

BIOMOLECULES

Topic: 5

LIPIDS

VERY SHORT ANSWER QUESTIONS

1. What are lipids?

Ans: Lipids: The constituents of animals and plants soluble in organic solvents (ether, chloroform, carbon tetrachloride, hexane, benzene etc) but insoluble in water are called lipids. Lipids are naturally occurring carbon compounds related to fatty acids and esters of fatty acids. Lipids are important dietary components due to their high calorific value.

2. What are common lipids?

Ans: The common lipids are fats, oils, waxes, steroids, terpenes, phospholipids and glycolipids.

The above lipids are stored in adipose tissues and are present in all organism including viruses.

Lipids occur in seeds, nuts and fruits of plants. Lipids occur in adipose tissues, bone marrows and nervous tissues of animals. In the living cells lipids are present in cytoplasm and plasma membrane.

3. How lipids are classified?

Ans: Classification and Structures of Lipids:

- Lipids are classified into three groups
- Simple lipids (Homo lipids)
- Compound lipid (hetero lipids)
- Derived lipids (obtained from simple and compound lipids)

4. What are waxes?

Ans: Waxes: Waxes are insect secretions (or) protective coatings on animal furs and plant leaves. Waxes are chemically esters of long chain saturated (or) unsaturated fatty acids with long chain monohydric alcohols. The fatty acids range between C_{14} & C_{36} . The alcohols range between C_{16} & C_{36} . Free fatty acids, alcohols and some hydrocarbons are also present mixed with the ethers. Waxes have higher melting points than neutral fats.

Examples:–

- 1) Bee's wax: - Secreted by bees. It is a palmitic acid ester of myricyl alcohol. ($C_{30} H_{61} OH$)

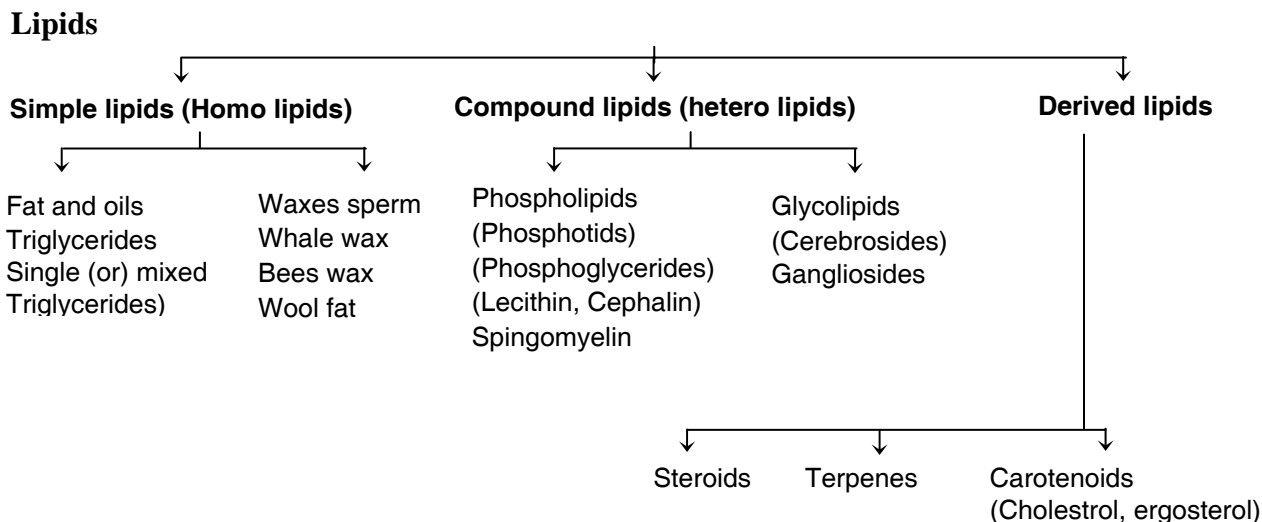
- 2) Spermacetic:- Palmitic acid ester of cetyl alcohol (C₁₆H₃₃OH). It is obtained from sperm whale oil.
- 3) Lanoline wool (or) fat: – Palmitic acid (or) Stearic acid (or) oleic acid ester of cholesterol. It is obtained from wool.

SHORT ANSWER QUESTIONS

1. Draw the flow diagram of classification of lipids.

Ans:

Some acids contain more than one double bond which is not conjugated.



