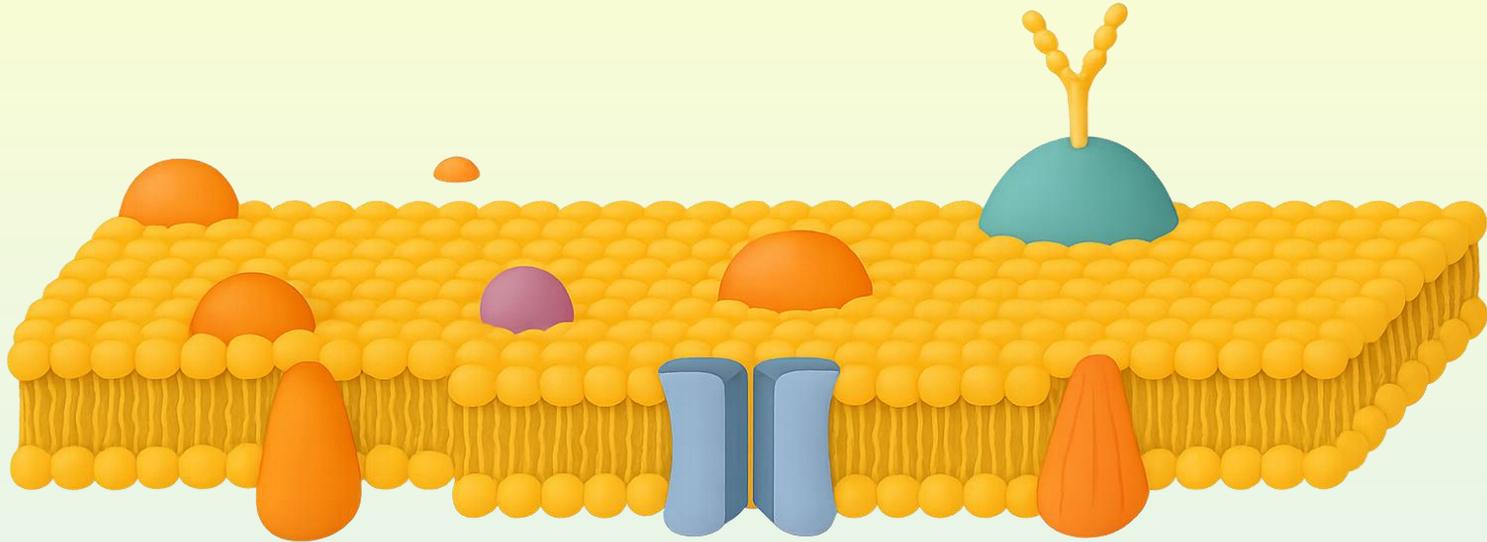


7. Plasma membrane



Is a **fluid mosaic model**, the plasma membrane is a dynamic, flexible structure composed of:

Phospholipids forming a bilayer

Proteins (integral and peripheral)

Cholesterol regulating fluidity

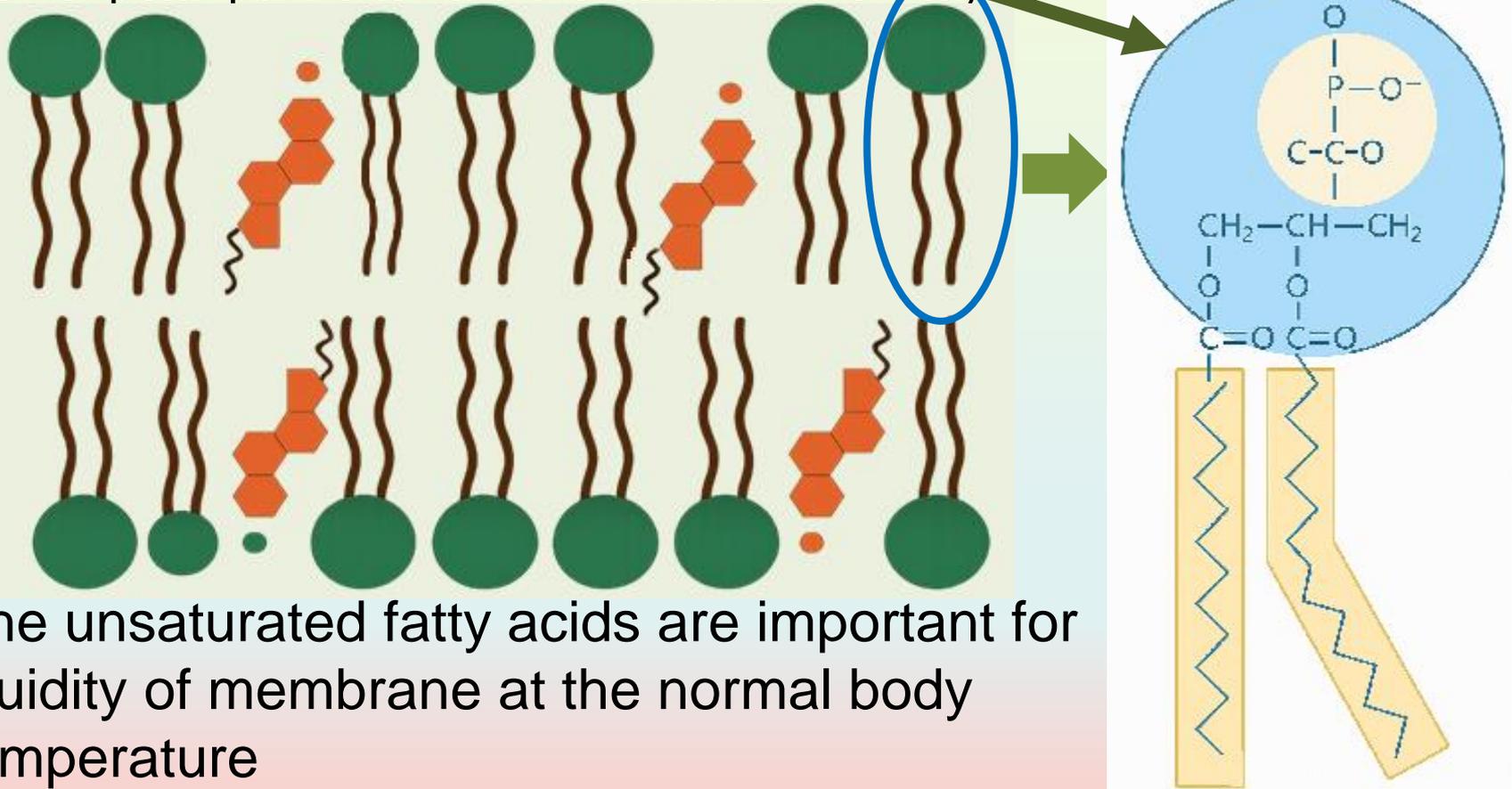
Carbohydrates attached to lipids and/or proteins

7.1. Lipid structure of Plasma Membrane

Membrane

1. Phospholipids:

Forming the bilayer structure by orienting the polar part to the surface and the nonpolar part is toward the center of the bilayer.



