* The most important thing is to understand these details

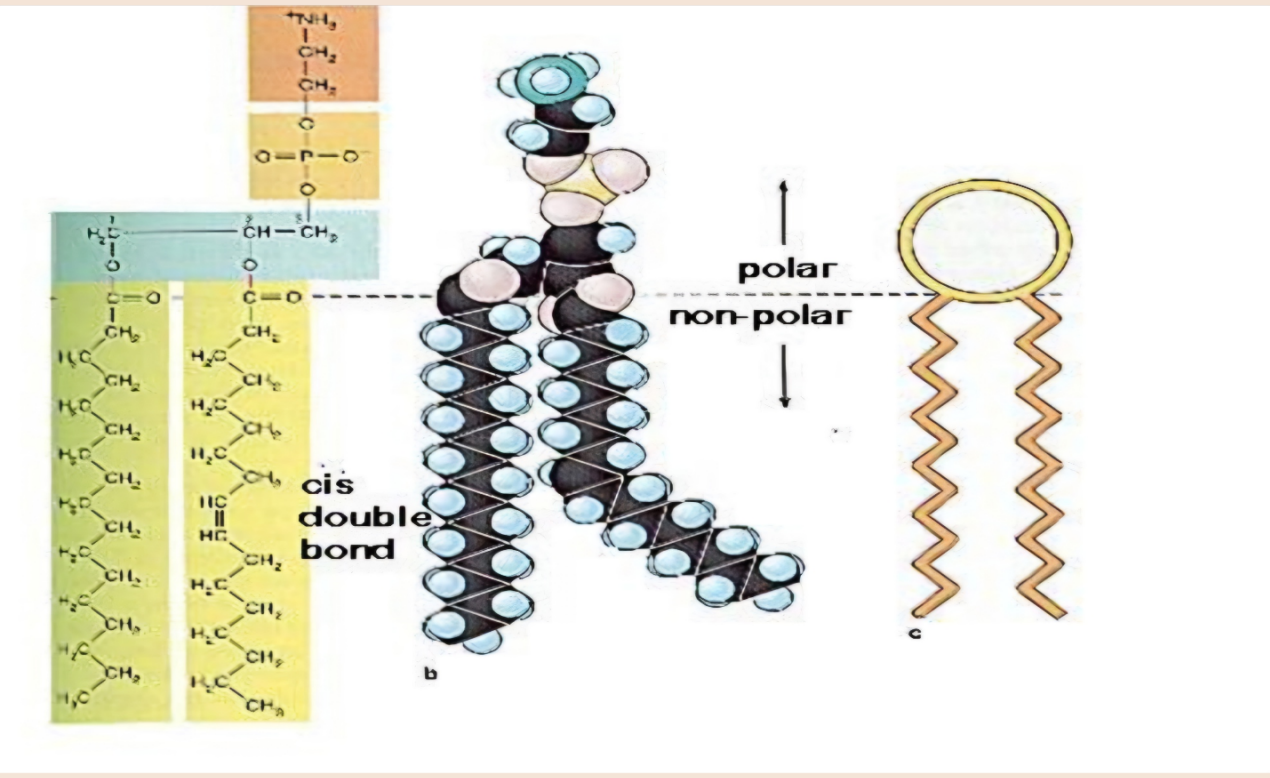
Cell membrane

Plasma membrane components

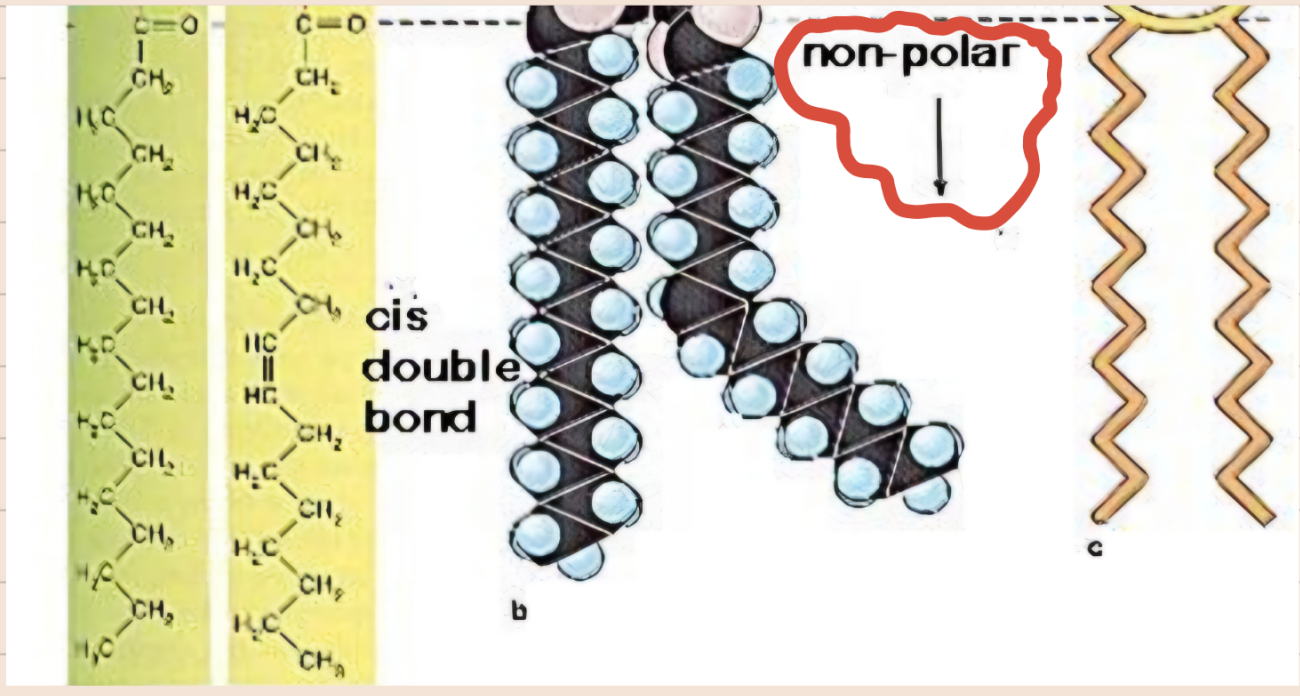
- Phospholipid Bilayer
- Integral proteins
- Peripheral Proteins
- Glycoproteins
- cholesterol

- Phospholipid Bilayer :-

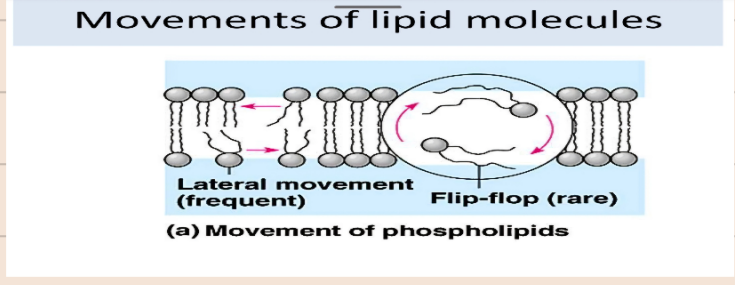
1- The phospholipids are arranged in a bilayer, with their polar, hydrophilic phospate heads facing outwards, and their non-polar, hydrophobic fatty acid tails facing each other in the middle of the bilayer.



