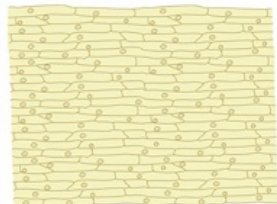


Introduction

Cell is the structural and functional unit of life. All living organisms are made of cells. Cells are similar to bricks that are assembled to make buildings. Similarly, Cells are assembled to make the body of every organism. Therefore, cells are the building blocks of an organism.



Brick Wall



Onion Peel

Discovery of cells

Robert Hook discovered cells in 1665. When he observed thin slices of cork (part of bark of a tree) under a self-designed microscope, he noticed that there are many partitioned boxes or compartments like a honeycomb. Each box was separated from the other by a wall. Hook coined the term "cell" for each box.



Cork Cell under microscope

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Cell Theory

Cell Theory

Mathias Schleiden and Theodor Schwann in 1838 postulated Cell Theory.

The Cell Theory states that:

All living organisms are formed of one or more cells.

New cells arise from pre-existing cells by cell division.

Cell is the fundamental unit of structure and function in living organism.

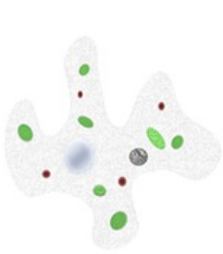
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Number Of Cells The number of cells in an organism may vary

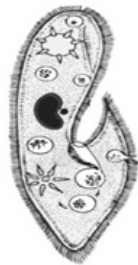
Number Of Cells

The number of cells in an organism may vary from one to millions and trillions. According to the number of cells, organisms are classified into Unicellular and Multicellular organisms.

- Unicellular Organism (uni: One; cellular: cell): Organisms composed of one single cell. Single cell performs all the vital activities needed for sustaining life like growth, reproduction, locomotion, excretion etc. Ex: Amoeba, Paramecium, Chlamydomonas etc.



(a) Amoeba



(b) Paramecium

- Multicellular Organisms (multi: many; cellular: cell): Organisms composed of more than one cell. The cells of these organisms usually perform specialized functions. Example: Plants, animals, etc.



(a) Tree (b) Elephant

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Shape Of Cells

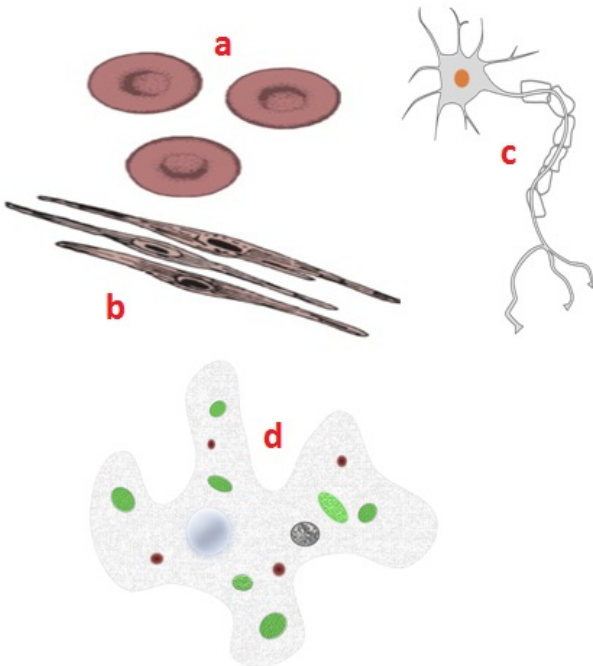
Shape Of Cells

The cell shows variety of shapes depending on the function they perform. Different shapes of cells are:

- Oval, round or spherical: Human RBC, Ovum.
- Spindle shaped (long and pointed at both ends): Muscle cell.
- Branched and elongated: Nerve Cells.
- Kidney Shaped: Guard Cells in leaves.
- Some cells keep on changing their shape.

Example: WBC in human, Amoeba (single-celled) keeps on changing its shape during locomotion through pseudopodia (false feet) and digestion of food vacuole.

- The cell and its components are enclosed in a membrane called cell membrane. These membranes provide shape to the cells of plants and animals. Plant cells have an additional covering over membranes called cell wall. Cell wall gives shape and rigidity to the cells.



