

Chapter 1: The Cell - The Fundamental Unit of Life

1. Introduction to Cells:

- The cell is the structural and functional unit of all living organisms.
 - **Protoplasm:** The living substance of a cell, composed of the cytoplasm and nucleus.
 - **Cell Theory:**
 - All living organisms are made up of cells.
 - The cell is the basic unit of structure and function.
 - New cells arise from pre-existing cells.
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2. Types of Cells:

- **Prokaryotic Cells:**
 - Lack a well-defined nucleus (e.g., bacteria).
 - DNA is present in the nucleoid region.
 - Lack membrane-bound organelles.
 - **Eukaryotic Cells:**
 - Have a distinct nucleus enclosed by a nuclear membrane (e.g., plant and animal cells).
 - Contain membrane-bound organelles like mitochondria, ER, and Golgi bodies.
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3. Differences between Prokaryotic and Eukaryotic Cells:

Features	Prokaryotic Cell	Eukaryotic Cell
Nucleus	Absent	Present
Organelles	Not membrane-bound	Membrane-bound
Cell Size	Smaller	Larger
Example	Bacteria, Blue-green algae	Plant and Animal Cells

4. Structure of Plant and Animal Cells:

- **Cell Wall (Plant Cell Only):**
 - Rigid, provides shape and protection.
- **Cell Membrane:**
 - Semi-permeable, controls entry and exit of substances.

- **Nucleus:**
 - Control center containing DNA.
- **Nucleolus:**
 - Produces ribosomes.
- **Cytoplasm:**
 - Jelly-like fluid containing organelles.
- **Mitochondria:**
 - Powerhouse of the cell, generates energy (ATP).
- **Endoplasmic Reticulum (ER):**
 - *Rough ER*: Protein synthesis.
 - *Smooth ER*: Lipid synthesis and detoxification.
- **Ribosomes:**
 - Sites of protein synthesis.
- **Golgi Bodies:**
 - Packaging and transportation of proteins.
- **Plastids (Plant Cell Only):**
 - *Chloroplasts*: Photosynthesis.
 - *Chromoplasts*: Pigment storage.
- **Lysosomes:**
 - Digestive enzymes to break down waste.
- **Centrosome (Animal Cell Only):**
 - Helps in cell division.
- **Vacuole:**
 - Stores water and nutrients; larger in plant cells.

5. Differences between Plant and Animal Cells:

Features	Plant Cell	Animal Cell
Cell Wall	Present (made of cellulose)	Absent
Plastids	Present (chloroplasts, etc.)	Absent
Vacuoles	One large central vacuole	Small, numerous
Centrosome	Absent	Present

Key Points to Remember:

- Cells are the building blocks of life.
- Prokaryotic cells are simpler, without a nucleus, while eukaryotic cells have a defined nucleus.
- Plant cells have a cell wall, large vacuole, and plastids, while animal cells lack these features but contain centrosomes.
- Understanding cell structure helps in studying the functioning of living organisms.

