Inside a Leaf Cell

Trace how cell structures work together

7.1 "Develop and use a model to explain the functions of specific cell structures necessary for maintaining a stable environment, including the cell membrane, cell wall, chloroplasts, endoplasmic reticulum, golgi apparatus, mitochondria..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the named cell structures, then number the nucleus, ribosome, endoplasmic reticulum, and Golgi apparatus in the order used to make and package a protein.

A Cell at Work

1. On a cloudy morning, a bean plant's leaf cells must keep working even when sunlight changes. Each cell membrane controls which substances cross its boundary, while the stiff cell wall outside it supports the cell. Water stored in the large vacuole helps the cell stay firm. Chloroplasts use light energy to make sugar from water and carbon dioxide. Mitochondria release usable energy from sugar so the cell can carry out its jobs. A useful cell model must show these parts working together, not as separate machines.

2. A leaf cell also makes proteins that help it function. Inside its nucleus, DNA holds instructions. A copy of an instruction, called messenger RNA, travels from the nucleus to a ribosome. The ribosome reads the messenger RNA to build a protein. Some ribosomes attach to the endoplasmic reticulum, where newly made proteins can enter for folding and transport. The Golgi apparatus modifies, sorts, and packages many of these proteins for delivery. If one part of this route fails, the cell may not receive the proteins it needs.

3. Imagine moving a leaf cell into salty water. Its membrane lets water cross, but it does not let every dissolved substance cross freely. Water may leave the cell, shrinking its vacuole; the cell wall can remain in place even as the membrane pulls away from it. Students could compare leaf cells in plain water and salty water, then record changes to test this model. A bacterium also has a membrane and ribosomes, but it has no nucleus or membrane-bound organelles. Its DNA is in the cell, not enclosed in a nucleus.

2 ANSWER WITH EVIDENCE

Use the passage

1. In a model of a working leaf cell, what would an arrow from a chloroplast to a mitochondrion represent? Explain why.

2. Trace how an instruction in the nucleus can lead to a packaged protein. Include messenger RNA in your explanation.

3. What change could students record to test whether salty water causes water to leave leaf cells? Explain how that change supports the model.

4. Why would a model that puts DNA inside a nucleus work for a leaf cell but not for a bacterium?

3 YOUR TURN

Your own words

Draw a model of a leaf cell moved from plain water into salty water while it receives bright light. Label the cell membrane, vacuole, chloroplasts, and mitochondria, add arrows for water and sugar movement, and write two sentences explaining what may change and how two structures work together.

ANSWER KEY

Inside a Leaf Cell

GRADE 7 · 7.1

PART 1 · READ AND MARK

Underline the named cell structures, then number the nucleus, ribosome, endoplasmic reticulum, and Golgi apparatus in the order used to make and package a protein. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In a model of a working leaf cell, what would an arrow from a chloroplast to a mitochondrion represent? Explain why.	**The arrow would represent sugar. Chloroplasts make sugar, and mitochondria use it to release usable energy.**
2	Trace how an instruction in the nucleus can lead to a packaged protein. Include messenger RNA in your explanation.	**Messenger RNA copies an instruction from DNA in the nucleus. A ribosome reads it to build a protein. The protein may enter the endoplasmic reticulum, then go to the Golgi apparatus for modification, sorting, and packaging.**
3	What change could students record to test whether salty water causes water to leave leaf cells? Explain how that change supports the model.	**They could record whether vacuoles shrink in salty water compared with plain water. Shrinking supports the model that water leaves through the membrane.**
4	Why would a model that puts DNA inside a nucleus work for a leaf cell but not for a bacterium?	**A leaf cell has a nucleus containing DNA. A bacterium has DNA but no nucleus to enclose it.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Sketch: Labels identify the cell membrane, vacuole, chloroplasts, and mitochondria; arrows show water leaving through the membrane and sugar moving from a chloroplast to a mitochondrion. Written sentences: Water leaving through the membrane may shrink the vacuole. In bright light, chloroplasts make sugar that mitochondria use to release usable energy.

Accept models that show water leaving through the membrane and sugar moving from chloroplasts to mitochondria. Water loss is a possible response to salty water, not a guaranteed result in every condition.