AL-MUSTAQBAL UNIVERSITY COLLEGE

Department of Biomedical Engineering

Biochemistry

(Structure of biological membrane)

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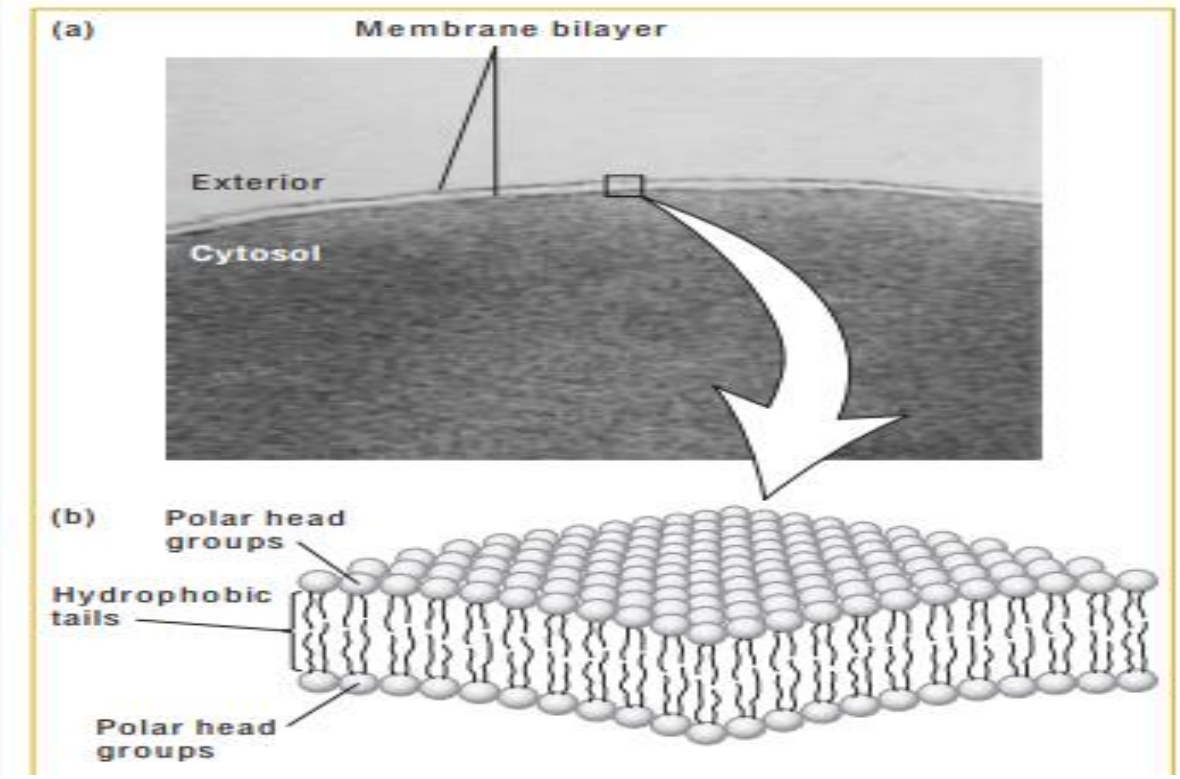
The cell membrane

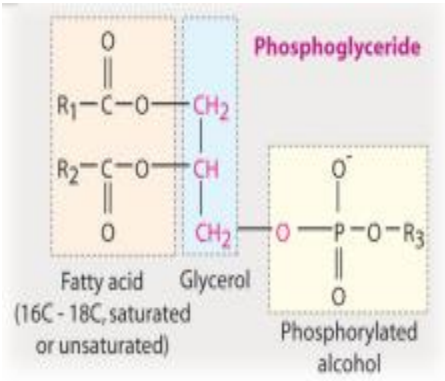
is a thin membrane that, with several other compounds, forms a protective and insulating wall that prevents the leakage of unwanted substances into the cell, and regulates the concentration of salts inside and outside the cell, which contributes to maintaining a healthy chemical and electrical balance inside it.

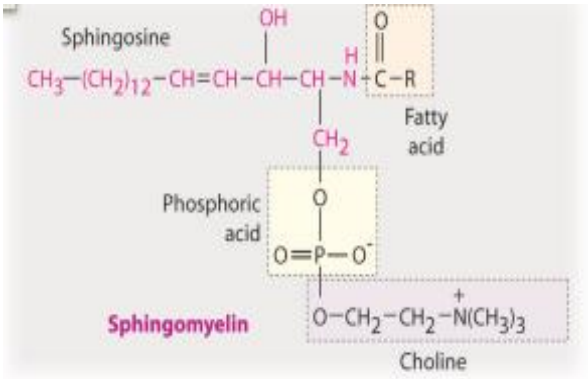
-The cell membrane separates the inner lining of the cell from the outer periphery of the cell, and is characterized by being highly flexible and capable of stretching and stretching if mechanical forces act on it. In the event that the membrane is subjected to a strong pressure force, it may rupture, but it quickly rebuilds itself again.

