

◆ Introduction – Discovery of the Cell

Definition:

A cell is the smallest structural and functional unit of life.

- Discovered by Robert Hooke in 1665 while observing cork slices.
- He saw tiny compartments like a honeycomb and called them “cells” (Latin: little rooms).
- Anton van Leeuwenhoek (1674) observed living cells in pond water.
- Robert Brown discovered the nucleus (1831).
- Schleiden and Schwann proposed Cell Theory.
- Rudolf Virchow added that all cells arise from pre-existing cells.

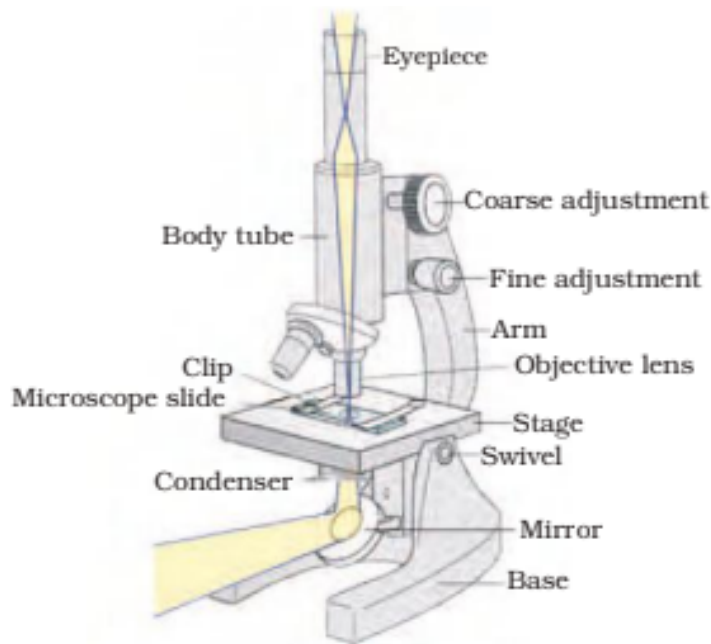


 Fig. 5.1 – Compound Microscope

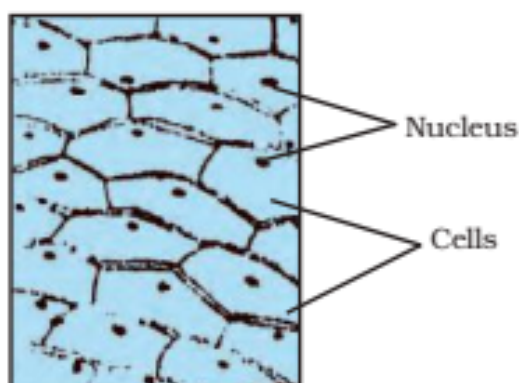


 Fig. 5.2 – Onion peel cells

◆ 5.1 What are Living Organisms Made Up of?

- All living organisms are made of cells.
- Some organisms like Amoeba, Paramecium are unicellular (single-celled).

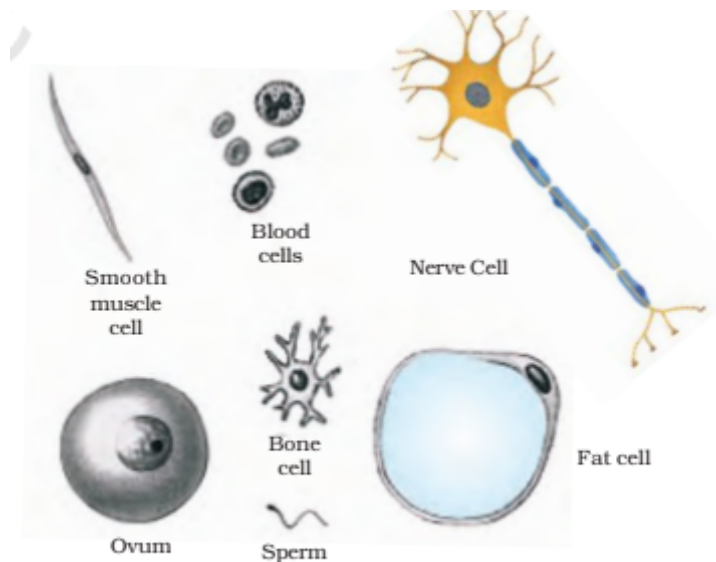
- Plants, animals, fungi are multicellular (many cells working together).
- Cells divide to form new cells → this is how all cells arise.


Activity 5.1: Onion Peel Observation

- Peel inner skin of onion, place it on glass slide with water
- Add safranin (stain), cover with cover slip
- Observe under microscope
 - ✓ You will see: Brick-shaped cells with boundaries and a central nucleus

Activity 5.2: Observe Different Plant Cells

- Try peels from onion root, leaves, etc.
- Questions: (a) Do all cells look alike?
 (b) Do shapes/sizes vary?
 (c) Are there common structures?



 Fig. 5.3 – Human cells: sperm, nerve, muscle, blood, ovum

◆ 5.2 What is a Cell Made Up of?

All cells have:

1. Plasma membrane
2. Cytoplasm
3. Nucleus

◆ 5.2.1 Plasma Membrane / Cell Membrane

Definition:

It is the outer covering of the cell that separates the interior from the external environment. It is selectively permeable.

Function:

- Allows movement of materials in and out
- Controls exchange of gases and nutrients

Diffusion:

Movement of substances from high to low concentration

Osmosis:

Movement of water across a selectively permeable membrane

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Activity 5.3: Egg & Osmosis

- (a) Remove eggshell using HCl → place in water → egg swells (water enters)
- (b) Place similar egg in salt solution → egg shrinks (water leaves)

Activity 5.4: Raisin Osmosis

- Raisins swell in water (hypotonic), shrink in sugar solution (hypertonic)

Endocytosis:

Engulfing food and materials (like Amoeba)

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◆ **5.2.2 Cell Wall (in plant cells)**

Definition:

A rigid outer layer made of cellulose outside the plasma membrane. Found only in plant, fungal, and bacterial cells.