(a) Spherical Human RBC (b) Spindle shaped Muscle Cell (c) Long branched Nerve Cell (d) Amoeba

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Size Of Cells

Size Of Cells

- Cell sizes in living organism are measured in micrometer.
- Most cells range from 5-15 micrometer.
- Smallest Cell is 0.1 to 0.5 mm in bacteria.
- Largest Cell is 170mm * 130mm is the egg of ostrich.
- Longest Cells in humans are Nerve Cells (1-2m).
- Size of cells is independent on the size of an organism but depends on its function.

Example: Nerve cell in both elephant and rat are long and branched. They both perform the same function of transferring messages.



(a) Bacteria

(b) Ostrich Egg

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Level Of Organization

Level Of Organization

In unicellular organism, single cell perform all the vital functions. It functions independently. Whereas, multicellular organism have various level of organization within them. Individual cells may perform a specific function or work together as a functional unit for the organism. The cells are dependent on one another.

There are 5 levels of organization in multicellular organisms from simplest to most complex.

- **Cell:** The fundamental unit of structure and function in living organism.

Example: Blood cells, Nerve cells, etc.

- **Tissue:** Group of cells that have similar structure and function to perform specific activity forms a Tissue.

Example: Connective, epithelial, muscle, nerve tissue, etc.

- **Organ:** Group of tissue, which are same at their structure and perform similar activity constitute an organ.

Example: Heart, Brain, Skin, etc.

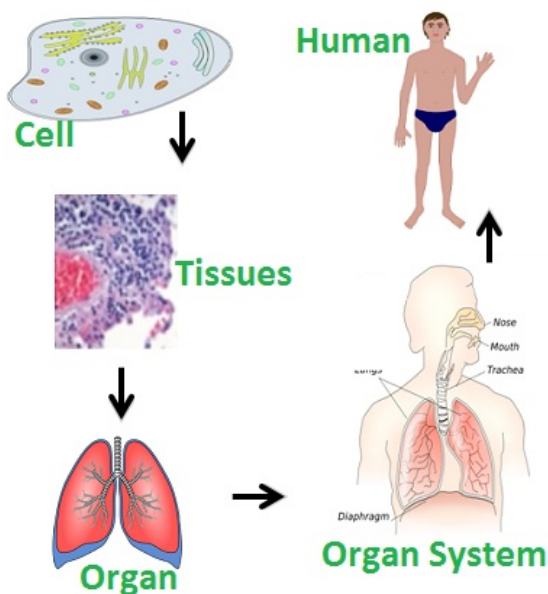
- **Organ System:** Many organs together form an organ system. Organs made up of group of tissues organize themselves to perform a specific activity for an organism.

Example: Circulatory system, Nervous System, etc.

- **Organism:** Aggregation of Organ system constitutes organism. The human has 11 organ systems.

Therefore, the correct order for level of organization in multicellular organism is:

Cells -> Tissues -> Organs -> Organ Systems -> Organisms

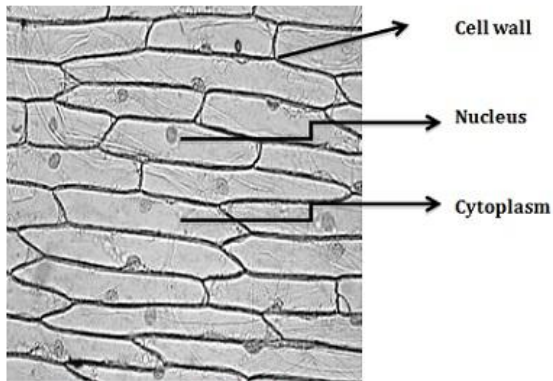
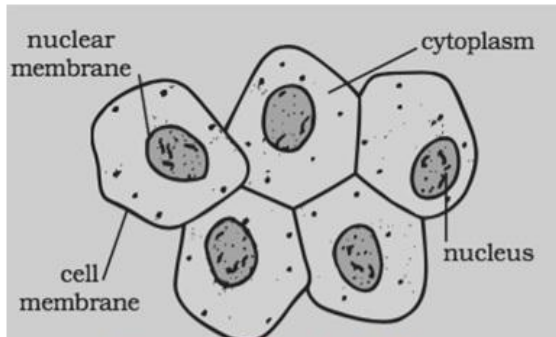


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Parts Of the Cell

Parts Of the Cell

Cell is made up of basically 3 components: Cell Membrane, cytoplasm and nucleus.



