

Plasma Membrane (Cell Membrane)

1. Definition

- The **plasma membrane** is a **thin, living, selectively permeable membrane** that surrounds the cytoplasm of the cell.
- It separates the **internal cellular environment** from the external environment.

2. Occurrence

- Present in **all living cells** (prokaryotic and eukaryotic).
- In plant cells, it lies **inside the cell wall**.

3. Chemical Composition

- **Lipids** ($\approx 40\text{--}50\%$)
 - Mainly **phospholipids**
 - Arranged in a **bilayer**
- **Proteins** ($\approx 50\text{--}60\%$)
 - Structural and functional roles
- **Carbohydrates** (small amount)
 - Present as **glycoproteins** and **glycolipids**
 - Form **glycocalyx** (cell recognition)

4. Structure: Fluid Mosaic Model

- Phospholipid bilayer with:
 - **Hydrophilic heads** facing outward
 - **Hydrophobic tails** facing inward
- Proteins embedded in lipid bilayer like a **mosaic**
- Membrane is **fluid**, not rigid

Types of Membrane Proteins

- **Integral (intrinsic) proteins**
 - Embedded deeply

- Act as channels or carriers
- **Peripheral (extrinsic) proteins**
 - Loosely attached
 - Structural or enzymatic role

5. Thickness

- About **7–10 nm**
- Visible under **electron microscope**

6. Functions of Plasma Membrane

(a) Selective Permeability

- Allows some substances to pass while restricting others

(b) Transport of Materials

- **Passive transport**
 - Diffusion
 - Facilitated diffusion
 - Osmosis
- **Active transport**
 - Requires energy (ATP)
 - Against concentration gradient

(c) Bulk Transport

- **Endocytosis**
 - Phagocytosis (solids)
 - Pinocytosis (liquids)
- **Exocytosis**
 - Removal of substances from cell

(d) Cell Recognition and Adhesion

- Glycoproteins act as receptors
- Helps in cell-to-cell communication

(e) Protection

- Maintains internal environment
- Provides mechanical boundary

7. Special Modifications

- **Microvilli** – increase surface area for absorption (intestinal cells)
- **Desmosomes** – cell adhesion
- **Gap junctions** – communication between cells

8. Comparison: Plasma Membrane vs Cell Wall

Feature	Plasma Membrane	Cell Wall
Nature	Living	Non-living
Permeability	Selectively permeable	Freely permeable
Occurrence	All cells	Plants, fungi, bacteria
Composition	Lipids & proteins	Cellulose / chitin / peptidoglycan

9. Importance of Plasma Membrane

- Maintains **cell integrity**
- Controls exchange of materials
- Essential for survival of the cell
- Plays role in **signaling and immunity**