Functions:

- Provides shape, strength, protection
- Prevents bursting in hypotonic environments

Plasmolysis:

Shrinkage of cytoplasm away from cell wall when placed in concentrated solution.

Activity 5.6: Rhoeo Leaf in Salt Solution

- Observe chloroplasts moving away from wall (in living cells only)
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◆ **5.2.3 Nucleus – Control Centre**

Definition:

Nucleus is the organelle that controls all cell functions and contains genetic material (DNA).

- Covered by nuclear membrane with pores
- Contains chromosomes (made of DNA + protein)
- DNA → carries hereditary information
- Chromatin: thread-like DNA when cell isn't dividing
- Genes: functional units of DNA

 In bacteria (prokaryotes), nucleus is not enclosed – called nucleoid.

Activity 5.7: Human Cheek Cell

- Scrape inner cheek, stain with methylene blue
- Observe oval-shaped cells with nucleus

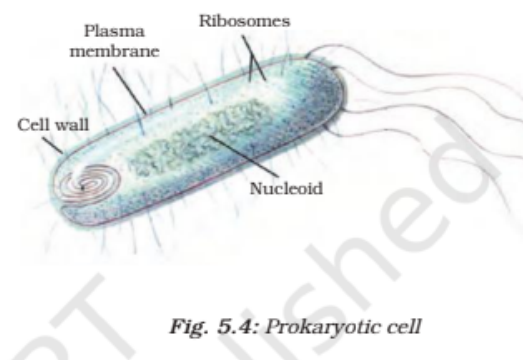


 Fig. 5.4 – Prokaryotic Cell

◆ 5.2.4 Cytoplasm

Definition:

The jelly-like fluid between nucleus and plasma membrane where organelles are suspended.

Function:

- Medium for chemical reactions
- Supports & protects cell organelles

 Prokaryotic cells → No membrane-bound organelles

 Eukaryotic cells → Have membrane-bound organelles

◆ 5.2.5 Cell Organelles – Specialised Structures

(i) Endoplasmic Reticulum (ER)

Definition:

A network of membranes inside the cytoplasm that helps in transport & synthesis.

Types:

- Rough ER (RER) → has ribosomes → protein synthesis
- Smooth ER (SER) → no ribosomes → lipid synthesis & detoxification

Membrane Biogenesis:

Formation of membranes using proteins & lipids

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(ii) Golgi Apparatus

Definition:

A stack of membrane-bound vesicles (cisterns) involved in packing and modifying materials.

Functions:

- Packaging proteins/lipids
 - Formation of lysosomes
 - Processing sugars
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(iii) Lysosomes – “Suicide Bags”

Definition:

Sacs filled with digestive enzymes made by RER

Functions:

- Digest waste, foreign materials
 - Recycle worn-out organelles
 - Can self-destruct in damage
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(iv) Mitochondria – Powerhouse

Definition:

Double-membraned organelle responsible for energy production (ATP).

Features:

- Inner folds → more surface area
 - Contains own DNA & ribosomes
 - Produces ATP (energy currency)
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■ (v) Plastids (Only in plants)

Types:

- Chloroplasts (contain chlorophyll) → photosynthesis
- Chromoplasts → coloured pigments
- Leucoplasts → storage of starch, fats, proteins

■ Structure:

Have membrane, stroma & own DNA like mitochondria

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■ (vi) Vacuoles – Storage Chambers

■ Definition:

Membrane-bound sac storing water, food, waste

- Large in plant cells → contains cell sap
- Helps maintain turgidity
- In Amoeba → used for food & excretion

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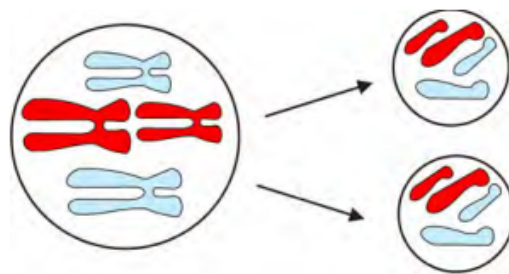
◆ Cell Division

■ Definition:

Process by which new cells are formed

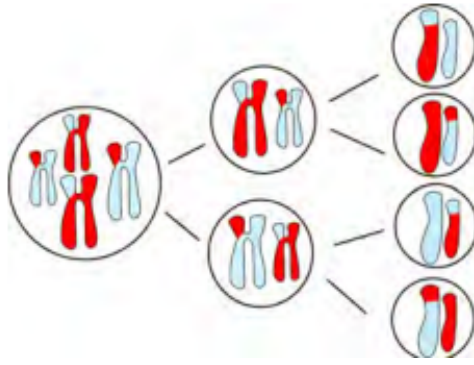
Types:

1. **Mitosis** → Growth & repair → 2 identical daughter cells




📷 Fig. 5.7 – Mitosis

1. **Meiosis** → Gamete formation → 4 cells with half chromosomes



a.

 Fig. 5.8 – Meiosis

Summary: What You Have Learnt

- Cell = fundamental unit of life
- All cells have membrane, cytoplasm, nucleus
- Organelles have specific functions
- Prokaryotes lack true nucleus
- Eukaryotes have membrane-bound nucleus and organelles
- Diffusion & osmosis allow movement of materials
- Mitochondria = energy
- ER = protein/lipid transport
- Golgi = packaging center
- Lysosomes = digest & clean
- Vacuoles = store materials
- Cells divide by mitosis or meiosis