# Eukaryotic Cells

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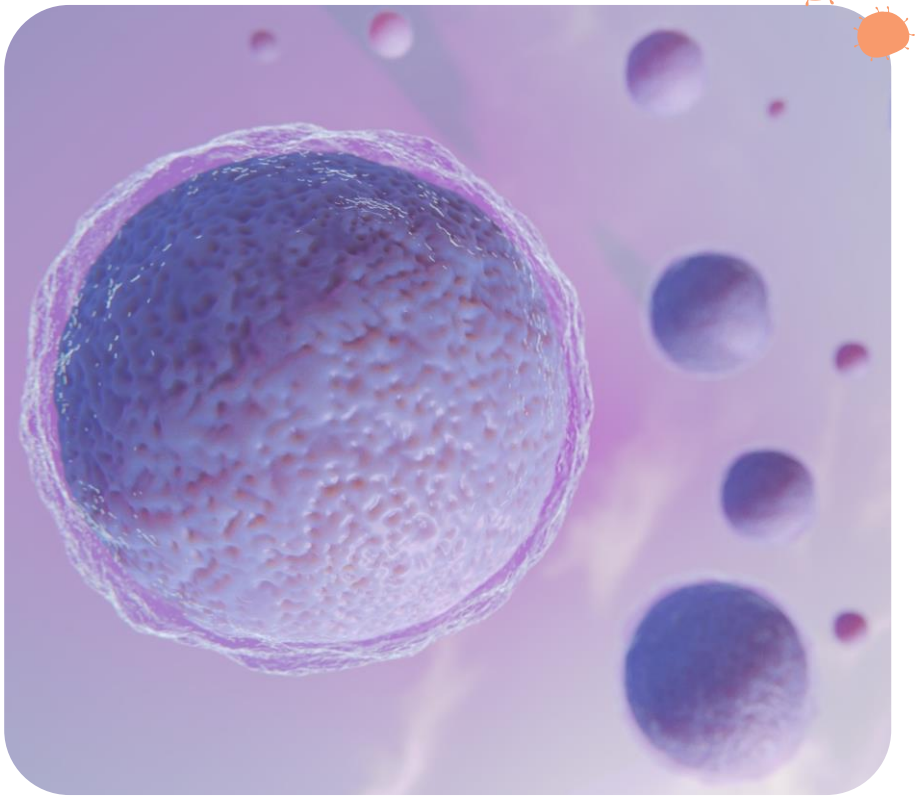
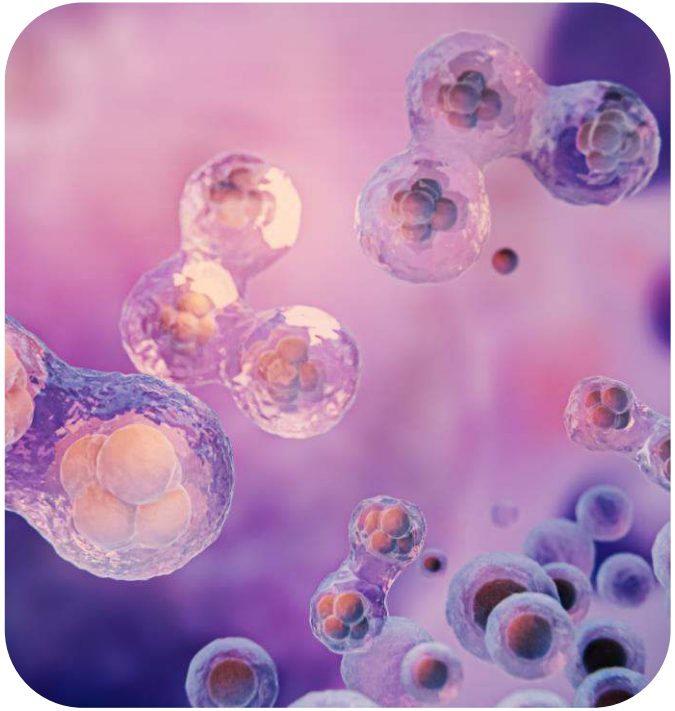
# Eukaryotic cells

Eukaryotic cells have a nucleus enclosed within the nuclear membrane and form large and complex organisms. Protozoa, fungi, plants, and animals all have eukaryotic cells. They are classified under the kingdom Eukaryota.

They can maintain different environments in a single cell that allows them to carry out various metabolic reactions. This helps them grow many times larger than the prokaryotic cells.



