Bones on the Move

Trace how the skeleton works with other systems to maintain stable conditions.

HAP.3.b "Construct an explanation of the relationships between the skeletal system and other organ systems, including the body's mechanisms for maintaining homeostasis."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline three places where bones interact with other body systems, then number the steps from falling blood calcium to increased calcium absorption from food.

What a Hike Asks of Your Bones

1. On a steep hike, Maya's leg muscles pull on tendons attached to her bones. The bones act as levers, letting her climb while her skeleton supports her weight. Each step also places stress on bone tissue. Bone is living tissue: cells remove old material, and other cells build new material. When activity and nutrition support rebuilding, regularly loaded bones can become stronger. If Maya rests in bed for weeks, her muscles pull less often on her bones, and bone loss can exceed rebuilding. This link between muscle use and bone remodeling changes the strength of her skeleton.

2. Maya's muscles and nerves need a narrow range of calcium in her blood to work properly. Most of the body's calcium is stored in bones, so bone tissue also serves as a mineral reserve. If blood calcium falls, the parathyroid glands release a hormone called PTH. PTH prompts more calcium to enter the blood from bone and helps the kidneys return more calcium to the blood instead of losing it in urine. PTH also helps activate vitamin D in the kidneys; active vitamin D helps the small intestine absorb calcium from food. These responses stabilize blood calcium, though frequent bone loss can weaken bones.

3. Near the end of the climb, Maya breathes faster, and her heart pumps faster to deliver oxygen to working muscles. Red bone marrow, found inside certain bones, makes red blood cells that carry oxygen from the lungs through the bloodstream. This means bones support oxygen delivery, not just movement. The faster breathing and blood flow during exercise help match oxygen delivery to the muscles' increased demand. Marrow does not suddenly make extra red blood cells for one climb; their production takes time. Across these connections, the skeleton helps the body adjust while keeping internal conditions suitable for its cells.

2 ANSWER WITH EVIDENCE

Use the passage

1. Explain how a change in muscle use can change bone strength during Maya's training or bed rest.

2. Trace how the parathyroid glands, kidneys, bones, and small intestine respond when blood calcium falls.

3. Why might keeping blood calcium steady weaken the skeleton if calcium intake stays low?

4. How do red bone marrow, the lungs, and blood flow help Maya's muscles during the climb? Why is making more red blood cells not an immediate response?

3 YOUR TURN

Your own words

A student wears a leg cast for several weeks, eats little calcium-rich food, and then returns to hiking. In four or five sentences, explain how the cast and diet might affect bone strength and blood calcium, then predict why breathing faster on the first hike back will not immediately rebuild the leg bone.

Bones on the Move

PART 1 · READ AND MARK

Underline three places where bones interact with other body systems, then number the steps from falling blood calcium to increased calcium absorption from food. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Explain how a change in muscle use can change bone strength during Maya's training or bed rest.	**Muscles pull on bones during activity, placing stress on bone tissue. With enough nutrition, rebuilding can strengthen regularly loaded bones; during prolonged bed rest, bone loss can exceed rebuilding.**
2	Trace how the parathyroid glands, kidneys, bones, and small intestine respond when blood calcium falls.	**The parathyroid glands release PTH. It prompts calcium to enter the blood from bone and helps the kidneys retain calcium and activate vitamin D. Active vitamin D helps the small intestine absorb calcium from food.**
3	Why might keeping blood calcium steady weaken the skeleton if calcium intake stays low?	**The body can draw calcium from bone to keep enough in the blood for muscles and nerves. Frequent bone loss can weaken the skeleton.**
4	How do red bone marrow, the lungs, and blood flow help Maya's muscles during the climb? Why is making more red blood cells not an immediate response?	**Bone marrow makes red blood cells, which carry oxygen from the lungs through the blood to muscles. Faster breathing and blood flow increase oxygen delivery during the climb, but making red blood cells takes time.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

In the cast, the student's muscles pull less often on the leg bones, so bone loss could exceed rebuilding. If blood calcium falls, PTH can cause calcium to enter the blood from bones and help the kidneys retain calcium. Active vitamin D can help the small intestine absorb calcium, but the student's diet offers little to absorb. On the first hike back, faster breathing and blood flow can deliver more oxygen to working muscles. They cannot rebuild the leg bone immediately because bone remodeling takes time.

Accept explanations that connect a change in one system to a response or effect in another. For Part 3, students should distinguish the immediate response to exercise from the slower process of bone remodeling.