The unsaturated fatty acids are important for fluidity of membrane at the normal body temperature

7.1. Lipid structure of Plasma Membrane

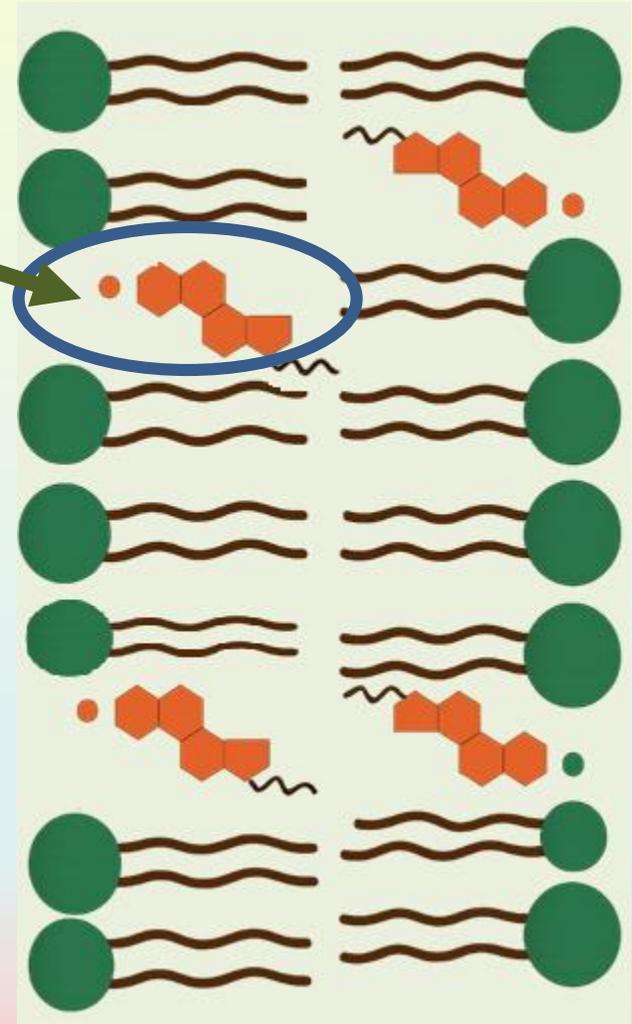
Membrane

2. Cholesterol

Forming about 50% of Cell membrane structure in some cells)

Cholesterol helps to separate phospholipids, so the fatty acid chains can't come together and crystallize

Helps preventing extremes and maintaining consistency of membrane



7.1. Lipid structure of Plasma Membrane

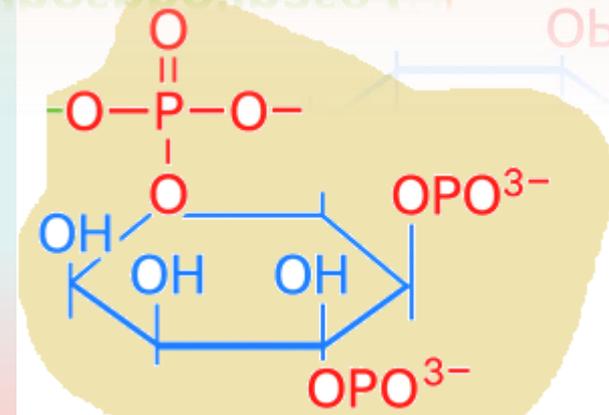
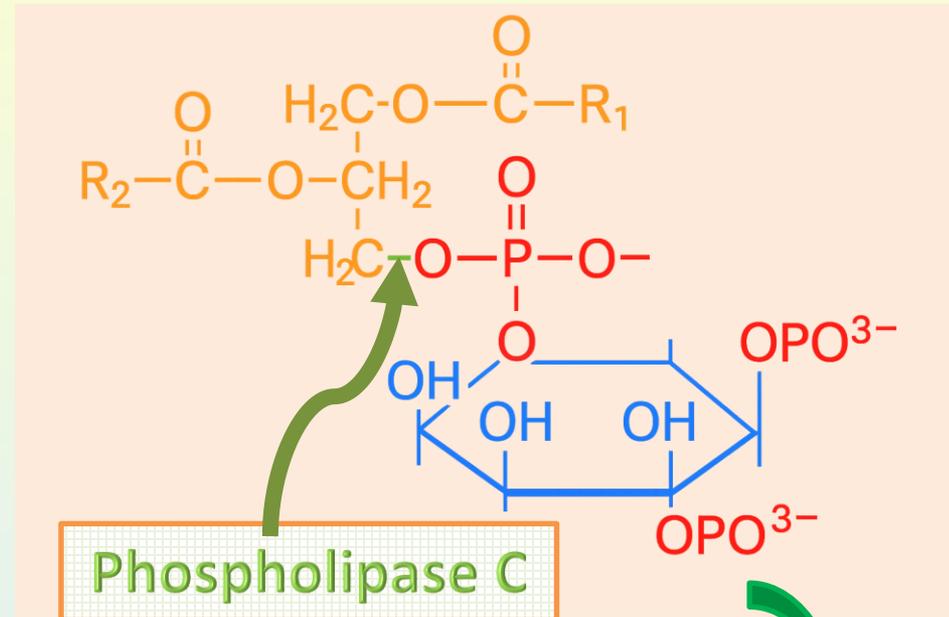
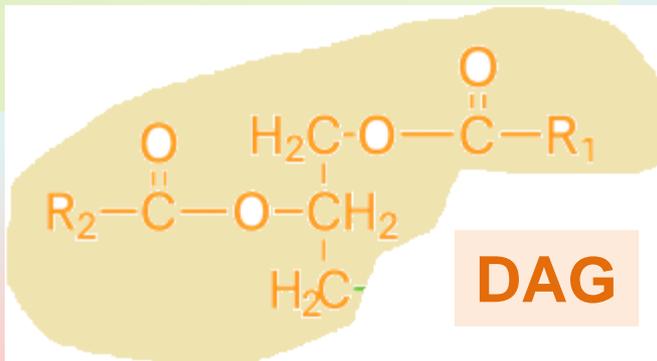
3. Functional Phospholipids in plasma membranes

