NAME _____ CLASS _____ DATE _____

AP BIOLOGY · 2.9, 2.10

Compartments and their origins

Notes to fill in alongside the guide. Each numbered block matches a chapter of the guide, and of the lesson slides. Write in the gaps, answer the cues, annotate the figures, and sum up each section in your own words.

BY THE END YOU CAN

- [ ] Explain how membranes and membrane-bound organelles compartmentalize a eukaryotic cell's reactions 2.9.A
- [ ] Describe the endomembrane system and the route of a secreted protein through it 2.9.A
- [ ] Explain how internal membranes minimize competing interactions and increase the surface area where reactions happen 2.9.B
- [ ] Describe the endosymbiotic origin of mitochondria and chloroplasts, and relate their functions to their free-living ancestors 2.10.A
- [ ] Compare how prokaryotic and eukaryotic cells divide up their work 2.10.A

01 Keep it apart

2.9.A

CUES

Predict: A lysosome's enzymes work best at pH 5, and the cytoplasm is about pH 7.2. A lysosome leaks a little. What happens?

What is meant by compartments?

What is meant by compartmentalization?

NOTES

1 The membranes inside a eukaryotic cell divide it into _____, each with its own enzymes and conditions.

2 This is _____.

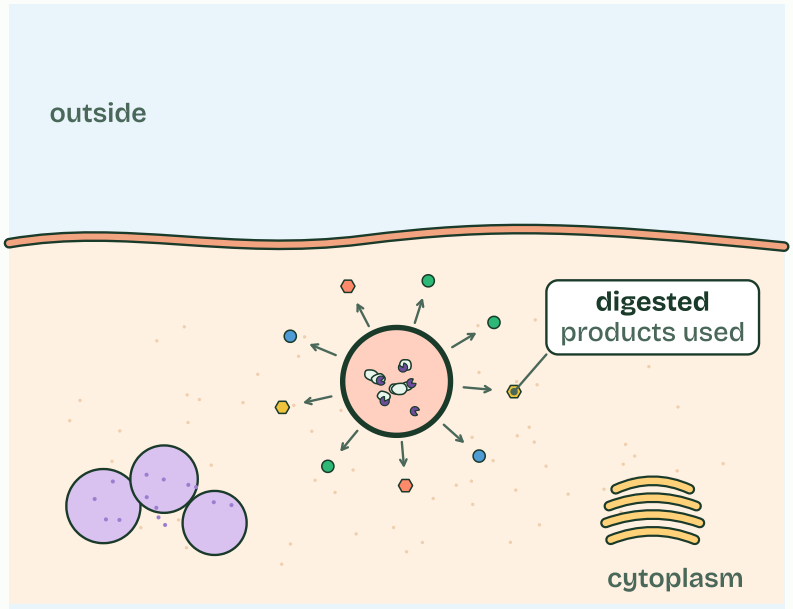
3 Membranes divide a eukaryotic cell into _____.

4 _____ keep reactions that would interfere apart.

Your own notes

ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each: 1 bacterium; 2 phagocytic vacuole; 3 Lysosomes fuse; 4 digested.



SPOT THE MISTAKE

What do students often get wrong about cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 01 in two or three sentences of your own.

02 Genes behind a wall

2.9.A

CUES

Predict: Why can a bacterium start making a protein from an mRNA before the mRNA is even finished?

