The Uphill Climb

Use evidence to connect cells, organs, and body subsystems.

MS-LS1-3 "Construct an evidence-based argument for how the body is a system of interacting subsystems composed of groups of cells, tissues, and organs. (SEP: 7; DCI: LS1.A; CCC: Systems)"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline details showing how cells form tissues and organs, circle the names of three subsystems, and number three steps that show oxygen moving from air to Nia's leg muscles.

What Powers Nia's Climb?

1. At the bottom of a steep hill, Nia starts pedaling her bike. Her leg muscles push the pedals, but muscles cannot keep working alone. Groups of similar muscle cells form muscle tissue. Muscle tissue, along with other tissues, makes up organs such as a thigh muscle. Its cells use oxygen to release energy for movement. As Nia climbs, those cells need more oxygen. Her body must bring supplies to the muscle cells and carry away carbon dioxide, a waste they produce.

2. Nia breathes faster as she pedals. Air enters her lungs, which are organs in the respiratory subsystem. In the lungs, oxygen passes into blood through thin walls made of cells. Her heart, an organ of the circulatory subsystem, beats faster and pumps blood toward her working legs. Red blood cells carry oxygen through blood vessels to the muscle tissue. At the same time, blood picks up carbon dioxide from the muscles and carries it back to the lungs, where Nia breathes it out.

3. A nerve signal from Nia's brain helps coordinate her movement and breathing. Nerve cells form nervous tissue, which is part of organs such as the brain and nerves. Nerves carry signals to muscles so they contract in a useful pattern. The nervous subsystem helps control breathing rate, too. No single organ can explain the climb. The muscles need oxygen delivered by the lungs and heart, while signals from nerves help time the movements. These linked actions show why the body is a system of interacting subsystems.

2 ANSWER WITH EVIDENCE

Use the passage

1. Nia's thigh muscle is an organ, not just a single cell. What two details from the passage support this claim?

2. A classmate says the lungs alone supply oxygen to Nia's leg muscles. Use evidence to explain why the heart and blood vessels are also needed.

3. How is Nia's breathing out connected to her working muscles? Support your answer with two steps from the passage.

4. Someone says Nia's nerves matter for pedaling but not for breathing. What passage evidence challenges that claim?

3 YOUR TURN

Your own words

Imagine Nia keeps climbing, but her heart cannot pump blood faster. Write one paragraph arguing how this could affect her leg muscles. Use at least three details from the passage, and connect cells, tissues, organs, and interacting subsystems.

ANSWER KEY

The Uphill Climb

GRADES 6-8 · MS-LS1-3

PART 1 · READ AND MARK

Underline details showing how cells form tissues and organs, circle the names of three subsystems, and number three steps that show oxygen moving from air to Nia's leg muscles. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Nia's thigh muscle is an organ, not just a single cell. What two details from the passage support this claim?	**Groups of muscle cells form muscle tissue. Muscle tissue joins with other tissues to make a thigh muscle.**
2	A classmate says the lungs alone supply oxygen to Nia's leg muscles. Use evidence to explain why the heart and blood vessels are also needed.	**Oxygen enters the blood in the lungs, but the heart pumps blood toward the legs. Red blood cells carry oxygen through blood vessels to the muscle tissue.**
3	How is Nia's breathing out connected to her working muscles? Support your answer with two steps from the passage.	**Working muscle cells produce carbon dioxide. Blood carries it from the muscles to the lungs, where Nia breathes it out.**
4	Someone says Nia's nerves matter for pedaling but not for breathing. What passage evidence challenges that claim?	**Nerves signal muscles to contract in a useful pattern, and the nervous subsystem also helps control breathing rate.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

If Nia's heart cannot pump blood faster, her leg muscles may receive less oxygen during the climb. A thigh muscle is an organ made of tissues, including muscle tissue formed from muscle cells. Those cells need more oxygen as they work to push the pedals. Her lungs bring oxygen into the blood, but the heart must pump that blood toward her legs. Even if the respiratory subsystem brings in more air, the circulatory subsystem may not deliver oxygen quickly enough for the working muscle cells.

Accept other evidence-based wording that correctly traces materials or signals between subsystems. For Part 3, students should describe reduced oxygen delivery as a possibility, not claim that the muscles would receive no oxygen.