

Cell – The Structural and Functional Unit of Life

- The cell is the structural and functional unit of the body.
- All living beings develop from pre-existing cells.
- Robert Hooke (1665) discovered the cell. He observed cork cells of a tree bark.
- Cell Theory: All organisms start their life with a single cell. Each cell is capable of carrying out various metabolic processes.
- Cell Number:

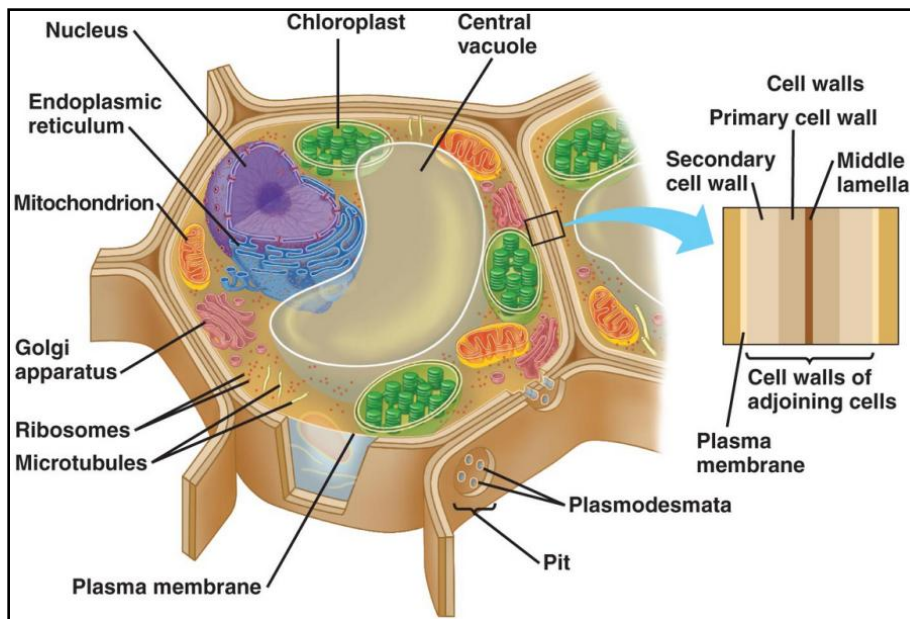
Unicellular Organisms	Made of a single cell. Example: Amoeba
Multi-cellular Organisms	Consists of many cells adapted to perform different functions. Examples: Plants, human beings

- Cell Size

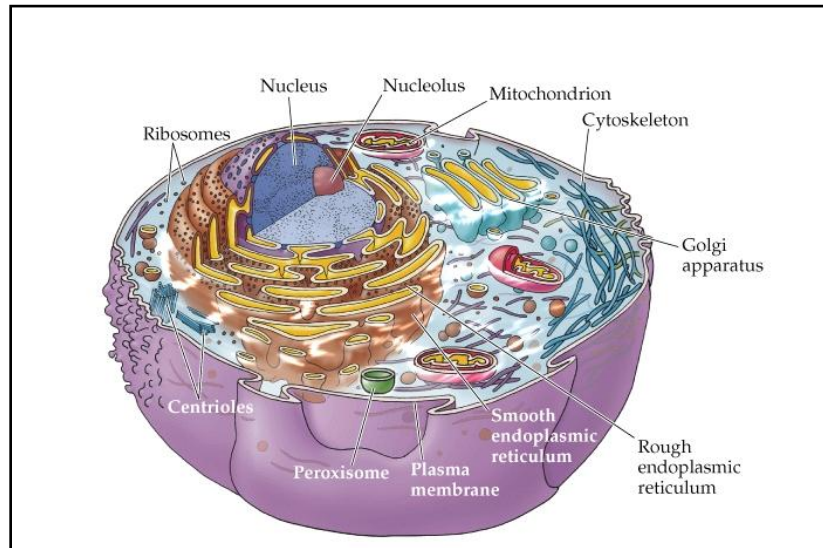
The size of cells ranges from $1/10^{\text{th}}$ to $1/1000^{\text{th}}$ mm.