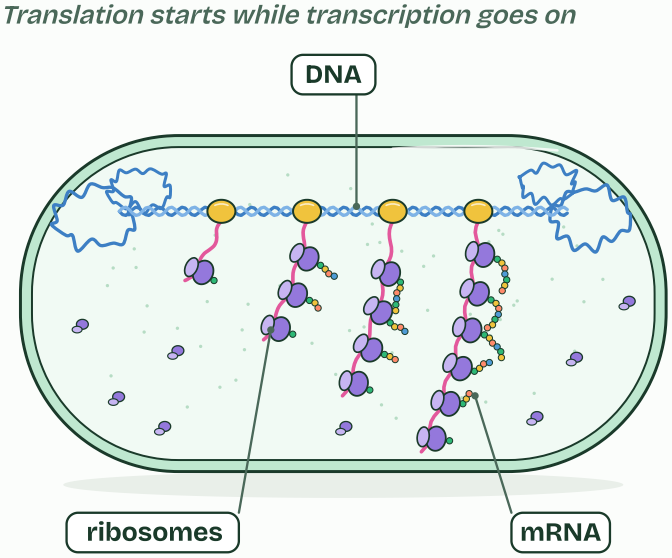
NOTES

1 Its double membrane, the _____, keeps the DNA apart from the cytoplasm, where proteins are made.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Prokaryote and Eukaryote. Note what changes each time.



SPOT THE MISTAKE

What do students often get wrong about cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 02 in two or three sentences of your own.

03 Folded for surface

2.9.B

CUES

Predict: Heart muscle cells have mitochondria with many more cristae than the mitochondria of skin cells. What does this suggest?

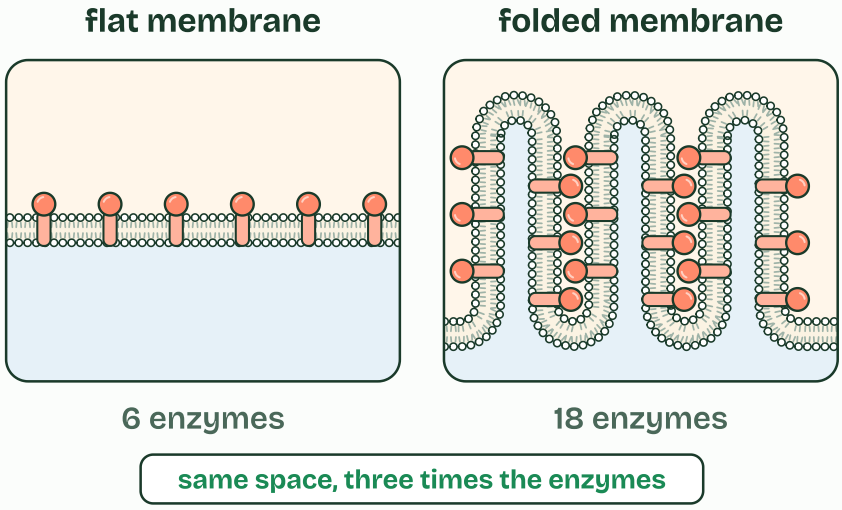
NOTES

1. The inner membrane of a mitochondrion is folded into _____, which carry the proteins that make most of the cell's ATP.
2. A chloroplast is packed with stacks of _____, whose membranes carry the pigments and proteins of the light reactions.
3. Internal membranes: _____.
4. A _____ across a compartment has room for six enzymes.
5. Fold the same membrane into the _____ and it holds three times as many.
6. More membrane, more enzymes, _____: cristae and thylakoids.

Your own notes

ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each: 1 flat membrane; 2 same space; 3 more reactions at once.



SPOT THE MISTAKE

What do students often get wrong about cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 03 in two or three sentences of your own.

04 A route out of the cell

2.9.A

CUES

Predict: Cells that secrete a lot of protein, such as those making digestive enzymes, have lots of which structures?

What is meant by endomembrane system?

NOTES

1 The _____ is a set of compartments that pass membrane and cargo between them: the nuclear envelope, the endoplasmic reticulum, the Golgi complex, lysosomes, vacuoles and the plasma membrane.

