

Cellular Structure and Function

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1. Introduction to Cells

- Cells are the basic structural and functional units of all living organisms.
- They vary in size, shape, and function, but share common features.

2. Cell Membrane

- Outer boundary of the cell that regulates the passage of substances in and out of the cell.
- Composed of a phospholipid bilayer with embedded proteins.

3. Cytoplasm

- Jelly-like substance within the cell where organelles are suspended.
- Site of many cellular processes, including metabolism and protein synthesis.

4. Nucleus

- Control center of the cell containing genetic material (DNA).
- Directs cellular activities and regulates gene expression.

5. Organelles

- Specialized structures within the cell that perform specific functions.
- Examples include mitochondria (energy production), endoplasmic reticulum (protein synthesis), and Golgi apparatus (protein packaging).

6. Mitochondria

- Powerhouses of the cell that produce energy (ATP) through cellular respiration.
- Have their own DNA and can replicate independently.

7. Endoplasmic Reticulum (ER)

- Network of membranes involved in protein and lipid synthesis.
- Rough ER has ribosomes attached for protein synthesis, while smooth ER is involved in lipid metabolism.

8. Golgi Apparatus

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- Modifies, sorts, and packages proteins for transport within or outside the cell.
- Consists of flattened sacs called cisternae.

9. Lysosomes

- Contain digestive enzymes to break down waste materials and cellular debris.
- Important for recycling cellular components.

10. Cytoskeleton

- Network of protein filaments that provides structural support and facilitates cell movement.
- Composed of microtubules, microfilaments, and intermediate filaments.

11. Cell Division

- Process by which cells reproduce and multiply.
- Includes mitosis (for growth and repair) and meiosis (for sexual reproduction).

Understanding the structure and function of cells is fundamental to understanding how living organisms operate at the most basic level. Cells work together in a coordinated manner to maintain the overall function and health of an organism.