Cells at Work

Trace how cell structures support survival

BIO.1C "Students will relate the diversity of organelles to a variety of specialized cellular functions. Develop and use models to explore how specialized structures within cells (e.g., nucleus, cytoskeleton, endoplasmic reticulum, ribosomes…"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline cell structures and their jobs, number four structures in the mucus-protein pathway in order, and circle the reason a virus needs a living cell to reproduce.

A Protective Coating

1. An airway cell lining your nose does more than form a barrier. Its nucleus stores the instructions for a mucus protein that helps trap dust. Ribosomes build the protein, and the rough endoplasmic reticulum helps fold and move it. The Golgi apparatus modifies and packages it for release outside the cell. Mitochondria supply usable energy for these steps, while the cytoskeleton provides tracks for moving packages toward the cell surface. Lysosomes break down worn cell parts so their materials can be reused. This coordinated work helps maintain a protective coating over the airway.

2. The airway cell is an animal cell and a eukaryote: its DNA sits in a nucleus, and it contains membrane-bound organelles. A leaf cell is also eukaryotic, but chloroplasts capture light energy to make sugars. Its large central vacuole stores water and dissolved substances, including some sugars. Unlike the airway cell, the leaf cell has a cell wall that helps it keep its shape. A yeast cell is fungal and eukaryotic; it has a cell wall and vacuoles but no chloroplasts. It gets sugars from its surroundings. Bacteria are prokaryotes: they have DNA and ribosomes but no nucleus or other membrane-bound organelles.

3. A virus found in nasal mucus is not a cell. It contains genetic material enclosed in a protein coat, and some viruses also have an outer membrane called an envelope. Unlike bacteria, viruses have no ribosomes to build proteins and no machinery to supply the energy needed for reproduction. A virus can enter a living airway cell and use its ribosomes and other resources to make viral parts. These parts are assembled into new viruses. The infected cell may be damaged as its resources are diverted, weakening the protective airway coating.

2 ANSWER WITH EVIDENCE

Use the passage

1. Trace the path from instructions to the release of a mucus protein. What does each of four cell structures do?

2. How do a leaf cell and a yeast cell differ from an airway cell, and how do they differ from each other?

3. Compare a bacterium with an airway cell. Name one structure they share and one key structural difference.

4. Why can a bacterium build its own proteins while a virus must use a living cell to make new viruses?

3 YOUR TURN

Your own words

Imagine a leaf cell whose chloroplasts stop working. Write five sentences modeling how the cell could keep functioning briefly, using the roles of its chloroplasts, vacuole, and mitochondria. Explain why darkness affects a nearby yeast cell differently and where the yeast gets sugar.

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PART 1 · READ AND MARK

Underline cell structures and their jobs, number four structures in the mucus-protein pathway in order, and circle the reason a virus needs a living cell to reproduce. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Trace the path from instructions to the release of a mucus protein. What does each of four cell structures do?	**The nucleus stores the instructions, ribosomes build the protein, the rough endoplasmic reticulum folds and moves it, and the Golgi apparatus modifies and packages it for release.**
2	How do a leaf cell and a yeast cell differ from an airway cell, and how do they differ from each other?	**Unlike an airway cell, both have cell walls. The leaf cell has chloroplasts and makes sugars using light; the yeast cell has no chloroplasts and gets sugars from its surroundings.**
3	Compare a bacterium with an airway cell. Name one structure they share and one key structural difference.	**Both have ribosomes. The airway cell has a nucleus and other membrane-bound organelles, while the bacterium has neither.**
4	Why can a bacterium build its own proteins while a virus must use a living cell to make new viruses?	**A bacterium has ribosomes to build proteins. A virus has no ribosomes or machinery to supply energy, so it must use a living cell's resources.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Without working chloroplasts, the leaf cell cannot make new sugars using light. Its vacuole can provide some stored sugars while its water helps the cell keep its shape. Mitochondria break down available sugars to supply usable energy for cell work. These supplies may help the cell function briefly, but they cannot replace ongoing sugar production forever. Yeast has no chloroplasts, so darkness does not directly stop it from getting sugars from its surroundings.

Accept other accurate pathways that include all four structures in Question 1. In the model, accept stored sugars as a short-term source of energy, not as a permanent replacement for photosynthesis.