom display in which diagrams show fish, salamander, turtle, chicken, pig, and human embryos at an early stage. The diagrams are drawn at the same scale and face the same direction. At this stage, each embryo has a curved body, a tail, a large head region, and visible grooves in the neck area. These are gross anatomical features: the overall body structures, rather than microscopic tissue details. Real embryo images may be enlarged for observation.

2. A second row shows the embryos at a later stage. The fish and salamander still have long tails and similar elongated bodies. The turtle and chicken have developing limb buds, while the pig and human have larger head regions and distinct limb buds. As development continues, the adult forms will look much less alike: a fish has fins, a chicken has wings, and a human has arms. The early diagrams reveal a pattern of similarities that the adult anatomy can hide.

③ Shared developmental patterns can provide evidence of common ancestry, but a few similar shapes do not establish which species share the most recent ancestor. For example, long tails and elongated bodies in fish and salamander embryos do not by themselves show that those two are more closely related to each other than to the other animals. Scientists compare many developmental features at comparable stages together with other evidence. Developmental stage is not simply the number of days since fertilization, because species develop at different rates. A human embryo does not turn from a fish into a human: it remains a developing human throughout.

1 WORKS CITED

Use with the passage

Hill, Mark A. UNSW Embryology. K12 Human and Other Animal Development. Section: Human and Mouse Embryo. https://embryology.med.unsw.edu.au/embryology/index.php/K12_Human_and_Other_Animal_Development . Consult the labeled human side view and mouse four-view image before completing Your Turn.

2 ANSWER WITH EVIDENCE

Use the passage

1. What two display choices in the imagined example help a fair comparison? What else must be comparable?

2. Name two gross anatomical features shared by all six embryos in the imagined early-stage example.

3. Which two animals have the similar later-stage pattern described? Why does that pattern alone not establish their closest relationship?

4. Why can a comparison of fully formed adults hide a pattern that embryo diagrams reveal?

3 YOUR TURN

Your own words

Inspect the real images in the teacher-provided UNSW Embryology display: human Carnegie stage 16 (Stage16_bf5.jpg, side view) and mouse E11.5 (Mouse_CT_axes_E11.5.jpg, four views). Use the matching right-facing side view, second from the left in the mouse strip. These are two species; the four mouse views are not four stages. In the boxes, sketch and label at least two shared gross features you actually see, such as body curvature or limb buds, and one visible difference. Identify which image supports each observation. Compare the embryos with familiar adult human and mouse forms. In two sentences, explain how a shared developmental pattern provides evidence of common ancestry that adult differences may obscure, and name one limitation of these images. Do not infer relative body size from display size, or claim which species is closest from this pair alone. Teacher must supply the labeled images before this task; source details are on the Works Cited page. Optional extension: invent three species A/B/C at two stages and compare your drawings, clearly labeling them fictional rather than evidence about real ancestry.

ANSWER KEY

Embryo Clues

GRADES 6-8 · MS-LS4-3

PART 1 · READ AND MARK

Read the hypothetical six-animal example below. Underline its shared features and circle its differences. Mark the limit on inferring relatedness. Then inspect the real human and mouse images your teacher supplies for Your Turn; the written example alone is not pictorial evidence. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What two display choices in the imagined example help a fair comparison? What else must be comparable?	**The diagrams face the same direction and use the same scale. Developmental stages must also be comparable; equal chronological age alone is not enough.**
2	Name two gross anatomical features shared by all six embryos in the imagined early-stage example.	**Any two: a curved body, a tail, a large head region, or visible grooves in the neck area.**
3	Which two animals have the similar later-stage pattern described? Why does that pattern alone not establish their closest relationship?	**Fish and salamander have long tails and elongated bodies in the example. A few shared shapes are insufficient to rank closest ancestry; comparable developmental features and other evidence are needed.**
4	Why can a comparison of fully formed adults hide a pattern that embryo diagrams reveal?	**Adult forms can look much less alike, such as fins, wings, and arms, while early embryos can share visible features.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Possible image observations: both side views show a curved body, a large head region and developing limb projections. The mouse tail is visibly longer and more tightly curved in these displayed specimens; other clearly located differences are acceptable. Example two-sentence interpretation: Similar early body and limb patterns in these two mammals support common ancestry even though the adults look different. These enlarged images show one stage per species and use different imaging methods, so they cannot establish a complete family tree or precise size comparison. Sketches and labels must match the supplied views, not be copied from the imagined six-animal passage.

Required teacher preparation: open Hill, UNSW Embryology, K12 Human and Other Animal Development, section Human and Mouse Embryo; display the labeled human side photograph Stage16_bf5.jpg and the mouse surface rendering Mouse_CT_axes_E11.5.jpg. See the complete source address on the Works Cited page. The human image is Carnegie Collection embryo 8112, stage16; the mouse image is Johnson et al. (2006), PLoS Genetics 2(4):e61, Figure1A, a CT surface rendering, not an ordinary photograph. Keep species/stage labels and image credits. Supply the actual display on screen before assigning the comparison; this PDF does not reproduce the images. Match side views and discuss differing image methods/magnification. Accept accurate visible features with named image evidence and cautious common-ancestry interpretation; do not require identical embryos, fictional data, internal anatomy or a closest-relative ranking. The six-animal reading is an imagined scaffold, not observations of this real pair.