Faculty of Medicine

Histology Department

PLASMA MEMBRANE

Lecture 4

In

Block 102PMS

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Plasma Membrane

Learning objectives (*Lecture 4*)

After the lecture, students should be able to:

- Identify the components of the cell.
- Describe the structure of plasma membrane.
- Recognize the role of transmembrane proteins in membrane transport.
- Identify endocytosis & exocytosis.

Cells are the structural and functional units (the smallest living parts) of the body.

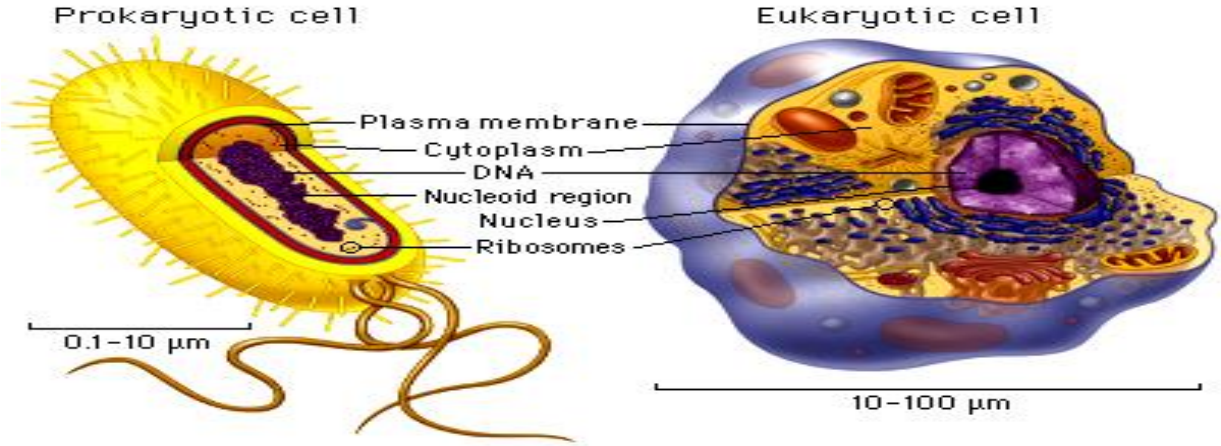
***Cells can be eukaryotic or prokaryotic:**

Eukaryotic cells (eu = true) (e.g. human & animal cells):

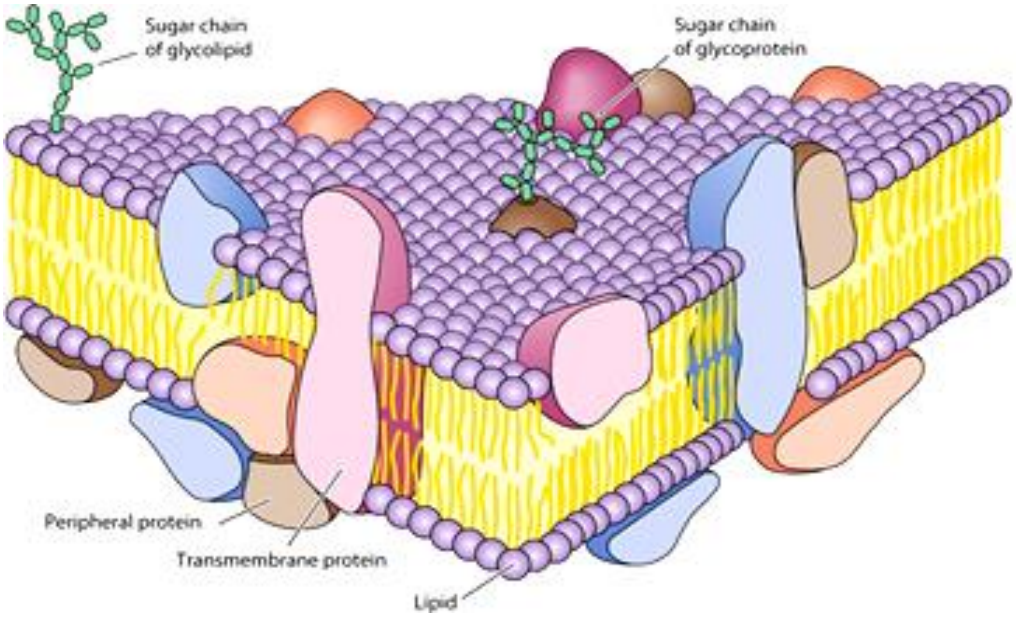
a. **Are larger than prokaryotic cells.**
b. **Have plasma membrane that defines the outer limit of the cell.**
c. **Have a definite membrane-limited nucleus.**
d. **Their cytoplasm contains membrane-limited organelles.**

