BIOLOGY
Topic Summary

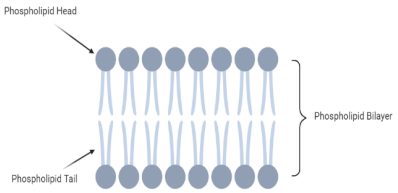
LT8 - THE FLUID MOSAIC MODEL

The fluid mosaic model describes the structure of the plasma membrane as a mosaic of different molecules. These molecules include; phospholipids, cholesterol, proteins and carbohydrates. This gives the membrane a fluid character as structures can move around it.

Phospholipid Bilayer

The phospholipid bilayer is an extremely important component in cell membranes that controls what can come in/ leave the cell, acting as a barrier. The heads of phospholipids form intermolecular forces between each other to form a layer of phospholipids on the inside and outside of cells. The phospholipid heads face outwards as they are hydrophilic and can form interactions with water molecules while the tails face inwards as they are hydrophobic and repel water.

The phospholipid bilayer's main purpose is to control what substances can enter and leave the cell. It allows the cell membrane to be partially permeable, meaning only certain substances can enter/ leave. The bilayer is able to do this as the tails of phospholipids are hydrophobic, so it will repel water and ions dissolved in water away. The phospholipid bilayer is also fluid because of the 'heads' that allow it to do so. Fluidity is important as it ensures rapid diffusion of molecules and gases, essential to cells.

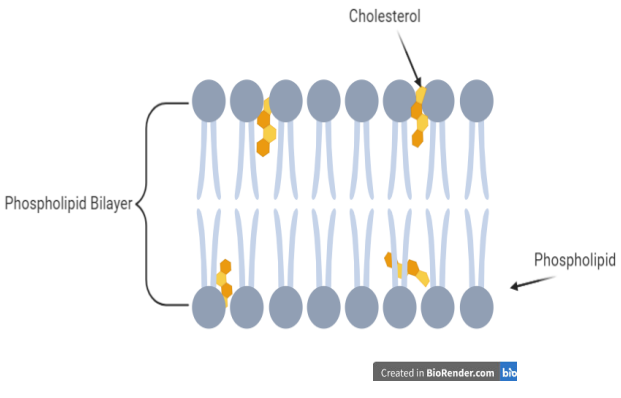


↑*Phospholipid Bilayer*↑

Cholesterol

As well as phospholipids, cholesterol is a type of lipid. In the plasma membrane cholesterol molecules sit with phospholipids, in the core of the cell membrane.

The main function of cholesterol is to maintain the stability and regulate fluidity of the cell membrane. Its role is dependent on the temperature. For example at high temperatures it decreases the fluidity of the membrane while at lower temperatures it increases fluidity. This helps to resist the effects of temperature on the cell membrane.



↑*Cholesterol imbedded within phospholipid bilayer*↑

Hydrophobic & Hydrophilic

Hydrophobic is the term given to molecules that are 'water-hating'. This means that a molecules that is hydrophobic will repel water away from itself.

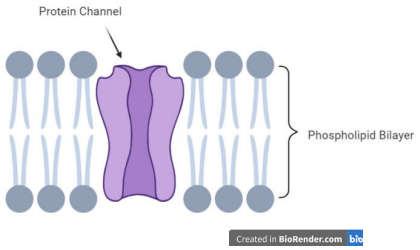
Hydrophilic is the opposite. Hydrophilic molecules are 'water-loving' and will be attracted towards water molecules.

Channel Proteins

The channel protein is an intrinsic protein, meaning it is imbedded within the membrane.

The main role of the channel protein is to form pores filled with water and transporting them through the membrane. This also allows for water soluble ions to enter and leave the cell.

This is important as the cell membrane is semi-permeable so normally wouldn't let these molecules and ions, required by the cell, through.

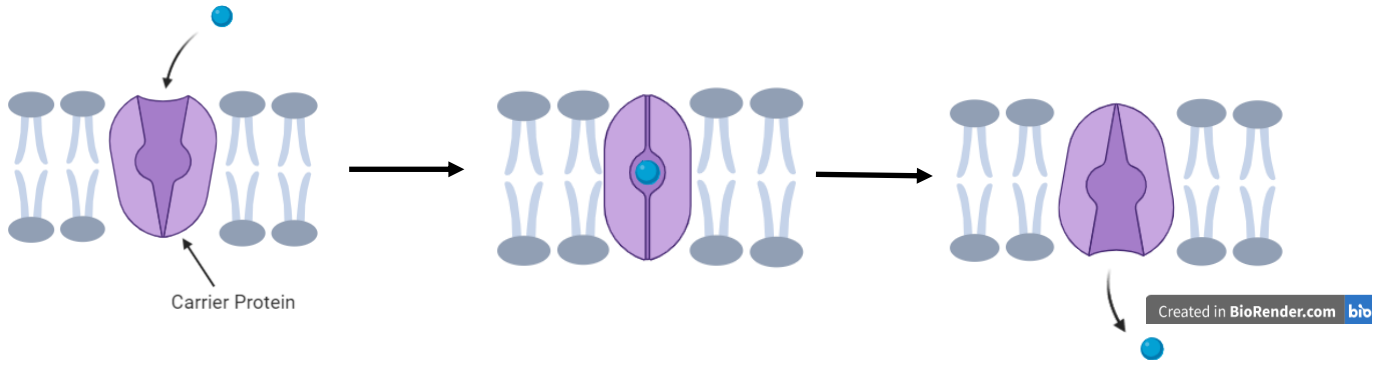


↑*Channel Protein within the cell membrane*↑

Carrier Proteins

The carrier protein is also imbedded within the cell membrane. The main role of the carrier protein is to allow large molecules to pass through the membrane such as glucose.

These molecules are big and can not pass through by diffusion alone. The carrier protein is specific to the molecule it is transporting. This means it will change its shape to be able to transport the molecule.

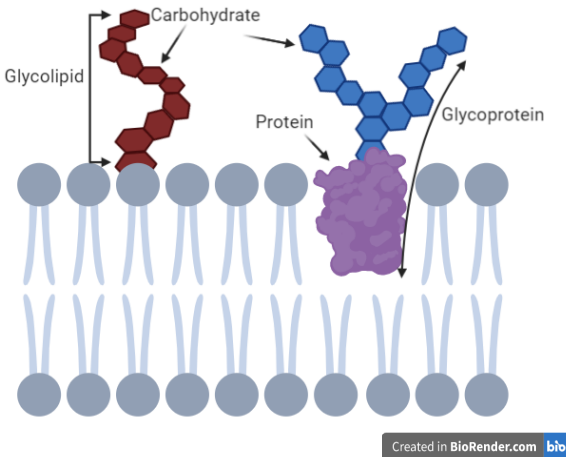


These pictures above shows how molecules can pass through the membrane using the carrier protein. First the carrier protein opens allowing the molecule in via diffusion. It then closes with the molecule inside and finally it opens allowing the molecule to leave through the opposite end.

Glycolipids & Glycoproteins

Glycolipids and glycoproteins are both located outside of the cell membrane while still being connected to it. They are usually described as being extrinsic.

The roles of both of these components are very similar. Both, glycoproteins and glycolipids act as surface receptors for hormones and neurotransmitters to bind to. They can act as antigens for cell recognition in the immune system. They also help to stabilise the membrane by forming hydrogen bonds with water molecules surrounding the cell.



↑*Glycolipid (on the left) & Glycoprotein (on the right)*↑