The Climb Inside

Trace how specialized cells support a hiker's movement.

BIO.1A.3 "Using specific examples, explain how cells can be organized into complex tissues, organs, and organ systems in multicellular organisms."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle a cell type and underline the tissue it forms. Then write 1 to 4 beside that cell type, tissue, organ, and organ system to trace one complete pathway.

A Hiker's Hidden Team

1. Halfway up a steep trail, a hiker's leg muscles need more oxygen. The heart helps meet that demand by moving blood through vessels. Individual cardiac muscle cells contract when electrical signals reach them. Many of these cells connect and form cardiac muscle tissue, which contracts as a coordinated layer. That tissue, along with connective tissue, nerve tissue, and other tissues, makes up the heart. The heart is an organ because its different tissues work together to pump blood. Together, the heart and blood vessels form the cardiovascular system, which carries oxygen toward working muscles.

2. Air entering the hiker's lungs reaches millions of tiny air sacs called alveoli. Thin epithelial cells line these sacs. Together, the lining cells form epithelial tissue, which lets oxygen pass into nearby blood across a short distance. The lungs also contain connective tissue that supports their structure and smooth muscle tissue that adjusts the width of some airways. These tissues work together in each lung, an organ that moves air close to blood. The lungs and airways are organs of the respiratory system, which brings air into the body and removes carbon dioxide.

3. During the climb, breathing becomes faster, and the heart pumps blood more quickly. In the lungs, oxygen crosses the thin lining of the air sacs and enters blood in nearby capillaries. The cardiovascular system then carries that blood to leg muscles, where cells use oxygen to release energy from food. The two organ systems have different jobs, but they cooperate to support the hiker's movement. Their organization matters: specialized cells form tissues with shared functions, several tissues build an organ, and organs work with other structures in a system. A single cell cannot do all these jobs alone.

2 ANSWER WITH EVIDENCE

Use the passage

1. Trace how cardiac muscle cells contribute to the cardiovascular system. Name the tissue and organ between those levels, and explain what each level does.

2. Trace how the epithelial cells lining the air sacs contribute to the respiratory system. Include the tissue and organ they help form.

3. Why is a lung an organ rather than just one kind of tissue? Use two tissues from the passage to explain.

4. Explain how the lungs and heart, as organs in different systems, work together to deliver oxygen to the hiker's leg muscle cells.

3 YOUR TURN

Your own words

Use a plant root, not an example from the passage: root hair cells help absorb water, the root epidermis is a tissue, and many roots make up the root system. In 3 or 4 sentences, explain how the cells' work contributes at each level, including the root as an organ.

ANSWER KEY

The Climb Inside

HIGH SCHOOL · BIO.1A.3

PART 1 · READ AND MARK

Circle a cell type and underline the tissue it forms. Then write 1 to 4 beside that cell type, tissue, organ, and organ system to trace one complete pathway. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Trace how cardiac muscle cells contribute to the cardiovascular system. Name the tissue and organ between those levels, and explain what each level does.	**Cardiac muscle cells contract together as cardiac muscle tissue. This tissue helps the heart pump blood, and the heart works with blood vessels in the cardiovascular system to carry blood toward working muscles.**
2	Trace how the epithelial cells lining the air sacs contribute to the respiratory system. Include the tissue and organ they help form.	**The lining cells form epithelial tissue that lets oxygen pass into nearby blood. This tissue is part of a lung, an organ of the respiratory system.**
3	Why is a lung an organ rather than just one kind of tissue? Use two tissues from the passage to explain.	**A lung contains tissues with different jobs. For example, epithelial tissue allows oxygen to pass into blood, while connective tissue supports the lung's structure.**
4	Explain how the lungs and heart, as organs in different systems, work together to deliver oxygen to the hiker's leg muscle cells.	**In the lungs, oxygen enters nearby blood across the air-sac lining. The heart pumps blood through vessels to the leg muscles, where cells use the oxygen.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Root hair cells in the root epidermis take up water from soil. The epidermis is one tissue in a root organ, alongside tissues that move water inward and upward. Many roots form the root system, which supplies water to the rest of the plant.

Accept explanations that correctly connect specialized cells to a tissue, the tissue to an organ, and the organ to an organ system. For the plant response, students should identify the root as the organ and explain how water absorption supports the plant.