Prokaryotic cells (karyo = nucleus) (e.g. bacteria):

a. **Are smaller cells.**
b. **Have cell wall outer to the plasma membrane.**
c. **Lack nuclei.**
d. **Lack membrane-limited organelles.**



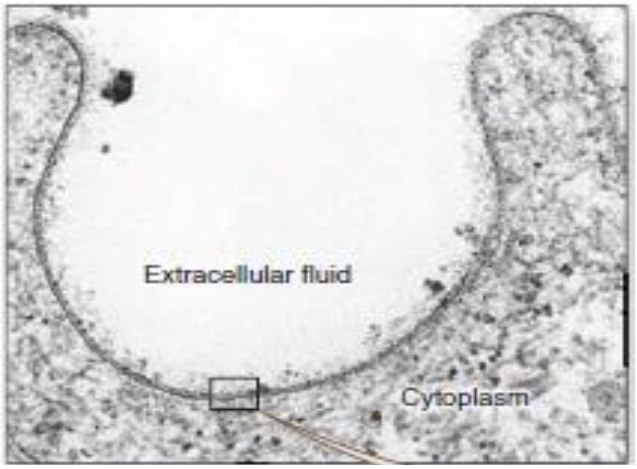
Plasma Membrane



***The plasma membrane (also called plasmalemma) envelops every eukaryotic cell & defines its outer limit.**

***Membranes range from 7.5-10 nm in thickness and so, they are visible <u>ONLY</u> in the electron microscope (E.M.).**

***With E.M., the plasma membrane has *a trilaminar appearance* with two dark outer lines enclosing a light band in between.**



***Plasma membrane consists of *lipids, proteins and carbohydrates*.**

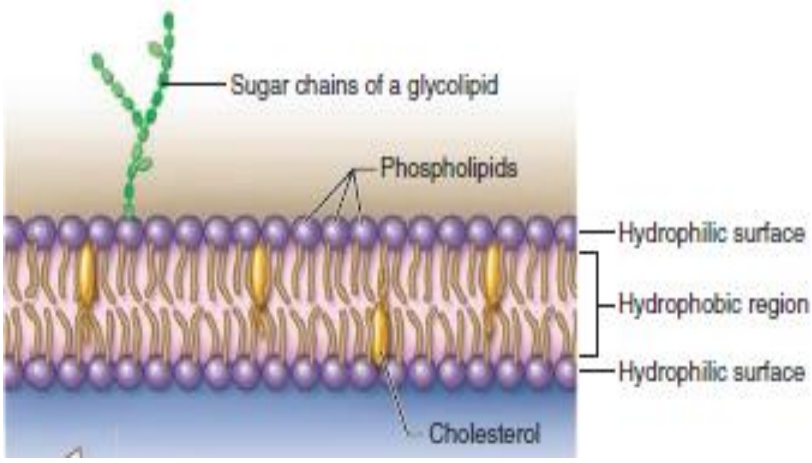
➢ Membrane Lipids

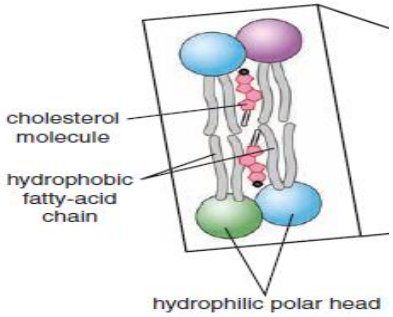
Plasma membrane has phospholipids & cholesterol as their major lipid components:

1. Phospholipids are organized into a double layer (bilayer) with their hydrophilic heads form each membrane surface and their hydrophobic chains located in the middle of the membrane.