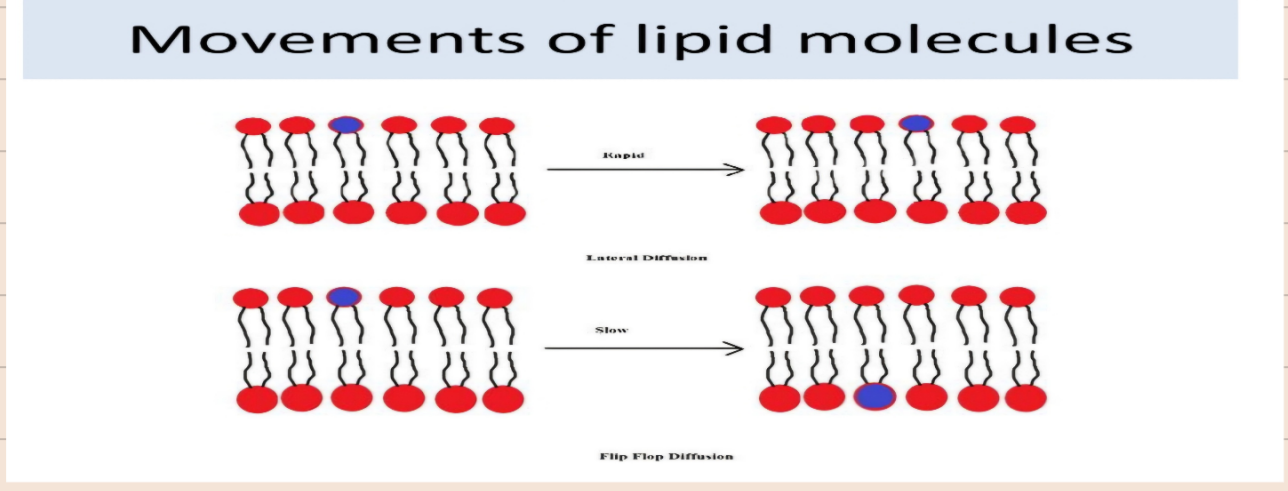
2- This hydrophobic layer acts as a barrier to all but the smallest molecules (Oxygen and Carbon Dioxide), effectively isolating the two sides of the membrane.



3- Phospholipids can exchange position in the horizontal plane but not the vertical.



* Two types of movements
  - Lateral → frequent
  - Flip-flop → rare



Lipids in plasma membrane: [Handout]

The plasma membrane is a lipid bilayer in which proteins are impeded. The most abundant of these lipids are phospholipids (P-Choline and P-Ethanol-amine). The molecule of phospholipid has a polar electrical head containing negative charge of phosphate group oriented towards the periphery and two nonpolar fatty acid tails oriented toward the center of the lipid bilayer. The electrical properties of phospholipids permit self assembly in a bilayer structure when found themselves in hydrophilic medium. At the normal body temperature of 37 degrees C the membrane is in fluid state.

- Integral proteins :-

1- Usually span from one side of the phospholipid bilayer to the other.

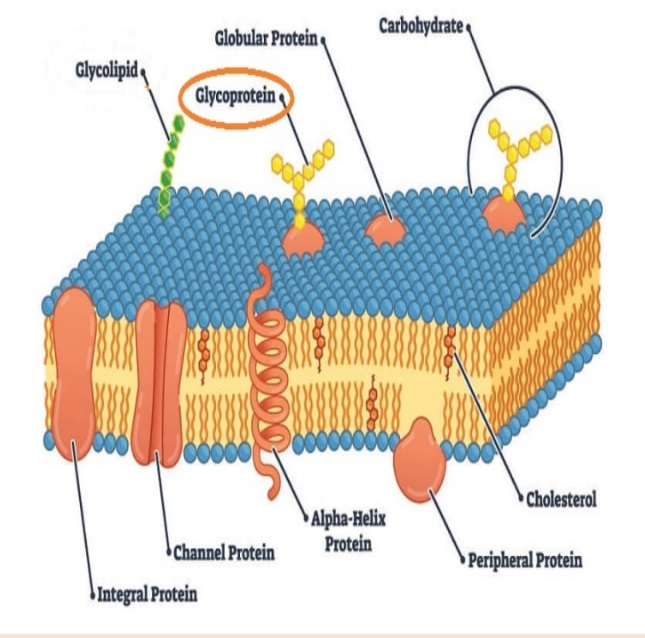
2- Proteins that span the membrane are usually involved in transporting substances across the membrane.

- Peripheral proteins :-

1- These proteins sit on one of the surfaces. They can slide around the membrane very quickly and collide with each other, but can never flip from one side to the other.

2- Proteins on the inside surface of plasma membrane are often involved in maintaining the cell's shape, or in cell motility.

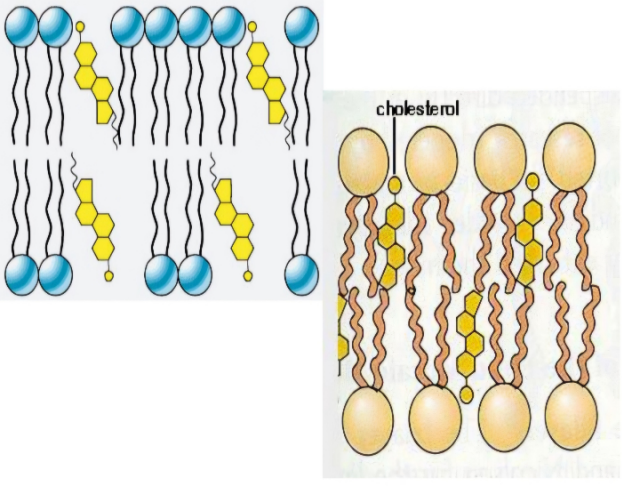
3- They may also be enzymes, catalysing reactions in the cytoplasm.



