

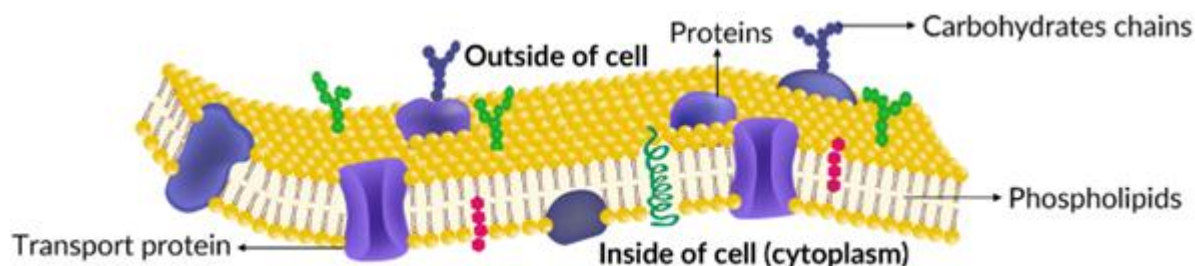
Plasma Membrane

An **outermost envelope-like membrane** or a structure, which surrounds the cell and its organelles is called the plasma membrane. It is a **double membraned cell organelle**, which is also called the phospholipid bilayer and is **present both in prokaryotic and eukaryotic cells**.

In all living cells, the plasma membrane functions as the boundary and is **selectively permeable**, by allowing the entry and exit of certain selective substances. Along with these, the plasma membrane also acts as a **connecting system by providing a connection between the cell and its environment**.

Structure of Plasma Membrane

A plasma membrane is mainly composed of carbohydrates, phospholipids, proteins, and conjugated molecules, and it is about 5 to 8 nm in thickness.



Different Structural Models of Plasma Membrane

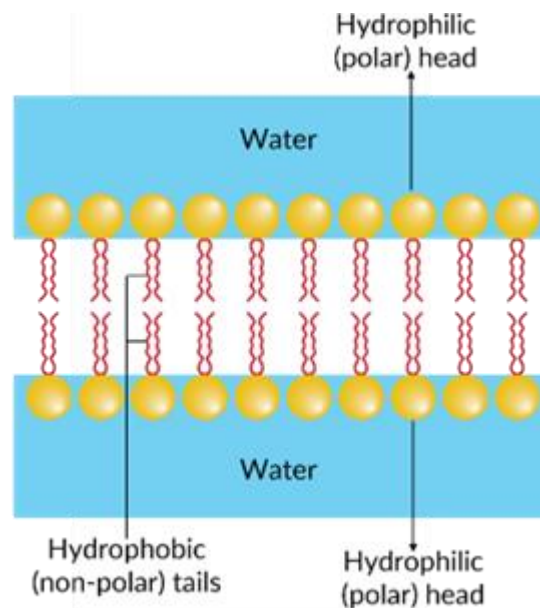
Many authors have given different models and ideas for the presence and structure of cell membrane. But Fluid mosaic model suggested by Singer and Nicolson is the most acknowledged of them all.

The following are the molecular models of the cell membrane suggested by different biologists.

Lipid – Lipid Bilayer Model:

In 1902, Overton noted that substances soluble in lipid could selectively pass through the membranes. On the basis of this, he said that the cell membrane is composed of a **thin layer of lipid**.

Gorter and Grendel (1925) were the first scientists to propose a possible structure of the cell membrane. On the basis of **studies of plasma membranes of red blood cells**, they showed that the lipid obtained from the red cell spread in area two times that of a simple molecular film. So, it was believed that the **membrane comprised of two layers of lipid molecules**, the **polar hydrophilic groups of the molecules positioned on the outside** and **hydrophobic ends placing at right angles to the surface positioned on the inside**.

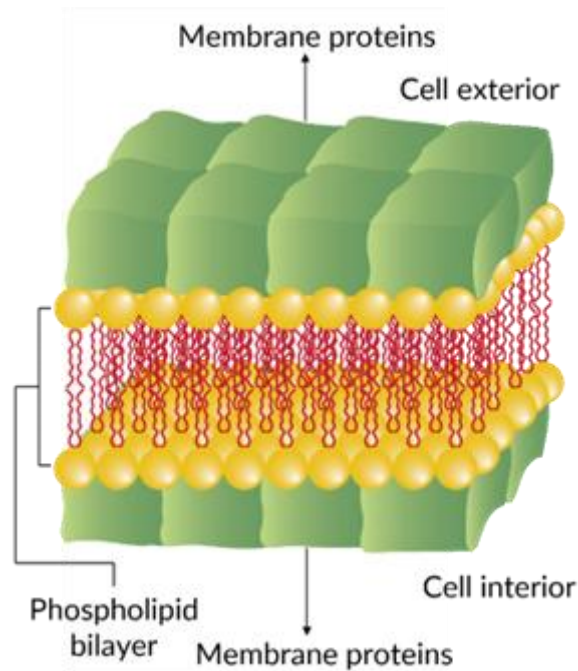


Sandwich Model (Davson –Danielli Model)

In 1935, **Davson and Danielli** suggested **sandwich or trilamellar model** for plasma membrane. According to this model, the plasma membrane is a **sheath-like structure that consists of two lipid layers sandwiched between uninterrupted or continuous layers of proteins**.