2 Ribosomes on the _____ make it and thread it inside.

3 A vesicle carries it to the _____, which modifies it, often adding sugars, and sorts it.

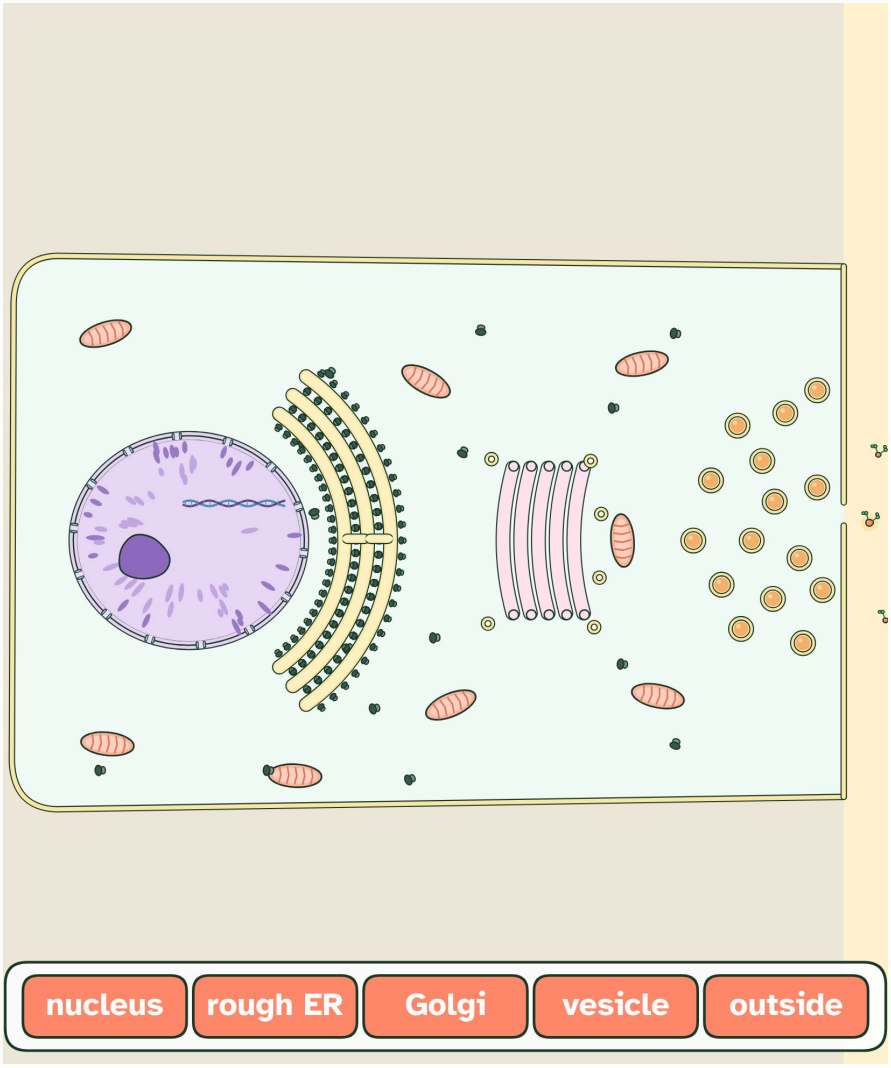
4 Another vesicle buds off, travels to the _____, and fuses with it, releasing the protein outside the cell by exocytosis.

5 _____: nuclear envelope, ER, Golgi, lysosomes, vacuoles, plasma membrane.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (From gene to outside): what is happening, and why?



SPOT THE MISTAKE

What do students often get wrong about cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 04 in two or three sentences of your own.

05 Bubbles that carry

2.9.A

CUES

Predict: A drug stops vesicles fusing with the Golgi. Where does a protein for export build up?

NOTES

1 _____ molecules outside the cell bind to _____ in the membrane.

2 _____ gathers on the inner face and begins to bend the membrane.