Glycoproteins:-

Usually involved in cell recognition which is part of immune system. They can also acts as receptors in cell signalling such as hormones.

Cholesterol in plasma membranes



-Cholestrol:-
(Binds together lipid in the plasma membrane reducing its fluidity as conferring structural stability.

Cholesterol in plasma membranes

- Increase integrity of cell membrane forming about 30% of the lipid bilayer structure.
- Cholesterol helps to separate phospholipids, so the fatty acid chains can't pack together and crystallize >> (important for keeping fluidity at low temperature).
- Maintaining flexibility and consistency of plasma membrane.

(at higher temperature decreasing fluidity and maintaining functional and healthy level of fluidity)

- Membrane fluidity :- the flexibility and movement of the cell membrane, which is crucial for its function.

* There are several factors influence membrane fluidity, including :-

1. Types of fatty acids → saturated / unsaturated
2. Temperature

[Handout]

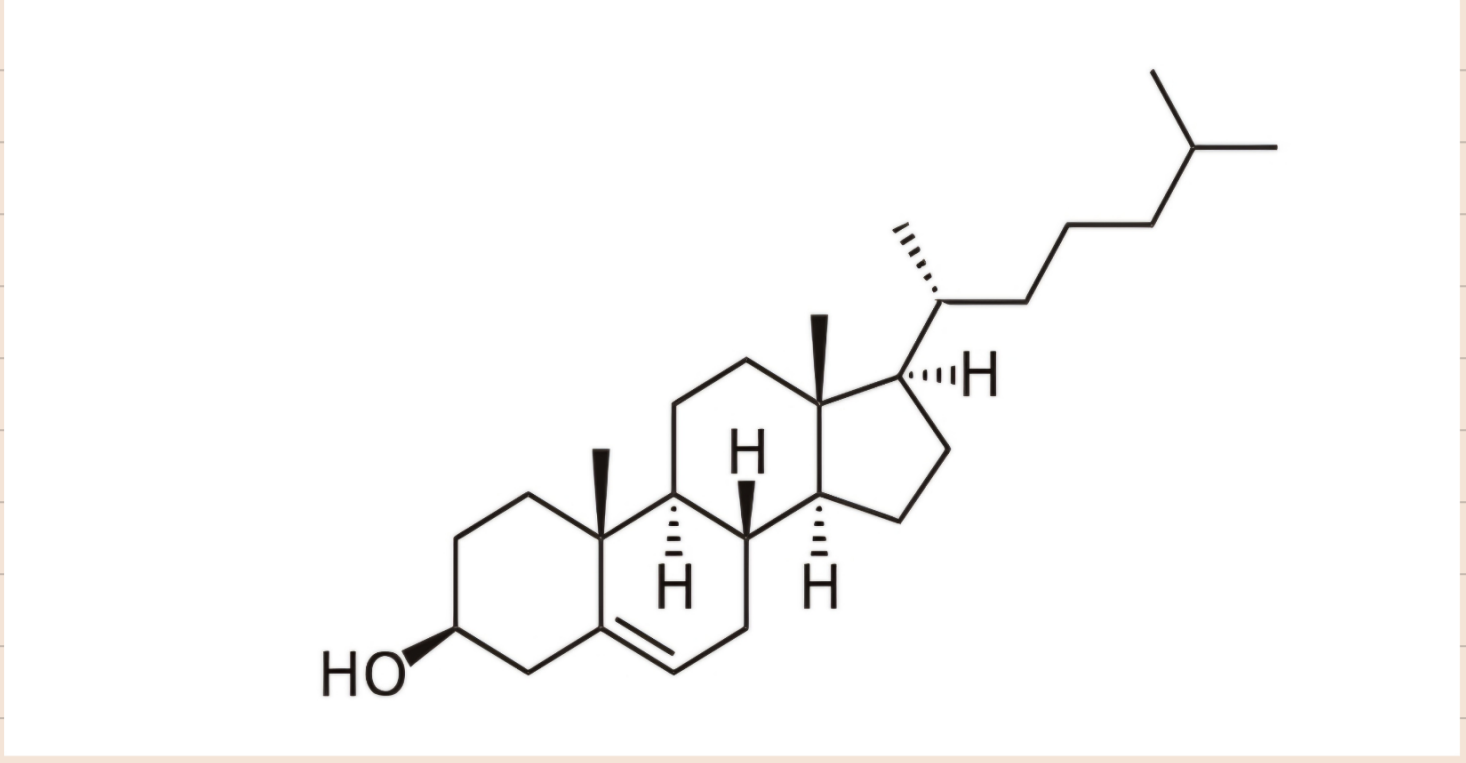
The arrangement of the fatty acid tails in phospholipids plays a crucial role in determining the characteristics of the membrane, particularly its fluidity. More unsaturated fatty acids content give more fluidity to membrane and higher cholesterol content prevents extremes in fluidity of plasma membranes.The saturated fatty acids lack double bonds and are therefore straight in shape. On the other hand, unsaturated fatty acids have one or more double bonds, resulting in a bent or kinked structure. The behavior of saturated and unsaturated fatty acid tails in phospholipids differs as the temperature decreases:

