The Fundamental Unit of Life Class 9 Notes

All living organisms are made up of basic building blocks that form the fundamental unit of life called cells. Be it plants, animals, or microorganisms; these simple biological units define all their structural and functional abilities. An in-depth analysis about the discovery of cells, who discovered cells and how, their types, components, functions, and much more is given in the 5th Chapter- The Fundamental Unit of Life in the CBSE class 9 syllabus of science. To make your learning experience wonderful, here are our fundamental unit of life class 9 notes.

Who discovered Cells and How?

Cells were discovered in 1665 by an English scientist named *Robert Hooke* while observing a thin slice of cork through a microscope lens. During his examination, he noticed that the cork was made up of several tiny “pores” or “cells” hence, the name.

Cells as a Structural and Functional Unit of Life

Cells form the basic structure of an organism and a collection of similar cells that perform an organized function form a Tissue. Each tissue serves a particular purpose and can be combined with other tissues to form organs. These carry out essential life processes like metabolism, growth, reproduction, etc. in unicellular and multicellular organisms. Here are some examples of tissues and organs in plants and animals:

Category	Tissues	Organs
Plants	Phloem, Xylem, Protective, etc.	Leaves, Roots, Stems, etc
Animals	Connective, Muscular, Nervous, etc	Heart, Liver, Kidney, etc

Types of Cells

Regardless of the complexity as well as the type of organism, cells are mainly divided into two categories. Mentioned below is a distinction between the 2 major types of cells in our fundamental unit of life class 9 notes-

Prokaryotic Cells

Cells in which a true nucleus is absent are called Prokaryotic Cells. Since they do not contain any membrane-bound organelle, these are always unicellular organisms, such as Bacteria, Blue-Green Algae, Amoeba, etc.

Eukaryotic Cells

Cells that have a true nucleus are called Eukaryotic Cells. These are complete cells that contain a nucleus, mitochondria, and another membrane-bound organelle. These are always multicellular organisms like animals, plants, fungi, etc.

Difference between Prokaryotic and Eukaryotic cells:

Prokaryotic cells	**Eukaryotic cells**
Nucleus and nucleolus are absent	Nucleus and nucleolus are present
Membrane-bound organelles can be seen	Membrane-bound organelles can be seen
Contain a single chromosome	Contain multiple chromosomes
Budding or fission cell division	Mitotic or meiotic cell division

Structure of a Cell

Whether prokaryotic or eukaryotic, the cells have a similar structure upto some extent. A variety of key features of the cell are same. A cell is essentially made up of 4 main components:

1. *Cell Wall and Cell Membrane*
2. *Nucleus*
3. *Cytoplasm*
4. *Cell Organelle*

Cell Membrane and Plasma Membrane

It is a biological membrane that separates a cell's contents from its outside surrounding or external environment.

Properties:

- Thin-walled, elastic, and semi-permeable
- Made up of proteins and lipids
- It is a living component of the cell

Functions:

- Protects the contents of the cell from its external environment
- Its semi-permeable allows only selective materials to flow in and out of the cell

Cell wall

The next important topic in our fundamental unit of life class 9 notes is the Cell Wall. It is a structural layer just outside the plasma membrane.

Properties:

- Flexible, tough, or rigid in some cells
- Non-living and freely permeable
- Made up of cellulose

Functions:

- Protects the cell membrane
- It is majorly responsible for maintaining the shape and size of the cell
- Prevents the cell from becoming flaccid and from drying out.

Nucleus

Nucleus refers to an organelle that is found in eukaryotic cells and contains the genetic material of a cell.

Properties:

- It is spherical in shape and is enclosed in a nuclear membrane (also known as the nuclear envelope)
- Contains a type of protoplasm called nucleoplasm in which the nucleus is suspended
- The nucleus contains chromosomes that are made up of proteins and specific molecules of deoxyribonucleic acid or DNA. Chromosomes are, therefore, the carriers of an organism's genetic information

Functions:

- Regulates the cell cycle and is responsible for cell division, protein synthesis, growth, etc.
- Controls the metabolic activity of cellular components
- Controls the genetic characteristics of an organism
- Stores hereditary materials in the form of DNA

Cytoplasm

It is a thick, jelly-like substance that is enclosed by the cell membrane and contains all the cell organelles except the nucleus.

Property:

The cytoplasm is mainly made up of salts, proteins, and water. This aqueous liquid is called *Cytosol*.

Function:

- It facilitates protein synthesis and other metabolic reactions.

Cell Organelle

Now that you are through with the aforementioned components of the cell, let us now study the last one in detail in our fundamental unit of life class 9 notes. The cell organelles play a very important role in the functioning of the human body. Have a look at their explanations-

Golgi Apparatus

Also known as the Golgi body, it is a complex of folded membranes and vesicles found in the cytoplasm of eukaryotic cells. Its function is to modify, sort, and dispatch proteins

for synthesis. It also facilitates the formation of lysosomes and the transport of lipids around the cells.

Mitochondria

They are rod-shaped membrane-bound organelles that are responsible for creating the chemical energy to power the biochemical reactions in the cells of most eukaryotic organisms. Since they are the site of cellular respiration and storage centres of ATP (the energy currency of cells), they are often known as the *“Powerhouse”* of cells.

Ribosomes

The small particles that contain chemical messengers called RNA (ribonucleic acid) and play a major role in protein synthesis.

Endoplasmic Reticulum (ER)

A network of membranous tubes (flattened sacs in the cytoplasm) that extend from the nucleus membrane to the plasma membrane of eukaryotic cells. Endoplasmic Reticulum gives internal support to the cell, enables the synthesis of proteins, lipids, and detoxifies any drugs or toxins.

