

Module 04: Cellular Function — Study Questions

Cell Theory and Cell Types

1. What are the three main principles of cell theory? Explain each principle in your own words.
2. Who were some of the scientists that contributed to the development of cell theory, and what were their contributions?
3. Why is the cell considered the basic unit of life? What characteristics do all cells share?
4. What is the main structural difference between prokaryotic and eukaryotic cells?
5. Give two examples of organisms with prokaryotic cells and two examples with eukaryotic cells.
6. What structures do both prokaryotic and eukaryotic cells have in common?

Cell Organelles and Functions

1. What is the function of the nucleus, and why is it called the "control center" of the cell?
2. How do ribosomes differ from other organelles in terms of structure, and what is their essential function?
3. Compare the functions of rough endoplasmic reticulum and smooth endoplasmic reticulum. Why does the rough ER appear "rough" under a microscope?
4. What is the role of the Golgi apparatus in processing and packaging proteins? Where do proteins go after leaving the Golgi?
5. What would happen to a cell if its lysosomes stopped functioning properly? Give specific examples of problems that could occur.

Energy and Metabolism

1. What is the primary function of mitochondria, and why are they called the "powerhouses" of the cell?
2. Explain the endosymbiotic theory and describe at least three pieces of evidence that support it.
3. Why do plant cells have both mitochondria and chloroplasts? What is the relationship between photosynthesis and cellular respiration?

Plant vs. Animal Cells

1. What three structures are found in plant cells but NOT in typical animal cells? Describe the function of each.
2. How does the cell wall provide advantages to plant cells that animal cells do not have?
3. What is the role of the central vacuole in plant cells? How does it differ from vacuoles in animal cells?

Cytoskeleton and Cell Structure

1. What are the three main components of the cytoskeleton, and what is the function of each?
 2. How do cilia and flagella differ in structure, number, and the type of movement they produce? Give an example of a cell that uses each.
 3. How does the cytoskeleton contribute to cell division? What specific structures are involved?
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Challenge Questions (Optional)

1. A cell is placed in a solution and you observe that the lysosomes begin to digest the cell's own organelles. What might be happening, and why would this occur?
2. If you were designing a cell to produce and secrete large amounts of protein (like an antibody-producing immune cell), which organelles would you expect to be most abundant? Explain your reasoning.