PIP2

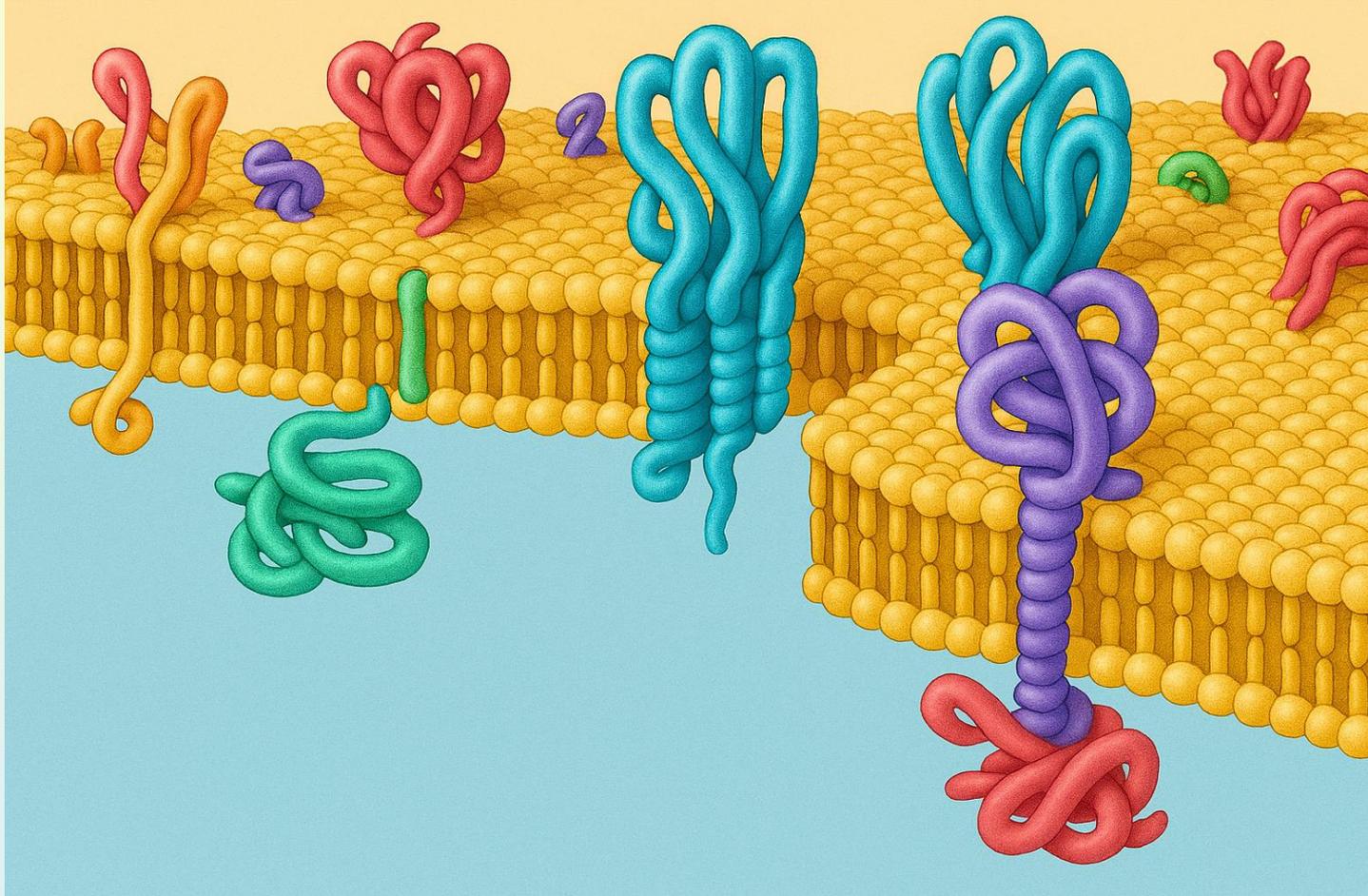
Phosphatidyl

Inositol 4, 5

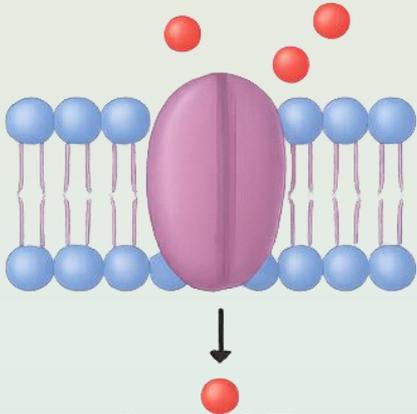
Bisphosphate



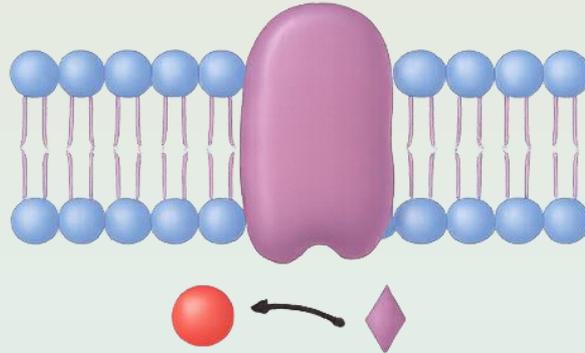
7.2. Proteins in plasma membrane



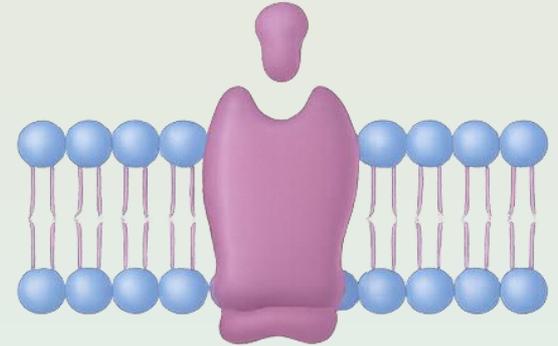
Functions of Membranous Proteins



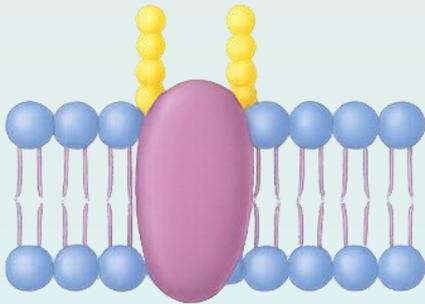
Channels and Transporters



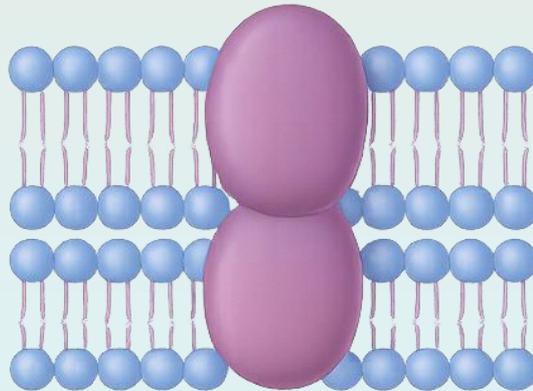
Enzymes



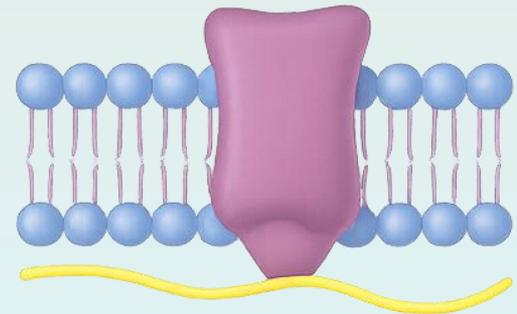
Receptors



Cell Identity Markers

