Study Notes: Cell Structure and Functions

1. Introduction to Cells

• Definition: A cell is the basic structural and functional unit of life. All living organisms are made up of cells.
• Discovery: Cells were discovered by Robert Hooke in 1665.

2. Types of Cells

• Prokaryotic Cells: Cells that lack a distinct nucleus, e.g., bacteria.
• Eukaryotic Cells: Cells that have a defined nucleus, e.g., plant and animal cells.

3. Parts of a Cell

• Cell Membrane: The outer boundary of the cell, controls the movement of substances in and out of the cell.
• Cytoplasm: Jelly-like substance where various organelles are suspended.
• Nucleus: The control center of the cell, contains genetic material (DNA).
• Mitochondria: Known as the powerhouse of the cell, responsible for energy production.
• Endoplasmic Reticulum (ER):
  - Rough ER: Studded with ribosomes, involved in protein synthesis.
  - Smooth ER: Lacks ribosomes, involved in lipid synthesis.
• Golgi Apparatus: Packages and distributes proteins and lipids.
• Lysosomes: Contain enzymes to break down waste materials.
• Chloroplasts (in plant cells): Contain chlorophyll and are involved in photosynthesis.

4. Differences Between Plant and Animal Cells

Feature	Plant Cell	Animal Cell
Cell Wall	Present (made of cellulose)	Absent
Chloroplasts	Present (for photosynthesis)	Absent
Vacuole	Large central vacuole	Small or absent
Shape	Generally fixed and rectangular	Irregular and flexible

5. Functions of Organelles

• Nucleus: Controls cell activities and contains genetic material.
• Mitochondria: Site of cellular respiration, providing energy for the cell.

• Endoplasmic Reticulum: Synthesizes proteins and lipids; rough ER assists in protein folding, while smooth ER synthesizes lipids.
• Golgi Apparatus: Modifies, sorts, and packages proteins and lipids for delivery to specific destinations.
• Lysosomes: Break down macromolecules, old cell parts, and foreign substances.
• Chloroplasts: Use sunlight to produce food for plants through photosynthesis.

6. The Importance of Cells

• Cells work together to form tissues and organs, allowing organisms to grow, repair damage, and carry out essential functions.
• The study of cells, or cytology, helps us understand many biological processes, including disease mechanisms and genetic inheritance.

7. Summary

• Cells are the smallest units of life that carry out all vital processes.
• There are different types of cells, each with specific functions and structures.
• Organelles within the cell have specialized roles that contribute to the overall functioning of the organism.