RAMA UNIVERSITY

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FACULTY OF ENGINEERING &TECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY

Membrane Transport:

The selective permeability of biological membranes to small molecules allows the cell to control and maintain its internal composition.

Only small uncharged molecules can diffuse freely through phospholipid bilayers. Small nonpolar molecules, such as $O_2$and CO_2, are soluble in the lipid bilayer and therefore can readily cross cell membranes.

Small uncharged polar molecules, such as H2O, also can diffuse through membranes, but larger uncharged polar molecules, such as glucose, cannot. Charged molecules, such as ions, are unable to diffuse through a phospholipid bilayer regardless of size; even H+ions cannot cross a lipid bilayer by free diffusion.

Although ions and most polar molecules cannot diffuse across a lipid bilayer, many such molecules (such as glucose) are able to cross cell membranes with the help of transmembrane proteins.

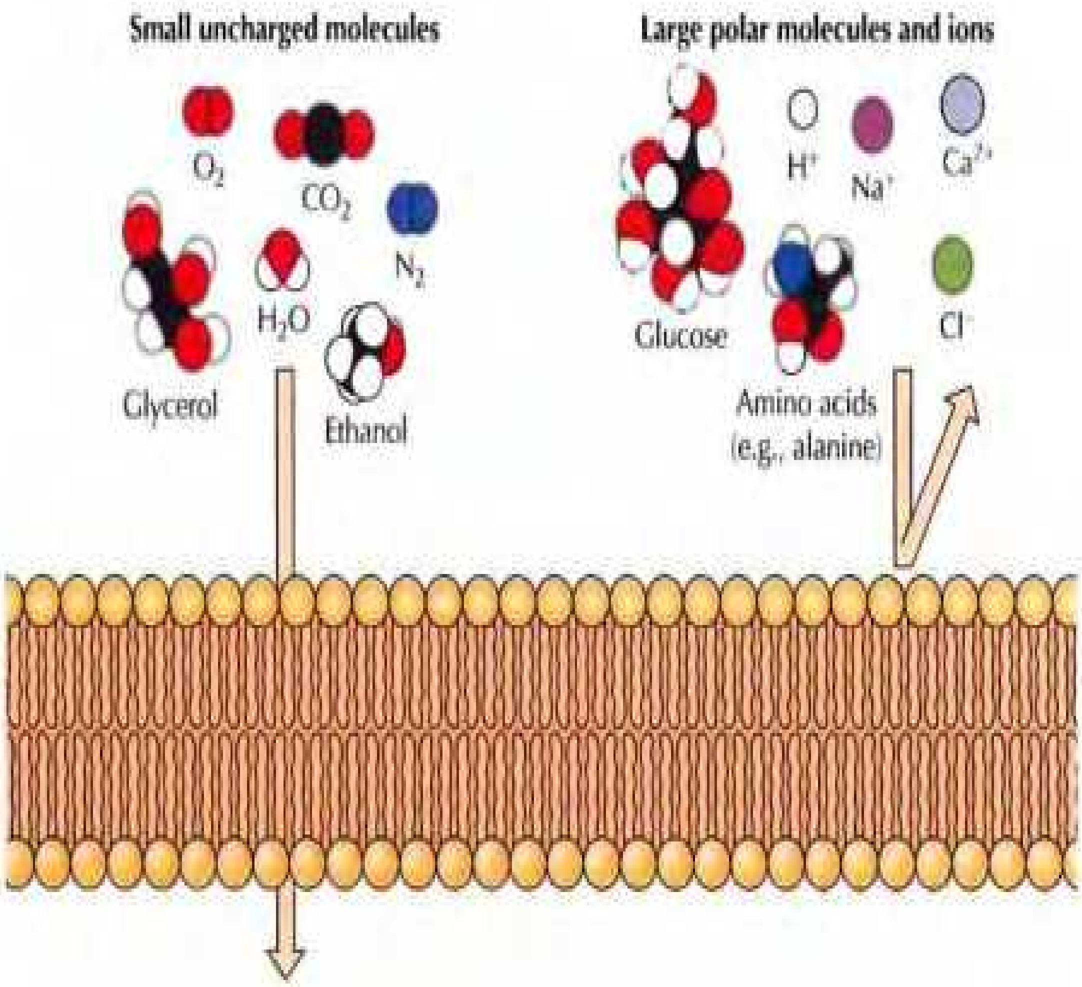

FIGURE 2.27 Permeability of phospholipid bilayers Small uncharged molecules can diffuse freely through a phospholipid bilayer. However, the bilayer is impermeable to larger polar molecules (such as glucose and amino acids) and to ions.

Types of transport/ Transport mechanism across biomembrane

The transport of small molecules, ions or solutes across membrane can take place by any of the following mechanism:

- ❖Simple diffusion
- ❖Passive transport or facilitated diffusion
- ❖Active transport

Simple diffusion

When two aqueous compartments containing unequal concentrations of a soluble compound or ion are separated by a permeable divider (membrane), the solute moves by simple diffusion from the region of higher concentration, through the membrane, to the region of lower concentration, until the two compartments have equal solute concentrations. When ions of opposite charge are separated by a permeable membrane, there is a transmembrane electrical gradient, a membrane potential, *V*m (expressed in volts or millivolts).

This membrane potential produces a force opposing ion movements that increase *V*m and driving ion movements that reduce *V*m .

Thus the direction in which a charged solute tends to move spontaneously across a membrane depends on both the chemical gradient (the difference in solute concentration) and the electrical gradient (*V*m) across the membrane.

Together, these two factors are referred to as the electrochemical gradient or electrochemical potential.

Passive transport or facilitated diffusion

The transport of solute or ions across the membrane in the energetically favorable direction, as determined by concentration and electrochemical gradients i.e. high concentration to lower concentration.

If the transport process across the membrane is aided by transport protein, it is called as **Facilitated Diffusion.**

During the transport no energy is expended to transport solute across the membrane. Membrane proteins that speed the movement of a solute across a membrane by facilitating diffusion are called **transporters** or **permeases.**

The transport of solute across membranes via the action of specific transmembrane proteins, which act as transporters.

There are two general classes of membrane transport proteins:

❖Channel proteins

❖Carrier proteins