Built to Bear

Use bone structure as evidence for function

HS-AP3-2 "Observe the characteristics of a bone from the axial or appendicular skeleton. Then construct an argument to support how the structure determines the function"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline three structural features of a lumbar vertebra and circle the function linked to each. Number each feature and its matching function with the same number.

A Bone Built for the Lower Back

1. Imagine lifting a heavy box while standing upright. In the lower back, each lumbar vertebra helps carry the weight above it. Its large, thick body sits toward the front of the spine. The body's broad top and bottom surfaces meet cushioning discs between vertebrae. This arrangement spreads compression across a wider area instead of concentrating it at one small point. The bone also contains a network of spongy tissue inside a harder outer layer. That combination provides strength without making the vertebra entirely solid and heavy. The shape of the body is evidence for its weight-bearing job.

2. Behind the body, a bony arch curves around an opening called the vertebral foramen. The body and arch of one vertebra enclose that single opening. When vertebrae are stacked, their foramina line up to form the vertebral canal. Nerve roots travel through this canal in the lower lumbar region. Bone around each opening helps shield these nerves from pressure or a direct blow. If the arch were absent, the opening would have less bony cover on its back side. The shape of this one bone matters not only to movement but also to protecting the nervous system.

3. A lumbar vertebra has bony projections called processes. The spinous process points backward, and transverse processes extend to the sides. These projections give back muscles and ligaments places to attach, so muscle forces can act on the spine. Small articular processes also form joints with neighboring vertebrae. Their joint surfaces help guide the way the lower back bends while limiting excessive twisting. No single feature explains everything the bone does. A useful argument identifies a feature, explains what it changes, and reaches a conclusion about the bone's job.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does the shape of a lumbar vertebra's body support its weight-bearing function?

2. What structural evidence supports the claim that a lumbar vertebra helps protect nerve roots?

3. Why must the foramina of several vertebrae line up to form the vertebral canal?

4. How do the articular processes affect movement in the lower back?

3 YOUR TURN

Your own words

A model lumbar vertebra has a body that is much narrower from side to side, while its arch, vertebral foramen, and processes keep their usual shapes. In four sentences, argue which function would be most affected and which would stay most similar, using at least two structural details from the passage.

ANSWER KEY

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HIGH SCHOOL · HS-AP3-2

PART 1 · READ AND MARK

Underline three structural features of a lumbar vertebra and circle the function linked to each. Number each feature and its matching function with the same number. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does the shape of a lumbar vertebra's body support its weight-bearing function?	**Its large, thick body has broad surfaces that spread compression over a wider area.**
2	What structural evidence supports the claim that a lumbar vertebra helps protect nerve roots?	**Its body and arch enclose a vertebral foramen, placing bone around an opening through which nerve roots pass.**
3	Why must the foramina of several vertebrae line up to form the vertebral canal?	**Each vertebra encloses only one foramen. The aligned foramina form a canal through which nerve roots travel.**
4	How do the articular processes affect movement in the lower back?	**They form joints with neighboring vertebrae whose surfaces guide bending and limit excessive twisting.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The narrower body would be less effective at bearing weight. Its smaller surfaces would spread the same compression over less area, increasing stress. Protecting nerve roots would stay more similar because the arch and vertebral foramen keep their usual shapes. The opening would still help form the canal that surrounds those nerves.

For the open-response task, accept arguments that predict increased stress on the narrower body while explaining why a function supported by an unchanged feature would remain more similar. Distinguish the foramen of one vertebra from the canal formed by aligned foramina.