Cell Membrane

- The outer boundary of cell enclosing nucleus and cytoplasm is called cell membrane or plasma membrane.
- The cell membrane separates cell and its components from the outside environment. Also, it separates cells from one another.
- The cell membrane is porous to specific ions and organic molecules and controls the movement of substances in and out of the cells. Therefore, the cell membrane is selectively permeable.
- It gives shape to the cell.
- In plant cells, there is an additional thick layer surrounding cell membrane called **cell wall**. The cell wall gives rigidity to the cell. It protects the plant cells against different environmental conditions like high wind speed, atmospheric pressure, etc. We can observe cells in the leaf peel of Tradescantia, Elodea, Rhoec or onion peel.

Cytoplasm

- It is a jelly like fluid present between nucleus and cell membrane.

- Organelles like chloroplast, mitochondria, golgi apparatus, ribosomes, etc. are dispersed in cytoplasm.

Nucleus

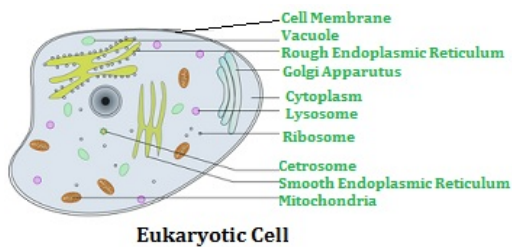
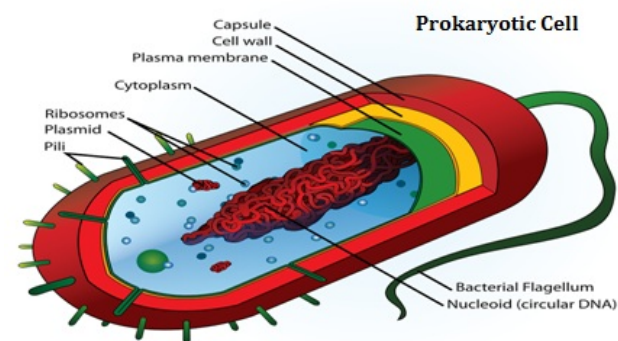
- Generally, it is spherical in shape and located in the center of the cell.
- A membrane called **nuclear membrane** separates nucleus from the cytoplasm.
- The nucleus is the control center as it regulates all the activities of the cell.
- When nucleus is observed under microscope, a small spherical body in the nucleus was seen and called nucleolus. Also, it contains thread-like structures called chromosome. These chromosomes carry genetic material (genes) and help in inheritance/transfer of characters from parents to offspring.
- The nuclear membrane is porous and allows the movement of materials between cytoplasm and nucleoplasm (Nucleolus and Chromosomes).

Class 8 Biology Cell

Prokaryotes and Eukaryotes

On the basis of presence of nuclear membrane, cells are classified into 2 categories as follows:

- **Prokaryotic Cells (pro: primitive; karyon: nucleus):** The cells without a well-defined nucleus and the nuclear material are in the form of nucleoid dispersed in the cytoplasm are called prokaryotic cells. These cells are present in primitive organisms called prokaryotes. Example: Bacteria and blue green algae.
- **Eukaryotic Cells (eu: true; karyon: nucleus):** The cells with well-defined nucleus and a distinct nuclear membrane are called eukaryotic cells. Except bacteria and blue green algae, all other organisms are called Eukaryotes.

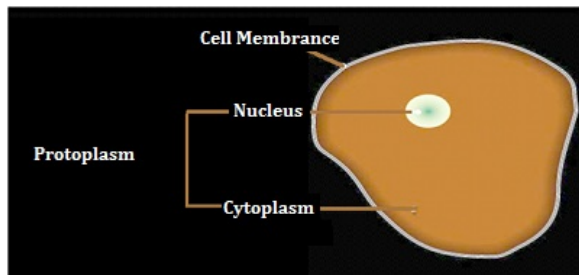


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Protoplasm

Protoplasm

- It is the living substance of the cell.
- It includes both cytoplasm and nucleus.

