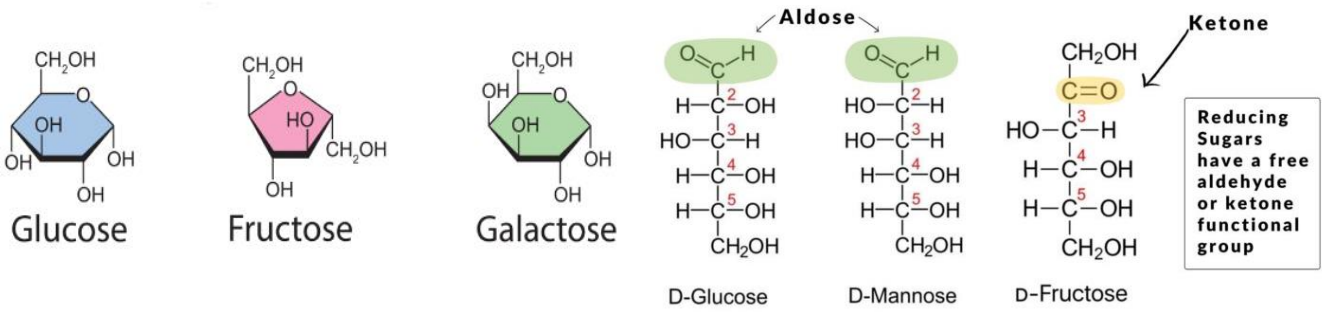
Carbohydrates (saccharides or sugars)

- Organic compound mainly made up of C, H and O.
- Defined as polyhydroxy aldehydes and ketones.
- Produced directly by the plants during photosynthesis.

Types: Monosaccharides, Oligosaccharides(2-5 units), Polysaccharides (more than 5 unites)

i- Monosaccharides

- Simplest carbohydrates which cannot be hydrolysed further into smaller components.
- Composed of three to seven carbon atoms per molecule.

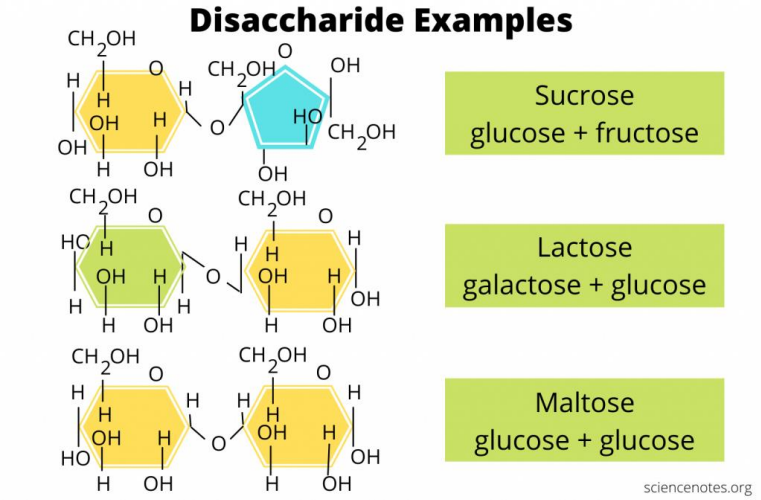


ii- Oligosaccharides

- Formed by condensation of 2-6 monosaccharide molecules.
- The bond between two monosaccharide units is called a **glycosidic bond.**

They are classified as:

(a) **Disaccharides** These are the sugars containing two monomeric units.
Non-reducing sugars because the free aldehyde or ketone group is absent.

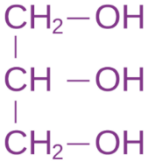


(b) Trisaccharide It contain three monomers. e.g., Raffinose.

(c) Tetrasaccharides, e.g., Stachyose

Lipids

- Generally insoluble in water.
- Are esters of fatty acids and alcohol or could be simply fatty acids.
- **Fatty acids**-hydrocarbon chains (R- contain variable no. of C) that containing carboxylic group (—COOH) in one end. (1 carbon to 19 carbons)
- E.g., Palmitic acid (16 carbons) , Arachidonic acid (20 carbons)



Depending upon the types of bonds present, fatty acids are of following two types

i. Saturated Fatty Acids-Do not have double bonds, (C—C). Generally solid at room temperature.

ii. Unsaturated Fatty Acids- Contain one or more than one double bonds (C = C). Generally liquid at room temperature.

Types:

Neutral or True Fats- Glycerol esterified with fatty acid is known as glyceride.

Glycerol is a simple lipid which is known as **trihydroxypropane**.

Eg: monoglyceride, diglycerlde and triglyceride

ii- Compound or Conjugated Lipids- These are the esters of fatty acids and alcohol but contain other substances also, e.g., Phospholipids, glycolipids, cutin & suberin (water proof) etc.

Phospholipids are lipids which have phosphorus and phosphorylated organic compound in them. Ex: lecithin.

Some tissue have complex structure of lipids, e.g., Neural tissues.

iii. Derived Lipids

These are lipid-like substances such as sterol or derivatives of lipids, e.g., steroids, prostaglandins and terpenes.

(a) **Ghee**- Hard Fats are solids at room temperature and contain long chains of fatty acids, e.g., Animal fat.

Softness of butter is due to the good quantity of short chain fatty acid it contains.

(b) **Oils**- liquid at room temperature because they have low melting point, remain as oils in winters also e.g., groundnut (peanut) oil, cotton seed oil, mustard oil, Gingely (Seasum)oil.

Cholesterol -27 carbon compound with a hydrocarbon tail, a central sterol nucleus made of four hydrocarbon rings, and a hydroxyl group.

Nucleotides (Nucleoside+ Phosphate group) Monomers of nucleic acids. Made up of three molecules, i.e., a pentose sugar, a cyclic nitrogenous base and a phosphoric acid (phosphate group), e.g., Adenylic acid, thymidylic acid, guanylic acid, uridylic acid and cytidylic acid.

1. Ribose (Pentose) Sugar. It is present in the form of ribose or deoxyribose sugar in RNA and DNA respectively.

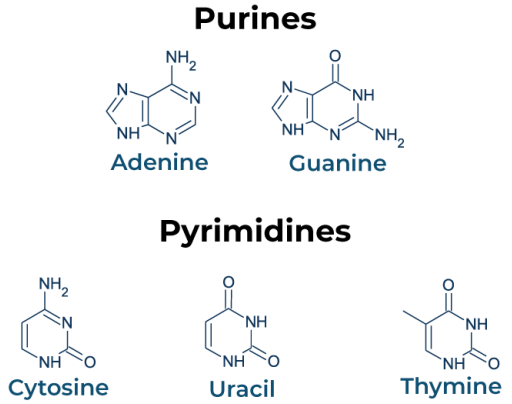
i. Nitrogenous Bases

These are the flat heterocyclic compounds having nitrogen and carbon in ring structure.

These are of basically two types

(a) Purines It is larger and composed of two rings. i.e., Adenine (A) and Guanine (G).

(b) Pyrimidines It is smaller and composed of single ring. i.e., Cytosine (C), Thymine (T) and Uracil (U).



iii. Phosphoric Acid (Phosphate Group)- PO_4^{-3}

A nucleotide may have 1, 2 or 3 phosphate groups. It gives acidic nature to the nucleotide.

Nucleoside= Ribose+ Nitrogenous Base

e.g., adenine + ribose —> adenosine.

Likewise guanosine, thymidine, uridine and cytidine are the examples of nucleoside.

The nucleoside combines with a phosphate group at 5-position by an ester bond to form a nucleotide.