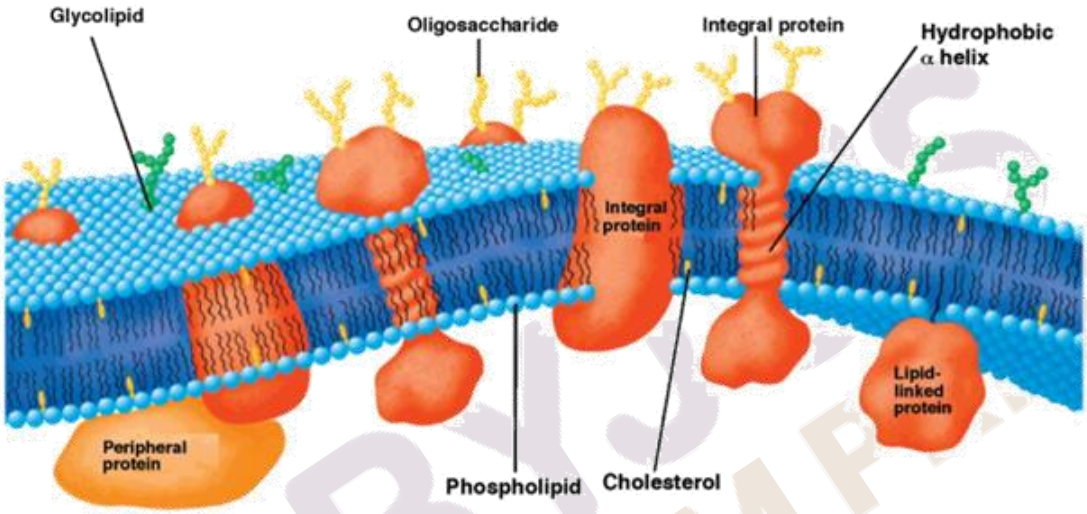
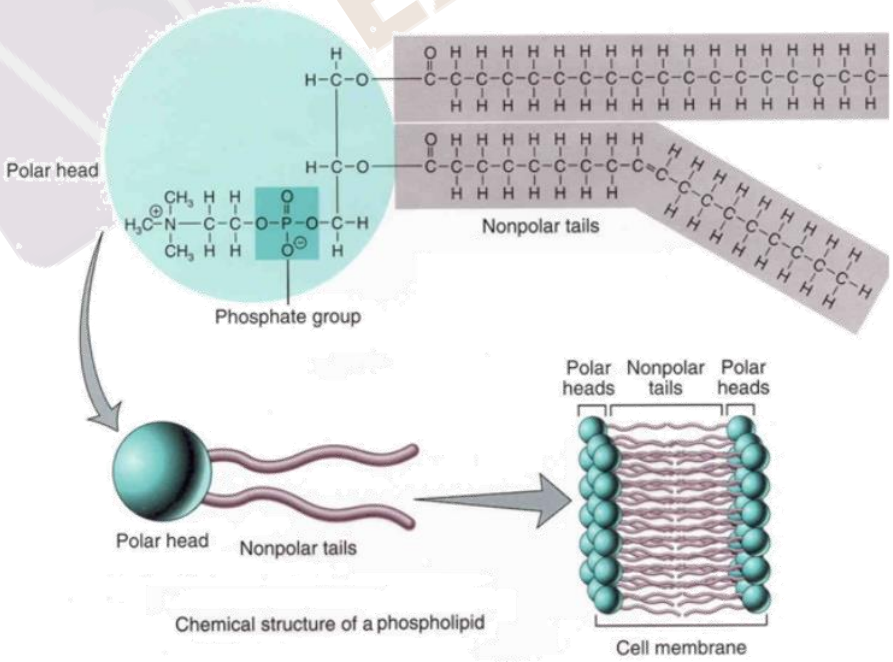
Membrane Lipids