2. Cholesterol molecules insert among the closely packed phospholipids, restricting the movement of phospholipids.

***Some lipid molecules have externally exposed oligosaccharide chains forming glycolipids which contribute to the *cell's glycocalyx*.**





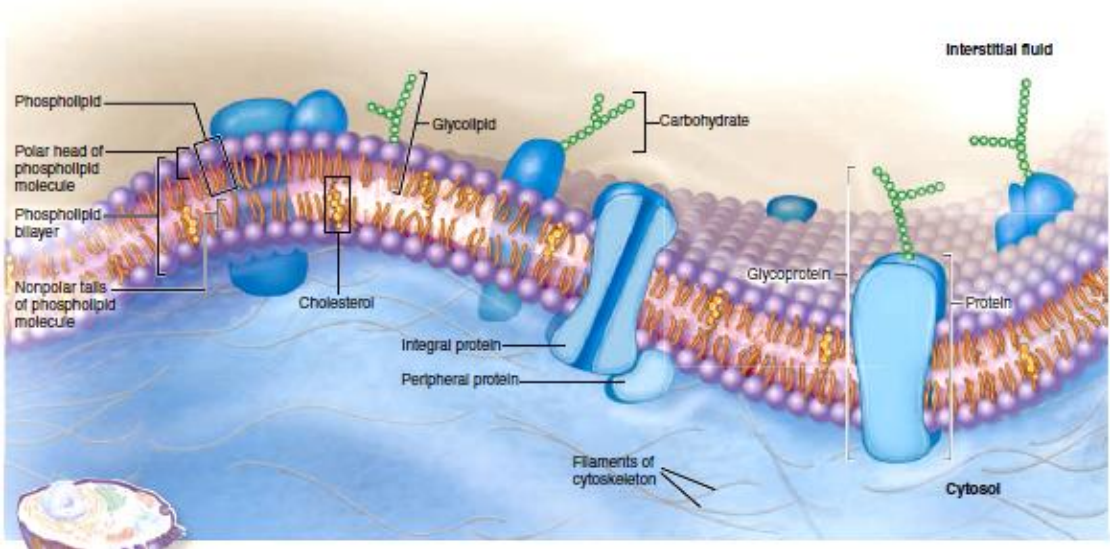
➢ Membrane Proteins

There are two types of proteins in the plasma membrane:

1. Integral proteins are directly incorporated within the phospholipid bilayer. When these proteins completely span the bilayer, they are called *transmembrane* proteins.

2. Peripheral proteins are loosely associated with one of the two membrane surfaces, particularly on the cytoplasmic side.

***Some protein molecules have externally exposed oligosaccharide chains forming glycoproteins which contribute to the *cell's glycocalyx*.**



➢ Membrane Carbohydrates

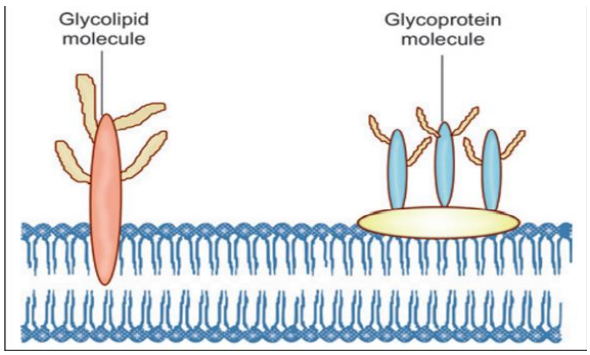
Are oligosaccharide chains linked to lipid & protein molecules and extend outward from the plasma membrane forming the cell's glycocalyx.

