

Membranes of the cell

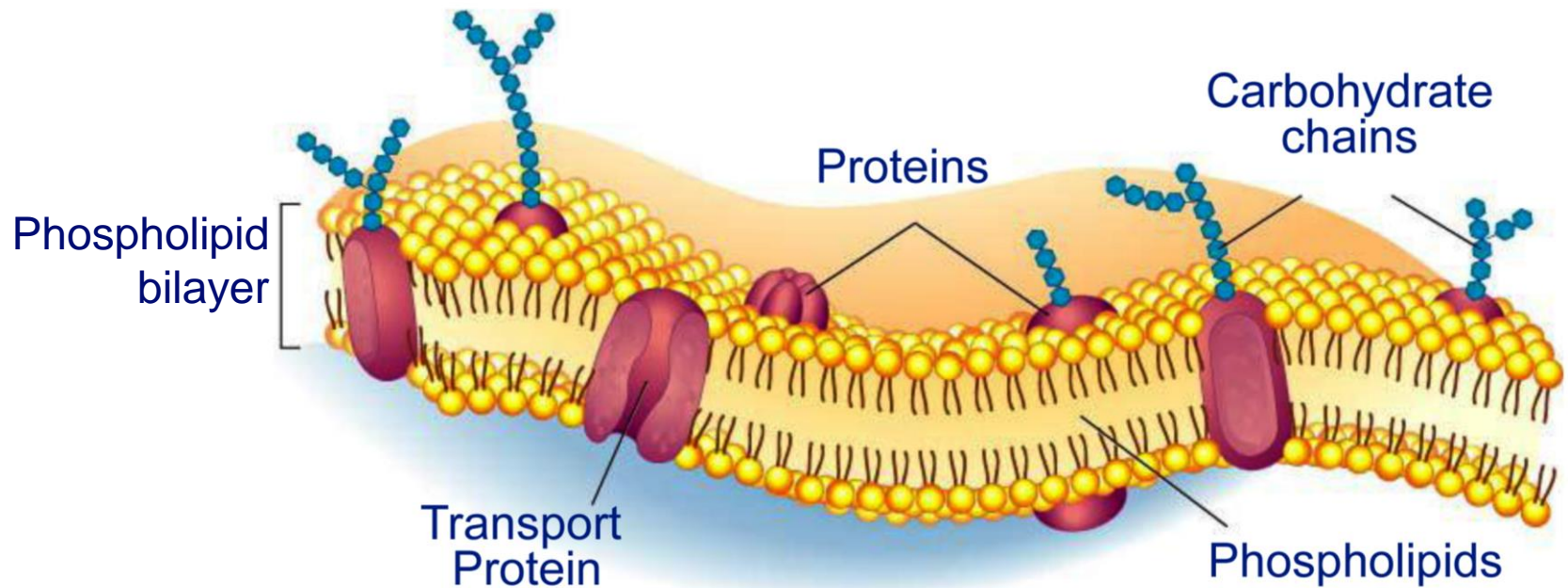


Cell membrane

- Thin semipermeable membrane
- Separates from & connects to the environment
- Selective transport of materials
- Signal transduction role: information flow with the help of /through the membrane (membrane receptors, membrane components in intracellular signal transduction)
- Connection site for cytoskeletal components → determination of the cell shape, cell-cell, cell-matrix junctions

The structure of biological membranes

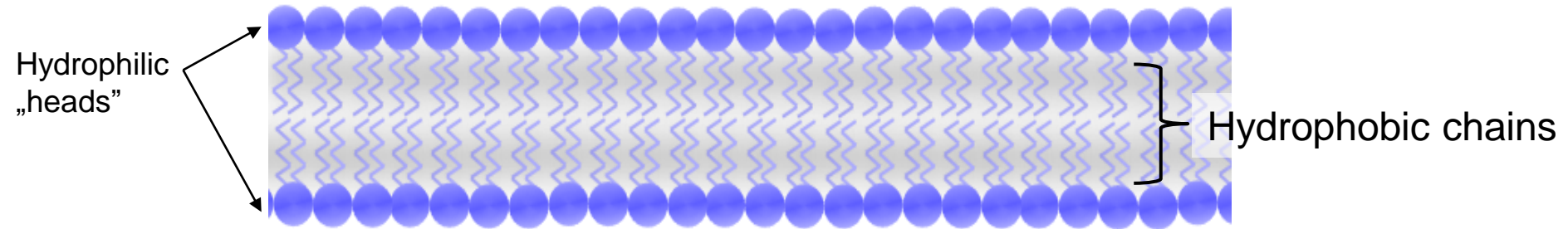
- Cell membrane & membrane organelles
- Phospholipid bilayer and embedded proteins (approx. 50%)
- Fluid mosaic model



Lipids of the membrane

Phospholipids: main constituent

- Bilayer: hydrophilic heads outside, hydrophobic tails inside



- The hydrophobic layer doesn't allow bigger hydrophilic molecules to pass through
- Phospholipid molecules can rotate, and move laterally (2 dimensional fluid) → flexible membrane
- Glycerophospholipids (Phosphoglycerides) and sphingolipids (sphingomyelins) (in these latter the main component is not glycerol but sphingosine)