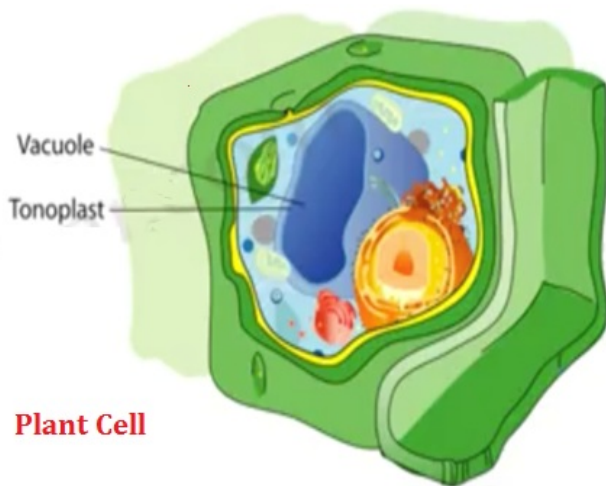


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Vacuole

Vacuole

- Vacuoles are membrane bound transparent organelle present in both animal and plant cell.
- They are small and many in animal cells whereas large and one in most of the plant cells.
- Vacuoles preserve the turgidity of the cell and also store waste material in them.
- Vacuoles are occupied with water containing inorganic and organic molecules.



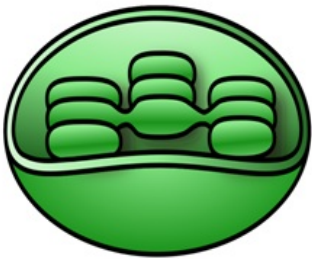
Plastids

- Plastids are mainly present only in plants and cyanobacteria.
- They are several small colored bodies scattered in the cytoplasm of leaf cells.
- There are 3 different types of plastids as follows:

Chloroplasts: Green colored plastids are called chloroplasts. The green color is due to the presence of pigment chlorophyll. Chlorophyll absorbs energy and is compulsory for the process of photosynthesis.

Chromoplasts: Colored Plastids, which provide colors to different parts of the plant (flowers and fruits) are called Chromoplasts. They manufacture and accumulate carotenoid pigments.

Leucoplasts: Colorless plastids occur in the storage part of the plant.



CHLOROPLASTS

Class 8 Biology Cell

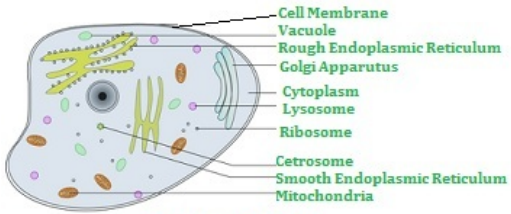
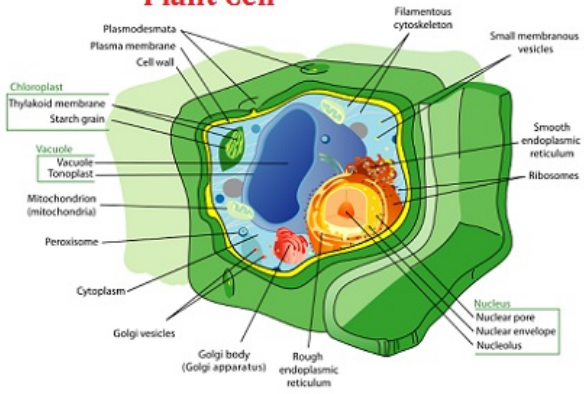
Comparison of plant and animal cell

Comparison of plant and animal cell

The differences and similarities between plant and animal cells are as follows:

Part of the Cell	Plant Cell	Animal Cell
Shape of the cell	Quadrangular or hexagonal	Round
Cell wall	Distinct Cell Wall and protective in function	Absent
Nucleus	Present	Present
Nuclear membrane	Present	Present
Cytoplasm	Present	Present
Plastids	Help plants to synthesize and store their food	Absent
Vacuole	Mostly one and big in size	Many and smaller in size
Cell Membrane	Present	Present
Lysosomes	Absent or scanty	Many
Cilia and flagella	Absent	Present
Centrioles	Absent	Present required for cell division

Plant Cell



Animal Cell