

Protein Delivery Route

Trace how organelles work together to make and release a protein.

LS.2.b "cell structure and organelles support life processes;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each organelle named in the passage, circle the job it performs, and number the protein's travel steps from instructions to release.

A Pancreatic Cell at Work

- ① Cells stay alive because specialized structures divide the work. In a pancreatic cell, the nucleus holds DNA instructions for making a digestive enzyme, a protein that helps break down food. Ribosomes read copied instructions and join amino acids into the protein. Many ribosomes sit on the rough endoplasmic reticulum, or rough ER. This folded membrane system provides space for proteins to enter, fold, and begin moving through the cell safely toward their destination without mixing with other cell materials.
- ② Next, transport vesicles carry the protein from the rough ER to the Golgi apparatus. The Golgi modifies, sorts, and packages proteins. A new vesicle can then travel to the cell membrane. When its membrane fuses with the cell membrane, the packaged enzyme is released outside the cell. This release lets the pancreatic cell send enzyme to a duct, where it can later help digest food. The cell membrane also controls which substances enter and leave.
- ③ Other organelles handle different life processes. Mitochondria transfer energy from food molecules into ATP, a molecule cells can use to power activities such as moving vesicles. Lysosomes contain enzymes that break down worn-out cell parts and some materials brought into the cell. If mitochondria cannot supply enough ATP, vesicles may move more slowly. If lysosomes fail, damaged materials can build up and interfere with normal cell work and cell survival over time for the organism.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 How do the nucleus and ribosomes work together to make a digestive enzyme?

2 Trace the enzyme's path from the rough ER until it is released outside the cell.

3 Why could low ATP cause a pancreatic cell to release enzyme more slowly?

4 What problem can occur if lysosomes fail, and why does that affect the cell?

3 YOUR TURN _____ Your own words

Write exactly four sentences explaining how a cell could make and release a protein it needs to send outside the cell. Name the nucleus, ribosomes, rough ER, Golgi apparatus, vesicle, cell membrane, and mitochondria, and explain each structure's role in the process.

PART 1 • READ AND MARK

Underline each organelle named in the passage, circle the job it performs, and number the protein's travel steps from instructions to release. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	How do the nucleus and ribosomes work together to make a digestive enzyme?	The nucleus holds the DNA instructions, and ribosomes read copied instructions and join amino acids to make the protein.
2	Trace the enzyme's path from the rough ER until it is released outside the cell.	A transport vesicle carries the protein from the rough ER to the Golgi apparatus. After the Golgi modifies, sorts, and packages it, a vesicle travels to and fuses with the cell membrane, releasing the enzyme outside.
3	Why could low ATP cause a pancreatic cell to release enzyme more slowly?	Mitochondria make ATP that powers activities such as moving vesicles. With too little ATP, vesicles may move more slowly.
4	What problem can occur if lysosomes fail, and why does that affect the cell?	Damaged materials can build up because lysosomes break down worn-out cell parts and some materials. The buildup can interfere with normal cell work and survival.

PART 3 • YOUR TURN (SAMPLE ANSWER)

The nucleus provides instructions for a protein the cell needs to release. Ribosomes build the protein, and the rough ER lets it fold and begin moving. The Golgi apparatus modifies, sorts, and packages it into a vesicle, which fuses with the cell membrane to release it outside the cell. Mitochondria provide ATP that helps power vesicle movement.

Accept equivalent wording that accurately connects each organelle to its role in protein production, movement, packaging, release, or energy supply. For Your Turn, require exactly four sentences and all seven named structures with accurate functions.