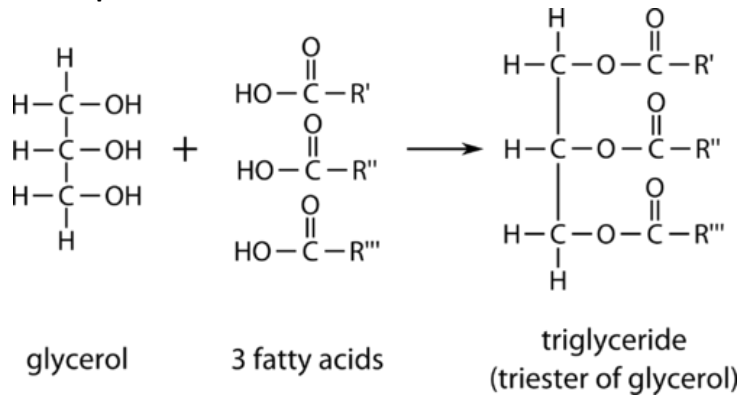


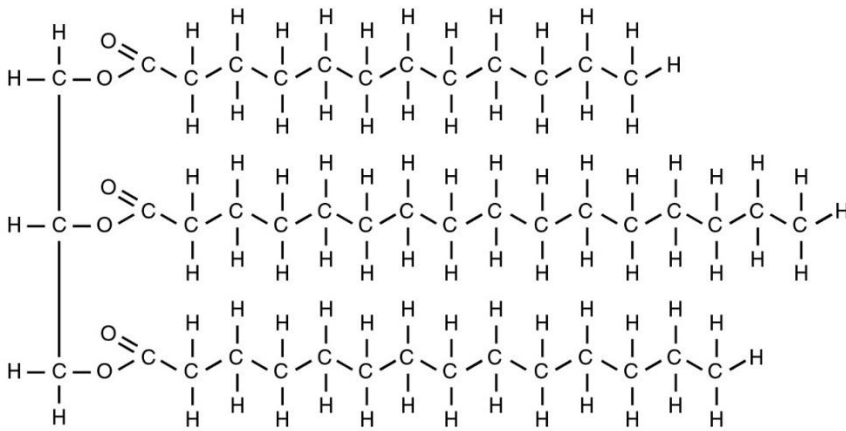
LIPIDS AND FATTY ACIDS

1. LIPIDS

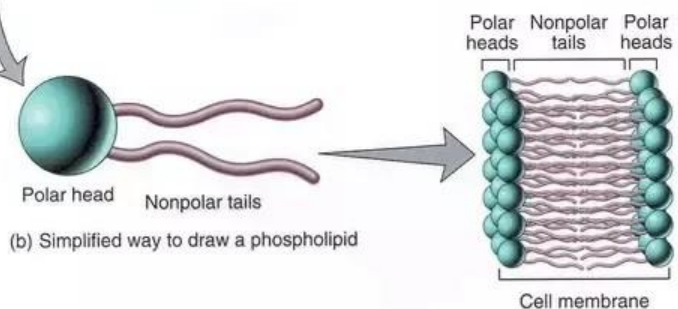
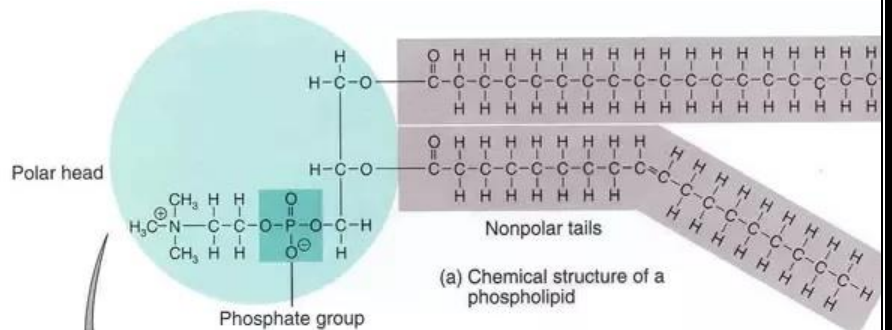
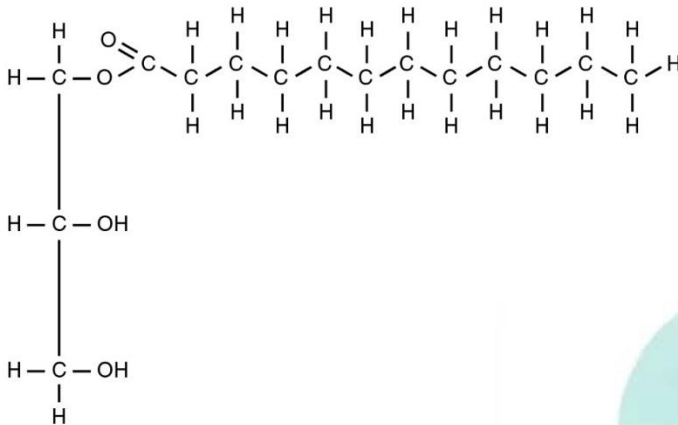
❖ Chemical composition of lipids



