

AP BIOLOGY CHEAT SHEET

Unit 2: Cell Structure & Function

Quick Overview

- **Focus:** eukaryotic vs prokaryotic cells, organelle functions, transport across membranes, and the importance of SA:V.
- **Exam lens:** structure relates to function, and membranes are selectively permeable.

Organelles: Must-Know Functions

- **Nucleus:** stores DNA, site of transcription.
- **Ribosomes:** protein synthesis (free ribosomes → cytosolic proteins, bound ribosomes → secreted proteins).
- **Endoplasmic Reticulum (ER):**
 - **Rough ER:** protein folding, modification, transport.
 - **Smooth ER:** lipid synthesis, detoxification.
- **Golgi Apparatus:** modifies, sorts, packages proteins; cis → trans face directionality.
- **Mitochondria:** cellular respiration; double membrane; own DNA.
- **Chloroplasts:** photosynthesis; thylakoid membranes; own DNA.
- **Lysosomes:** hydrolytic enzymes for digestion & recycling.
- **Vacuoles:** storage; central vacuole in plants maintains turgor pressure.
- **Cytoskeleton:** support, transport, motility (microtubules, microfilaments, intermediate filaments).

Prokaryotes vs Eukaryotes

- **Prokaryotes:** no nucleus or membrane-bound organelles; DNA in nucleoid; smaller.
- **Eukaryotes:** nucleus + membrane-bound organelles; larger.
- **Both:** ribosomes, plasma membrane, cytoplasm, DNA.

Membrane Structure

- **Fluid Mosaic Model:** phospholipid bilayer + proteins.
- **Amphipathic:** hydrophilic heads, hydrophobic tails.
- **Cholesterol:** regulates fluidity.
- **Proteins:** transport, receptors, enzymes, cell recognition.
- **Carbohydrates:** glycoproteins/glycolipids for cell-to-cell signaling.

Mini formula box

- **SA:V = Surface Area ÷ Volume**
- **For a cube: SA = 6s², V = s³, so SA:V = 6/s**
- **Key principle: as s (size) increases, SA:V decreases.**

Transport Across Membranes

- **Passive transport:** diffusion, facilitated diffusion (via channel/carrier proteins), osmosis.
- **Active transport:** requires ATP; pumps substances against gradient.
- **Bulk transport:** endocytosis (phagocytosis, pinocytosis, receptor-mediated), exocytosis.

Surface Area-to-Volume Ratio (SA:V)

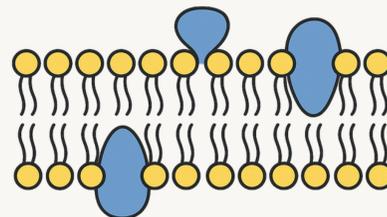
- **Cells must maximize SA:V for exchange of materials.**
- **Smaller cells = higher SA:V → more efficient.**
- **Structures like villi, microvilli increase SA:V.**
- **As cells grow, volume increases faster than surface area → diffusion limits size.**

Common exam pitfalls

- **Students often confuse free vs bound ribosomes.**
- **Students often forget that mitochondria and chloroplasts have their own DNA and ribosomes (endosymbiotic theory).**
- **Students often think all transport requires energy; only active transport does.**
- **Students often misapply SA:V – larger organisms solve exchange issues with organ systems (lungs, intestines).**

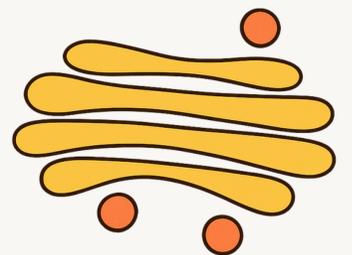
Visual Mnemonics

FLUID MOSAIC MEMBRANE



Heads like water,
tails hide.

Golgi Apparatus



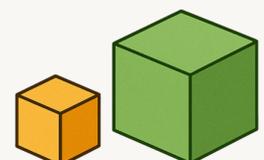
FedEx of the cell –
packages and ships

Mitochondria & Chloroplasts



Folded membranes =
more energy
Stacks of pancakes =
sunlight traps

SA:V Ratio



Small cells
stay efficient

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