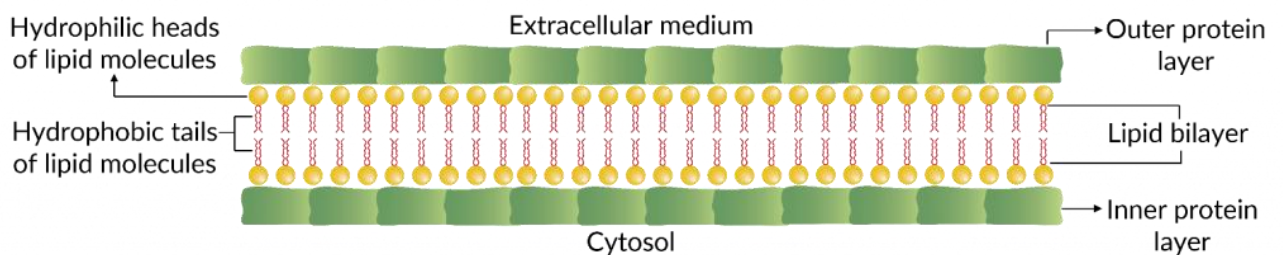
In this model, the arrangement of phospholipid molecules is so that hydrophilic heads of the phospholipid molecules face outside and hydrophobic non-polar lipid tail face in the inner region of the membrane.

The model also suggested that the polar ends of lipid molecules are associated with a single molecular layer of globular proteins. So, the plasma membrane thus, consists of a double layer of phospholipid molecules sandwiched between two uninterrupted layers of protein. This model is also called a **lipo-protein sandwich model** because the lipid layer is sandwiched between two protein layers.



Unit Membrane Model:

In 1959, Robertson suggested the unit membrane model, which says that all cellular membranes have the **same membrane structure**. They named this same membrane structure as the unit membrane. As per this model, the unit membrane comprises of **bimolecular lipid present in between outer and inner layers of protein**.



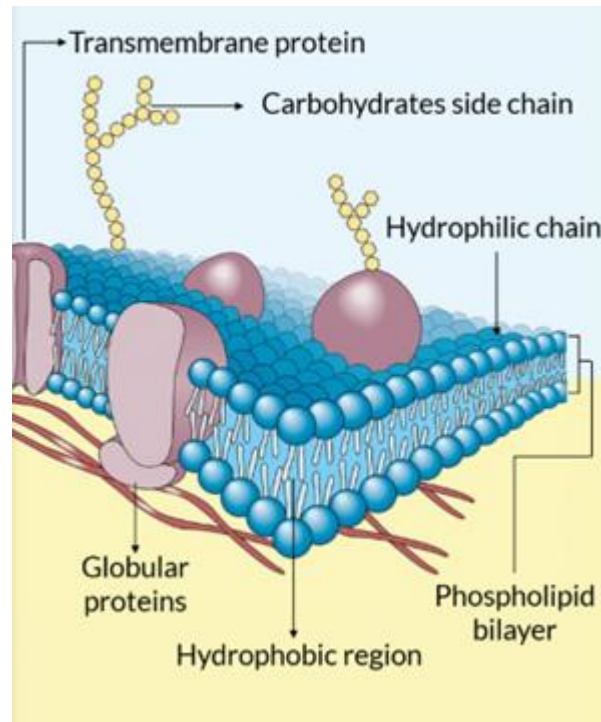
Fluid mosaic model

The fluid mosaic model was first proposed in **1972 by Singer and Nicolson** to describe the composition of the plasma membrane. The fluid mosaic model explains the structure of the plasma membrane as a mosaic of components that contains **phospholipids, cholesterol, proteins, and carbohydrates**. It provides the plasma membrane with a fluid character. The **thickness of cell membranes ranges from 5 to 10 nm**. The amount of proteins, lipids, and carbohydrates in the plasma membrane differs with cell type. For example, myelin has 18%

protein and 76% lipid whereas the mitochondrial internal membrane has 76% protein and 24% lipid.

Fluid part – the phospholipid bilayer is viscous, and single phospholipids can move position.

Mosaic part – the phospholipid bilayer is inserted with proteins, developing in a mosaic of components.



Functions of Plasma Membrane

- The plasma membrane functions as a physical barrier between the external environment and the inner cell organelles.
- The plasma membrane is a selectively permeable membrane, which permits the movement of only certain molecules both in and out of the cell.
- The plasma membranes play an important role in both the endocytosis and exocytosis processes.
- The plasma membrane also functions by facilitating communication and signalling between the cells.
- The plasma membrane plays a vital role in anchoring the cytoskeleton to provide shape to the cell and also maintain the cell potential.