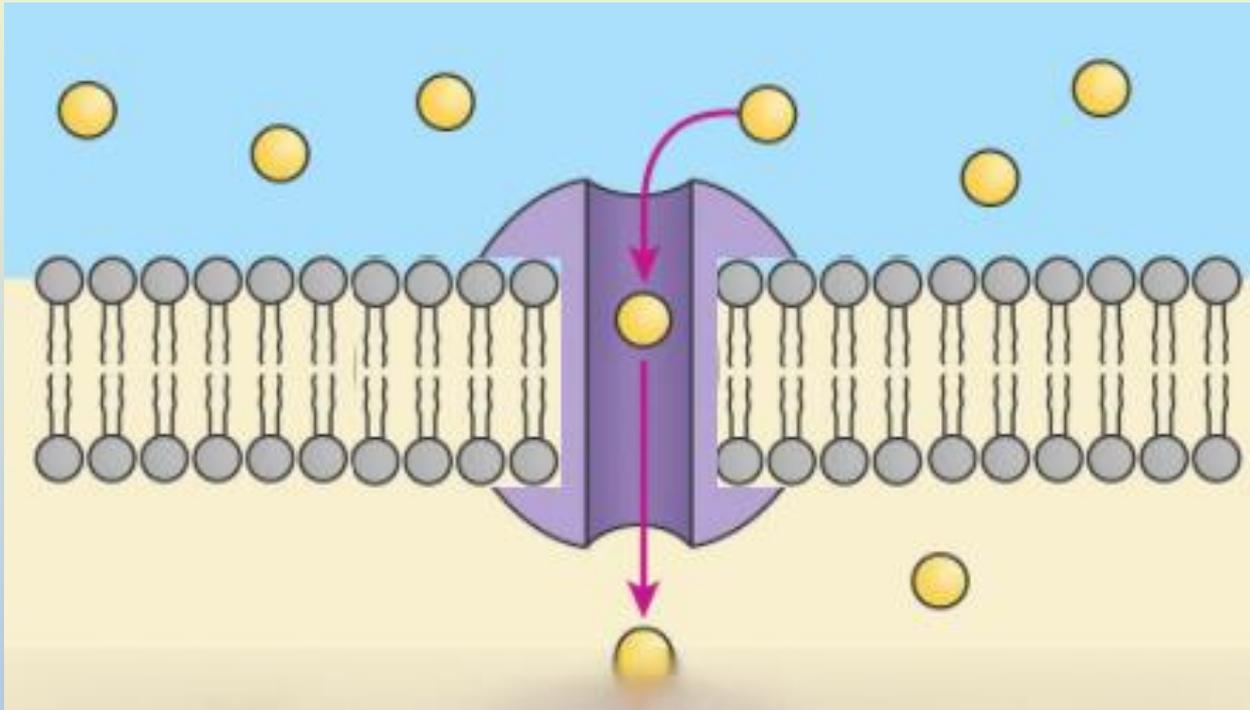


Linkers



Attachments to Cytoskeletal structure

7.2.1. Channels

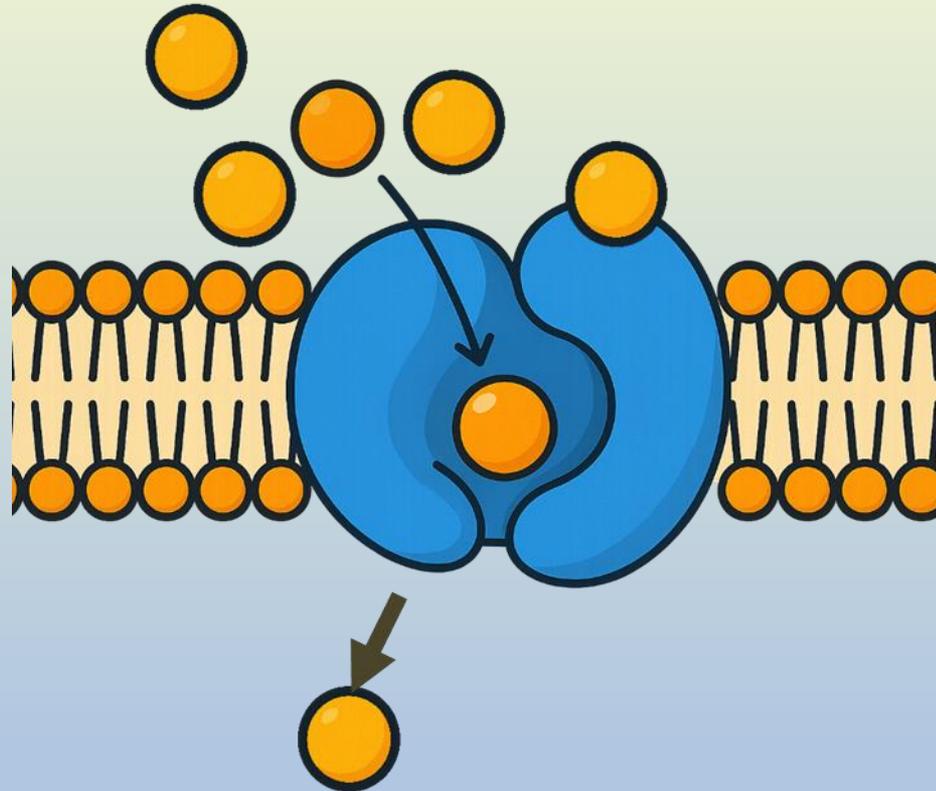


Channels

Form water-filled pathways for selective diffusion of ions or molecules.

Na⁺ channels (only Na⁺ passes), K⁺ channels (only K⁺ passes). Controlled by voltage-gated or ligand-gated mechanisms.

7.2.2. Carriers

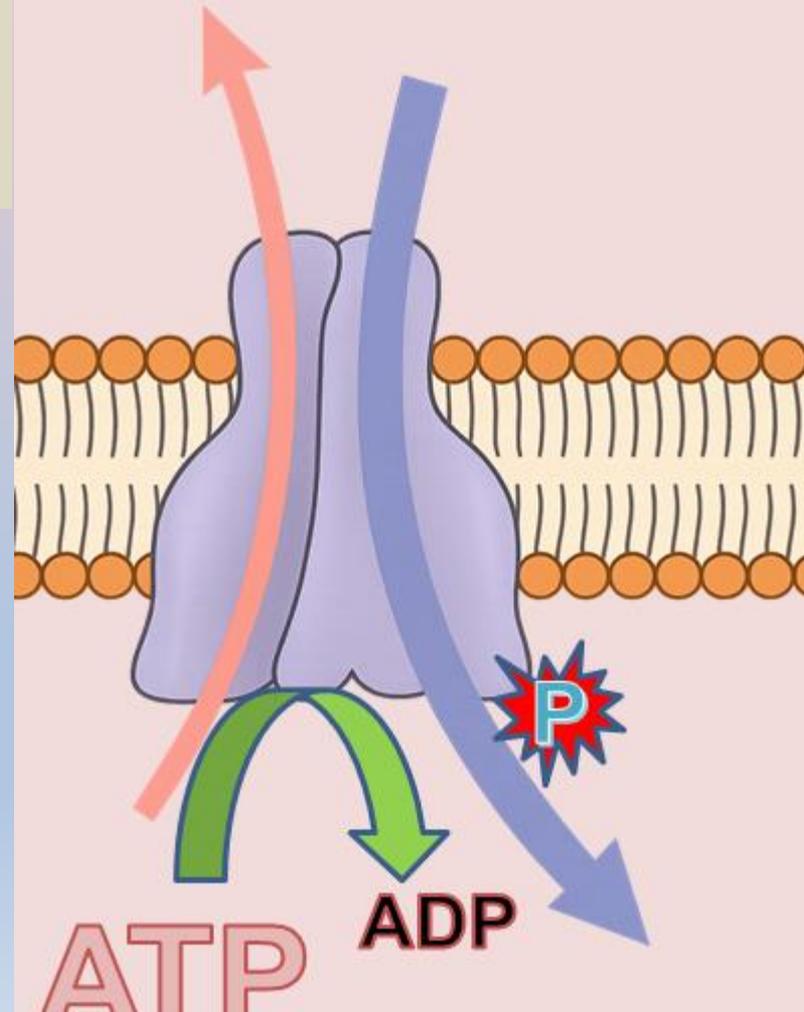
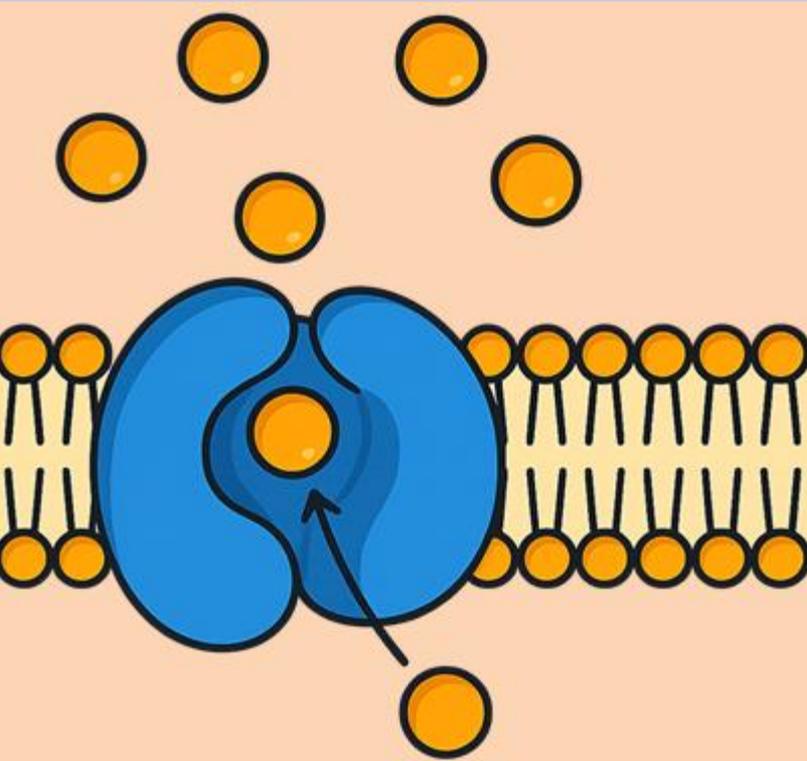
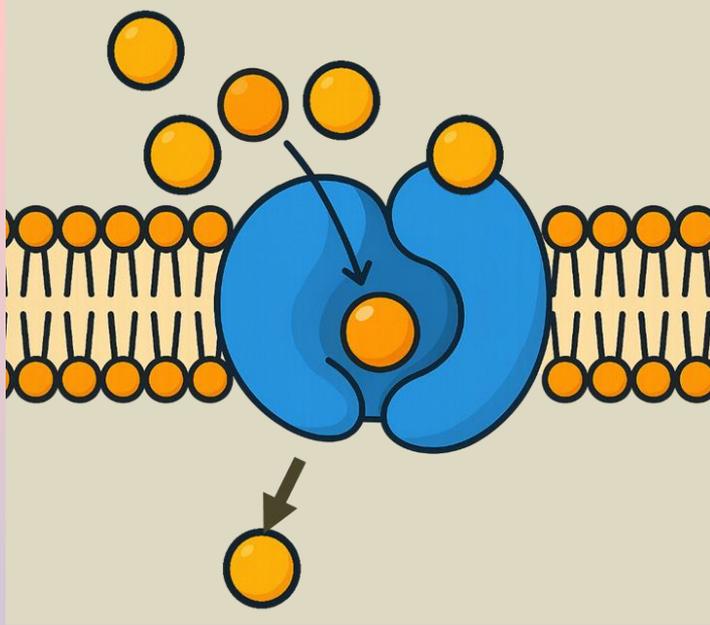


