BIOLOGY

CLASS NOTES FOR CBSE

Chapter 09. Biomolecules

01. Carbohydrates

These are the compound of carbon, hydrogen and oxygen having hydrogen and oxygen in the same ratio as that of water, i.e. 2 : 1. They are among the most widely distributed compound both in plant as well as animal kingdom.
On the basic of their reducing properties carbohydrates can be of two types, i.e. reducing sugar and non-reducing sugar.

Carbohydrates

Reducing sugar

- These are the sugars with free aldehyde (−CHO) or keto groups > C=0
- They can reduce (Cu^{2+}) to cuprous Cu^{+} ion.
- They reduce Fehling's solution and Benedict reagent. e.g. all monosaccharides,

Non-reducing sugar

- These sugar do not have free aldehyde or keto group.
- They cannot reduce the Fehling solution and Benedict reagent. e.g. sucrose.
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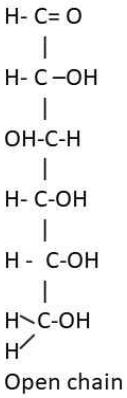
On the basis of hydrolysis, products of carbohydrates, products of carbohydrates can be monosaccharides, oligosaccharides and polysaccharides

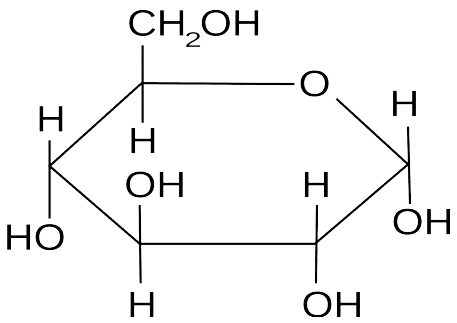
Monosaccharides

These are simple carbohydrates that cannot be hydrolysed further into smaller units. They consists of a single polyhydroxy aldehyde or ketone unit. These are mostly made up of 3-7 carbon atoms.

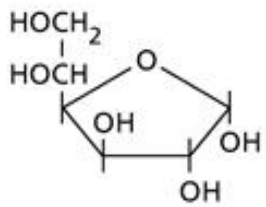
(i) Based on the number of carbon atom the monosaccharides are regarded as
  (a) **Trioses** having 3C atoms, e.g. glyceraldehyde and dihydroxyacetone.
  (b) **Tetroses** having 4C atoms, e.g. thriose and erythrose
  (c) **Pentose** having 5C atoms, e.g. ribose, ribulose
  (d) **Hexoses** having 6C atoms, e.g. glucose, galactose and mannose

(i) **Pyranose** ring which has hexagonal shape with 5C and 1 oxygen atoms.

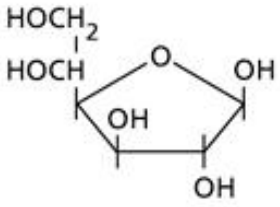




(ii) **Furanose ring** which has pentagonal shape with 4C atom and 1 oxygen atom.



α -D glucofuranose



β -D glucofuranose

Oligosaccharide

These are formed by the condensation of 2-9 monosaccharide units. In oligosaccharides these units are held together by glycosidic bonds.

(i) Disaccharide, e.g. sucrose, maltose, lactose, trehalose, etc.

(ii) **Trisaccharide,** e.g. raffinose.

(iii) **Tetrasaccharide,**, e.g. stachyose.

Polysaccharide or Glycans

These are polymers or chains of monosaccharides (usually more than9) bound in linear or branched chain pattern.

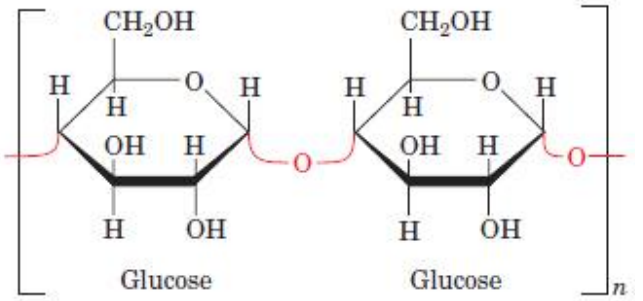
Homoglycans or Homopolysaccharide

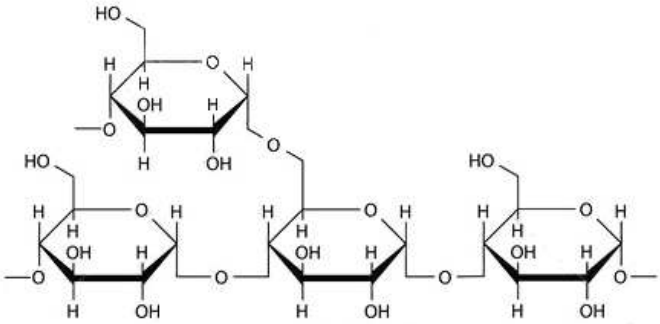
They are the polysaccharide, which are formed by the polymerisation of only one type of monosaccharide unit, e.g. starch, glycogen, cellulose, callose, etc.

(i) **Starch**

It is a polymer of D-glucopyranose units liked by $\alpha-1,4$- glycosidic linkages. It consists of a mixture of amylose and amylopectin in 1 : 4 ratio. Amylose is linear and consists of about 200-500 glucose unit, on the other hand amylopectin is branched and consists of over 1000 glucose units.

(ii)





(iii) **Glycogen**

It found mainly in mainly in liver and muscles. About 5000-15000 glucose units make up a glycogen molecule. It is a non-reducing sugar that gives red colour with iodine.

(iv) **Cellulose**

It is the most important structural component of the cell wall o plants. It is a linear polymer of $\beta-D$ glucose unit connected through $\beta-1$, 4- glycosidic linkages.

Heteroglycans or Heteropolysaccharide

They are the complex polysaccharide, Which are formed by the polymerisation of two or more types of monosaccharide unit,

02. Amino Acids

These are small molecule made up of carbon, hydrogen, nitrogen, oxygen and in some cases sulphur also. They are considered to be the first molecule formed in the atmosphere of the earth. *They serve as monomers of proteins*.

Structure

Amino acids are also referred as substituted methane. Each amino acid has a free carboxyl group, a free amino group and 'R' as the distinctive side chain (variable).

All these components are attached to a central carbon atom called α-carbon atom. Based on the nature of R group, a variety of amino acids are classified. The R in the amino acid could be a hydrogen or aliphatic, aromatic or heterocyclic group. The amino group imparts a basic character to amino acid. On the other hand carboxylic group gives it acidic character.