Largest cell in the world	Egg of an ostrich
Smallest cell	<i>Mycoplasma gallisepticum</i>
Largest human cell	Female ovum
Smallest human cell	Red blood cell
Longest cell	Nerve cell

- Cell Shape: Shapes of cells are often related to their functions.
 - Human red blood cells are circular and biconcave for easy passage through blood capillaries and to transport oxygen.
 - White blood cells are amoeboid bearing pseudopodia so that they can squeeze through blood capillaries and destroy pathogens.
 - Nerve cells are slender and long to carry impulses.
 - Guard cells are bean-shaped so that they can control the opening and closing of the stoma.
- Microscope: A microscope is an instrument used to magnify objects to be studied.
- Cell Structure:

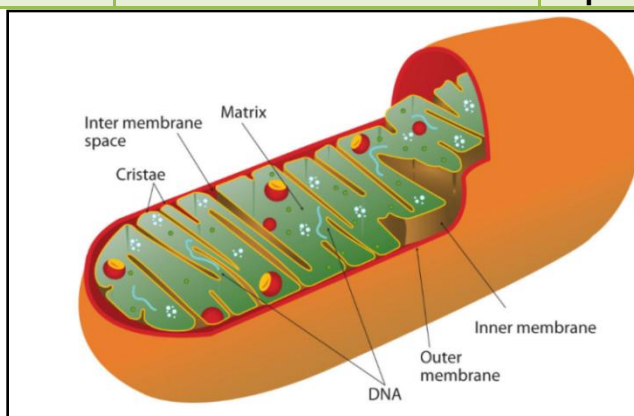


Plant Cell

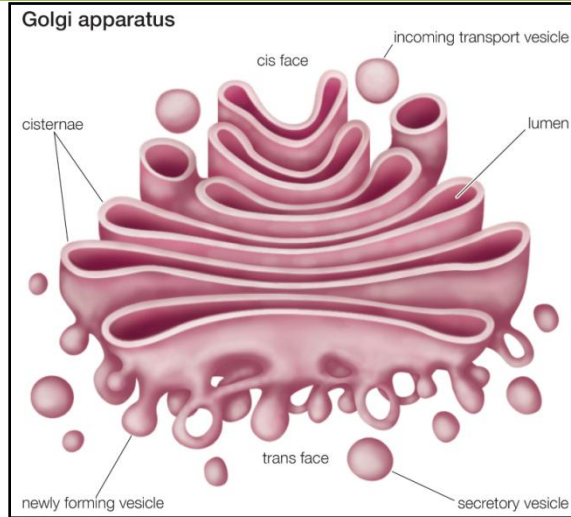


Animal Cell

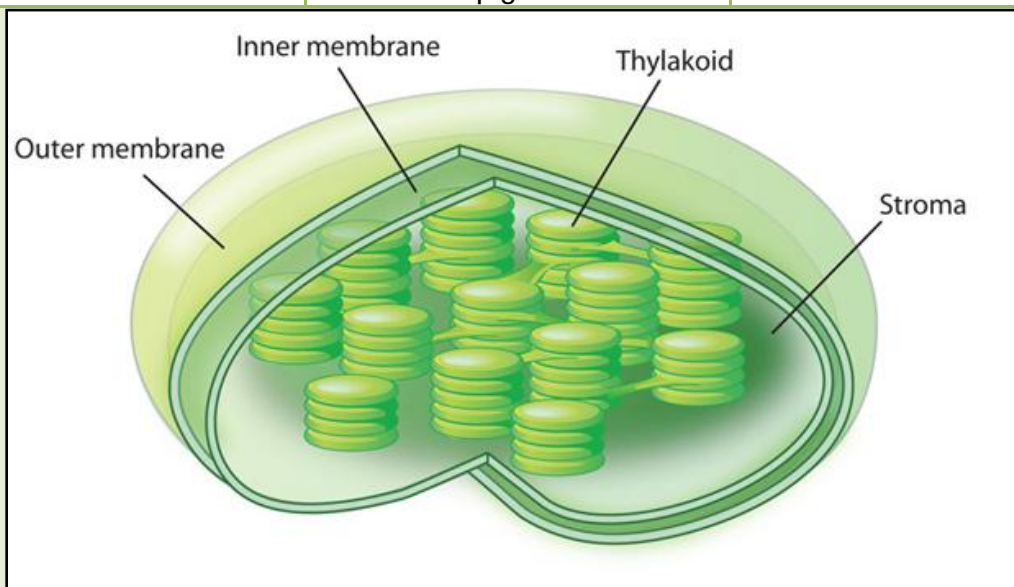
Part of Cell	Characteristics	Functions
1. Cell Membrane	• Living membrane • Outermost in animals • Semi-permeable	• Separates cell content from the surroundings • Maintains cell shape in animal cells
2. Cell Wall	• Present only in plant cells • Composed of cellulose	• Gives the plant cell rigidity and shape • Provides protection
3. Cytoplasm	• Semi-liquid substance • Cell organelles lie in the cytoplasm	• Site of enzyme-dependent metabolic reactions
4. Endoplasmic Reticulum	• Two types: Smooth endoplasmic reticulum (SER) and rough endoplasmic reticulum (RER)	• Supportive framework of the cell • Synthesis and transport of proteins and fats
5. Mitochondria	• Lined by a double membrane • Have their own DNA known as mitochondrial DNA	• Synthesis of respiratory enzymes • Site for aerobic respiration and energy storage, so also known as the powerhouse of the cell

