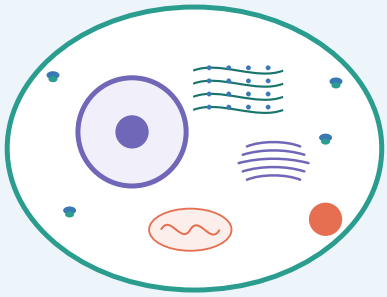
AP BIOLOGY | UNIT 2

TOPIC 2.1

Cell Structure and Function

Specialized cell components create efficient locations for protein production, transport, digestion, storage, and energy transformation.

A CELL IS AN ORGANIZED SYSTEM



organelles divide the work

THE CORE CAUSAL CHAIN

STRUCTURE
membranes and shapes

→

LOCATION
local conditions

→

PROCESS
specialized reactions

→

CELL FUNCTION
coordinated output

BY THE END, YOU SHOULD BE ABLE TO...

1. Match major organelles with their functions.
2. Trace a secreted protein through the endomembrane system.
3. Explain how organelle structure supports cellular processes.

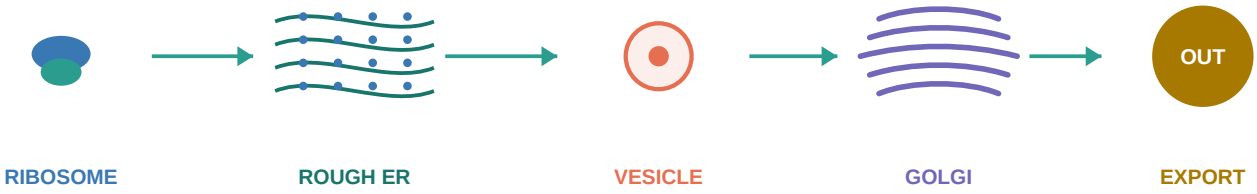
BIG IDEA

A strong structure-function explanation names a physical feature, the process it supports, and the benefit to the cell.

1 Protein production and trafficking

The endomembrane system links protein synthesis, modification, packaging, transport, and secretion.

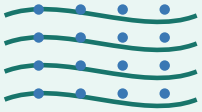
FOLLOW A SECRETED PROTEIN



Ribosome translates mRNA -> rough ER folds and begins processing -> vesicle transports -> Golgi modifies and sorts -> vesicle fuses with the plasma membrane.

ROUGH ER VS. SMOOTH ER

ROUGH ER



Ribosomes on the surface help synthesize proteins entering the endomembrane pathway.

SMOOTH ER



No attached ribosomes; functions include lipid synthesis and detoxification.

OTHER ENDOMEMBRANE ROLES

LYSOSOME

Hydrolytic enzymes digest and recycle materials.

VACUOLE

Stores water, ions, nutrients, or wastes.

NUCLEAR ENVELOPE

Connects the nucleus with the endomembrane system.

AP SCOPE NOTE

Know the pathway and each component's role. Ribosomes are not membrane-bound, even when attached to rough ER.

2 Structure supports specialized work

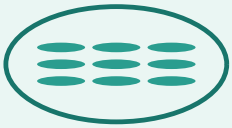
Membranes, folds, internal stacks, enzymes, and storage space make different organelles suited to different jobs.

MITOCHONDRION



Double membrane; folded inner membrane provides surface and compartments for aerobic respiration and ATP synthesis.

CHLOROPLAST



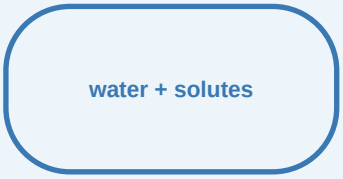
Double membrane and internal thylakoid stacks organize photosynthetic reactions in plants and algae.

LYSOSOME



A membrane-enclosed acidic compartment keeps hydrolytic enzymes separated while they digest materials.

CENTRAL VACUOLE



A large plant-cell compartment stores water and solutes; water pressure helps maintain cell firmness.

QUICK ORGANELLE MATCH

RIBOSOME	GOLGI	MITOCHONDRION	CHLOROPLAST
protein synthesis	modify + sort	ATP production	photosynthesis

COMMON ERROR

Do not list organelle functions alone. Link a structural feature to the process it supports and the cellular benefit.