3 The clathrin cage deepens it into a _____.

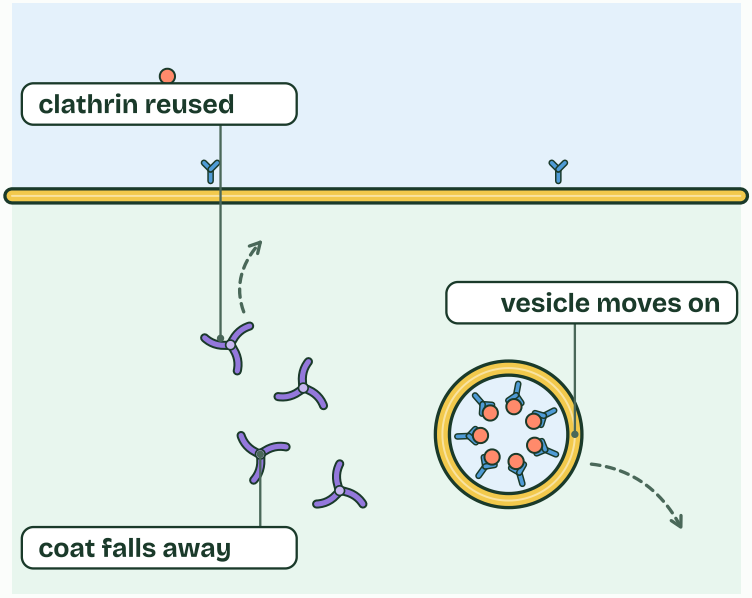
4 The pit pinches off: a _____ with its cargo inside.

5 The _____ to be used again, and the vesicle moves on.

Your own notes

ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each: 1 Cargo, receptors; 2 Clathrin; 3 coated pit; 4 coated vesicle; 5 coat falls away.



SPOT THE MISTAKE

What do students often get wrong about cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 05 in two or three sentences of your own.

06 The cell that swallowed a bacterium

2.10.A

CUES

Predict: If a cell lost all its mitochondria, could it make new ones from its own nuclear genes and membranes?

What is meant by endosymbiosis?