Plastids

Membrane-bound organelles are mostly found in plants and are responsible for the plant’s metabolic activities. There are 3 types of plastids that are explained in our fundamental unit of life class 9 notes:

Chloroplasts: Green plastids that contain chlorophyll and help in the production of food through the process of photosynthesis are called chloroplasts.

Chromoplast: Coloured plastids that usually contain yellow and orange colour are referred to as chromoplasts.

Leucoplasts: The colorless plastids which often store starch or oil are known as Leucoplasts.

Vacuoles

Membrane-bound organelles contain liquids or solids. These are permanent and large in plant cells (cover almost 90% of cell space in mature plants). Their main function is to ensure the rigidity of the cell and maintain its osmotic pressure.

Lysosomes

Found mostly in eukaryotic cells of animals, these spherical sac-like structures that ain digestive enzymes. They are responsible for breaking down worn-out parts of the cell and destroying any foreign bacteria or viruses. This is why they're also known as *"Suicide Bags".*

Centrosomes and Centrioles

Found only in eukaryotic cells of animals, centrosomes are unbounded organelles that contain centrioles. These are cylindrical microtubes that help in the process of cell division.

Difference between Plant and Animal cells

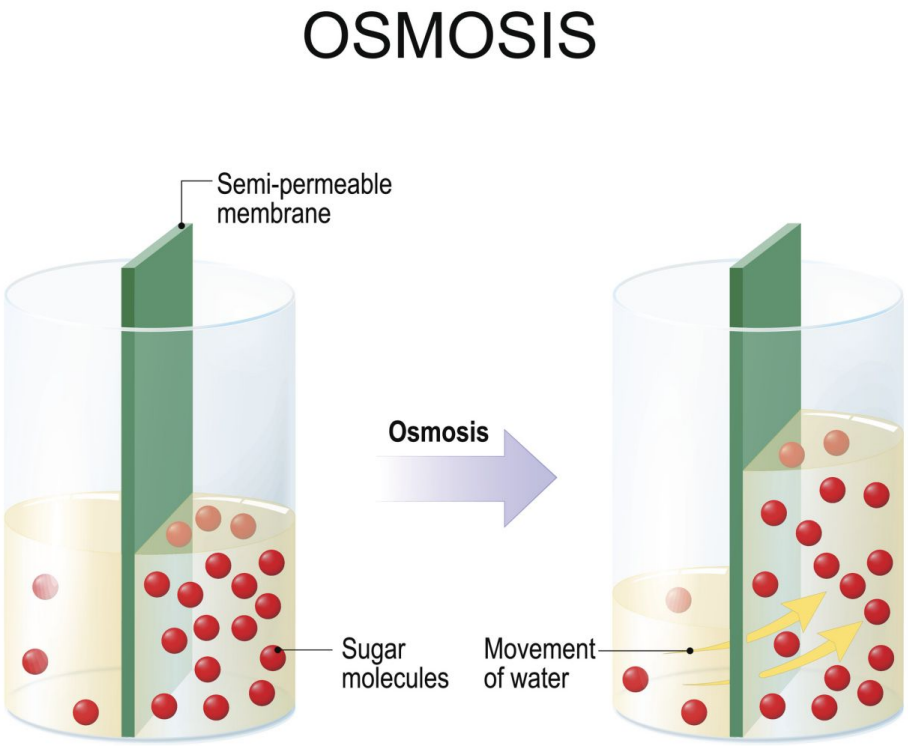
Another important distinction in our fundamental unit of life class 9 notes is between the plant cell and the animal cell. Refer to the table mentioned below to understand it better-

Plant Cells	Animal Cells
A rigid cell wall encapsulates the plasma membrane	No cell wall present
Larger than animal cells	Much smaller than plant cells
Contain plastids	Do not contain plastids (except protozoan Euglena)
Vacuoles are large and permanent	Vacuoles are small and temporary
Do not contain centrosomes and centrioles	Do contain centrosomes and centrioles

Osmosis and Diffusion

The flow of water through a semi-permeable membrane is referred to as **osmosis**. Because the membrane does not allow all molecules to pass through it, osmosis is a

selective process. Typically, water is the sole free-flowing molecule across this barrier. For instance, take two flasks and fill one with a mild sugar solution and the other with a highly concentrated sugar solution. A semipermeable membrane separates the two beakers. The water will then flow from the side of the beaker where it is more to the side where it is less. Because it is semi-permeable, or selectively permeable, the membrane enables only water to travel through it and not sugar.



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Diffusion, on the other hand, is the transfer of any material from one concentration to another. Diffusion occurs in solids, liquids, and gases, with gases diffusing at a higher pace. This is due to the fact that gas particles are energetic due to their high kinetic energy. Diffusion is the flow of gases into and out of the cell. For example, have you ever noticed the aroma of your favourite dish at home when it is unexpectedly prepared for you by your mother? This is related to the dispersion of the process. When food is prepared in the kitchen, the aromatic molecules from the kitchen begin to move out into the kitchen's surrounds and, over time, get distributed in the air.

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Isotonic, Hypotonic, and Hypertonic Solutions

- Isotonic solutions are those that have the same concentration of solutes and pH as the surrounding bodily fluid or cytoplasm.
- Hypotonic solutions are those solutions that have a lower solute concentration than the surrounding fluid and can cause the cell to rupture due to an excess of water entering the cell.
- Hypertonic solutions are those solutions that have a greater solute concentration than the surrounding fluid and so force water out of the cell, shrinking it.