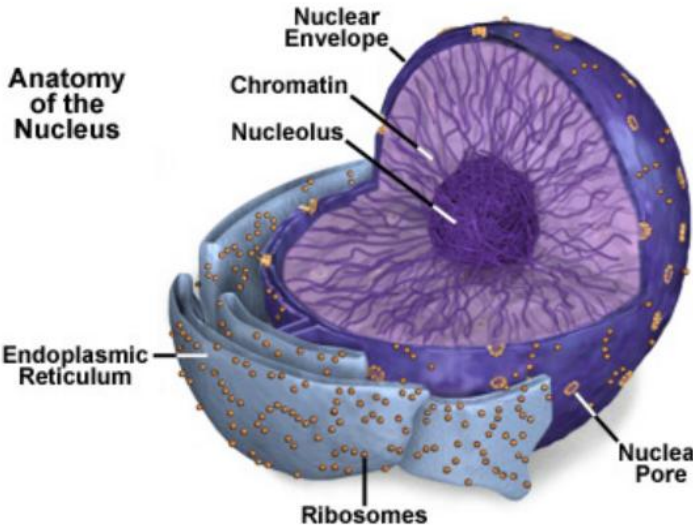


6. Golgi Apparatus	Stacks of flattened membrane sacs	Synthesis and secretion of enzymes and hormones
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7. Ribosomes	- Small granular structures - Scattered in cytoplasm, nucleoplasm or on the endoplasmic reticulum	Site for protein synthesis
8. Lysosomes	Membranous sacs	- Destroy foreign substances - Destroy old or damaged cells, so also known as suicidal sacs
9. Centrosome	- Found only in animal cells - A region surrounding the centrioles	Initiates and regulates cell division
10. Plastids	- Two kinds: Leucoplasts (colourless plastids) and chromoplasts (coloured plastids) - Chloroplast is a green-coloured pigment	- Leucoplasts store starch - Chloroplasts are sites for photosynthesis



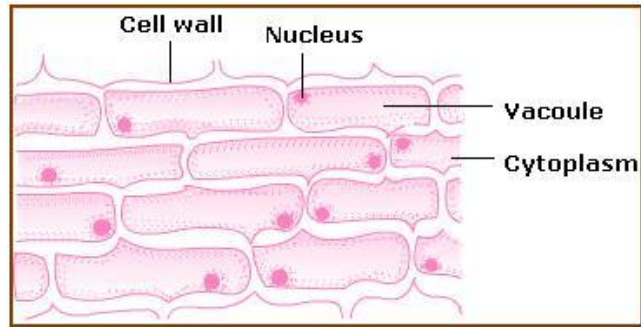
11. Nucleus	• Largest cell organelle • Contains chromatin network	• Regulates cell functions, so also known as control centre of the cell
Anatomy of the Nucleus 		
12. Nucleolus	• Present inside the nucleus	• Synthesis of ribosomes
13. Chromatin Fibres	• Contain genetic material, i.e. DNA	• Carry hereditary information
14. Vacuoles	• Sac-like structures which contain cell sap • Large and permanent in plant cells • Small and temporary in animal cells	• Storage of water and substances dissolved in water
15. Granules	• Small particles, crystal or droplets such as fat-containing granules, starch-containing granules in plant cells and glycogen-containing granules in animal cells	• Serve as food for cells

Differences between Plant Cell and Animal Cell

Plant Cell	Animal Cell
• Cell wall is present and is made of cellulose.	• Cell wall is absent.
• Centrosome is absent.	• Centrosome is present.
• Plastids are present.	• Plastids are absent.

Microscopic Examination of Onion Peel:

- The cells are firmly bound together.
- The nucleus is placed towards one side which is usually the case in plant cells.



Nucleus is Essential for Normal Life:

- The nucleus is essential for life.
- Amoeba divides by normal cell division.
- If the nucleus is removed, then amoeba does not survive.
- If the nucleus from another amoeba is transplanted in an enucleated amoeba, then the recipient survives and divides while the donor (enucleated) amoeba dies.

Differences between Eukaryotic Cells and Prokaryotic Cells:

Eukaryotic Cells	Prokaryotic Cells
• Membrane-bound cell organelles are present.	• Membrane-bound cell organelles are absent.
• The contents of nucleus are separated from the cytoplasm.	• Nuclear material lies in the cytoplasm.
• Example: Bacteria	• Examples: Animal cell, plant cell