(a) Triglyceride



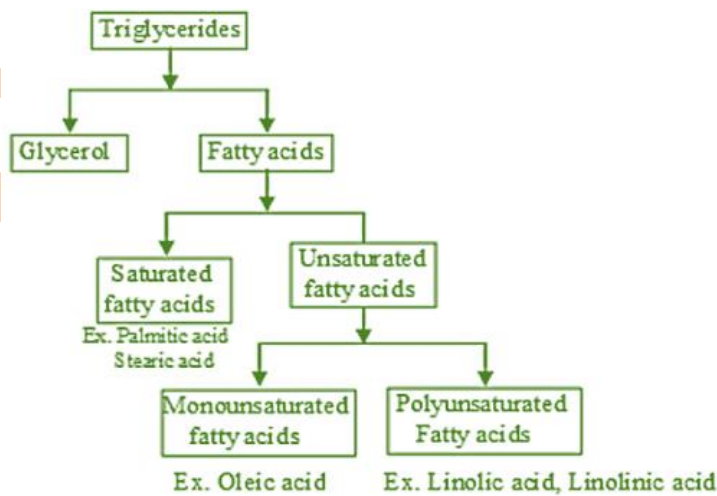
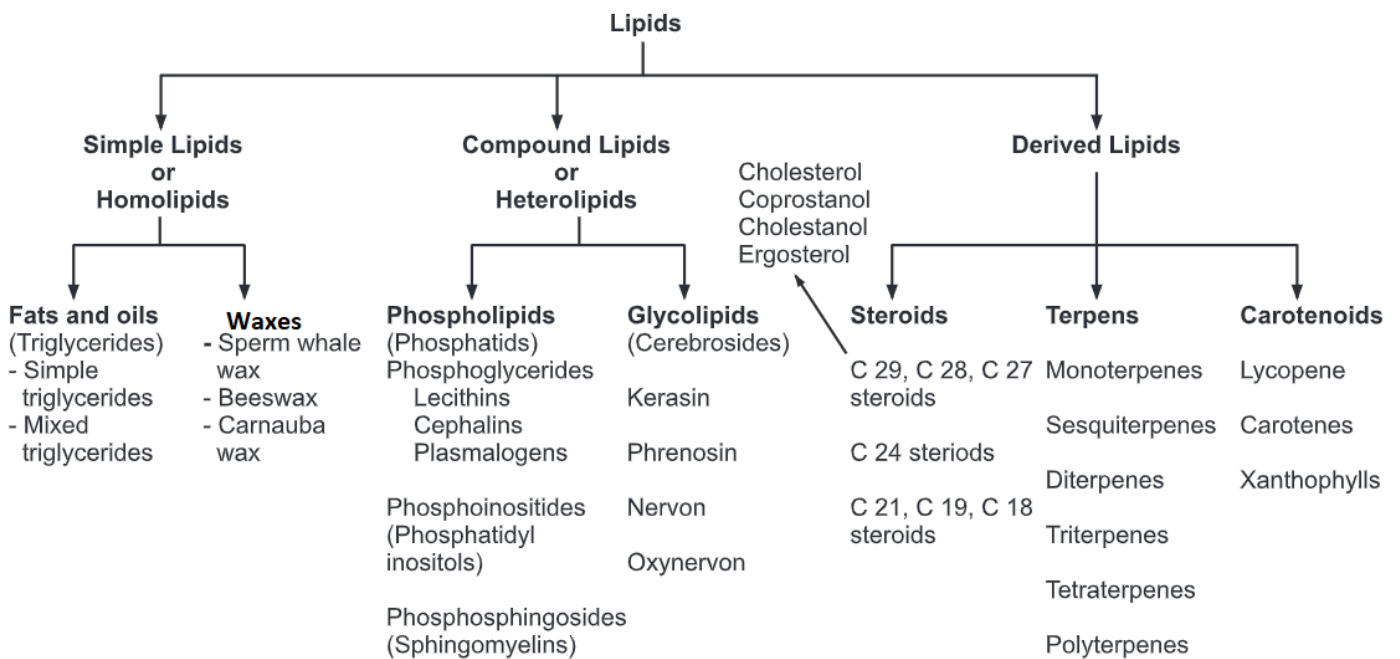
(b) Monoglyceride



❖ **Definition**

- Lipids are **fatty, waxy, or oily compounds that are soluble in organic solvents and insoluble in polar solvents such as water.**
- **Lipids** are a broad group of naturally-occurring molecules which includes fats, waxes, sterols, fat-soluble vitamins (such as vitamins A, D, E and K), monoglycerides, diglycerides, triglycerides(fats and oils) phospholipids, and others. The functions of lipids include storing energy, signaling, and acting as structural components of cell membranes. Lipids have applications in the cosmetic and food industries as well as in nanotechnology
- The word lipid is derived from the Greek word *lipos* meaning fat; universally present in all plant and animal cells