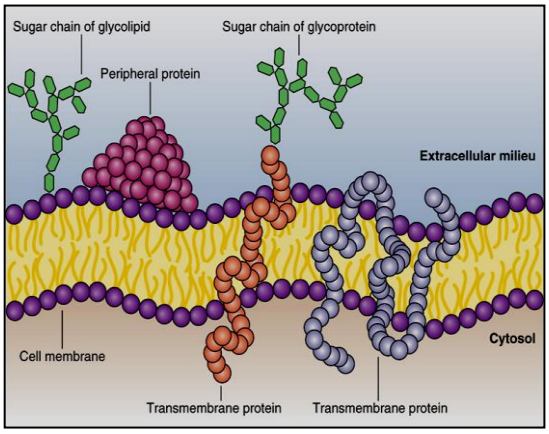
What is *the cell's glycocalyx* (cell coat)?

It is a delicate cell surface coating. It is formed of oligosaccharide chains attached to both lipid and protein components of plasma membrane and exposed at the external membrane surface.

Functions of the cell coat:

- **It binds antigens and enzymes to the cell surface**
- **It facilitates cell–cell recognition and interaction.**





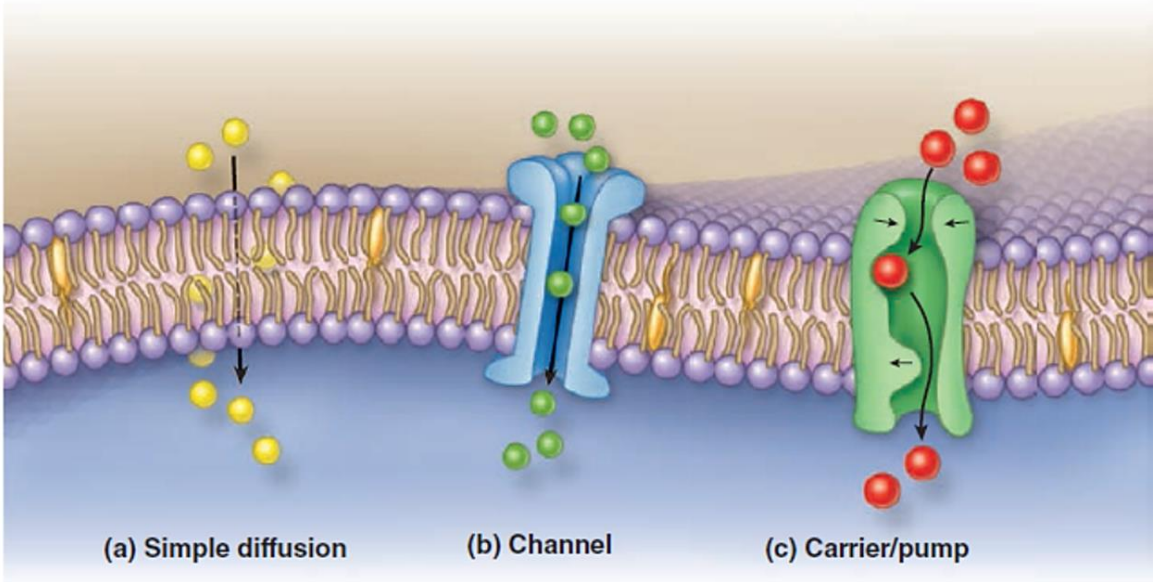
Transmembrane Proteins & Membrane Transport

- **The plasma membrane is the site where materials are exchanged between the cell and extracellular matrix (ECM).**
- **Some substances (fat-soluble and small, uncharged molecules) cross the plasma membrane by simple diffusion down their concentration gradient**

- **Membrane proteins serve as selective gateways for most small molecules entering the cell through:**

a. **Ion Channels are transmembrane proteins forming pores through which ions such as Na^+, K^+ and Ca^{2+} pass selectively.**

b. **Carriers are transmembrane proteins that bind specific molecules & deliver them to the other side of the membrane.**



