Module 4: Cells

Keys to Success & Study Guide

Learning Objectives

By the end of this module, you should be able to:

1. **Differentiate** between prokaryotic and eukaryotic cells based on structure and complexity.
2. **Identify** and describe the function of major eukaryotic organelles.
3. **Trace** the production and transport of proteins through the endomembrane system.
4. **Explain** the Endosymbiotic Theory regarding the origin of mitochondria and chloroplasts.

Key Terminology Checklist

Define these terms in your own words to ensure mastery.

- [ ] **Cytoplasm**: The gel-like fluid filling the cell (cytosol + organelles).
- [ ] **Plasma Membrane**: The phospholipid bilayer that forms the cell boundary.
- [ ] **Organelle**: A membrane-bound, specialized structure within a eukaryotic cell.
- [ ] **Ribosome**: The site of protein synthesis (found in all cells; not membrane-bound).
- [ ] **Cytoskeleton**: A network of protein fibers (microfilaments, intermediate filaments, microtubules) providing structure and movement.
- [ ] **ATP**: Adenosine triphosphate; the primary energy currency of the cell.

Concept Check

1. The Limits of Cell Size

- **Question**: Why are cells microscopic?

- **Key Answer**: As a cell grows, its volume increases faster than its surface area (SA:V ratio decreases). The membrane cannot supply nutrients or remove wastes efficiently for a large volume.

2. Prokaryote vs. Eukaryote

- **Question**: How do prokaryotic cells differ from eukaryotic cells?
- **Key Answer**: Prokaryotes lack a membrane-bound nucleus and organelles. DNA resides in a nucleoid region. Prokaryotes (Bacteria, Archaea) are smaller and simpler than eukaryotes.

3. Powering the Cell

- **Question**: What is the role of mitochondria?
- **Key Answer**: Mitochondria perform aerobic cellular respiration, converting glucose and oxygen into ATP. Cells with high energy demands (muscle, neurons) contain many mitochondria.

4. The Endomembrane System

- **Question**: What do lysosomes do?
- **Key Answer**: Lysosomes contain digestive enzymes that break down macromolecules, damaged organelles, and pathogens. Lysosomal rupture can trigger apoptosis (programmed cell death).