2. Explain the biological importance of lipids.

Ans: Biological importance of lipids:-

- Fats are important food reserves of animals and plant cells.
- Simple lipids act as important sources of energy in our food supply.
- Phospholipids serve as structural materials of cells and tissues such as cell membrane.
- Phospholipids are used as detergents to emulsify fat for transport within the body.
- Cholesterol is the principal sterol of higher animals and abundant in nerve tissues and gallstones.
- Simple lipids can acts as heat insulators and shock absorbers for the living organism.
- Lipids are essential for the absorption or fat soluble vitamin like A, D, E & K.
- Enzyme activators.

LONG ANSWER QUESTIONS

1. Explain the classification of lipids.

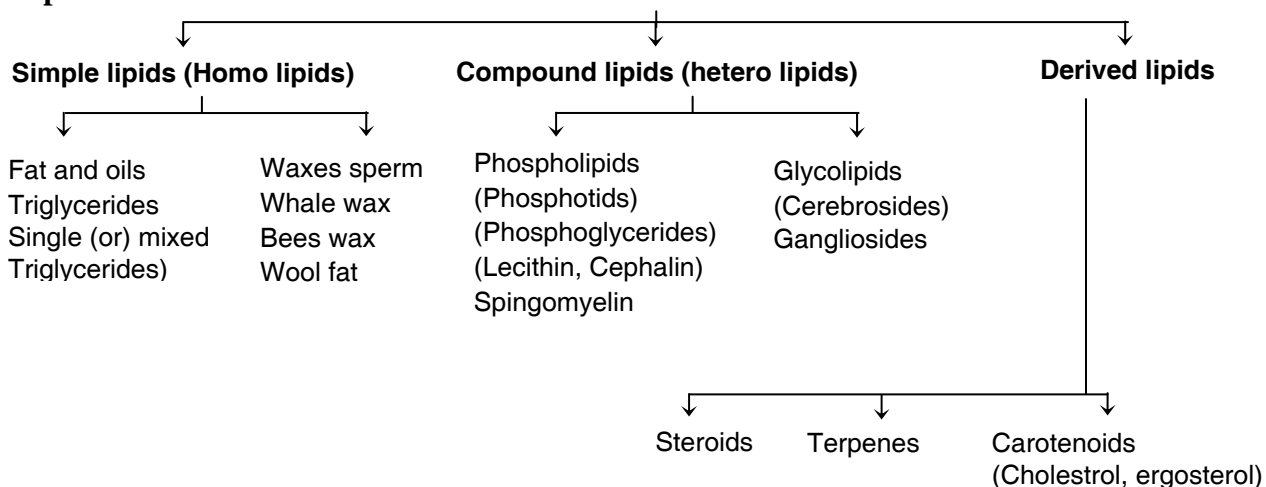
Classification and Structures of Lipids:

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Lipids



i) Simple Lipids:

Simple lipids are alcohol esters of fatty acids which include neutral fats and waxes.

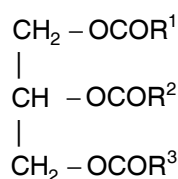
These fatty acids contain even number of carbon atoms and are both saturated and unsaturated carboxylic acids.

Simple lipids are known as triglycerides (or) triacyl glycerols.

Some simple lipids are solids (or) liquids at room temperature.

Solids are called fats and liquids are called oils.

- The structure of simple lipid is



$R^1, R^2, R^3 =$ Alkyl groups of fatty acids

$R^1, R^2, R^3 =$ may be same (or) different.

ii) Compound lipids:

Compounds (or) Heterolipids contain additional groups such as phosphoric acid, nitrogen containing bases and other substituents.

Derived fats:-

- **Terpenes** are polymers of 5-carbon unit called Isoprene. The side chains of A, E and K and the carotenes belong to this group.
- Derived fats are hydrolysis products of simple and compound lipids. The products include Glycerol, fatty acids, sphingosine (amino alcohol), steroids, terpenes & Carotenoids.
- Sterol means solid Alcohol.
- Cholesterol, ergosterol, bile acids, sex hormones, D-vitamin are the some of sterol derivatives.
- Sources of cholesterol are solid alcohol from bile, brain, nervous tissues, adrenal glands and egg yolk.
- Formula of cholesterol is $C_{27}H_{45}OH$.
- Ergosterol:- Solid alcohol present in fungi, yeast and ergot.
- Formula of Ergosterol is $C_{28}H_{43}OH$.