**Carrier
Proteins**

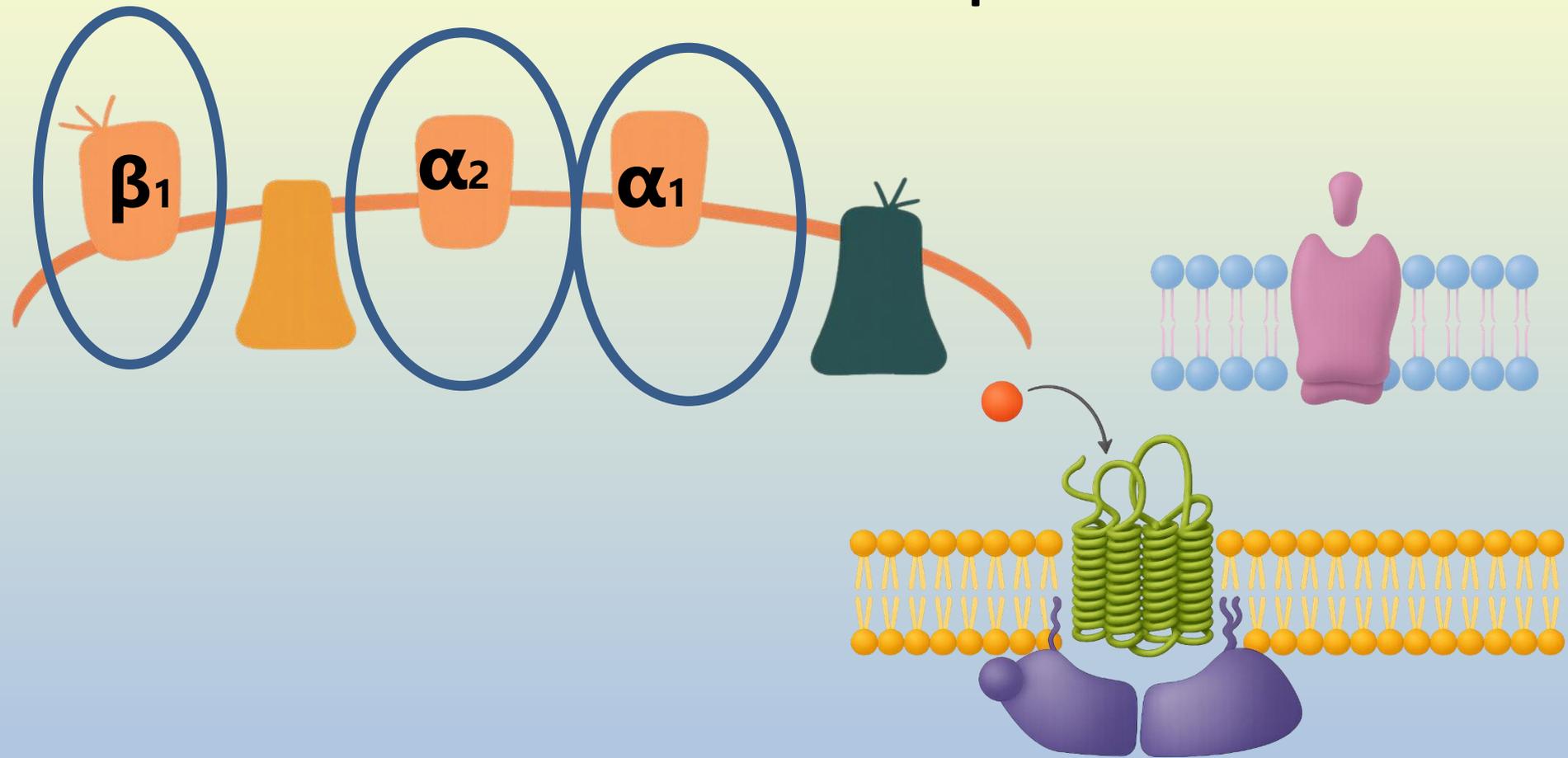
**Bind and transport
specific molecules across
the membrane.**

**Glucose transporters,
amino acid carriers.**

Types of Carriers



7.2.3. Receptors

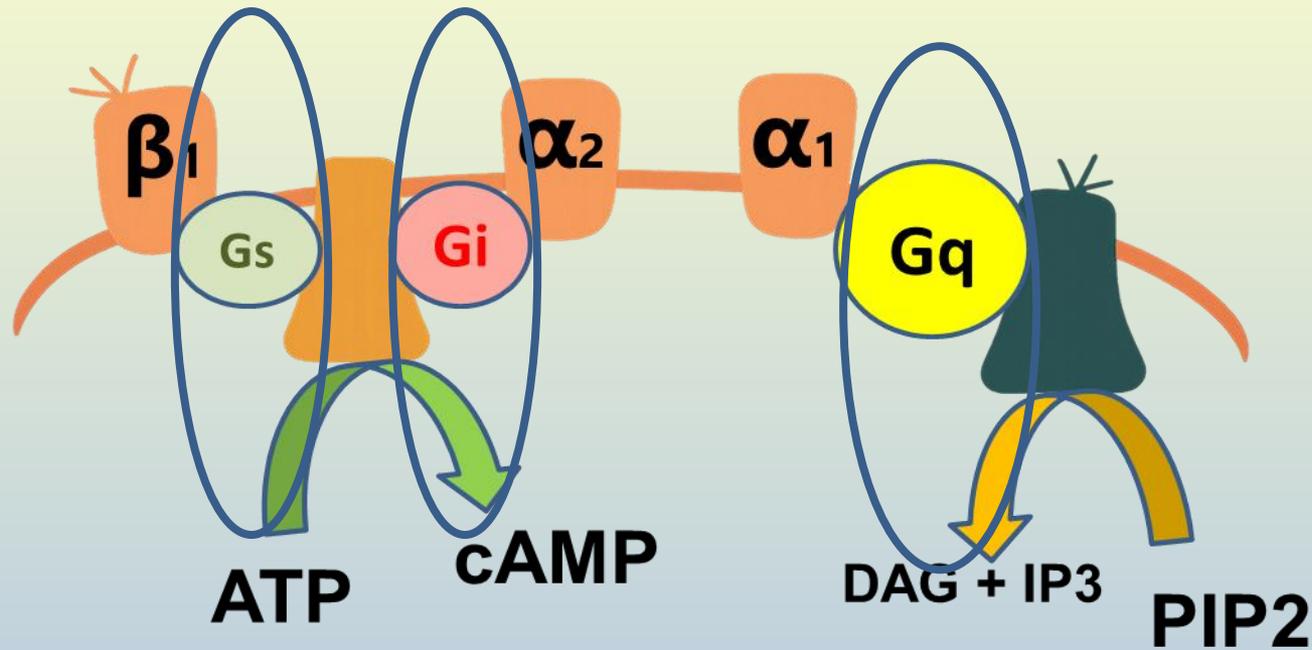


Receptors

Bind ligands and trigger cellular responses.