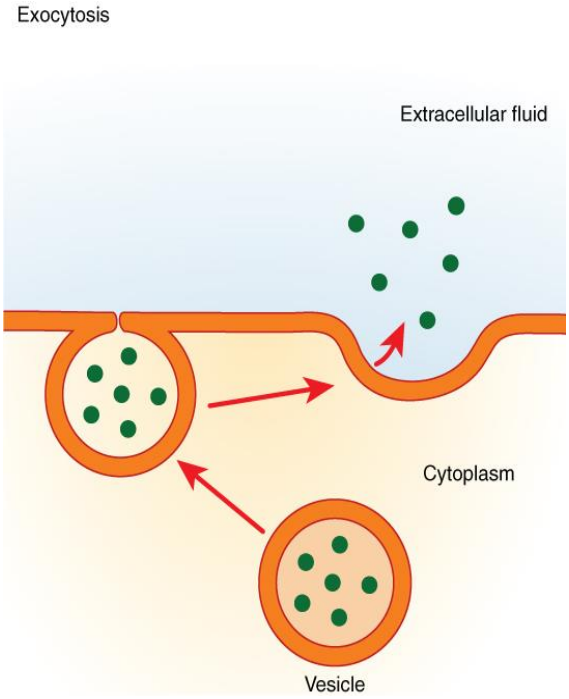
Exocytosis & Endocytosis

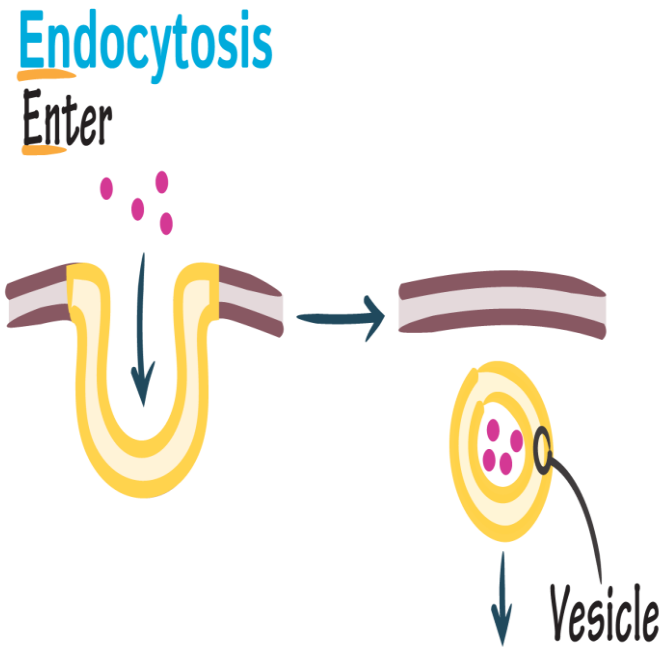
***Exocytosis:** **Means bulk movement of macromolecules out of the cell by fusion of secretory vesicles with the plasma membrane.**

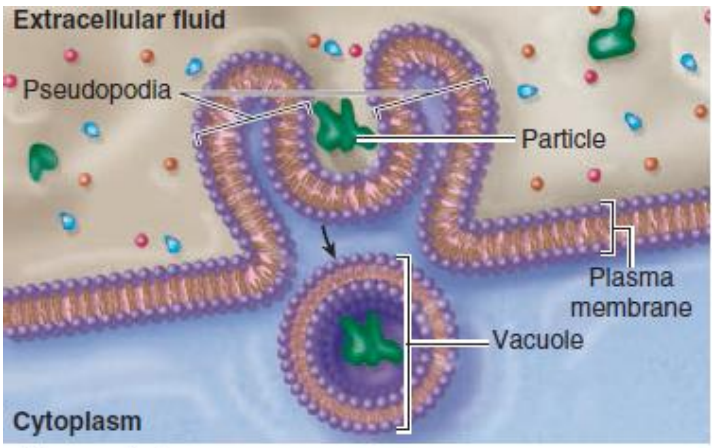
***Endocytosis**: **Means bulk movement of macromolecules into the cell by formation of vesicles at the plasma membrane. Endocytosis includes:**