Lipids of the membrane

Glycolipids

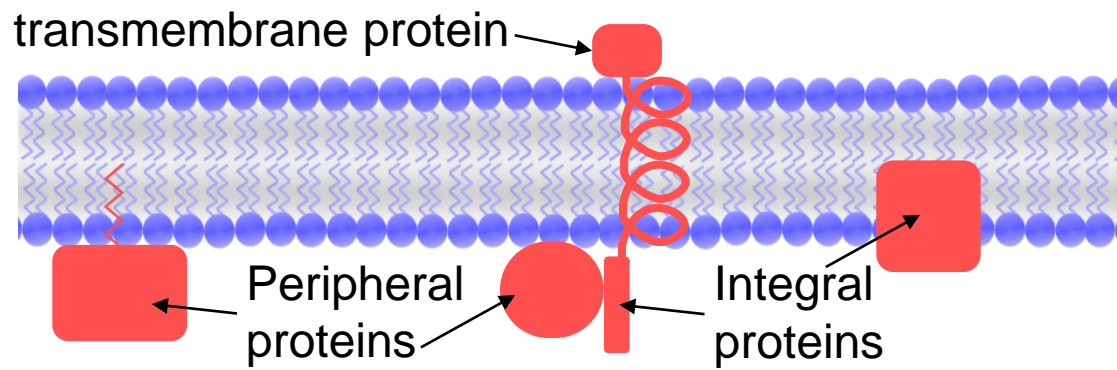
- A carbohydrate component (oligo- or monosaccharide) is linked to the hydrophilic part of the phospholipid
- Typically on the outer surface of the cell membrane
- Function as markers
- Eg.: ABO blood types

Cholesterol: steroid compound in eukaryotic membranes

- Its large hydrophobic part is inserted into between the fatty acid chains
- Provides stability and strengthens the membrane

Proteins of the membranes

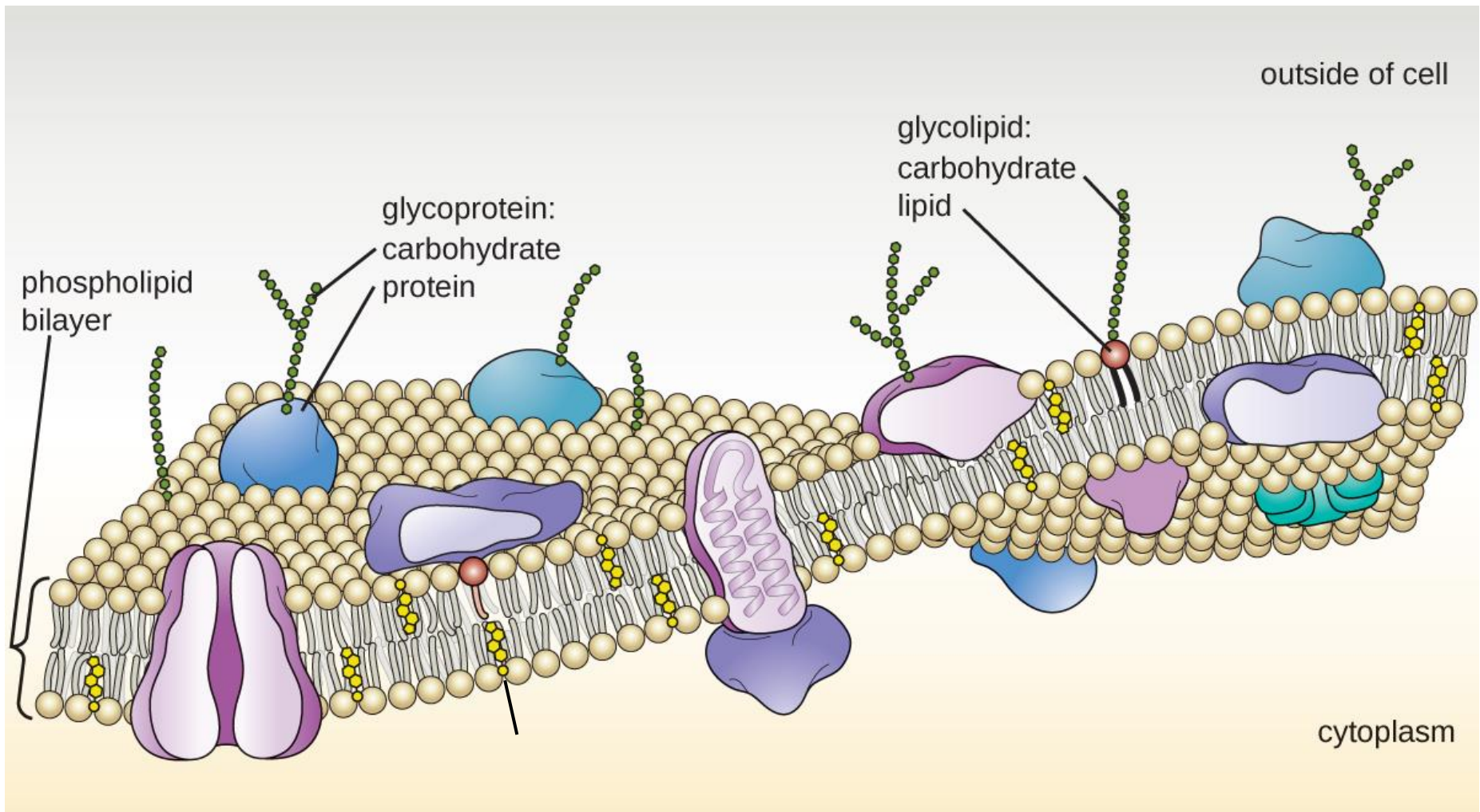
- Hydrophobic domain: in the hydrophobic membrane region in the middle; hydrophilic domain: outside of the membrane , can connect to hydrophilic phospholipid heads
- According to localisation:
 - Peripheral (on the inner/outer surface of the membrane)
 - Integral: inside the lipid (bi)layer
 - Subgroup: transmembrane protein: reaches through the membrane (it has a hydrophobic alpha helix inside there)



