****Question****

* 1. State 4 importance of cholesterol: Cell membrane synthesis – Cholesterol helps to regulate membrane fluidity over the range of physiological temperatures. It has a hydroxyl group that interacts with the polar head groups of the membrane phospholipids and sphingolipids. These exist along with nonpolar fatty acid chain of the other lipids. Cholesterol also prevents the passage of protons (positive hydrogen ions) and sodium ions across the plasma membranes.
* Cell transporters and signalling molecules – The cholesterol molecules exist as transporters and signalling molecules along the membrane. Cholesterol also helps in nerve conduction. It forms the invaginated caveolae and clathrin-coated pits, including caveola-dependent and clathrin-dependent endocytosis. Endocytosis means engulfing of foreign molecules by the cell. Cholesterols help in cell signalling by assisting in the formation of lipid rafts in the plasma membrane.
* Cholesterol in the myelin sheaths – The nerve cells are covered with a protective layer or myelin sheath. The myelin sheath is rich in cholesterol. This is because it is derived from compacted layers of Schwann cell membrane. It helps in providing protection, insulation and allows more efficient conduction of nerve impulses.
* Role inside the cells – Within the cells, cholesterol is the precursor molecule in several biochemical pathways. For example, in the liver, cholesterol is converted to bile, which is then stored in the gallbladder. Bile is made up of bile salts. This helps in making the fats more soluble and helps in their absorption. Bile salts also aid in absorption of fat soluble vitamins like Vitamins A, D, E and K.

**2. Differentiate between globosides and gangliosides:** A **ganglioside** is a molecule composed of a [glycosphingolipid](https://en.wikipedia.org/wiki/Glycosphingolipid%22%20%5Co%20%22Glycosphingolipid) ([ceramide](https://en.wikipedia.org/wiki/Ceramide%22%20%5Co%20%22Ceramide) and [oligosaccharide](https://en.wikipedia.org/wiki/Oligosaccharide%22%20%5Co%20%22Oligosaccharide)) with one or more [sialic acids](https://en.wikipedia.org/wiki/Sialic_acid%22%20%5Co%20%22Sialic%20acid) (e.g. [n-acetylneuraminic acid](https://en.wikipedia.org/wiki/N-acetylneuraminic_acid%22%20%5Co%20%22N-acetylneuraminic%20acid), NANA) linked on the [sugar chain](https://en.wikipedia.org/wiki/Sugar_chain%22%20%5Co%20%22Sugar%20chain). NeuNAc, an acetylated derivative of the carbohydrate sialic acid, makes the head groups of gangliosides anionic at [pH](https://en.wikipedia.org/wiki/PH%22%20%5Co%20%22PH) 7, which distinguishes them from [globosides](https://en.wikipedia.org/wiki/Globosides%22%20%5Co%20%22Globosides).

WHILE

**globoside** is a type of [glycosphingolipid](https://en.wikipedia.org/wiki/Glycosphingolipid%22%20%5Co%20%22Glycosphingolipid) with more than one [sugar](https://en.wikipedia.org/wiki/Sugar%22%20%5Co%20%22Sugar) as the side chain (or [R group](https://en.wikipedia.org/wiki/Side_chain%22%20%5Co%20%22Side%20chain)) of [ceramide](https://en.wikipedia.org/wiki/Ceramide%22%20%5Co%20%22Ceramide). The sugars are usually a combination of *[N](https://en.wikipedia.org/wiki/N-Acetylgalactosamine%22%20%5Co%20%22N-Acetylgalactosamine)*[-acetylgalactosamine](https://en.wikipedia.org/wiki/N-Acetylgalactosamine%22%20%5Co%20%22N-Acetylgalactosamine), [D-glucose](https://en.wikipedia.org/wiki/Glucose%22%20%5Co%20%22Glucose) or [D-galactose](https://en.wikipedia.org/wiki/Galactose%22%20%5Co%20%22Galactose).

**3Methylated form of phosphatidyl ethanol amin:** [phosphatidylcholines](https://en.wikipedia.org/wiki/Phosphatidylcholine%22%20%5Co%20%22Phosphatidylcholine)

1. **Which ring of cholesterol molecule contains a double bond?**

Ring A and B

**5  State 3 properties of phosphoglycerides. ;**

* **phosphoglycerides** are amphiphilic, as they have both hydrophobic (fears water) and hydrophilic (loves water) parts.
* The long hydrocarbon chains of the fatty acids are of course non-polar. The phosphate group has a negatively charged oxygen and a positively charged nitrogen to make this group ionic
* In addition there are other oxygen of the ester groups, which make on whole end of the molecule strongly ionic and polar.

**6. In a tabular form, differentiate between triacylglycerol and phosphosglyceride. State examples and with schematic structures.**

|  |  |
| --- | --- |
| TRIACYLGLYCEROL | PHOSPHOGLYCERIDES |
| * Triacylglycerol serve several functions in the body. First, they help maintain the structure of cell membranes by forming a lipid bilayer.
* Triacylglycerol, like all fats, also store energy.
* They are composed of a molecule of glycerol that has been esterified with three molecules of fatty acids
 | * Phosphoglycerides have a more rigid chemical structure than triglycerides do, so they make cell membranes tougher and help them to hold their shape better than triglycerides alone could.
* Phosphoglycerides help break down fats during the digestive process.
* **Phosphoglycerides** have three parts: a three-carbon backbone of glycerol, two long-chain fatty acids esterified (or attached via an ether link in Archaea) to hydroxyl groups on carbons 1 and 2 (C1 and C2) of the glycerol, and phosphoric acid esterified to the C3hydroxyl group of glycerol.
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**EXAMPLES OF TRIACYLGLYCEROL AND PHOSPHOGLYCERIDES WITH STRUCTURE**

**EXAMPLE OF PHOSPHOGLYCERIDE:**

**PLASMALOGENS**



**EXAMPLE OF TRIACYLGLYCEROL**

**SIMPLE AND MIXED TRIACYLGLYCEROL**