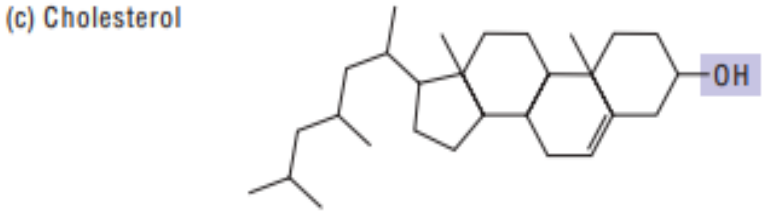


Membrane Composition

The major membrane lipids are phospholipids, glycosphin golipids, and cholesterol







Cholesterol is also present in the cell membrane, where it plays an important role in determining membrane fluidity

BIOLOGICAL MEMBRANES CONTAIN PROTEINS AS WELL AS LIPIDS:

- Proteins are 20-80% of cell membrane

- Rest is lipid or carbohydrate; supramolecular assembly of lipid, protein and carbohydrate

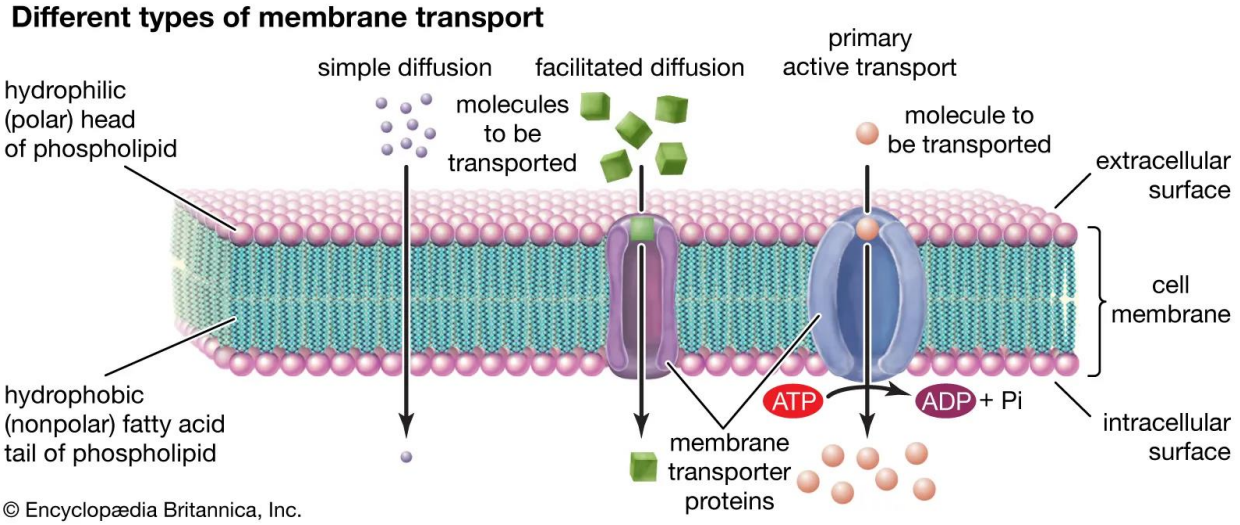
- Proteins are also distributed asymmetrically

- TWO classes of Membrane Proteins:

o Integral Membrane Proteins

o Peripheral Membrane Proteins

Functions of cell membrane proteins;



1-As channels through which some substances travel to and from the cell

2- The connection between the cytoskeleton and the cell membrane by association with microfilaments is one of the components of cytoskeleton

3- intercellular adhesion whereby the membrane proteins of adjacent cells can bind together

4- Cellular recognition wherein the glycoproteins that are located on the outer surface of the cell membrane are formed

Sites that identify a quality that other cells recognize

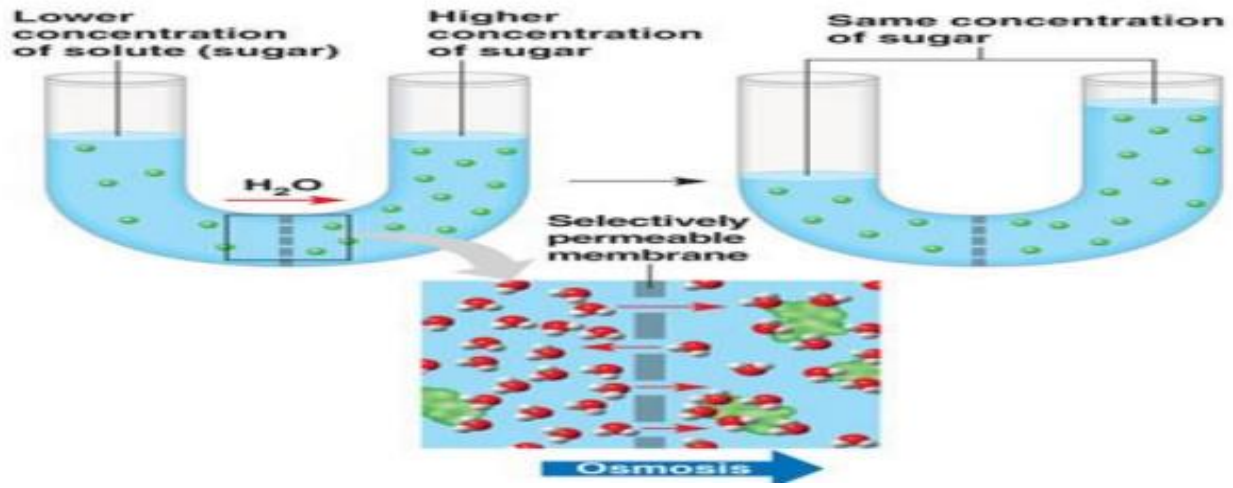
5- Receptors contain binding sites in special shapes to which some chemical compounds are specifically attached