Proteins of the membranes

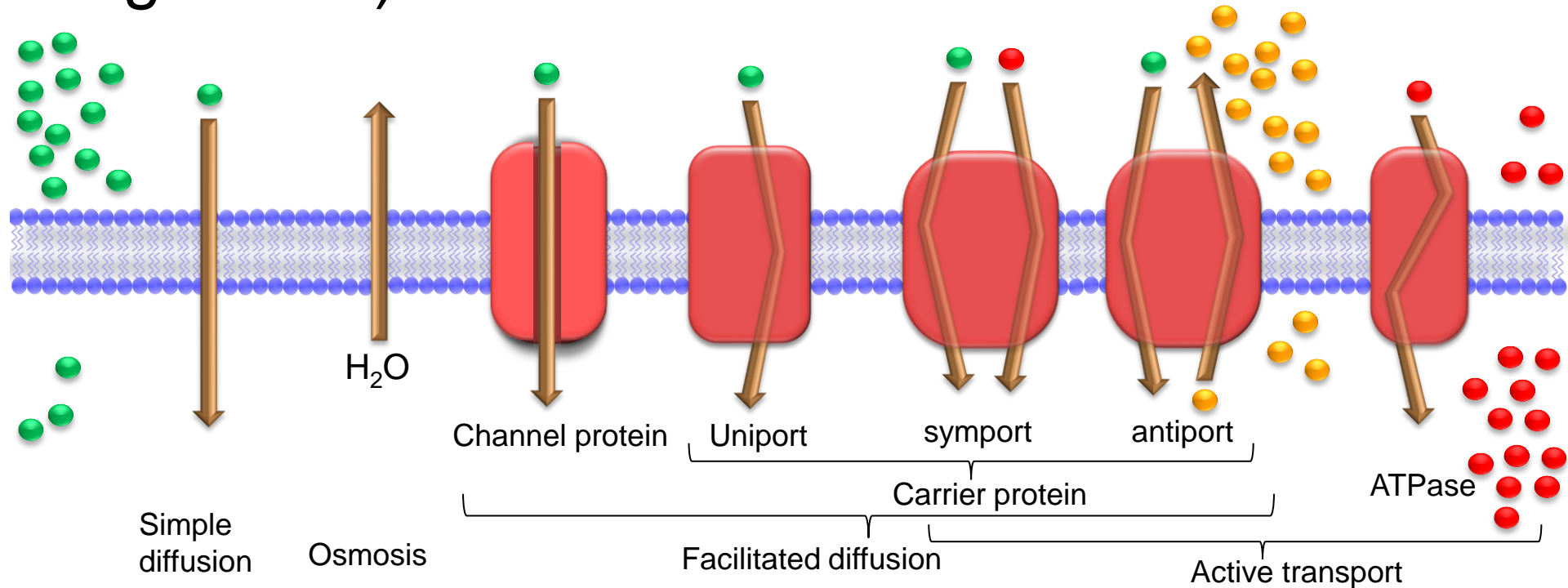
- Often glycoproteins (an oligosaccharide component is connected to the proteins, eg. mostly on the outer surface of the cell membrane): as markers (eg. Rh blood group), cell-cell connections, etc.
- According to function:
 - Transport proteins
 - Channel proteins
 - Carrier proteins
 - Pumps (ATP-ases)
 - Receptor proteins
 - Markers and recognition proteins
 - Enzymes
 - Cell adhesion molecules (cell- EC matrix, cell-cell connections; also connecting to the cytoskeleton)

The structure of the cell membrane



Transport through the membrane

- Passive transport: along the concentration gradient, no extra energy required
- Active transport: against the concentration gradient, extra energy is required(ATP or ion gradient)



Example: glucose transport in epithelial cells of the small intestine

