



**SNS COLLEGE OF ALLIED HEALTH SCIENCES**  
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**DEPARTMENT : PHYSICIAN ASSISTANT**

**COURSE NAME : NEUROLOGY**

**UNIT : NERVOUS SYSTEM**

**TOPIC : CELL MEMBRANE - PERMEABILITY AND  
TRANSPORT**



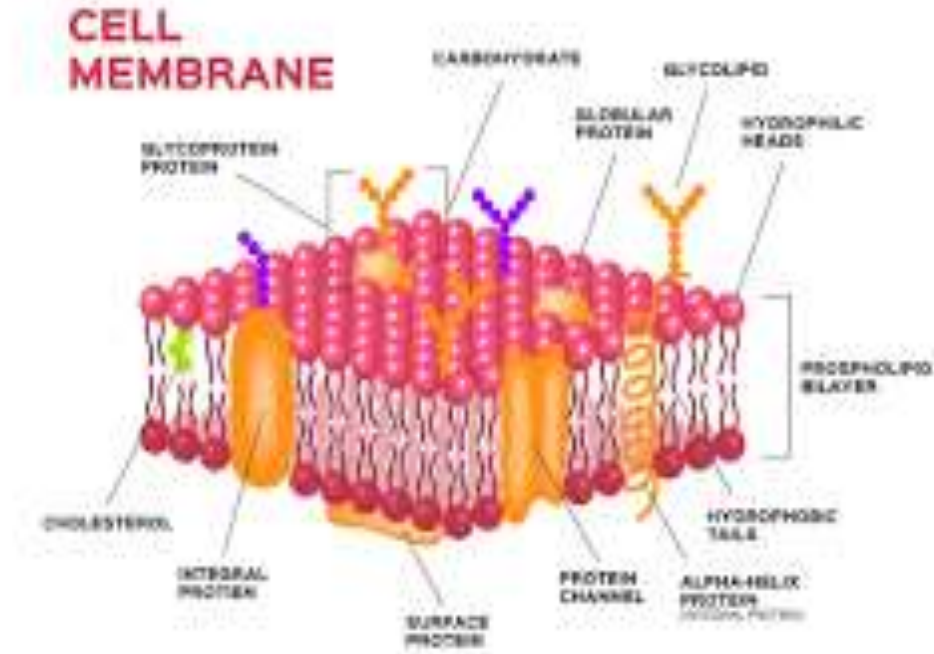
# PERMEABILITY



- **Passive permeability** refers to the movement of molecules or ions across the cell membrane without the input of energy from the cell. This movement occurs down their concentration gradient, from an area of higher concentration to an area of lower concentration. Passive permeability encompasses processes such as simple diffusion, facilitated diffusion, and osmosis.



- **Active permeability** involves the movement of molecules or ions across the cell membrane against their concentration gradient, requiring the input of energy from the cell. This energy is typically provided by adenosine triphosphate (ATP) hydrolysis or other energy-releasing processes within the cell.





## PASSIVE PERMEABILITY



### Simple Diffusion:

- Small, non-polar molecules such as oxygen and carbon dioxide can freely diffuse across the lipid bilayer due to their solubility in the hydrophobic environment.



## Facilitated Diffusion:

- Larger or polar molecules require assistance from membrane proteins such as channels or carriers to traverse the lipid bilayer.
- These proteins provide a hydrophilic pathway for molecules to move down their concentration gradient.



## **Active Transport:**

- Involves the movement of molecules against their concentration gradient, requiring energy expenditure typically in the form of ATP.
- Membrane proteins such as pumps actively transport ions or molecules across the membrane, maintaining concentration gradients. Examples include the sodium-potassium pump and the proton pump.



## Secondary Active Transport:

- Couples the movement of one molecule against its gradient with the movement of another molecule down its gradient.
- This process harnesses the energy stored in the electrochemical gradient of one molecule to drive the transport of another molecule. Symporters and antiporters are examples of secondary active transport proteins.





# OSMOSIS



- Osmosis refers to the passive movement of water across a selectively permeable membrane in response to differences in solute concentration.
- Water molecules move from an area of lower solute concentration to an area of higher solute concentration, aiming to equalize the solute concentration on both sides of the membrane.