Mechanisms of transport of substances across the cell membrane;

- ❑ passive transmission
- ❑ Efficient Transportation

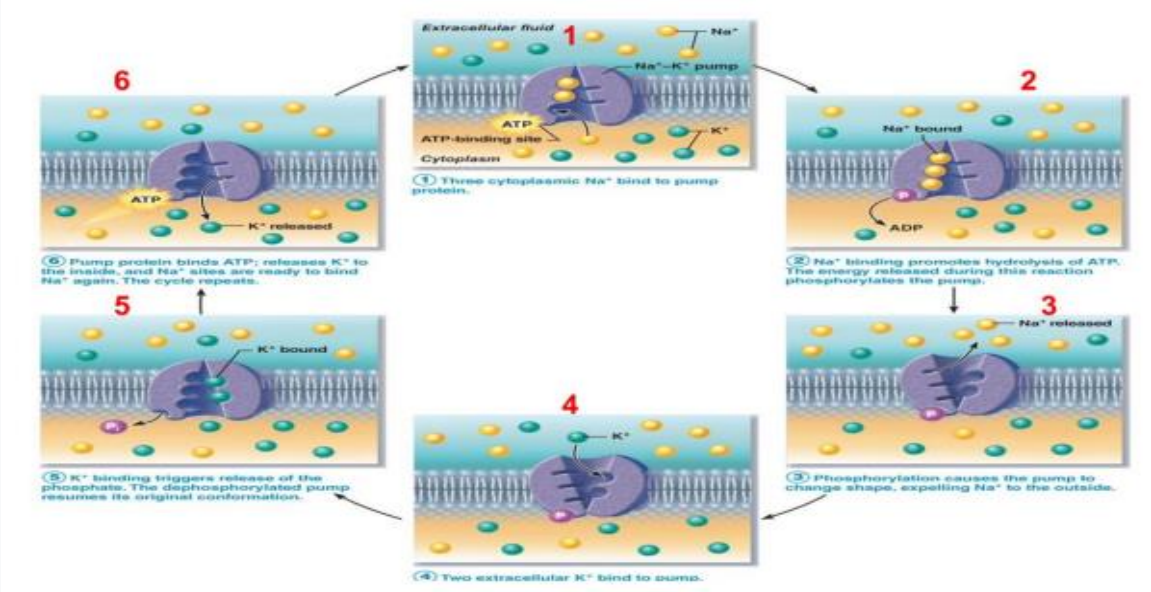
passive transfer:

A few substances, such as glycerol, can cross the plasma membrane by passive diffusion, often called diffusion or simple diffusion, is the process in which molecules move from a region of higher concentration to one of lower concentration. The rate of passive diffusion is dependent on the size of the concentration gradient between a cell's exterior and its interior. A fairly large concentration gradient is required for adequate nutrient uptake by passive diffusion (i.e., the external nutrient concentration must be high while the internal concentration is low) and the rate of uptake decreases as more nutrient is acquired unless it is used immediately. Very small molecules such as H2O, O2, and CO2 often move across membranes by passive diffusion. Larger molecules, ions, and polar substances must enter the cell by other mechanisms.



Effective transportation

Active transport requires energy (ATP) and depends on transmembrane transport proteins to transport soluble substances in reverse
The gradient of its concentration, i.e. from the side of its low concentration to its high concentration, the sodium pump - Potassium is one of the transport systems operating in this way.



How does the sodium-potassium pump work?

1 - 3 sodium ions bind to the sodium-potassium pump 2 - sodium binding induces phosphorylation by ATP 3 - phosphorylation results in a change in the protein's shape that leads to the excretion of sodium out of the cell 4 – binds Extracellular potassium with protein 5 - potassium binding induces dephosphorylation of the phosphate group
The protein returns to its original form 6- Potassium ions are pumped into the cell and become sites of Sodium is ready to bond to sodium ions again