# Characteristics of Eukaryotic Cell



- Eukaryotic cells have the nucleus enclosed within the nuclear membrane.
- The cell has mitochondria.
- Flagella and cilia are the locomotory organs in a eukaryotic cell.
- A cell wall is the outermost layer of the eukaryotic cells.
- The cells divide by a process called mitosis.
- The eukaryotic cells contain a cytoskeletal structure.
- The nucleus contains a single, linear DNA, which carries all the genetic information.

# Structure of Eukaryotic cell

The eukaryotic cell structure comprises the following:

| | |
|---|---|
| **Plasma membrane** | **The plasma membrane separates the cell from the outside environment. It comprises specific embedded proteins, which help in the exchange of substances in and out of the cell** |
| **Cell wall** | **A cell wall is a rigid structure present outside the plant cell. It is, however, absent in animal cells.<br>It provides shape to the cell and helps in cell-to-cell interaction.<br>It is a protective layer that protects the cell from any injury or pathogen attacks.<br>It is composed of cellulose, hemicellulose, pectins, protein** |
| **Cytoskeleton** | **The cytoskeleton is present inside the cytoplasm, which consists of microfilaments, microtubules, and fibres to provide perfect shape to the cell, anchor the organelles, and stimulate the cell movement.** |

# Structure of Eukaryotic cell

| | |
|---|---|
| **Nucleus** | •The nucleoplasm enclosed within the nucleus contains DNA and proteins.<br>•The nuclear envelop consists of two layers- the outer membrane and the inner membrane. Both the membranes are permeable to ions, molecules, and RNA material.<br>•Ribosome production also takes place inside the nucleus |
| **Endoplasmic Reticulum** | It is a network of small, tubular structures that divides the cell surface into two parts: luminal and extraluminal.<br>Endoplasmic Reticulum is of two types:<br>- Rough Endoplasmic Reticulum contains ribosomes.<br>- Smooth Endoplasmic Reticulum that lacks ribosomes and is therefore smooth. |
| **Ribosomes** | These are the main site for protein synthesis and are composed of proteins and ribonucleic acids. |

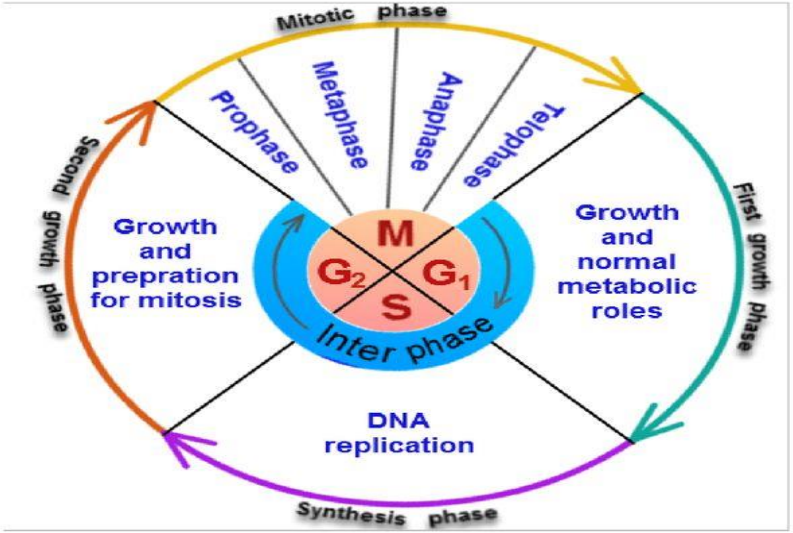
# Structure of Eukaryotic cell

| | |
|---|---|
| **Golgi Apparatus** | It is made up of flat disc-shaped structures called cisternae.<br>It is absent in red blood cells of humans and sieve cells of plants.<br>They are arranged parallel and concentrically near the nucleus.<br>It is an important site for the formation of glycoproteins and glycolipids |
| **Mitochondria** | These are also known as “powerhouse of cells” because they produce energy.<br>It consists of an outer membrane and an inner membrane. The inner membrane is divided into folds called cristae.<br>They help in the regulation of cell metabolism |
| **Lysosomes** | They are known as “suicidal bags” because they possess hydrolytic enzymes to digest protein, lipids, carbohydrates, and nucleic acids. |

# Eukaryotic cell cycle

The Eukaryotic Cell Cycle

The **cell cycle** is when a cell grows, prepares for division, and divides into two new daughter cells.