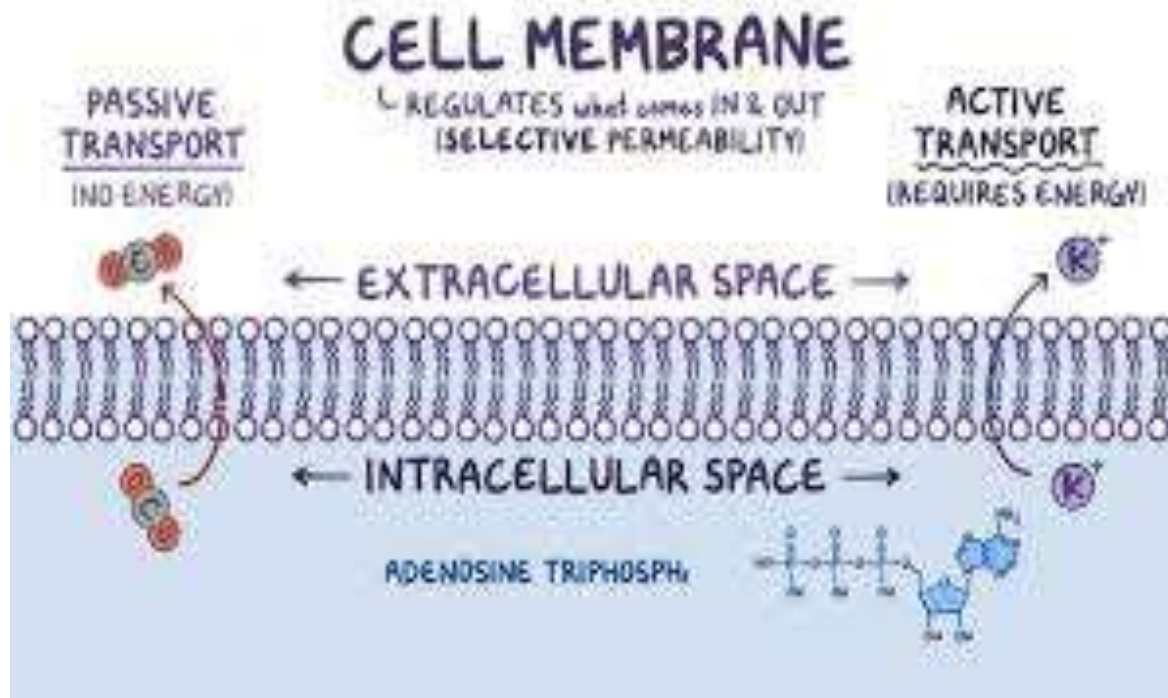


# TRANSPORT



## Channels:

- Integral membrane proteins that form hydrophilic pores spanning the lipid bilayer.
- Channels are selective for specific ions or molecules based on size, charge, and chemical properties.
- Examples include ion channels such as sodium channels, potassium channels, and aquaporins for water transport.





## Carriers:

- Integral membrane proteins that undergo conformational changes to transport specific molecules across the membrane.
- Carriers exhibit specificity for certain molecules and often facilitate facilitated diffusion.
- Examples include glucose transporters (GLUT proteins) and amino acid transporters.



## Pumps:

- Integral membrane proteins that actively transport ions or molecules against their concentration gradients.
- Pumps require energy input, usually from ATP hydrolysis, to drive the transport process.
- Examples include the sodium-potassium pump ( $\text{Na}^+/\text{K}^+$ -ATPase), which maintains the electrochemical gradients of sodium and potassium ions across the membrane.



## **Vesicular Transport:**

- Involves the formation of membrane-bound vesicles for the transport of large molecules or particles into or out of the cell.
- Endocytosis encompasses processes such as phagocytosis, pinocytosis, and receptor-mediated endocytosis.
- Exocytosis releases substances from the cell by fusing vesicles with the plasma membrane.



# ASSESSMENT



- What is Permeability ?
- What is Transport ?