

BIOLOGY

Topic Summary

LT7 - PHOSPHOLIPIDS

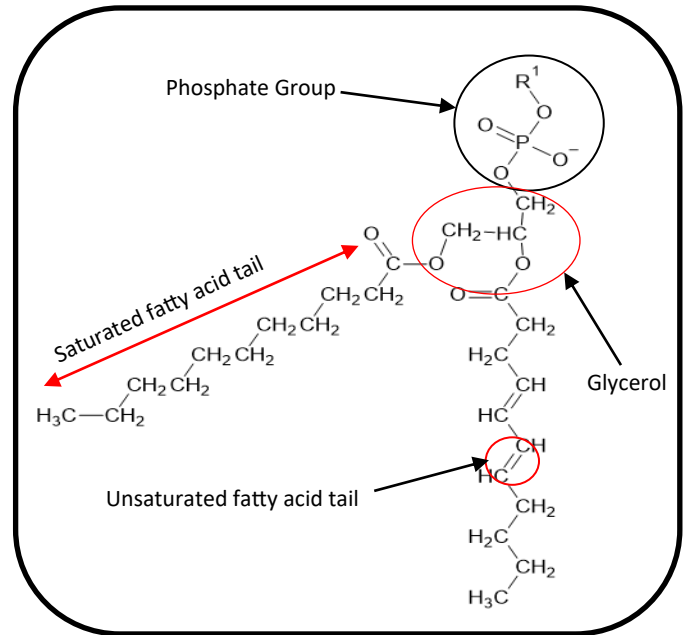
A lipid is an extremely important macromolecule, vital for survival due to its various roles within the human body. A phospholipid is a class of lipids that is essential for the formation of membranes as well as being a barrier between cells and extracellular fluid. They also regulate what molecules can enter and leave the cell.

Structure of Phospholipids

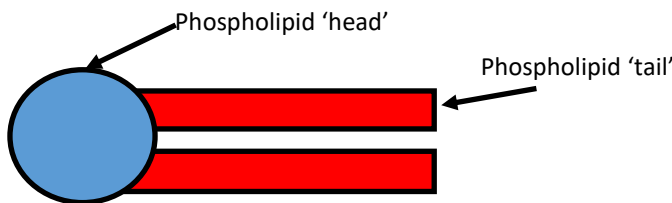
Phospholipids are very similar to triglycerides (another class of lipids) in structural makeup. Both contain glycerol and fatty acids. However in phospholipids instead of three fatty acids (like in triglycerides) there are only two due to one being replaced by a phosphate group.

The phosphate group and the glycerol are known as the 'head' of the phospholipid

The two fatty acids are known as the 'tails' of the phospholipid molecule.



↑A Phospholipid Molecule↑



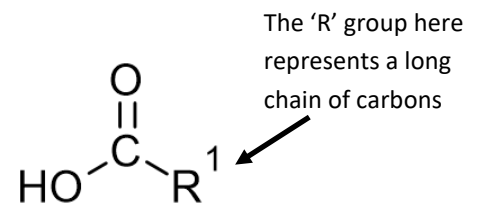
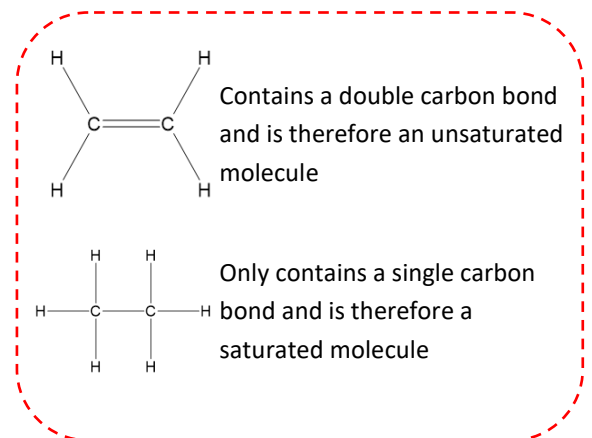
↑Another way phospholipids may be drawn↑

Fatty acids

A fatty acid is an organic compound made up of carboxylic acid and a long chain of carbons. The long chain of carbons is usually represented as an 'R'.

Fatty acids in phospholipids can be either saturated or unsaturated.

A saturated molecule is a molecule that does not contain any double or triple carbon bonds. In other words it only contains single carbon bonds. An unsaturated molecule contains at least one double/ triple bond.



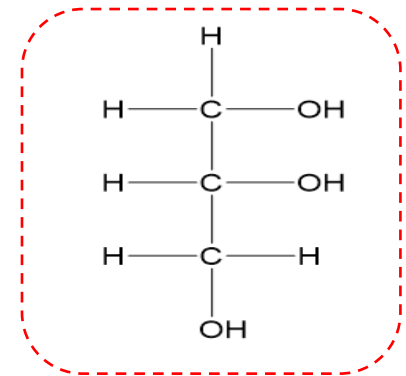
↑A fatty acid ↑



Glycerol

Glycerol is also an organic molecule that is a component in phospholipids. It contains three hydroxyl (OH) groups all bonded to one carbon atom each.

Glycerol is generally hydrophilic and very soluble in water. Glycerol is able to form intermolecular forces with water molecules, giving glycerol its soluble properties.



↑Glycerol Molecule↑

Hydrophobic and Hydrophilic Regions of Phospholipids

A hydrophobic molecule is a 'water-hating' molecule. This means any molecule that is hydrophobic will repel water away from itself.

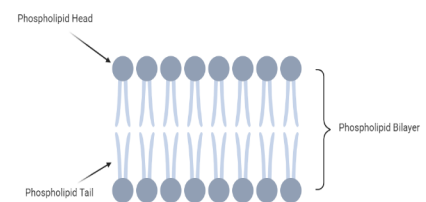
A hydrophilic molecule is the opposite. It is a 'water-loving' molecule that attracts water molecules by forming intermolecular forces of attraction.

Phospholipids are known as being amphipathic molecules. This is when a molecule is both hydrophobic and hydrophilic at the same time. In phospholipids the hydrophilic region is the phospholipid 'head'. The hydrophobic regions in a phospholipid are the fatty acid 'tails'.

These properties are extremely important to the function of phospholipids in living organisms.

Importance of Phospholipids

Phospholipids are an integral part of all cell membranes and therefore essential to life. Phospholipids form a 'phospholipid bilayer' in cells. This is a layer of phospholipids on the inside and outside of the cell. The phospholipid tails, due to their hydrophobic nature, cluster together away from water while the hydrophilic heads form interactions with the environment around the cell. This then forms the phospholipid bilayer. The hydrophilic heads face the outside while the hydrophobic tails are always on the inside, never exposed to water.



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↑Phospholipid bilayer

The phospholipid bilayer acts as a barrier. It allows the cell membrane to be partially permeable, meaning it only allows certain molecules to pass through. This is vital in ensuring that certain ions and substances remain out of the cell/ inside the cell. The bilayer is able to act as a barrier due to the hydrophobic tails repelling water and any ions dissolved in water away from the cell. It will either repel water back into the cell or keep it out. The phospholipid bilayer is also fluid due to the hydrophilic heads. This allows the cell membrane to remain fluid, allowing essential molecules in.