Biomolecules

1. **Carbohydrates :** These are optically active polyhydroxy aldehydes or ketones or the compounds which produce these on hydrolysis.

2. **Classification :**

   (i) **Monosaccharides:** Those carbohydrates which cannot be hydrolysed into further simpler carbohydrates. *E.g.,* glucose, fructose, galactose etc.

   (ii) **Disaccharides:** