GOVERNMENT OF ANDHRA PRADESH

COMMISSIONERATE OF COLLEGIATE EDUCATION

Plasma Membrane

Botany

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Objectives :

1.Definition of Plasma membrane.

2.Findings of plasma membrane.

3.Components of plasma membrane.

4.Structural Models of plasma membrane.

5.Functions of Plasma membrane.

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Plasma membrane Definition

Biological membrane which encloses the content of the cell i.e. protoplasm and separates the cell content from the outer environment. It`s thickness ranges from 4-10nm.

- **Also called as plasmalemma or cell membrane.**
- **Present both in Prokaryotes and Eukaryotes.**
- **Present as outermost layer in animal cells.**
- **But present beneath the cell wall in plant cells**

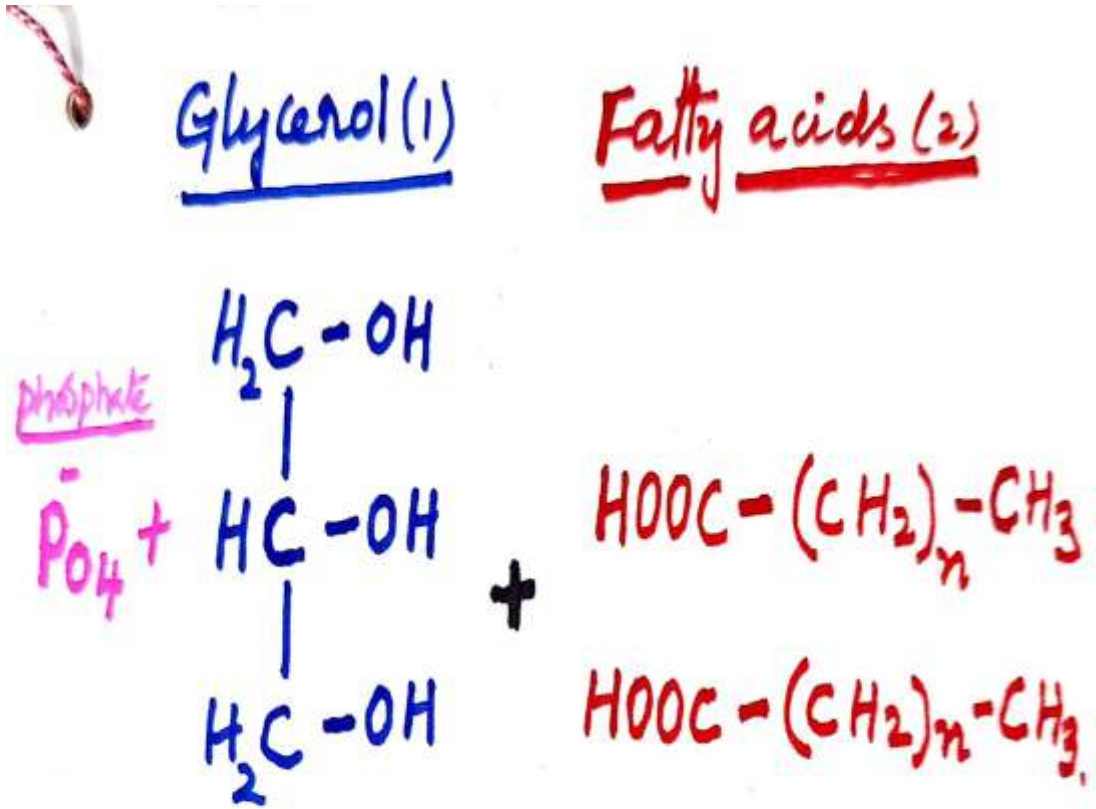
Findings of Plasma membrane:

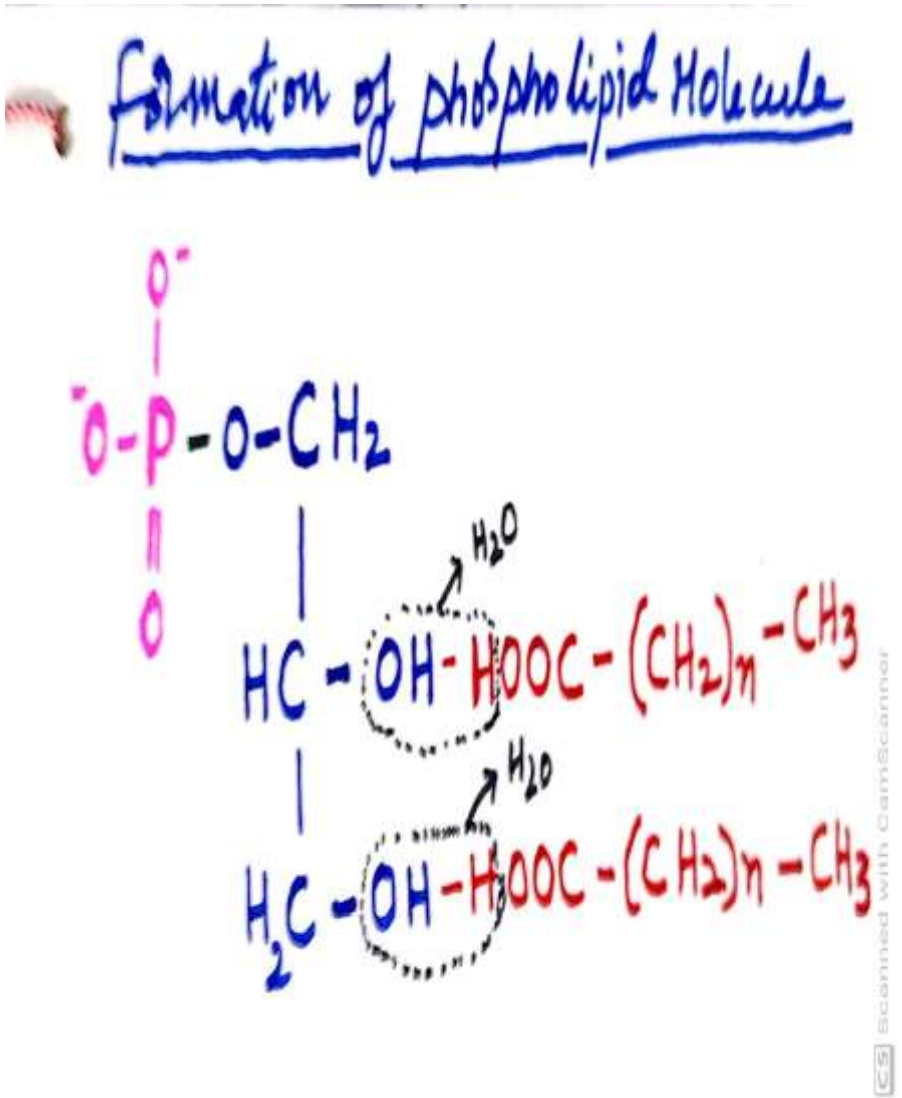
- **C.Nageli nd C.Cramer in 1855 discovered the cell membranes**
- **Charles Ernest Overton in 1895 called these** membranes as lipoids as they are made up of lipids.
- **Gorter and Grendel in 1925** discovered that all biological membranes are bilipid layers.
- **Danielli and Davson in 1935** discovered that membranes are made up of not only lipids but also with proteins.
- **Rebertson in 1950 discovered** that two protein layers are adsorbed to two lipid layers.
- **In 1972 Singer and Nicolson discovered** that the proteins are irregularly distributed in lipid layers in a mosaic pattern.

Principle Components :

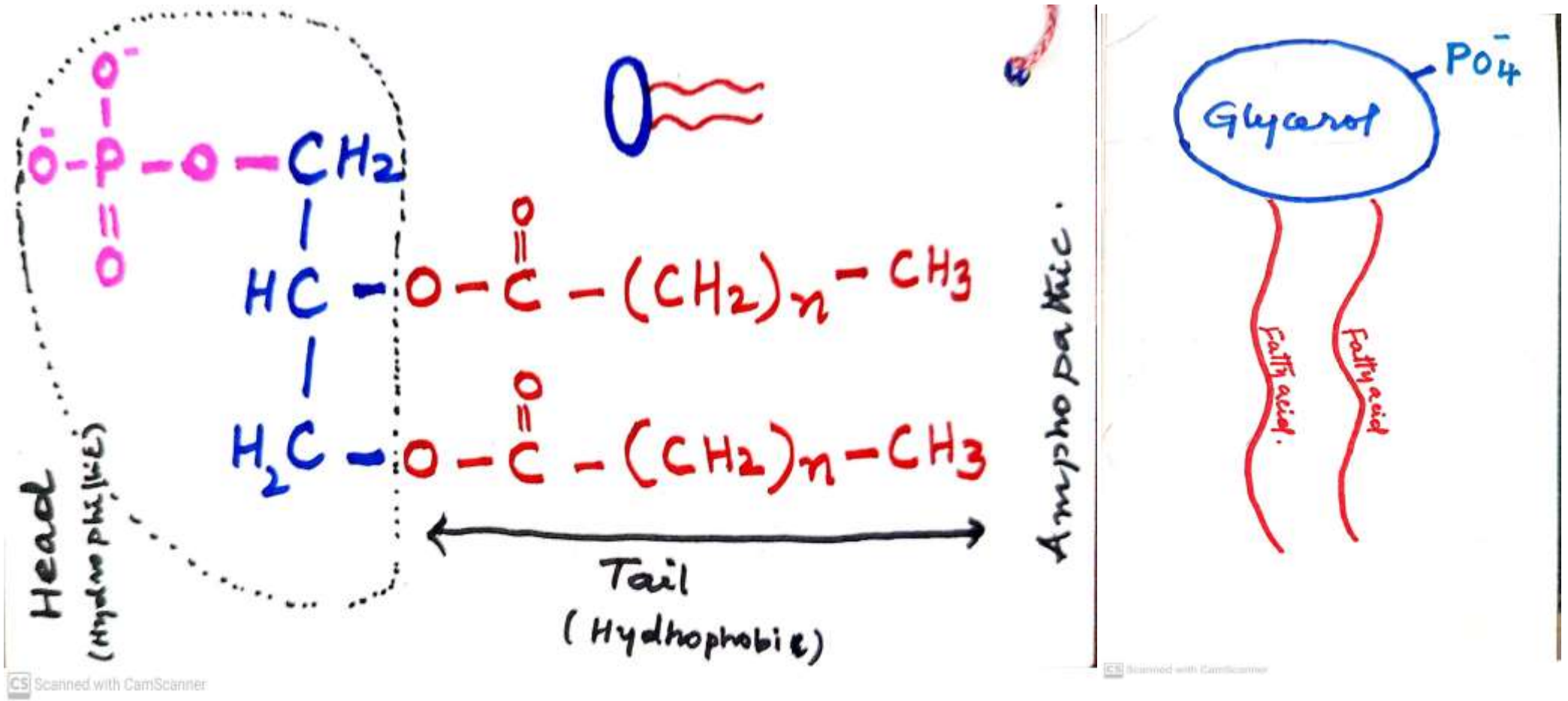
- **1.Lipids (** Core molecules of membrane and useful to maintain fluidity)
- **2.Proteins** (Passage channels for materials)
- **3.Carbohydreate groups** (act as markers to recognise immune cells from foreign cells)
- **4.Cholestrol** (Regulate fluidityof the membrane)

1.Formation of a Lipid Molecule

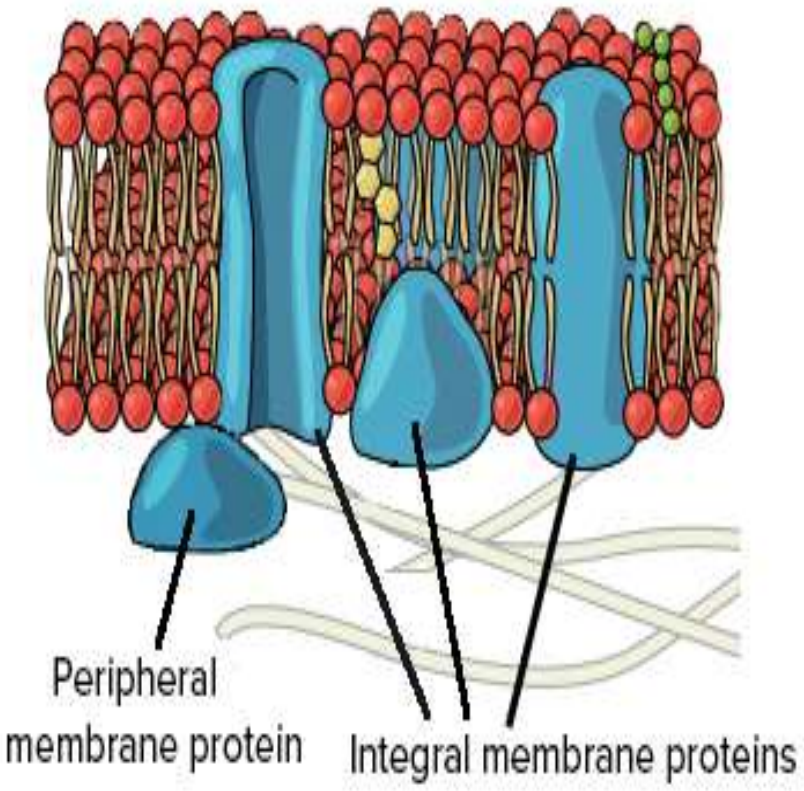




Phospholipid molecule



2.Membrane Proteins



1.Peripheral Proteins: 1.Present on either side of the membrane.

2.They will not penetrate into the hydrophobic area.

3.And they will be loosely attached.

2.IntegralProteins:1.They penetrated in to the hydrophobic core region of the membrane.

2.Some times they will be extended across the lipid layer.

3.Hence called as trans membrane proteins.

3.Carbohydrates

1.Third major component.

2.Two types:

a.Glycolipid (sugar attached to lipid molecule)

b.Glycoprotein (sugar attached to protein)

3.Act as markers

to differentiate body cells and pathogen cells in immune system

4.Cholestrol

1.Another type lipid

2.Present in animal plasma membranes

3.Maintain fluidity (At low temp. increases fluidity and high temp decreases fluidity)

Models of Plasma membrane.

Four important models were proposed,

1. Lipid and Lipid Bilayer Model - Gorter & Grendel-1925.

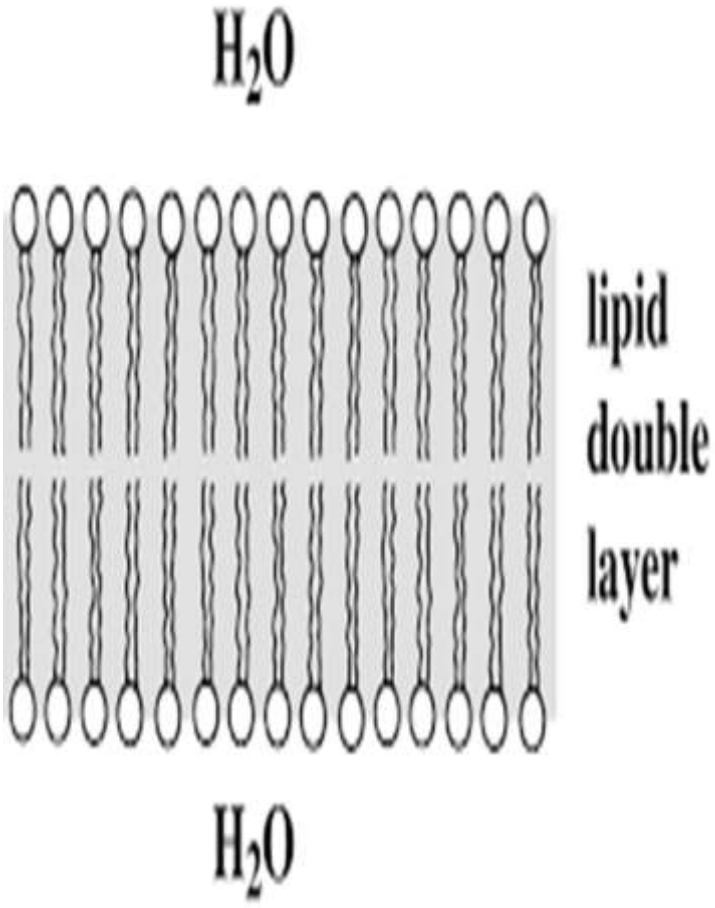
2. Sandwich model –Danielli & Daveson 1935.

3. Unit membrane Model –Robertson 1950

4. Fluid Mosaic Model – Singer & Nicolson 1972

Lipid and lipid bilayer model

– Gorter and Grendel 1925

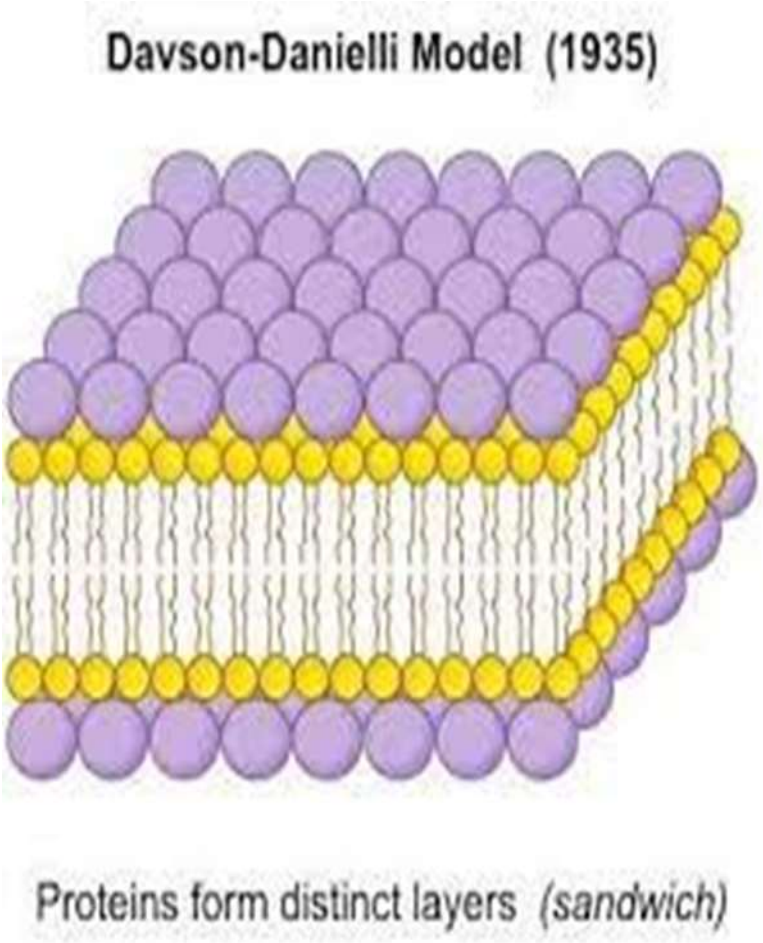


https://www.google.com

- This was the very First model
- The membrane is a double lipid layer.
- The lipid molecules hydrophillic heads present towards out side and hydeophobic tails present towards inside of the membrane.
- This is foundation model for other models.But not given clear structure of plasma membrane.

Sandwich Model

Danielli and Davson 1935



- The membrane consists a bilipid layer but covered by globular protein layer on either side of it.
- It was compared with sandwich, as the bilipid layer was placed in between two globular protein layers
- Predominated up to discovery of fluid Mosaic model.

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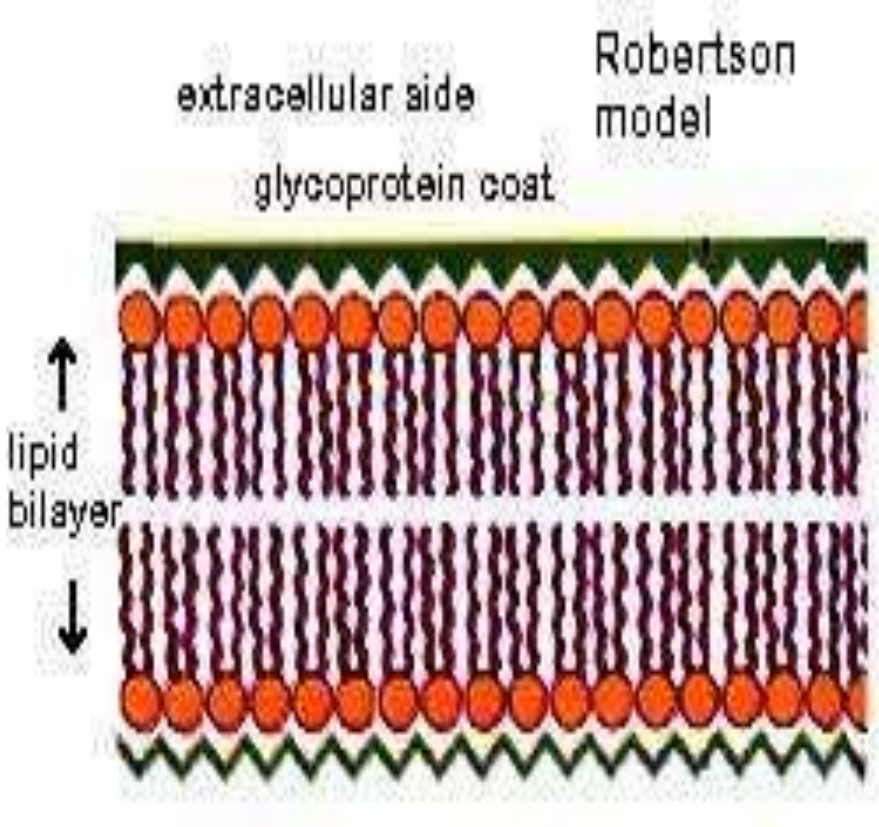
Unit membrane Model

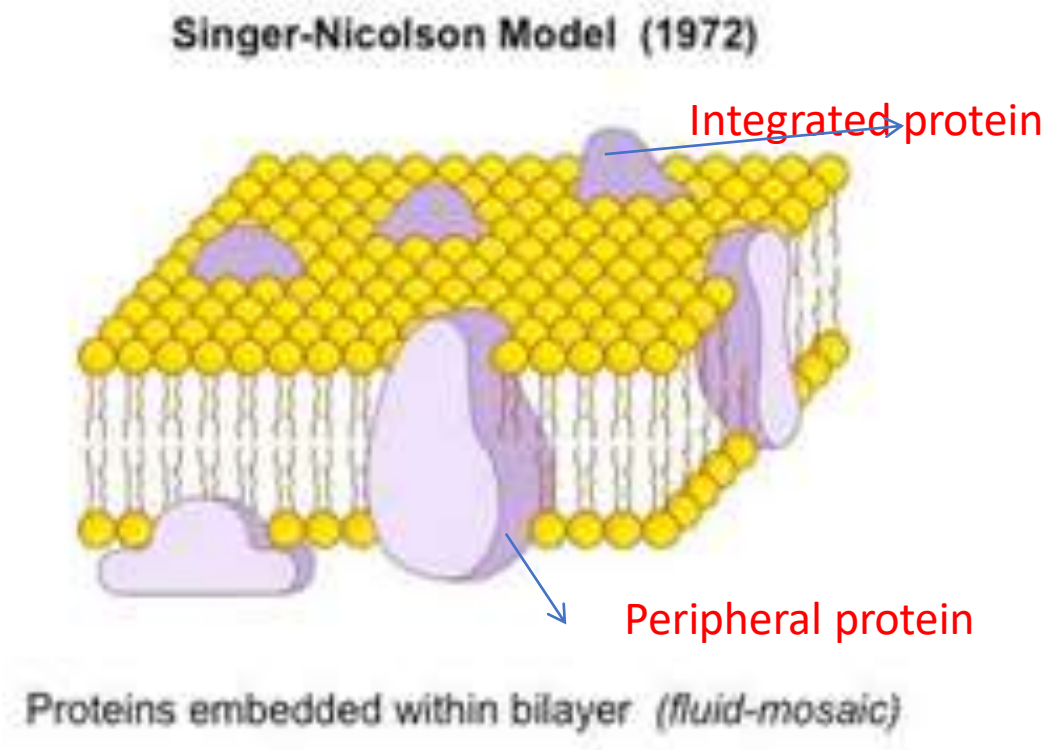
- Robertson 1950



- All cell membranes are similar in their structure and function.
- Membrane consists a bimolecular lipid layer is packed tightly by two protein layers on either side.
- Hence this is also called as Trilaminar model.
- But unable to explain tranport of the materials in and out of the cell.

Fluid mosaic model

-Singer and Nicolson 1972



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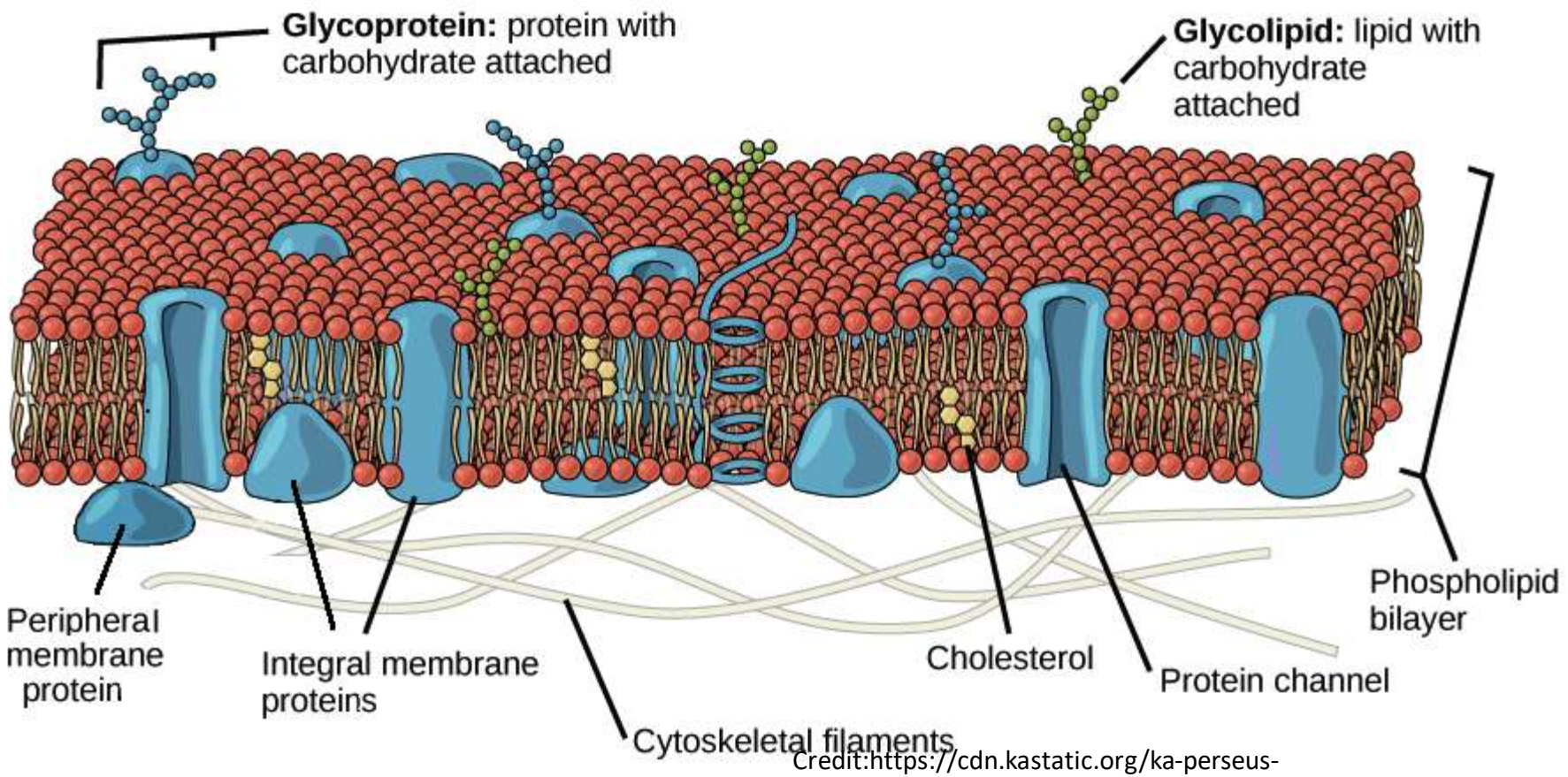
- Widely accepted one.
- According this theory the membrane consists a bilipid layer and the proteins are distributed in two ways.
- Peripheral proteins and integrated proteins.
- The proteins facilitate the transport of the materials in and out of the cell.

Three dimensional Structure of Plasma membrane



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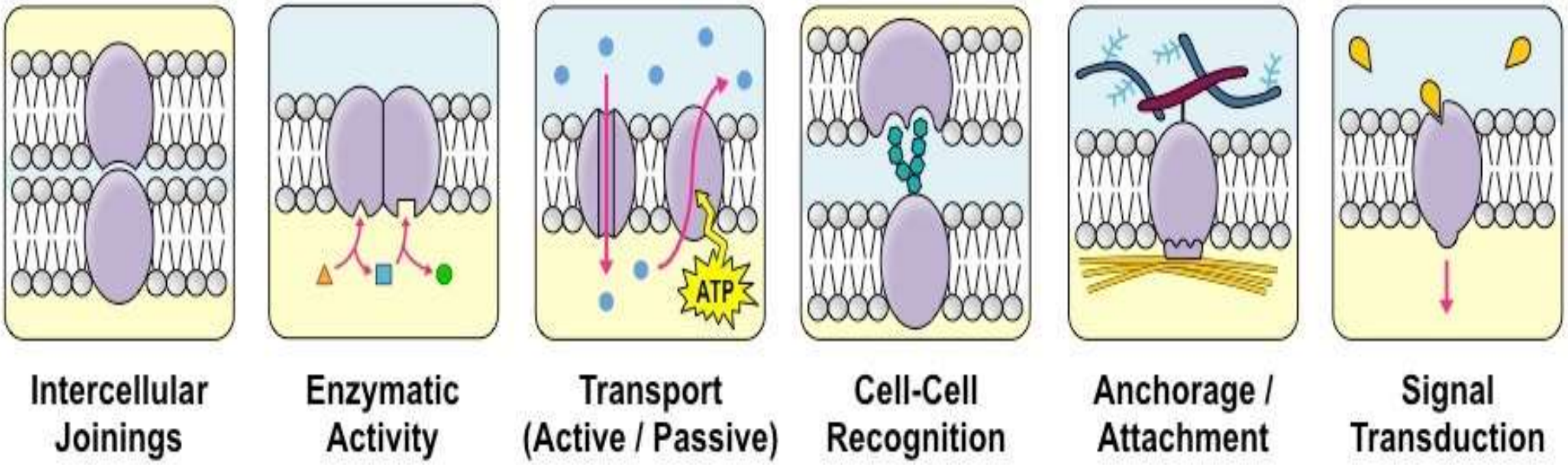
Functions of Plasma membrane

- Plasma membrane is **selectively permeable** membrane i.e. allows certain substances in and out of the cell depends upon the requirement.
- **Membrane Proteins** perform various functions
- **1.Protection**
- **2.Intercellular Joinings**
- **3.Enzyme Activity**
- **4..Transport**
- **5.Cell-Cell Recognition**
- **6.Anchorage**
- **7.Signal transduction**

Functions of Membrane Proteins



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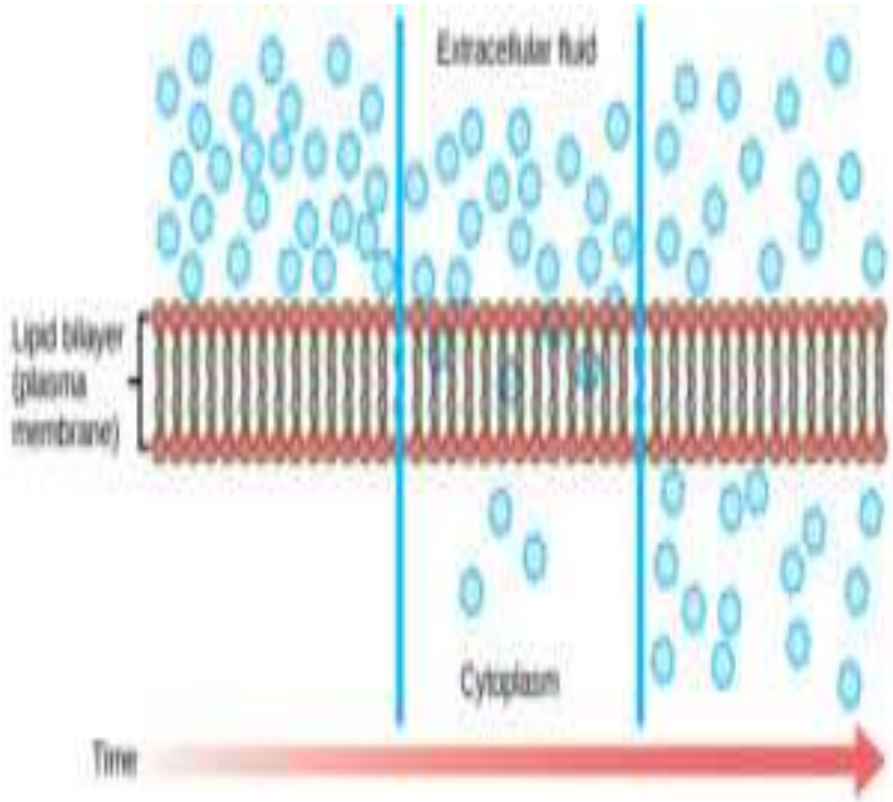
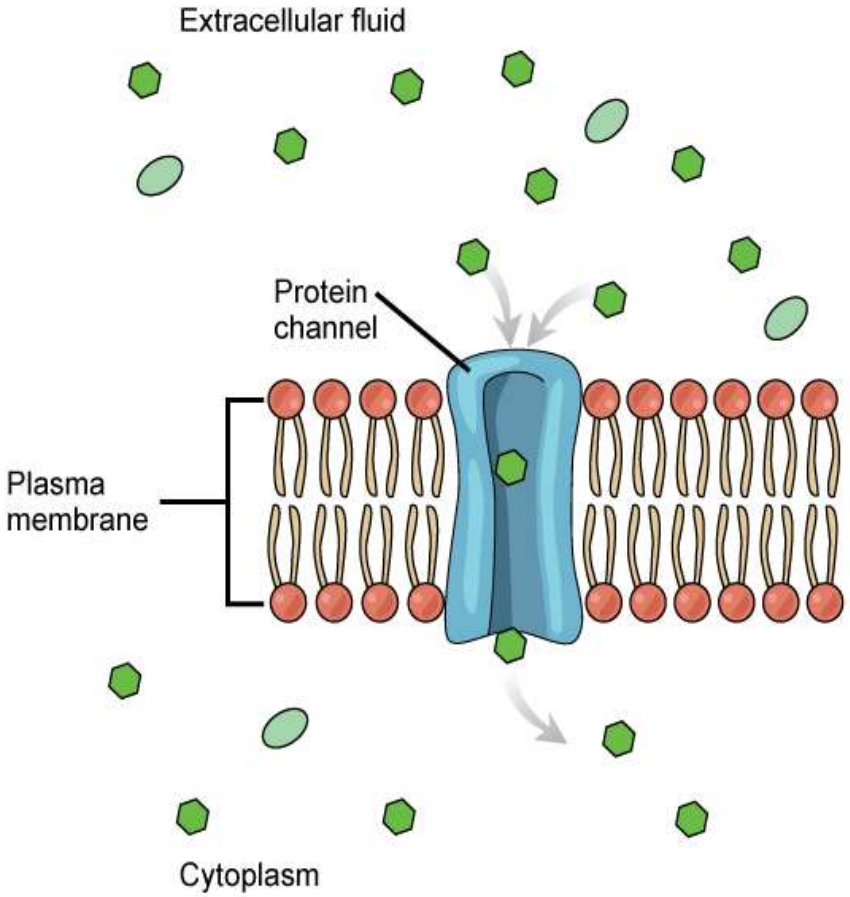
Types of Transport through Plasma membrane

- 1.Diffusion
- 2.Osmosis
- 3.Active and Passive transport
- 4.Exocytosis
- 5.Endocytosis/Phagocytosis

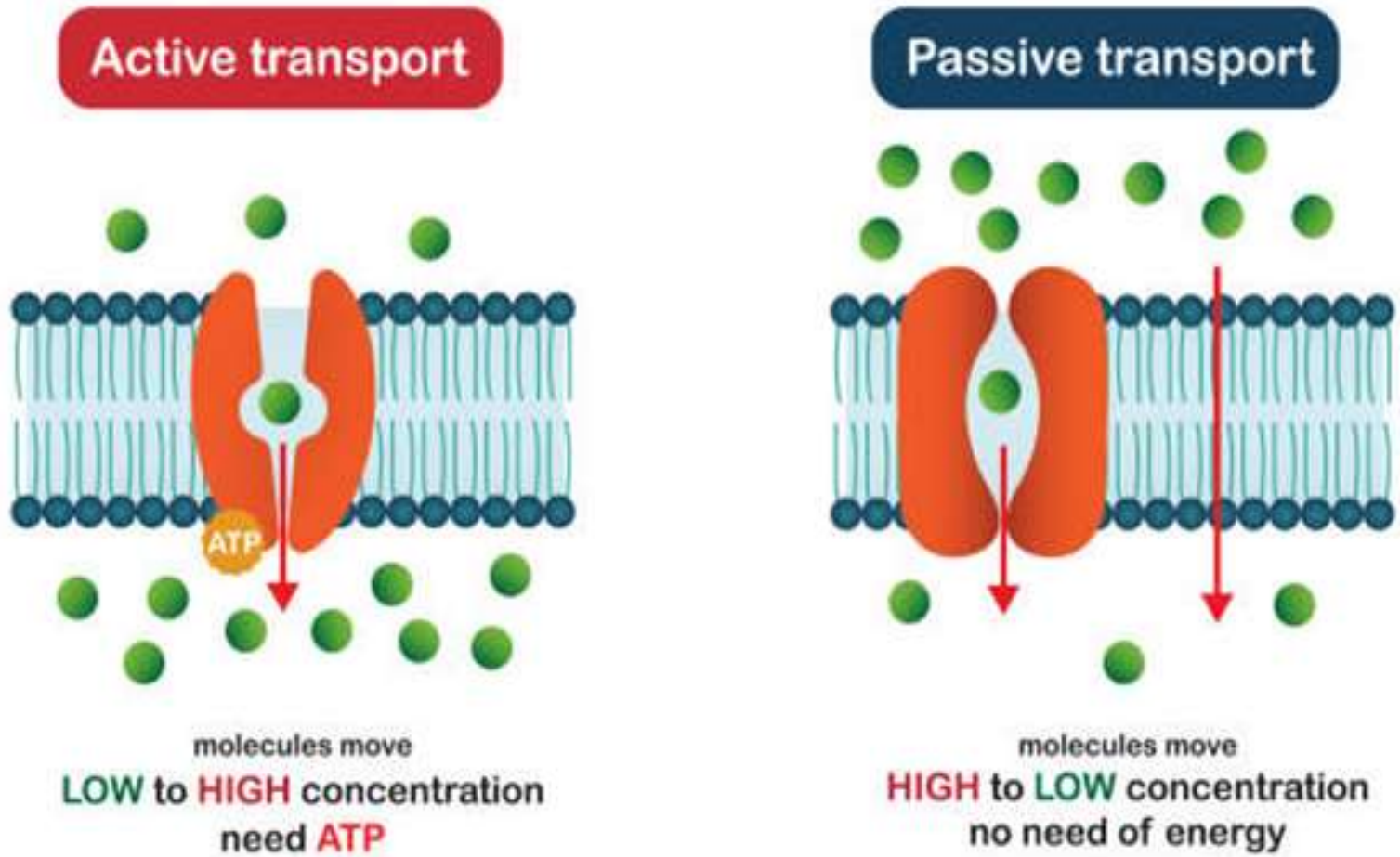
Diffusion and facilitaded diffusion



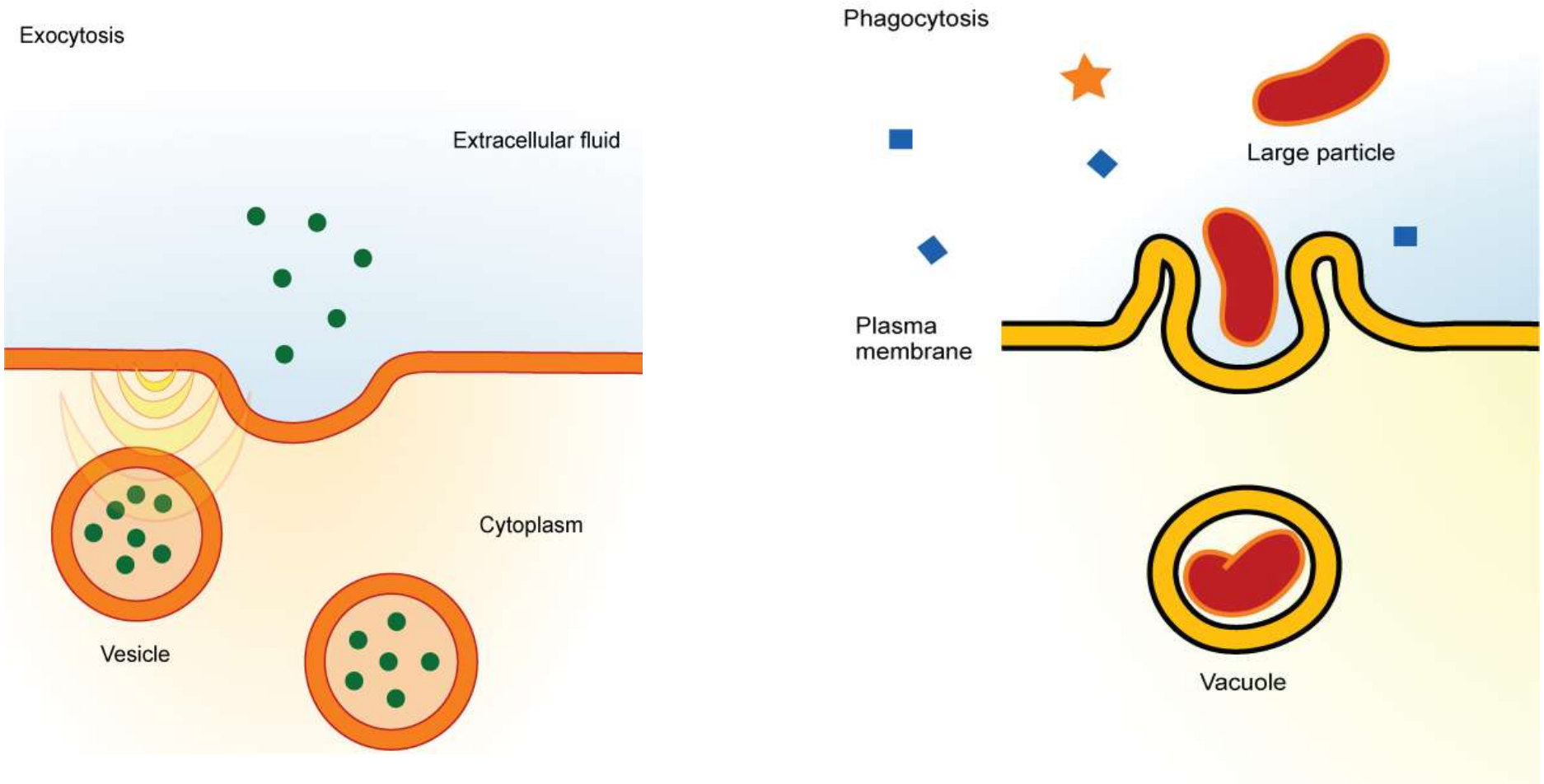


Scientific diagram

Active vs Passive Transport



Exocytosis and Endocytosis



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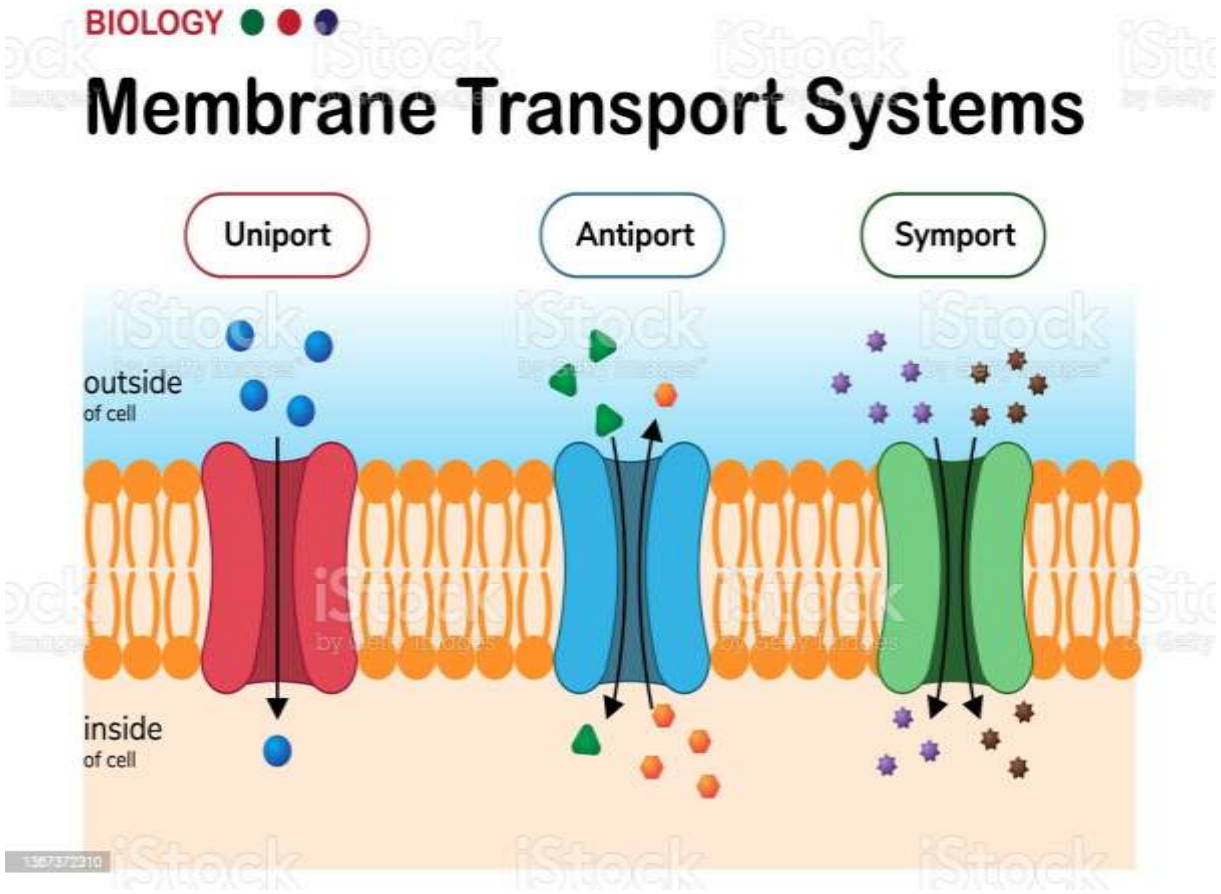
Types of transport



- **Uniport:**Movement of onetype of molecule in one direction
- **Symport:**Movement of two types of molecules in one direction.
- **Antiport:**Movement of two types of molecules in opposite direction

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THANK YOU