❖ **Classification of lipids**



**2. Fatty acids**

- Fatty acids are the organic acids consisting of a chain of alkyl group containing between 4 and 22 or more carbon atoms with a terminal carboxyl group.
- Basic building units of lipids and principal constituents of body fat. There are more than 100 different fatty acids occurring naturally.
- 90% of the fatty acids in our body occur in the form of esters of triglycerides, glycolipids, phospholipids, sphingolipids, etc.
- Fatty acids are also called “Carboxylic acids” due to the presence of carboxyl group (-COOH)
- Degree of unsaturation of fatty acids depend upon the no. of double bonds present in the hydrocarbon chain of the fatty acid. Fatty acids may be Saturated or Unsaturated depending upon the degree of unsaturation. Greater the degree of unsaturation in a fatty acid, more would be the chances of Lipid oxidation.
- Fatty acids are “Amphipathic” in nature. It contains both, non-polar hydrocarbon chain and a polar carboxyl group, therefore, act as Hydrophilic as well as Hydrophobic.

➤ **Classification of fatty acids**

**1. Based on chemical nature**

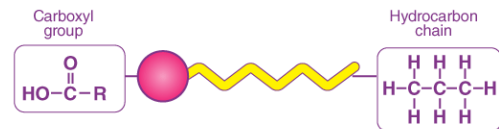
**(a) Saturated fatty acids**

- Saturated fatty acids are the fatty acids that contain no double bond in their hydrocarbon chain.
- They are solid at room temperature.
- Saturated fatty acids can increase the risk of coronary heart diseases.
- Examples, Butyric acid, Caproic acid.

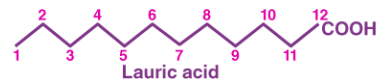
**(b) Unsaturated fatty acids**

- Unsaturated fatty acids are the fatty acids that contain one or more double bond in their hydrocarbon chain.
- These may either be Monounsaturated fatty acids (MUFA) or Poly unsaturated fatty acids (PUFA).
- They are liquid at room temperature.
- Abundant in fish and vegetable oils and reduce the risk of coronary heart diseases.
- Examples, Stearic acid, oleic acid, etc.

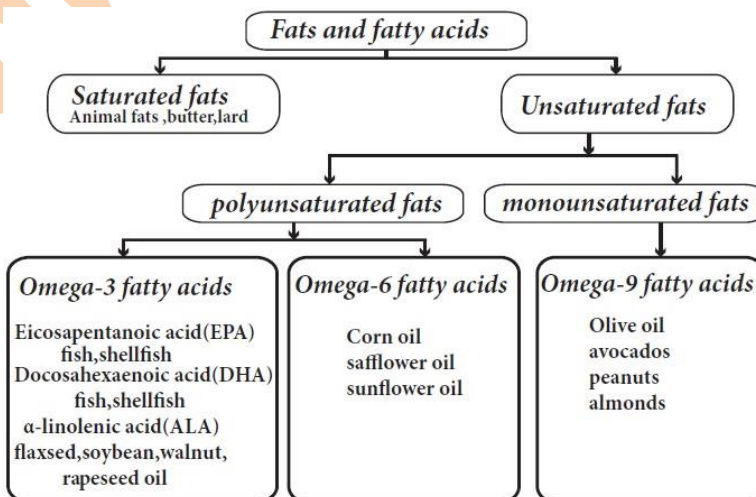
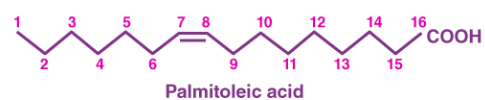
Fatty acid made up from carboxylic group and hydrocarbon chain



**Saturated fatty acid**  
No double bond in structure



**Unsaturated fatty acid**  
> 1 of double bond



**2. Based on nutritional requirements****(i) Essential fatty acids**

- Essential fatty acids are the fatty acids that cannot be prepared by the body and are obtained from diet.
- Our body is not capable to synthesize them.
- For example, linoleic acid, linolenic acid, arachidonic acid.

**(ii) Non-Essential fatty acids**

- Fatty acids that can be synthesized by our body and are not required from diet.
- For example, Palmitic acid, Stearic acid.

**3. Biological function of lipids**

- They are more palatable and storable to unlimited amount compared to carbohydrates.
- They have a high-energy value (25% of body needs) and they provide more energy per gram than carbohydrates and proteins but carbohydrates are the preferable source of energy.
- Supply the essential fatty acids that cannot be synthesized by the body.
- Supply the body with fat-soluble vitamins (A, D, E and K).
- They are important constituents of the nervous system.
- Tissue fat is an essential constituent of cell membrane and nervous system. It is mainly phospholipids in nature that are not affected by starvation.
- Stored lipids "depot fat" is stored in all human cells acts as:
  - A store of energy.
  - A pad for the internal organs to protect them from outside shocks.
  - A subcutaneous thermal insulator against loss of body heat.
- Lipoproteins, which are complex of lipids and proteins, are important cellular constituents that present both in the cellular and subcellular membranes.
- Cholesterol enters in membrane structure and is used for synthesis of adrenal cortical hormones, vitamin D3 and bile acids.
- Lipids provide bases for dealing with diseases such as obesity, atherosclerosis, lipid-storage diseases, essential fatty acid deficiency, respiratory distress syndrome

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