CHAPTER 3: MOVEMENT OF SUBSTANCES ACROSS THE PLASMA MEMBRANE

Characteristics of Molecules that Can or Cannot Diffuse Across the Phospholipid Bilayer

1. **Polar** molecules are **water soluble** and **hydrophilic.**
2. **Non-polar** molecules are **lipid-soluble** (fat-soluble) and **hydrophobic.**
3. Polar molecules dissolve in other polar molecules, and non-polar molecules dissolve in other non-polar molecules.
4. The phospholipid bilayer forms a **barrier** to the diffusion of **hydrophilic** (polar) molecules.
5. In general, **ions** of any size, **most polar molecules** and **most large molecules cannot diffuse** through the phospholipid bilayer; they have to go through the pore proteins.

Characteristics of some molecules that can and cannot diffuse through the phospholipid bilayer

Types of molecules that can diffuse through the phospholipid bilayer	**Characteristics of the molecules**
Water, glycerol, ethanol, urea	• Small, uncharged, polar (hydrophilic) molecules • Although the hydrophobic tails of the phospholipids prevent polar water molecules from passing through them, water molecules are **small enough** to squeeze between the phospholipid bilayer gaps or move through the pores.
Oxygen	• Small, uncharged, non-polar (hydrophobic) molecules
Carbon dioxide	
Nitrogen	
Benzene	
Fatty acid	• Non-polar, lipid-soluble molecules
Alcohol	
Steroid	
Vitamins A, D, E, K	
Types of molecules that cannot diffuse through the phospholipid bilayer	**Characteristics of the molecules**
Glucose, sucrose	• Large uncharged polar molecules
Amino acid	
Nucleic acid	
Polysaccharides	• Large molecules
Ions, e.g. H^+, Na^+, HCO_3^-, K^+, Ca^{2+}, Cl^-, Mg^{2+}	• Charged, regardless of molecule size, as they are highly hydrated, i.e. combined with water molecules