1. **Phagocytosis: Is a type of endocytosis meaning the ingestion of particles (cell eating).**

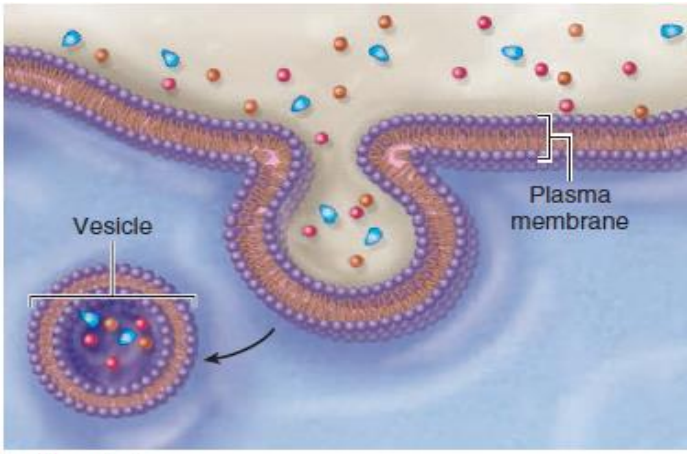
2. **Pinocytosis: Is a type of endocytosis in which extracellular fluid is taken up by the cell (cell drinking).**





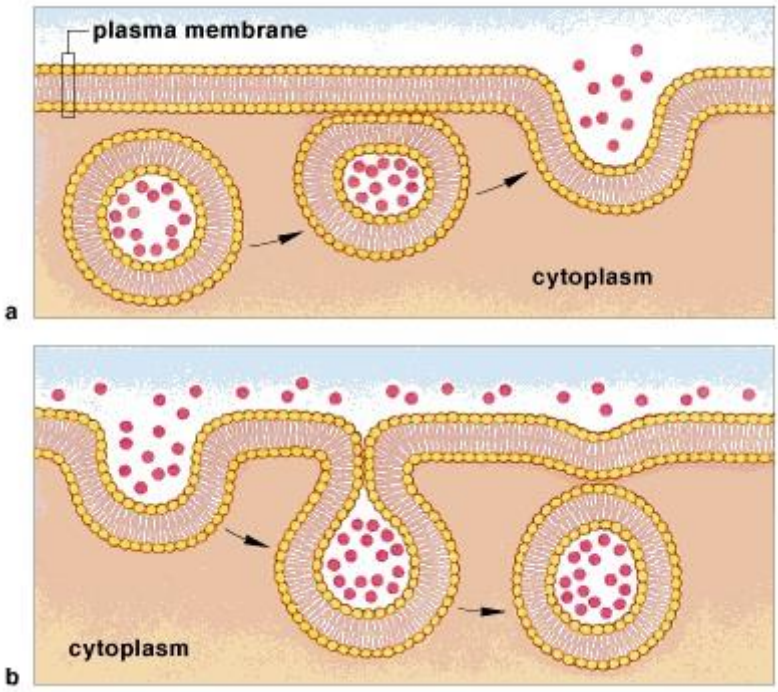


a Phagocytosis



b Pinocytosis

Identify process (a) & process (b)



Process (a) is ……

Process (b) is ……

Lecture References:

-Junqueira's Basic Histology: Text and Atlas 16th Edition.

Self-Assessment of Lecture 4

I- Complete the missing words:

1. **The cell lacking nuclei and membrane-limited organelles is ……. cell.**
2. **Oligosaccharide chains of glycolipids & glycoproteins constitute the ……..……**

II- Choose the correct answer:

1. Bulk movement of macromolecules into the cell by formation of vesicles is:

a- Exocytosis.

b- Endocytosis.

c- Receptors.

d- Channels.

2. …….. is loosely associated with one of the two membrane surfaces, particularly on the cytoplasmic side:

a- Lipid bilayer.

b- Cholesterol.

c- Integral protein.

d- Peripheral protein.