AP BIOLOGY · UNIT 2 · TOPIC 2.1

Cell Structure and Function

Learning objective 2.1.A Explain how the structure and function of subcellular components and organelles contribute to the function of cells.

Name: Date: Period:

Use the tool **The Secretory Route**. Work on the **Explore the cell** tab for Parts 1 to 3, then switch to **Match them up** for Part 4. Click any organelle to read its panel.

switch tab *scroll down* *record from the tool*

score yourself

The purple bar in the margin names the AP science practice a question uses.

Part 1 · Structure to function



Use the **Explore the cell** tab. It is the one showing when the tool opens.

Click each organelle in turn. Circle its membrane type and record its function, without copying the panel word for word.

Organelle	**Membrane** *circle one*	**What it does**
Ribosome	none / single / double	
Rough ER	none / single / double	
Smooth ER	none / single / double	
Golgi complex	none / single / double	
Lysosome	none / single / double	
Mitochondrion	none / single / double	
Chloroplast	none / single / double	
Vacuole	none / single / double	
Nuclear envelope	none / single / double	

Part 2 · The endomembrane system

Stay on the **Explore the cell** tab.

Keep the plant cell showing. Press Highlight the endomembrane system. List every structure that lights up, then list the three that stay dim.

In the endomembrane system	Not in the endomembrane system

SP 1 · CONCEPT EXPLANATION

1. The ribosome, the mitochondrion and the chloroplast are not part of the endomembrane system. Describe what the structures of the endomembrane system have in common that these three structures do not.

2. Identify the three structures in the plant cell that have a double membrane.

Part 3 · Trace a protein

Stay on the **Explore the cell** tab.

Press **Send a protein** and watch the whole journey. Then fill in the route from memory, in order.

Stop	Structure	What happens there
1		
2		
3		
4		
5		
6		

SP 1 · CONCEPT EXPLANATION

3. Every stop on the route in the Part 3 table is either a ribosome or part of the endomembrane system. Explain why a protein that the cell secretes must follow a route made of these structures.

Part 4 · Explain it



Click the **Match them up** tab at the top of the tool.

Work the **Match them up** cards first. Then answer questions 4 to 7 in complete sentences.

SP 1 · CONCEPT EXPLANATION

4. Rough ER and smooth ER differ in one structural feature.
(a) Describe the structural difference between rough ER and smooth ER.

(b) Explain how this difference results in the different functions of rough ER and smooth ER.

5. The inner membrane of a mitochondrion is highly folded. Explain how this folding supports the function of the mitochondrion.

6. A lysosome contains hydrolytic enzymes. Explain why it is important to the cell that a lysosome is enclosed by a membrane.

SP 6 · ARGUMENTATION

7. Ribosomes are found in the cells of all forms of life, including prokaryotes.
(a) Identify what this observation provides evidence for.

(b) Explain how the observation supports your identification.

Part 5 · Learning check self-report

Scroll down to the **Learning check** at the bottom of the tool. Type an answer to each question, check it against the rubric, and check off the points you earned. Then record your score here and, for every point you did not earn, write what the rubric asked for that your answer left out.

Question	Points possible	Points I earned	Missed opportunities (what the rubric wanted that I left out)
1	3		
2	2		
3	2		
4	2		
Total	**9**		

What the model simplifies

The cell is drawn as a flat cross-section with one of each organelle. A real cell contains hundreds of mitochondria, thousands of ribosomes and a far more tangled ER.

Organelles are drawn at readable sizes, not to scale. A ribosome is roughly a thousand times smaller relative to the nucleus than this diagram shows.

The secretory route is shown as a single protein taking one clean path. In a real cell many proteins move at once, some are recycled, and some never leave the ER.

The tool covers only the structures the CED names for this topic. Structures such as the cytoskeleton, centrioles and peroxisomes exist in real cells but are not assessed here.