



**Department of biology**



***Department of Biology***

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**((Botany))**

**First Stage**

**LEC- 2**

**Pro & Eukaryotic cell**

**By**

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### Introduction

The cell is the basic structural and functional unit of life. All living organisms are composed of cells, and most biological processes occur within them. Cells differ in their size, shape, and complexity depending on the type of organism.

Generally, cells are classified into two major categories: prokaryotic cells and eukaryotic cells. These two types differ mainly in their internal organization and structural complexity.

### Prokaryotic Cells:

Prokaryotic cells are considered the simplest form of living cells. They do not contain a true nucleus or membrane-bound organelles. The genetic material is located in a region of the cytoplasm called the nucleoid.

Prokaryotic cells are typically small and structurally simple compared with eukaryotic cells. Despite their simplicity, they are capable of carrying out essential life processes such as metabolism, growth, and reproduction.



### Characteristics of Prokaryotic Cells:

- They are usually very small in size, typically between 1–10  $\mu\text{m}$ .
- They lack a true nucleus.
- Their DNA is not surrounded by a nuclear membrane.
- They do not contain membrane-bound organelles.
- The genetic material usually consists of a single circular chromosome.
- They reproduce mainly by binary fission.

### Examples of Prokaryotic Organisms

Prokaryotic cells are found in organisms such as:

- Bacteria
- Cyanobacteria (blue-green algae)

These organisms are mostly unicellular and can survive in diverse environmental conditions.



### Eukaryotic Cells

Eukaryotic cells are more complex and highly organized compared to prokaryotic cells. They possess a true nucleus that contains the genetic material and is enclosed by a nuclear membrane.

In addition to the nucleus, eukaryotic cells contain several specialized structures called organelles, each of which performs a specific function necessary for the survival of the cell.

Eukaryotic cells are generally larger than prokaryotic cells and exhibit a higher level of structural organization.

### Characteristics of Eukaryotic Cells:

- They are usually larger in size than prokaryotic cells.
- They possess a well-defined nucleus surrounded by a nuclear membrane.
- They contain several membrane-bound organelles.
- Their genetic material is organized into chromosomes.
- Cell division occurs through mitosis and meiosis.



### **Plant Cells as Eukaryotic Cells:**

Plant cells belong to the group of eukaryotic cells and possess several structures that distinguish them from other types of cells.

**These structures include:**

#### **Cell Wall**

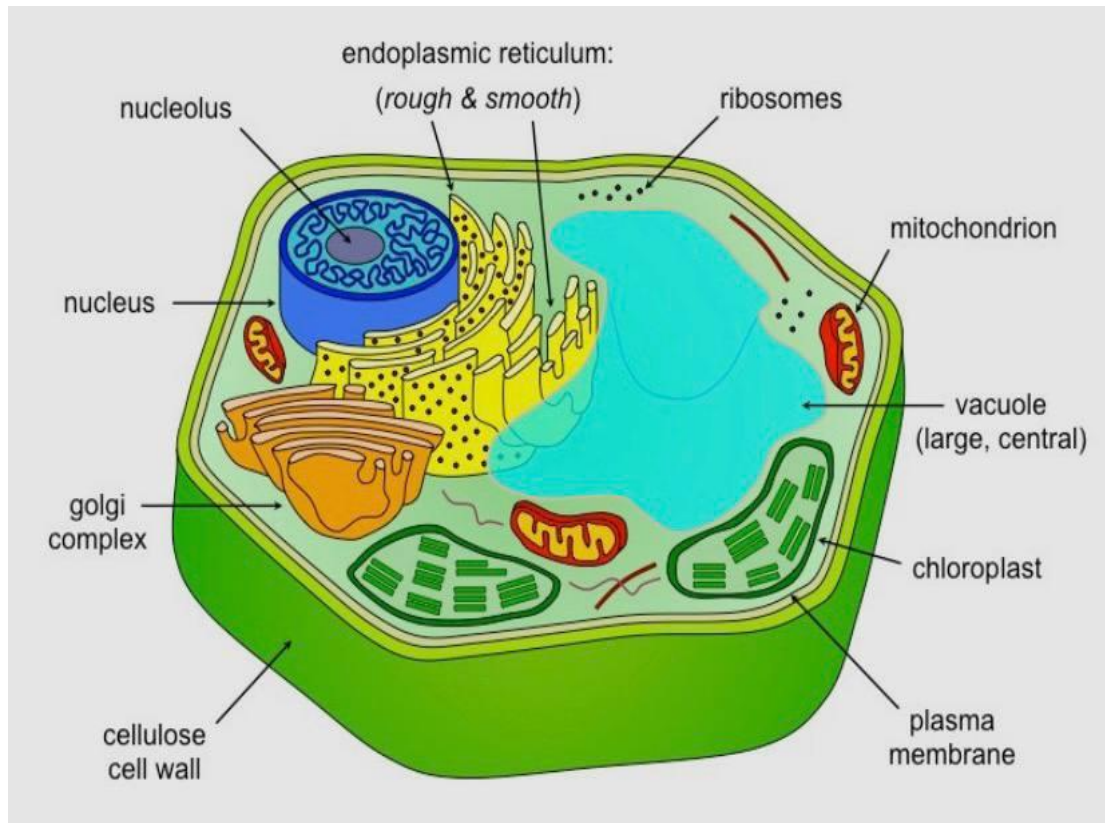
The plant cell wall is a rigid structure surrounding the cell membrane. It is mainly composed of cellulose and provides protection and structural support.

#### **Chloroplasts**

Chloroplasts are specialized organelles that contain chlorophyll and are responsible for the process of photosynthesis, through which plants produce their own food.

#### **Large Central Vacuole**

Plant cells typically contain a large central vacuole that helps maintain turgor pressure, stores water and nutrients, and contributes to cell growth.



**Figure 1: Typical Structure of a Plant Cell**

### **Importance of Eukaryotic Cell Organization**

The complex organization of eukaryotic cells allows different cellular processes to occur efficiently within specialized compartments called organelles. Each organelle performs a specific function that contributes to the survival and proper functioning of the cell.

For example, mitochondria are responsible for energy production, while the nucleus controls genetic information and regulates cellular activities.



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This compartmentalization increases the efficiency of metabolic processes and allows eukaryotic cells to perform more complex biological functions.

In plant cells, the presence of specialized organelles such as chloroplasts enables plants to perform photosynthesis and produce their own food, which is a key characteristic that distinguishes plants from many other organisms.