Tissue Clues

Read microscopic descriptions to compare the four basic tissue types.

HS-AP1-4 "Compare and contrast the histological structure between the 4 basic tissue types."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one clue about cell shape or arrangement for each tissue type, and circle details about material between cells. Use your marks to compare the tissues.

What a Tissue Slice Reveals

1. At a hospital, a pathologist examines thin tissue slices under a microscope. A slice from the lining of the mouth shows epithelial tissue: closely packed cells form continuous sheets, with little space between neighbors. The sheet rests on a thin basement membrane that separates it from tissue below. Epithelial cells may be flat or tall, and a sheet may have one layer or several. A different slice, from a tendon, shows connective tissue. Here cells are farther apart, embedded in extracellular matrix made of collagen fibers and ground substance. The many aligned fibers help the tendon resist pulling forces.

2. A slide from the wall of the small intestine contains muscle tissue. Its elongated cells lie in bundles and contain contractile proteins that shorten the cells when they work. Unlike the mouth lining, this tissue is not organized as a surface sheet; unlike tendon, most of its volume is cells rather than a broad extracellular matrix. A slice from the spinal cord contains nervous tissue. Large neurons have long extensions that carry signals, while smaller glial cells support them. Nervous tissue has little extracellular space, but its branching cell shapes differ from the parallel, pulling cells of muscle.

3. The samples show why color alone cannot identify a tissue. Both epithelium and muscle contain many cells with relatively little material between them, yet only epithelium forms a continuous covering on a basement membrane. Connective tissue stands out because its cells sit within a substantial matrix; in a tendon, parallel fibers give strength along the direction of a pull. Muscle and nervous tissue both contain specialized cells, but their shapes reveal different jobs: elongated muscle cells contract, while neurons extend processes to communicate. A single organ may contain all four types, arranged together rather than mixed into one tissue.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the spacing of cells and the amount of extracellular material differ between the mouth lining and the tendon?

2. Epithelium and muscle both have relatively little material between cells. What difference in their arrangement helps you tell them apart?

3. Compare the shapes of muscle cells and neurons. How does each shape fit the job described in the passage?

4. How would extracellular material and cell shape help you distinguish tendon tissue from nervous tissue?

3 YOUR TURN

Your own words

A tissue engineer needs a barrier, fiber-reinforced support, a pulling layer, and a signaling network. In 5 to 6 sentences, assign a basic tissue type to each job and compare at least two structural features that make the tissues suited to different jobs.

Tissue Clues

PART 1 · READ AND MARK

Underline one clue about cell shape or arrangement for each tissue type, and circle details about material between cells. Use your marks to compare the tissues. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the spacing of cells and the amount of extracellular material differ between the mouth lining and the tendon?	**The mouth lining has closely packed epithelial cells with little space between them. Tendon has connective tissue cells farther apart in a substantial extracellular matrix.**
2	Epithelium and muscle both have relatively little material between cells. What difference in their arrangement helps you tell them apart?	**Epithelium forms a continuous sheet on a basement membrane. Muscle has elongated cells in bundles rather than a surface sheet.**
3	Compare the shapes of muscle cells and neurons. How does each shape fit the job described in the passage?	**Muscle cells are elongated and shorten to produce a pull. Neurons have long, branching extensions that carry signals.**
4	How would extracellular material and cell shape help you distinguish tendon tissue from nervous tissue?	**Tendon has a substantial matrix with aligned collagen fibers and cells farther apart. Nervous tissue has little extracellular space and includes neurons with long extensions.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

For a barrier, I would use epithelial tissue because its closely packed cells form a continuous sheet on a basement membrane. Fiber-reinforced support needs connective tissue, with cells spaced among collagen fibers and ground substance. To make a pulling layer, I would use muscle tissue, whose elongated cells contain contractile proteins. A signaling network needs nervous tissue, with neurons that extend long processes and glial cells that support them. Epithelium and muscle have relatively little material between cells, but only epithelium forms a surface sheet. Connective tissue has much more extracellular matrix than nervous tissue, whose neurons carry signals instead of resisting pulls.

Accept accurate comparisons that use cell arrangement, cell shape, or extracellular matrix to distinguish the tissue types. For Part 3, students should assign all four jobs correctly and compare at least two structural features.