

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.
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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.
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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
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8. Cytoplasm

Semi-liquid jelly-like substance inside the membrane.

- Holds cell organelles
 - Many chemical reactions occur here
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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)
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(2) Mitochondria

Called the **powerhouse of the cell**.

Function:

- Site of cellular respiration
 - Produces energy (ATP)
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(3) Endoplasmic Reticulum (ER)

Network of membranes.

Types:

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

Tiny particles.

Function:

- Make proteins
 - Found on RER or free in cytoplasm
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(5) Golgi Apparatus

Looks like a stack of flattened sacs.

Function:

- Modifies, stores and packages proteins
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(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.
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(7) Vacuoles

Storage sacs.

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