Example: Acetylcholine receptor activates Na^+ channels in muscle cells.

7.2.5. G Proteins

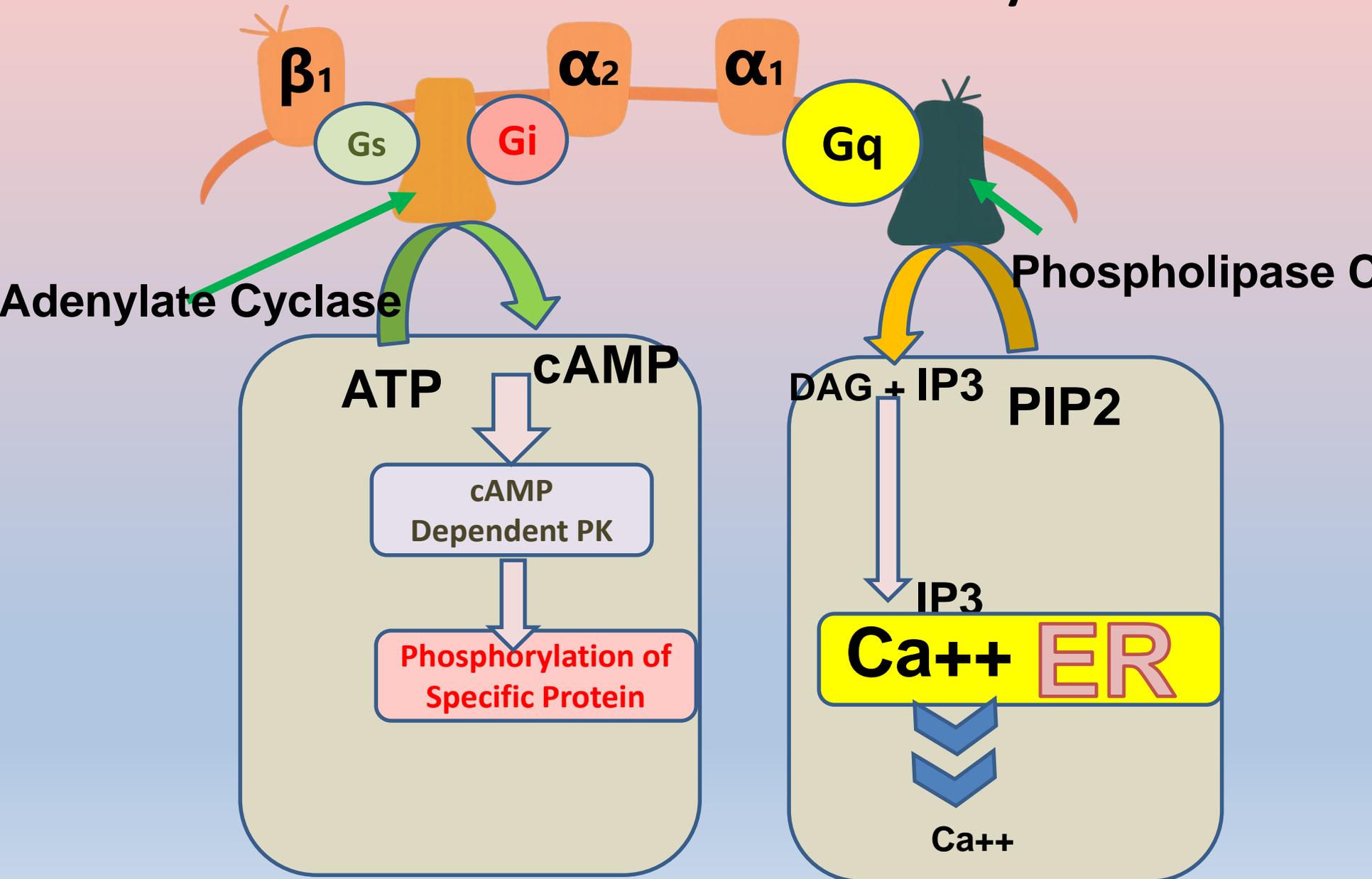


G Proteins

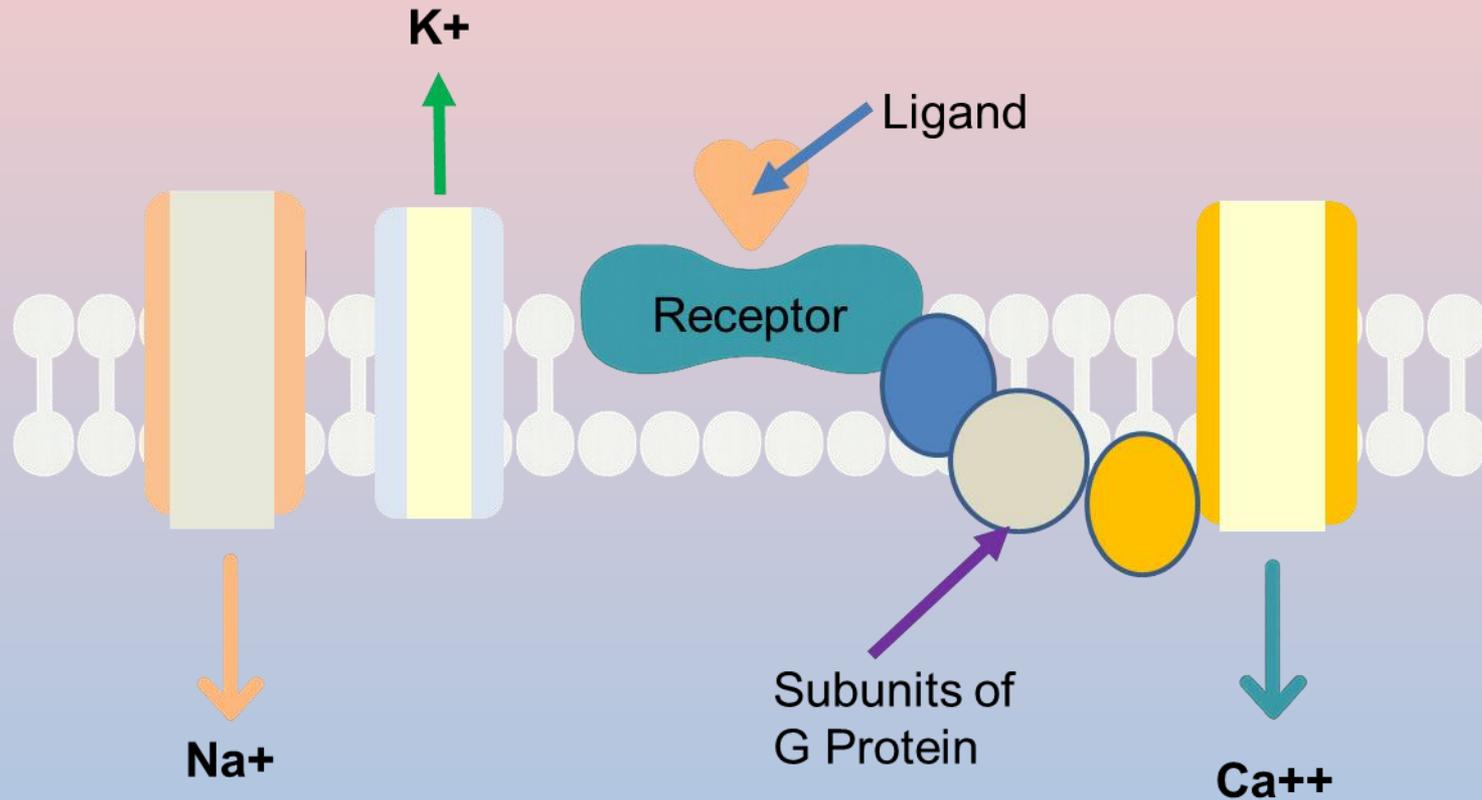
Act as molecular switches transmitting signals from receptors to intracellular pathways.