# Examples of Eukaryotic Cell



- **Plant Cells :** The cell wall is made up of cellulose, which provides support to the plant. It has a large vacuole which maintains the turgor pressure. The plant cell contains chloroplast, which aids in the process of photosynthesis.
- **Fungal Cells :**The cell wall is made of chitin. Some fungi have holes known as septa which allow the organelles and cytoplasm to pass through them.
- **Animal Cells :**These do not have cell walls. Instead, they have a cell membrane. That is why animals have varied shapes. They have the ability to perform phagocytosis and pinocytosis.
- **Protozoa :**Protozoans are unicellular organisms. Some protozoa have cilia for locomotion. A thin layer called pellicle provides supports to the cell.

# Activity 1 : Fill in the blank boxes

Put the number of the correct word in each box

Eukaryotic cells are [1] and structurally organized. They contain a [ ] , which houses [ ] , along with other [ ] organelles such as mitochondria, endoplasmic reticulum, and [ ] . These cells are found in organisms like plants, animals, and fungi. [ ] have a more sophisticated system for cellular processes, including metabolism, growth, and reproduction. Their compartmentalized structure allows for specialized functions, facilitating diverse and [ ] life forms.

| | |
|---|---|
| 1 | Complex |
| 2 | Golgi apparatus |
| 3 | Membrane-bound |
| 4 | Eukaryotes |
| 5 | Nucleus |
| 6 | multicellular |
| 7 | DNA |

# Activity 2 : Explain the difference

Explain the difference between an eukaryotic and prokaryotic cells

| Eukaryotic cell | Prokaryotic cell |
| --- | --- |
| | |

# Activity 3: Animal cells vs plant cells

Explain the difference between an animal and a plant cell. You can include categories such as shape, structures present (chloroplasts, cell wall, vacuoles, etc.), and function of each structure

| Animal cells |
| --- |
| |

| Plant cells |
| --- |
| |

# Activity 4 : Fill the table

Place the number of each word in its right group in the table

| | | | | |
|---|---|---|---|---|
| **Eukaryotic** | **3** | | | |
| **Both** | | | | |
| **Prokaryotic** | | | | |

| | |
|---|---|
| 1 | DNA |
| 2 | Plants, animals, fungi |
| 3 | Bacteria or archaea |
| 4 | Cytoplasm |
| 5 | Ribosomes |
| 6 | Small, less complex |
| 7 | Large, more complex |
| 8 | Have a membrane |
| 9 | Have a nucleus |
| 10 | No membrane bound |
| 11 | Cell membrane |
| 12 | Don’t have a nucleus |

# Activity 5: Cell structure and function

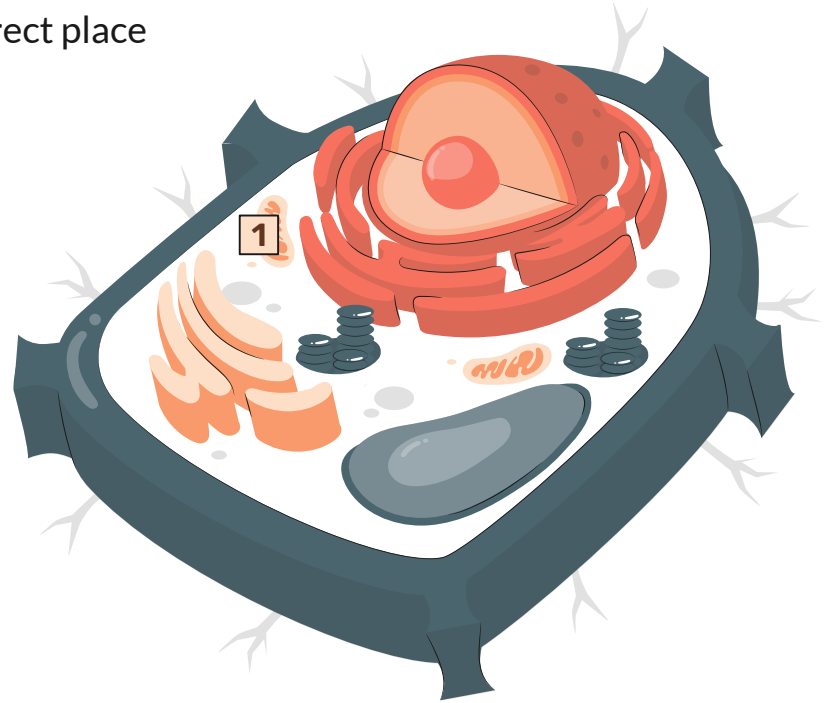
Match the following cell structures with their corresponding functions:

| | |
|---|---|
| **Cell membrane** | Synthesis and modification of proteins |
| **Nucleus** | Storage and modification of genetic material |
| **Ribosomes** | Production of energy (ATP) through cellular respiration |
| **Mitochondria** | Intracellular transport of materials |
| **Endoplasmic reticulum** | Regulation of substances entering and leaving the cell |
| **Golgi apparatus** | Packaging and sorting of proteins for transport |

