

Class 9 Science – Chapter 5: The Fundamental Unit of Life

These notes are written in a simple classroom style so they are easy to learn and revise before exams.

1. What is Life Made Of?

All living organisms, whether it is a huge banyan tree, a human being, or tiny bacteria, are made up of **cells**. A cell is the smallest unit that can perform all life processes such as nutrition, respiration, growth, excretion and reproduction. Because of this, the cell is called the **fundamental (basic) unit of life**.

Just like a building is made of bricks, our body is made of cells.

2. Discovery of the Cell

- In 1665, **Robert Hooke** observed a thin slice of cork using a microscope.
- He noticed many small compartments and named them **cells**.
- Later, **Anton van Leeuwenhoek** observed living cells in pond water.
- This marked the beginning of cell study.

3. Cell Theory

Proposed by **Schleiden and Schwann** and later expanded by **Rudolf Virchow**.

Main statements:

1. All living organisms are made of cells.
2. Cell is the basic unit of structure and function.
3. All cells come from pre-existing cells.

4. Shape and Size of Cells

Cells differ in shape because they perform different functions.

Cell Type	Shape	Reason
Nerve cell	Long and branched	To carry messages
Muscle cell	Spindle-shaped	Helps in movement
RBC	Round, biconcave	Carries oxygen
Amoeba	Irregular	Changes shape for movement

Most cells are microscopic. The **smallest cell** is *Mycoplasma*, and one of the **largest cells** is the ostrich egg.

5. Basic Structure of a Cell

Every cell has three main parts:

1. **Cell membrane**
2. **Cytoplasm**
3. **Nucleus**

Plant cells also have an extra outer layer called **cell wall**.

6. Cell Membrane (Plasma Membrane)

It is the thin outer covering of the cell.

Functions:

- Protects the cell
- Gives shape
- Controls movement of materials (selectively permeable)

Movement of Substances

Diffusion

Movement of substances from high concentration to low concentration.

Example: Oxygen enters cells by diffusion.

Osmosis

Movement of water through a semipermeable membrane.

Solution Type Effect on Cell

Hypotonic Cell swells

Hypertonic Cell shrinks

Isotonic No change

7. Cell Wall (Plant Cells Only)

- Present outside cell membrane
- Made of **cellulose**
- Provides strength and protection

- Makes plant cells rigid

8. Cytoplasm

Semi-liquid jelly-like substance inside the membrane.

- Holds cell organelles
- Many chemical reactions occur here

9. Cell Organelles and Their Functions

(1) Nucleus

The most important organelle.

Structure:

- Nuclear membrane
- Nucleolus
- Chromosomes

Functions:

- Controls activities of the cell
- Stores hereditary material (DNA)

(2) Mitochondria

Called the **powerhouse of the cell**.

Function:

- Site of cellular respiration
- Produces energy (ATP)

(3) Endoplasmic Reticulum (ER)

Network of membranes.

Types:

- **Rough ER** (with ribosomes) → protein synthesis
- **Smooth ER** → fat synthesis and detoxification

(4) Ribosomes

Tiny particles.

Function:

- Make proteins
- Found on RER or free in cytoplasm

(5) Golgi Apparatus

Looks like a stack of flattened sacs.

Function:

- Modifies, stores and packages proteins

(6) Lysosomes

Contain digestive enzymes.

Function:

- Digest food and waste
- Destroy damaged cell parts

Called “**suicide bags**” because they can burst and digest the cell.

(7) Vacuoles

Storage sacs.

- In plants → large central vacuole (stores cell sap)
- In animals → small

(8) Plastids (Plant Cells Only)

Type Function

Chloroplast Photosynthesis

Chromoplast Gives colour

Leucoplast Stores food

10. Differences Between Plant and Animal Cells

Feature Plant Cell Animal Cell

Cell wall Present Absent

Plastids Present Absent

Vacuole Large Small

Shape Fixed Irregular

11. Prokaryotic and Eukaryotic Cells**Feature Prokaryotic Eukaryotic**

Nucleus No true nucleus True nucleus

Organelles Absent Present

Size Small Large

Example Bacteria Plants, animals

12. Important Biological Terms

- **Organelle** – Small structure inside cell
- **Chromosomes** – Carry genes
- **Gene** – Unit of heredity
- **ATP** – Energy molecule

13. Important Points for Exams

- ✓ Cell is basic unit of life
- ✓ Nucleus controls activities
- ✓ Mitochondria produce energy
- ✓ Plant cells have cell wall
- ✓ Plasma membrane is selectively permeable
- ✓ Lysosomes digest waste

14. Quick Revision Summary

- All life processes occur inside cells
- Cell membrane allows only certain substances
- Cytoplasm is site of reactions

- Nucleus contains DNA
- Mitochondria = energy
- ER + ribosomes = protein
- Golgi = packaging