Involved in signal transduction mechanisms for ligands, and change activity of channels or enzymes

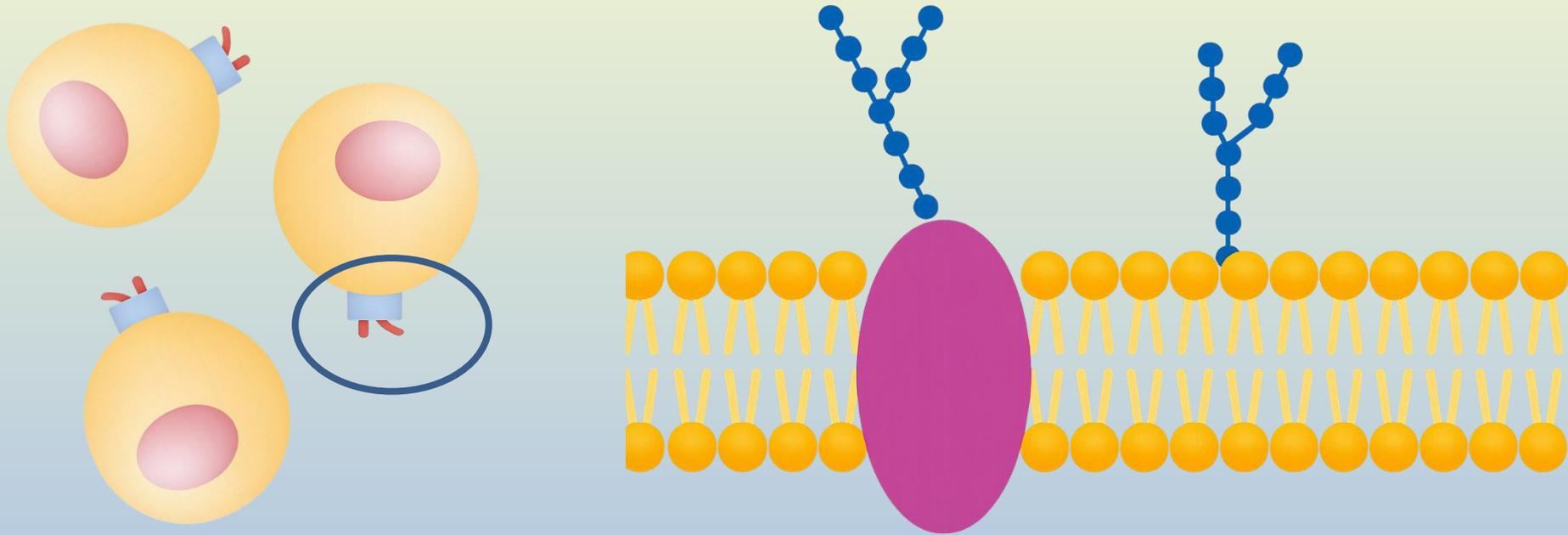
G Proteins linked to enzymes



G Proteins linked to Channels



7.2.6. Cell Identity Markers

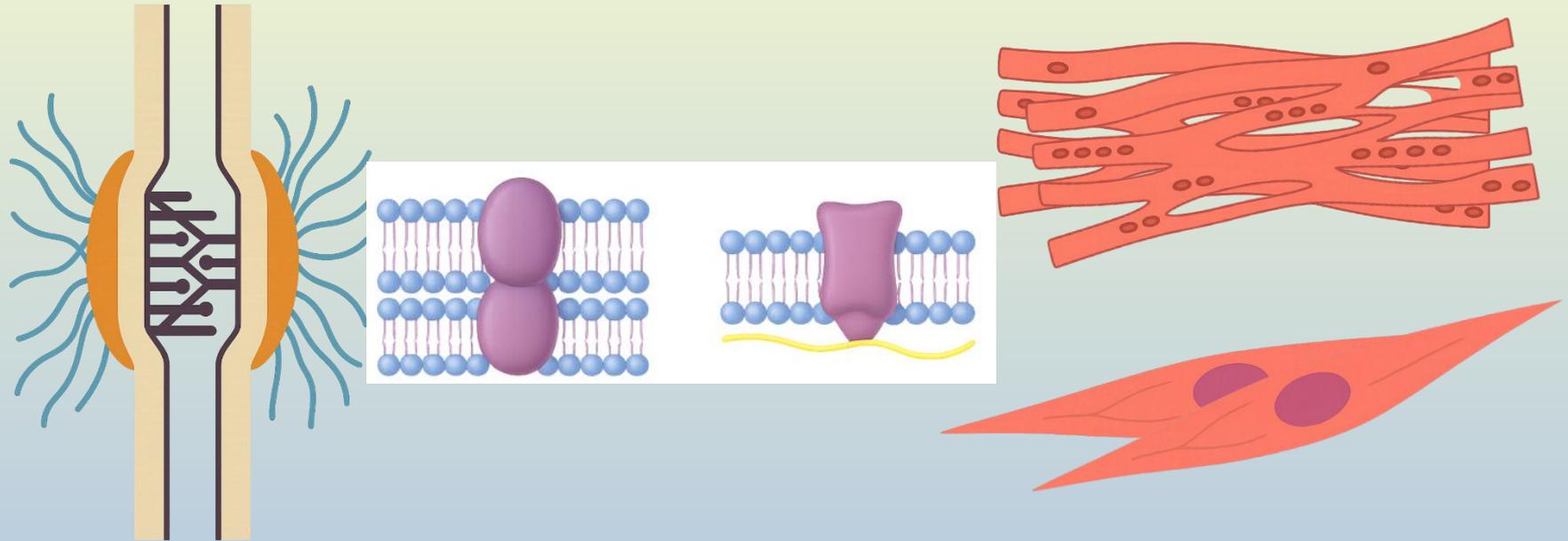


Glycoproteins

**Act as markers for
identification and
recognition by immune
cells.**

**Example: MHC proteins
as self antigens.**

7.2.7. Linkers and Junctions



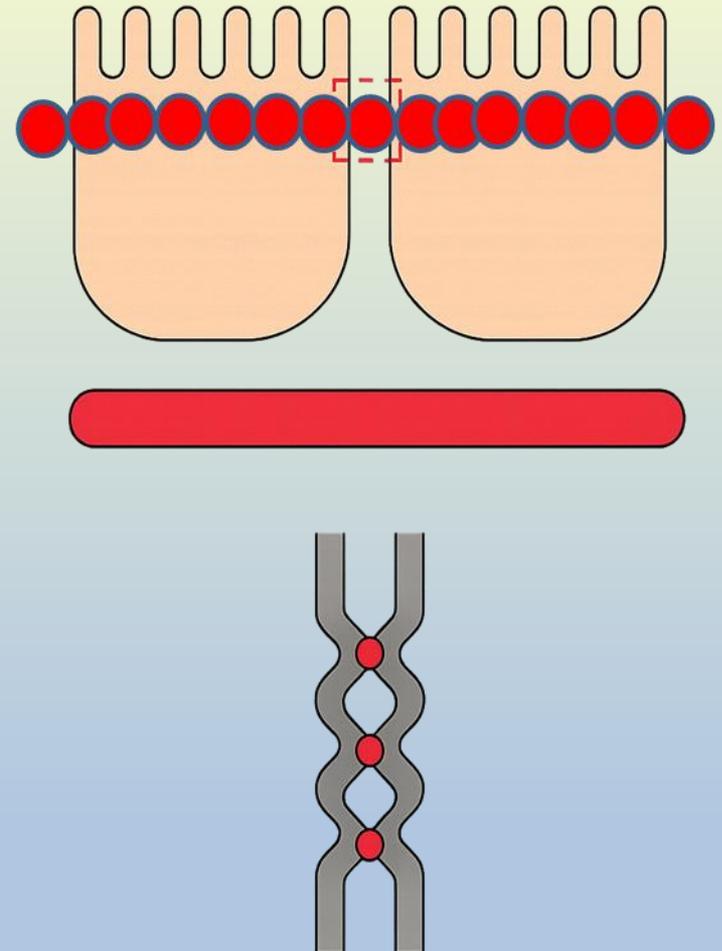
Linkers & Junctions

Provide structural integrity by connecting membrane to cytoskeleton and facilitate cell adhesion.

