Module 4: Cells

Comprehension & Critical Thinking Questions

Part 1: Core Concepts

1. **Cell Theory**
    - State the three tenets of Cell Theory.
    - Why is the cell considered the basic unit of life?
2. **Cell Types**
    - Create a Venn Diagram comparing prokaryotic and eukaryotic cells.
    - Which domains of life are prokaryotic? Which are eukaryotic?
3. **The Endomembrane System**
    - Trace the path of a secretory protein from synthesis to export: Nucleus → Ribosome → Rough ER → Transport Vesicle → Golgi Apparatus → Secretory Vesicle → Plasma Membrane.

Part 2: Application

1. **Organelle Function**
    - If a cell were a factory, what role would each organelle play?
        - Mitochondria (Power Plant)
        - Lysosome (Recycling Center)
        - Nucleus (Control Center/CEO)
    - Provide the biological justification for each analogy.
2. **Plant vs. Animal Cells**
    - You observe a cell with a rigid cell wall and green organelles under a microscope. Is this a plant or animal cell? Explain.

- Why do plant cells have a central vacuole while animal cells generally do not?

Part 3: Analysis & Evaluation

1. **Surface Area to Volume Ratio**
    - Analyze why cells must remain small. What happens to nutrient exchange efficiency as cell size increases?
2. **Endosymbiotic Theory**
    - Explain the Endosymbiotic Theory. What evidence suggests that mitochondria and chloroplasts were once independent prokaryotes?
        - Double membranes
        - Circular DNA
        - 70S ribosomes (similar to bacteria)