# Activity 6: Plant cells

Drag and drop the number of each part in its correct place

| | |
|---|---|
| | 1. Mitochondrion |
| 2 | 2. Nucleolus |
| 3 | 3. Nucleus |
| 4 | 4. Endoplasmic reticulum |
| 5 | 5. Chloroplasts |
| 6 | 6. Cell wall |
| 7 | 7. Vacuole |
| 8 | 8. Cell membrane |
| 9 | 9. Golgi apparatus |



# Activity 7 : Choose the right answer

Color in orange the right answer to each question between A, B, C options

**1.** Which of the following is responsible for protein synthesis in eukaryotic cells?

| | | | | | |
|---|---|---|---|---|---|
| **A** | Nucleus | **B** | Ribosomes | **C** | Mitochondria |

**2.** Which organelle is responsible for converting light energy into chemical energy in plant cells?

| | | | | | |
|---|---|---|---|---|---|
| **A** | Chloroplast | **B** | Nucleus | **C** | Endoplasmic reticulum |

**3.** Which of the following organelles is involved in the breakdown of cellular waste and debris?

| | | | | | |
|---|---|---|---|---|---|
| **A** | Golgi apparatus | **B** | Endoplasmic reticulum | **C** | Lysosome |

# Activity 8 : Cell structures

Copy the right cell structure and paste it into its description

| Cell membrane | Nucleus | Endoplasmic reticulum | Cell membrane |
| --- | --- | --- | --- |
| Network involved in protein and lipid synthesis, modification, and transport | Powerhouses generating ATP and involved in cellular respiration for energy production | Thin barrier controlling substance movement in and out of the cell | Contains DNA, regulates cell activities, and controls protein synthesis |

# Activity 9 : Parts of an animal cell

| | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
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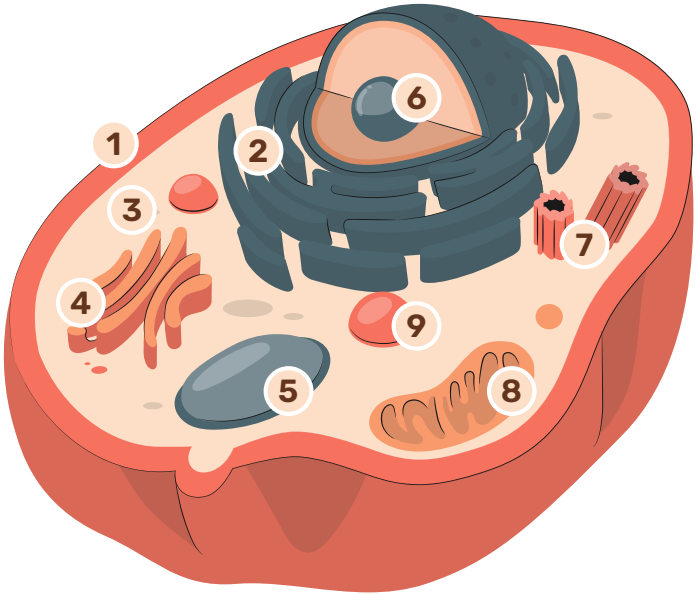
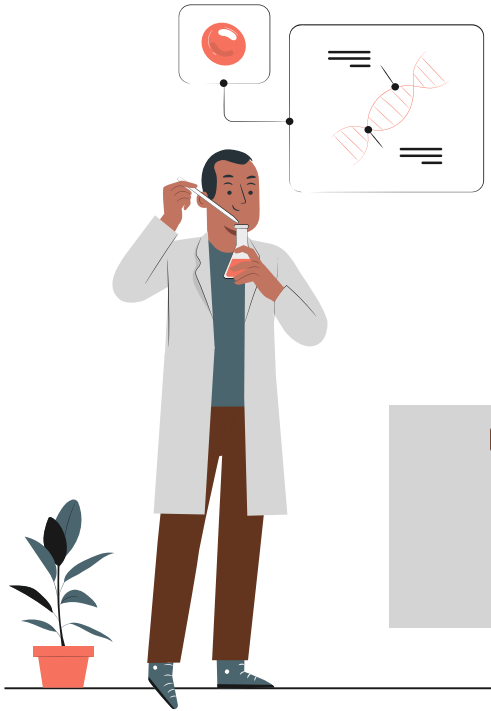
| 7 | |
| 8 | |
| 9 | |





# Thanks!