Junctions: like Tight junctions, Adhering junctions, Gap junctions.

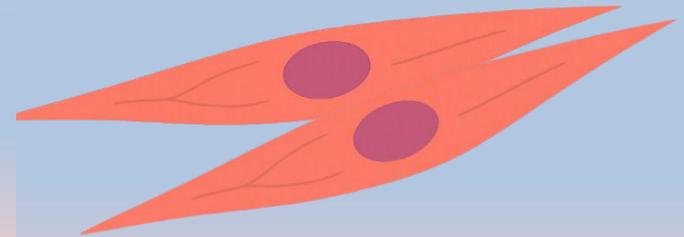
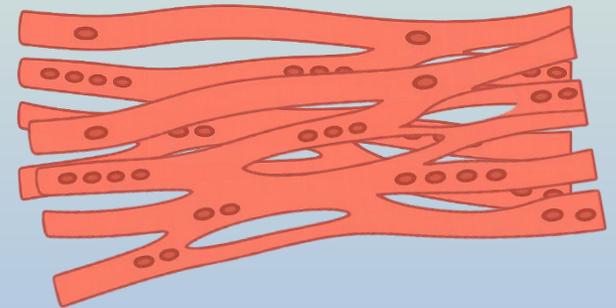
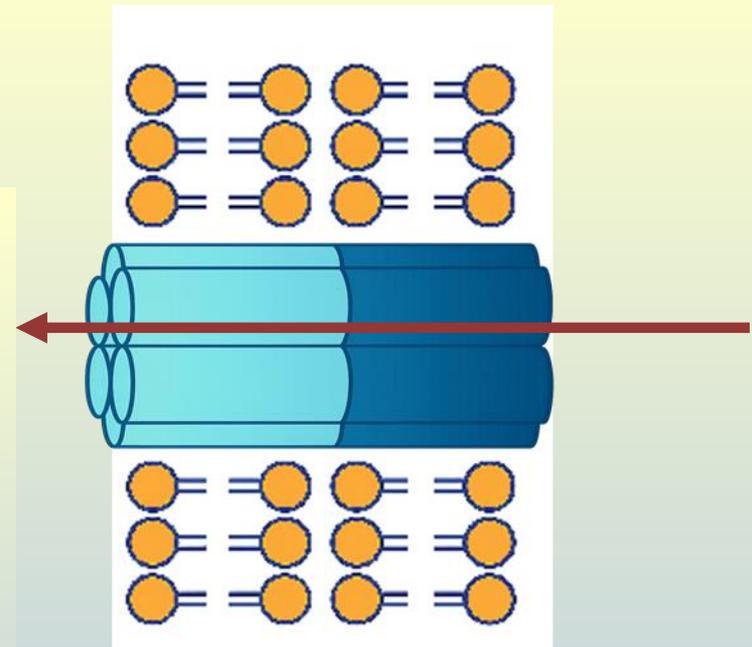
7.2.7.1. Tight Junction

Belt like structures that Join cells tightly and prevent passage of particles through the para-cellular space.



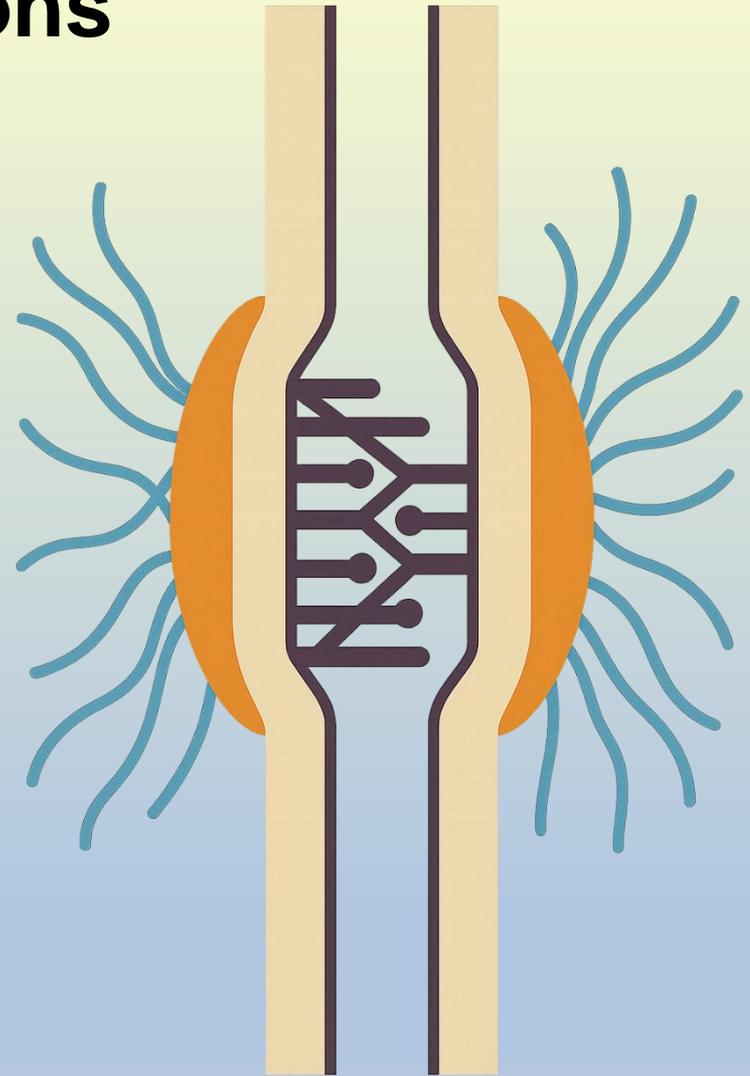
7.2.7.2 Gap Junctions

- Form **small tunnels** between cells allowing direct communication.
- Made of protein units called **connexons**.
- Permit passage of small ions and molecules.
- Important structures in **heart** and **smooth muscle** for synchronized activity (functional syncytium).



7.2.7.3 Adhering Junctions

- Composed of desmosomes
- Provide strong mechanical attachments.
- Protein filaments span a ~20 nm intercellular space.
- Resist stress in tissues such as skin and cardiac muscle.



Summary

- Collectively, organelles operate in a highly integrated manner, ensuring coordinated biochemical processes that sustain cellular viability and responsiveness.
- The plasma membrane's selective permeability ensures controlled movement of ions, nutrients, and waste products, contributing to electrical gradients, metabolic activity, and intercellular signaling.

Summary

- Understanding organelle structure and function is fundamental to explaining normal physiology and the pathogenesis of diseases arising from organelle dysfunction.
- Disruption of membrane integrity is associated with various pathological conditions, highlighting its clinical importance in cellular injury, inflammation, and immune responses. Understanding the structure and function of the plasma membrane is essential for comprehending fundamental physiological processes and the pathogenesis of numerous diseases.