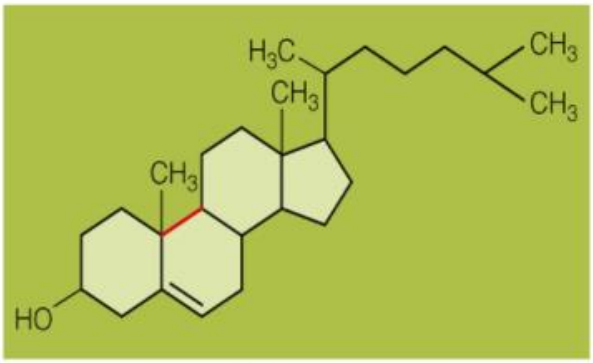
Membrane Lipids

The plasma membrane or cell membrane is the outermost layer in an animal cell and is the second layer from outside in the case of bacteria and plants, as they possess an outermost cell wall outside the cell membrane or plasma membrane. It is a semi-permeable membrane made up of **lipids** and **proteins**. The lipid layer is arranged in a bilayer fashion with proteins either embedded inside or anchored to the surface of the lipid bilayer. Lipids provide **hydrophobicity** to the membrane whereas proteins provide **hydrophilicity** to the membrane. Membrane lipids are two types phospholipids and sterols (generally cholesterol). Due to the hydrophobic nature of lipids, the membrane is readily dissolved in organic solvents and due to the presence of water-soluble proteins, it is also soluble in water up to some extent. Due to the presence of both the hydrophobic nature and hydrophilic nature in the membrane, it confers Amphiphilic properties i.e. both lipid-soluble and water-soluble. A detailed structure of the plasma membrane is shown below.



Phospholipid molecules, the major constituent of plasma membrane, have a head (often of glycerol) to which are attached two long fatty acid chains that look much like tails. These tails are repelled by water and dissolve readily in organic solvents, giving the molecule its lipid character. To another part of the head is attached a phosphoryl group with a negative electrical charge; to this group in turn is attached another group with a positive or neutral charge. This portion of the phospholipid dissolves in water, thereby completing the molecule's amphiphilic character.





Cholesterol

In contrast, sterols have a complex hydrocarbon ring structure as the lipid-soluble region and a hydroxyl grouping as the water-soluble region.

Properties of membrane lipids:

I. Membrane lipids (Phospholipids and sterols) are amphiphilic molecules possessing both a hydrophobic tail region embedded inside and a hydrophilic head region protruding outside which interacts with the outer fluid.

II. The hydrophobic region of the lipid bilayer acts as a barrier to the polar ions and bigger molecules, hence, semi-permeable in nature.

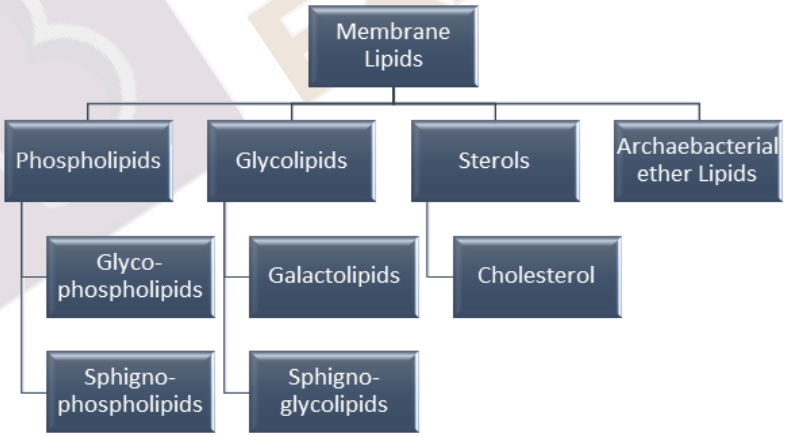
III. Easy diffusion of nonpolar, water molecules, gases, and small molecules inside the membrane allow the continuous operation of necessary processes inside the cell.

IV. Membrane provides compartmentalization inside a cell such as in eukaryotic cells.

V. Along with lipids and proteins, additionally carbohydrate chains are also associated with the membrane.

VI. Membrane fluidity allows the shifting of protein molecules inside the membrane to change their respective position.

Classification of Membrane lipids:



1. Phospholipid - When lipid molecules have an attached phosphate group moiety, it is termed phospholipid.
   a. Glycophospholipid - When lipid molecule is conjugated with carbohydrate and phosphate group.
   b. Sphingophospholipid - Sphingophospholipids are the main components of eukaryotic cell membranes. Phospholipid that is derived from sphingosine (18-carbon amino alcohol) is sphingophospholipids.
2. Glycolipids - Lipid molecules conjugated with carbohydrate molecules are known as glycolipids.
   a. Galactolipid - When lipid molecule is conjugated with carbohydrate (Galactose).
   b. Sphignoglycolipid - Glycolipid that is derived from sphingosine is sphingoglycolipids.

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