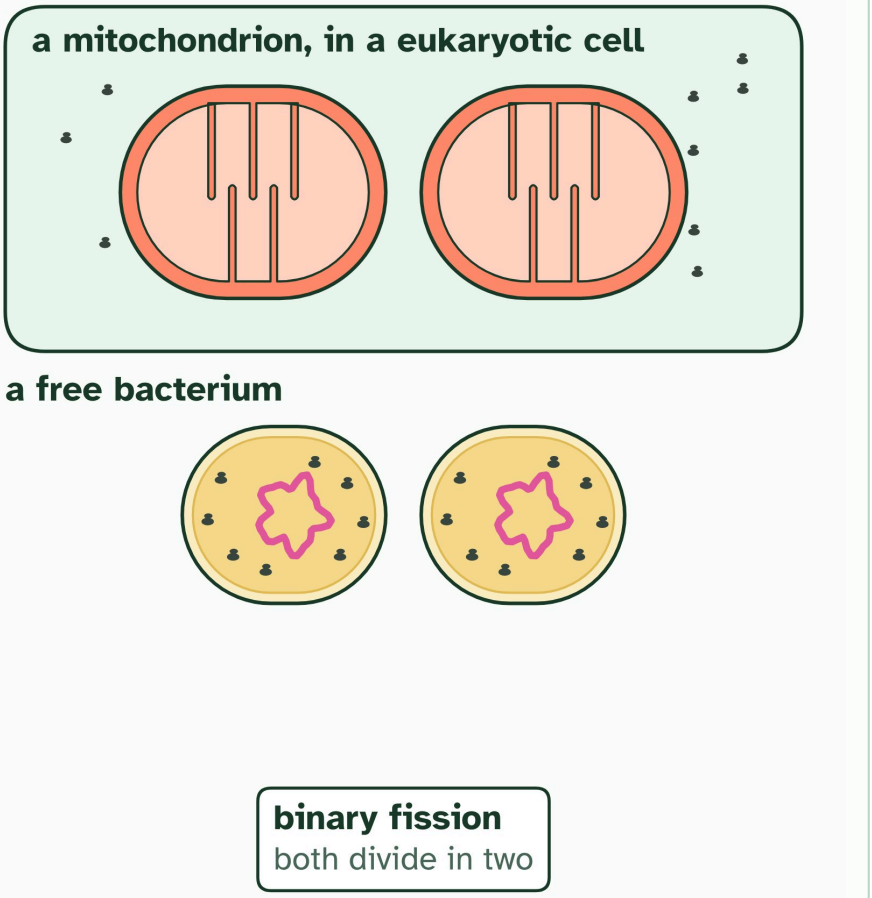
NOTES

1. The theory of _____ says they were once free-living prokaryotes.
2. Over many generations it became the _____.
3. Later some of these cells took in a photosynthetic cyanobacterium the same way, and it became the _____.
4. Engulfed but not digested: _____.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Taking in a partner): what is happening, and why?



SPOT THE MISTAKE

What do students often get wrong about origins of cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 06 in two or three sentences of your own.

07 Still bacteria inside

2.10.A

CUES

Predict: Some antibiotics stop bacterial ribosomes working and leave the patient's cytoplasm ribosomes alone. In high doses, which organelle's proteins can they also affect?

NOTES

1 Each has _____: the inner one its own, the outer one from the vesicle it was engulfed in.

2 Each has its own _____, like a bacterium's, and its own _____, small like a prokaryote's.

3 Each makes new copies only by _____, as bacteria do.

Your own notes

SPOT THE MISTAKE

What do students often get wrong about origins of cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 07 in two or three sentences of your own.

08 Regions without walls

2.10.A

CUES

Predict: Cyanobacteria have stacks of internal thylakoid membranes, yet they are still prokaryotes. Why?

NOTES

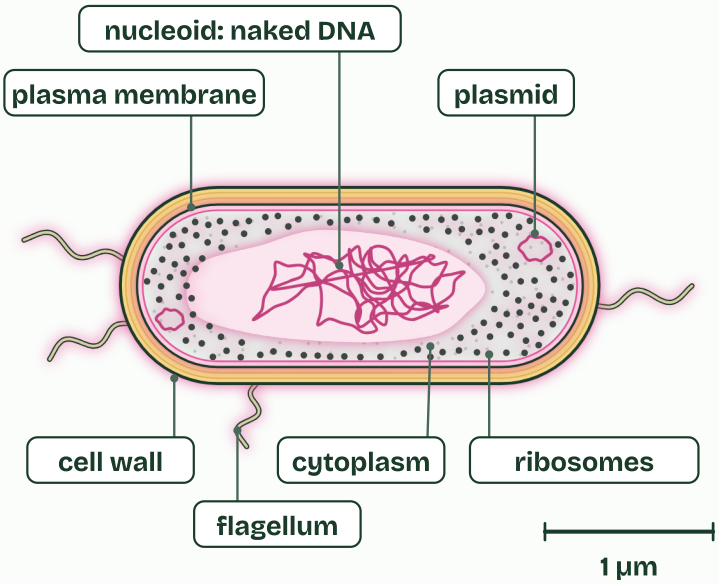
1 The DNA sits in the _____.

2 Prokaryotes: _____.

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: flagellum, cell wall, plasma membrane, cytoplasm, nucleoid, plasmid, ribosomes.



SPOT THE MISTAKE

What do students often get wrong about origins of cell compartmentalization? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 08 in two or three sentences of your own.

Check yourself

The check for this guide is online: a fresh paper of past-paper style questions from the exam bank on 2.9, 2.10 each time, marked as you go, and saved to your Exam practice progress when you are signed in. Scan the code, or type the link.

biologybybradford.com/exam-maker/sit?program=ap&units=U2&ced=2.9,2.10&paper=quiz&marks=15&src=ep

How this was made. The course structure, the activities and the teaching choices come from my own classroom, my presentations and my years of teaching IB and AP Biology. I use Claude, an AI, to help write and build the interactive guides, lesson plans, slides and practice questions, and to draw the diagrams and code the interactives. I direct the work and review it against the IB and AP specifications before it goes live.