



- **Potassium, phosphate and magnesium** are the most important ions which are found in the intracellular fluid (inside the cell).
- **Sodium, chloride and bicarbonate** are the main ions which are found in the extracellular fluid (outside the cells).
- Biological membranes can be considered as barriers. Also, they support the uptake of nutrients and cell-cell communication. In addition, they receive and transmit various signals.
- **The cell membrane is composed of:**
 - **Lipids:**
 - ✓ They are more found in myelinated neurons. They are mainly responsible for the compartmentalization of cells.
 - ✓ There are three forms of lipids:
 - ❖ *Phospholipids (composing 50-90% of the cell membrane: most abundant):*
 - They are amphipathic.
 - Aggregation of phospholipids might lead to the formation of micelles (ball-shaped molecule with a hydrophobic cor and a hydrophilic surface) or bilayers (notice that a lipid bilayer is asymmetrical).
 - ❖ *Sterols (composing 5-25% of the cell membrane):*
 - They provide fluidity for the membrane such as cholesterol which is found between the hydrophobic tails.
 - ❖ *Glycolipids (they are present in cell membrane is very small amounts).*
 - **Proteins:**
 - ✓ Classification of membrane proteins:
 - ❖ Receptors.
 - ❖ Transporters: ion channels, aquaporins, glucose transporters.
 - ❖ Ion channels.
 - ❖ Enzymes.
 - ❖ Structural components.



- ✓ The functions of these proteins:
 - ❖ Catabolism (e.g. enzymes).
 - ❖ Receptors for hormones.
 - ❖ Transporting ions and nutrients.
 - ❖ Structural integrity.
- ✓ GPCRs (G-Protein Coupled Receptors) are protein which are linked with G-proteins.
- ✓ Peripheral membrane proteins are held together by electrostatic interactions.
- ✓ More proteins are found in mitochondria of cells.
- ✓ Proteins carry most of the reactions inside the cell.
- **Carbohydrates:**
 - ✓ They are present attached to proteins or lipids as glycoprotein or glycolipid.
 - ✓ Typical sugars in glycoproteins and glycolipids include:
 - ❖ Glucose, galactose, mannose and fructose.
 - ❖ N-acetylated sugars (N-acetyl glucosamine, N-acetyl galactosamine, and N-acetyl neuraminic acid).
 - ✓ Membrane sugars may be involved in cell identification and recognition (ABO blood groups).
- The protein-lipid ratio is 1:1 (in human erythrocytes).
- The movement of biological membranes can be:
 - **Lateral movement (fast):** hitting the next one.
 - **Flip-flop (slow):** what is outward becomes inward.