- At lower temperatures, the straight tails of saturated fatty acids can tightly pack together, creating a dense and relatively rigid membrane.- In contrast, phospholipids with unsaturated fatty acid tails cannot pack as tightly due to the bent structure of the tails. As a result, a membrane

composed of unsaturated phospholipids remains fluid at lower temperatures compared to one made up of saturated phospholipids.Most cell membranes consist of a combination of phospholipids, some with two straight (saturated) tails and others with one straight and one bent (unsaturated) tail.

3 Cholestrol

Animals possess an extra membrane constituent, apart from phospholipids, which aids in preserving fluidity. Cholesterol, a distinct lipid variety, is intricately interwoven within the phospholipids of the membrane, effectively reducing the impact of temperature fluctuations on fluidity.



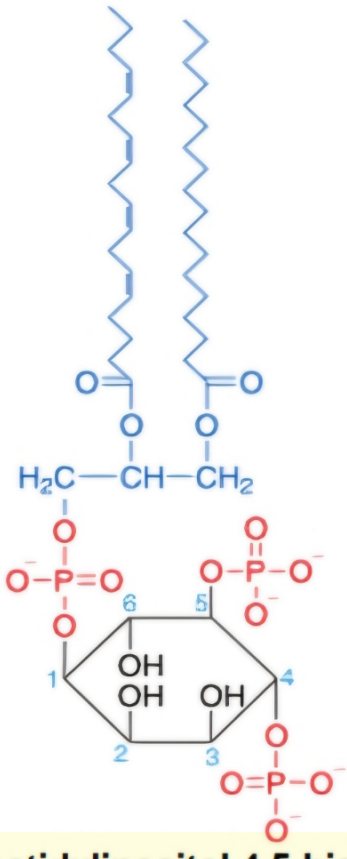
The chemical structure of cholesterol is depicted in a diagram,showcasing three hexagonal shaped rings and one pentagon shaped ring.An OH group is connected to the first hexagonal ring, while ahydrocarbon chain is attached to the pentagon shaped ring.

Cholesterol plays a crucial role in regulating the fluidity of phospholipids within a membrane. At lower temperatures, it prevents the phospholipids from tightly packing together, thereby increasing fluidity. Conversely, at higher temperatures, cholesterol reduces fluidity, ensuring that the membrane maintains a functional and healthy level of fluidity. Ultimately, cholesterol broadens the temperature range at which the membrane can effectively function.This lipid structure prevents water soluble molecules to pass through the bilayer, only lipid soluble substances can diffuse freely through the lipid membrane.

Functional Phospholipids in plasma membranes

Follow the Link:
https://en.wikipedia.org/wiki/Phosphatidylinositol_4,5-bisphosphate

Very important



Phosphatidylinositol 4,5-bisphosphate (PIP2)