



## BIOLOGICAL MEMBRANES

The model of a biological membrane includes lipids (20-80 wt%), protein (10-80 wt%) and carbohydrate (2-10 wt%).

The carbohydrate portion consists of oligosaccharides attached to proteins (glycoproteins) or lipids (glycolipids).

Transmembrane proteins are embedded in the bilayer; peripheral proteins are associated with the surface. Proteins function as enzymes, channels, pumps, receptors and energy transducers.

The lipid bilayer, spontaneously formed by the amphipathic molecules, is a two-dimensional, non-covalent, fluid assembly. The major classes of lipids are phospholipids, sphingolipids, glycolipids and cholesterol. The bilayer forms a barrier for ions and polar molecules, with proteins controlling the transport of these across the barrier.

The bilayer is asymmetric with respect to the interior and exterior sides of the cell or organelle. Carbohydrates are usually on the exterior surface and peripheral proteins are usually on the cytoplasmic surface of the plasma membrane. The two lipid monolayers include different proportions of the constituent lipids.

The thickness of most membranes is between 6 nm and 10 nm. Most membranes are electrically polarized, such that the interior is negative relative to the exterior (typically -60 mV).

### Example of Membrane Composition: Human Red Blood Cell

Protein	Lipid	Carbo		PA	PC	PE	PS	SM	GS	Chol
49%	43%	8%		2%	19%	18%	8%	18%	10%	25%