Built to Protect

Model how cell arrangement helps an airway lining work

HAP.2.2 "Construct a model to demonstrate how the structural organization of cells in a tissue relates to the specialized function of that tissue."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline details about cell shapes, positions, or arrangements. Circle the words that explain how those details help the airway lining work.

A Moving Airway Lining

1. On a cold day, every breath can bring dust and tiny particles into the airways. The trachea, or windpipe, is lined with a tissue called respiratory epithelium. A tissue is a group of cells organized to do a shared job. Here, the job is not just to cover a surface. The lining helps trap inhaled particles and move them away from the lungs. Imagine a model made of closely packed blocks along the inside of a tube. The blocks represent cells, but a useful model must show more than their location. It must also show which parts of the cells help the whole lining work.

2. Some cells in this lining make mucus, a sticky liquid that catches dust. Other cells have cilia, tiny moving projections on the side facing the airway. Many cilia beat in the same direction, pushing the mucus toward the throat, where it can be swallowed. In a model, you could use short threads for cilia and a thin strip for mucus. Place the threads on the airway side of neighboring cells, not on the side facing deeper tissue. If the threads point toward deeper tissue instead, the model would show the wrong path for moving trapped particles.

3. The cells also sit close together on a thin supporting layer called the basement membrane. Cells that make mucus and cells with cilia are mixed across the lining, so trapped particles are near the moving cilia. A model that shows only one cell would miss that teamwork. Likewise, evenly spaced cilia would not explain movement unless the model also showed their shared direction. Arrows along the airway surface can show the path of mucus toward the throat. When you judge a tissue model, ask whether each shape, position, and arrow helps explain a function of the tissue.

2 ANSWER WITH EVIDENCE

Use the passage

1. In a model of the airway lining, where should you place the cilia, and how does that position help the tissue work?

2. Why should mucus-making cells and ciliated cells appear near each other in your model?

3. What part of this tissue's function would a model of only one cell fail to show?

4. A classmate draws arrows from the airway surface toward deeper tissue. How would you revise the arrows, and what would they show?

3 YOUR TURN

Your own words

The bladder lining must stretch as the bladder fills and keep urine from reaching deeper tissue. Draw two labeled panels showing your model of its cells before and after stretching, then write two sentences explaining how their arrangement meets both needs.

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PART 1 · READ AND MARK

Underline details about cell shapes, positions, or arrangements. Circle the words that explain how those details help the airway lining work. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In a model of the airway lining, where should you place the cilia, and how does that position help the tissue work?	**Place cilia on the sides of cells facing the airway. There they can move mucus and trapped particles along the airway surface.**
2	Why should mucus-making cells and ciliated cells appear near each other in your model?	**Mucus traps particles, and nearby cilia move that mucus toward the throat.**
3	What part of this tissue's function would a model of only one cell fail to show?	**It would fail to show how mucus-making and ciliated cells work together across the lining.**
4	A classmate draws arrows from the airway surface toward deeper tissue. How would you revise the arrows, and what would they show?	**Draw arrows along the airway surface toward the throat. They show mucus carrying trapped particles away from the lungs.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1 labels: empty bladder, urine side, deeper tissue, closely joined cell layers, folded surface. Panel 2 labels: full bladder, urine side, deeper tissue, the same joined layers spread across a flatter surface. The folds flatten as the bladder fills, letting the lining cover a larger area. The cells remain tightly joined in both panels, keeping urine from reaching deeper tissue.

Accept models that show a plausible change in cell shape or arrangement during stretching while maintaining a continuous barrier. Labels and explanations should connect both features to their functions.