Under the Skin

Cell structures shape the jobs of tissues

HAP.1 "Obtain, evaluate, and communicate information to explain how differences in cellular structure (mitochondria, cytoskeletal structure, endoplasmic reticulum..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each cell structure named in the passage. Number each place where the text connects a structure to a tissue's organization or function.

What Happens Beneath a Paper Cut?

1. A paper cut on a finger crosses more than one kind of tissue. The outer epithelial tissue forms a tight sheet of cells. Its cell membranes carry proteins that help neighboring cells attach, and its cytoskeleton helps each cell keep its shape. Together, these features help the sheet stay continuous as it blocks germs and slows water loss. Beneath it, connective tissue is organized differently: cells are spaced within an extracellular matrix. The matrix supports the skin even when the finger bends. A cut can break the sheet and disturb the supporting layer below it.

2. In the supporting layer, connective tissue cells called fibroblasts make collagen, a strong protein in the matrix. Their rough endoplasmic reticulum, or rough ER, helps produce proteins that will be sent out of the cell. During repair, fibroblasts add collagen to the damaged area. Muscular tissue in the hand and forearm contains long muscle fibers packed with organized actin filaments and myosin motor proteins. Their sliding shortens the fibers, allowing movement. These cells contain many mitochondria, which release usable energy from food molecules. That energy helps power repeated contractions when the finger moves.

3. The cut also activates nervous tissue. Neurons have long extensions supported by their cytoskeleton, so signals can travel between the finger and the spinal cord. Proteins in each neuron's cell membrane control the movement of charged particles, creating electrical signals. Sensory neurons carry information about the cut; other neurons help direct muscles to pull the finger away. Neurons need mitochondria to supply energy for maintaining these signals. All four tissues contain membranes, cytoskeletons, ER, and mitochondria, but their cells emphasize different structures. Those differences help explain why one tissue forms a barrier, another supports, another contracts, and another communicates.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do membrane proteins and the cytoskeleton help epithelial tissue act differently from the connective tissue beneath it?

2. Why does rough ER in fibroblasts matter for the way connective tissue is organized?

3. Compare how the cytoskeleton helps epithelial cells and neurons perform different functions.

4. How do cell structures give muscular and nervous tissues different roles when a finger pulls away from a cut?

3 YOUR TURN

Your own words

In four or five sentences, explain how all four tissue types help a hand catch a falling glass. For each tissue, connect one named cell structure to its organization or function.

ANSWER KEY

Under the Skin

PART 1 · READ AND MARK

Underline each cell structure named in the passage. Number each place where the text connects a structure to a tissue's organization or function. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do membrane proteins and the cytoskeleton help epithelial tissue act differently from the connective tissue beneath it?	**Membrane proteins help epithelial cells attach, and the cytoskeleton helps them keep their shape, forming a protective sheet. Connective tissue has cells spaced within a supporting matrix.**
2	Why does rough ER in fibroblasts matter for the way connective tissue is organized?	**Rough ER helps fibroblasts make collagen to send outside the cells. That collagen becomes part of the matrix surrounding and supporting the spaced cells.**
3	Compare how the cytoskeleton helps epithelial cells and neurons perform different functions.	**It helps epithelial cells keep their shape in a continuous barrier. In neurons, it supports long extensions that carry signals between the finger and spinal cord.**
4	How do cell structures give muscular and nervous tissues different roles when a finger pulls away from a cut?	**Membrane proteins help neurons create signals that direct the response. Organized actin and myosin enable muscle fibers to shorten, while mitochondria supply energy for repeated contractions.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

As the hand closes around the glass, membrane proteins help epithelial cells stay attached in a protective sheet. Fibroblasts use rough ER to make collagen for the connective tissue matrix that supports the skin during the grip. When the glass touches the hand, proteins in neuron membranes help create signals that carry information and direct a response. Organized actin filaments and myosin motor proteins shorten muscle fibers to close the fingers. Mitochondria supply the muscle fibers with energy for repeated contractions.

Accept equivalent explanations that correctly link a named cell structure to each tissue's organization or function. Students may use more than one structure for a tissue.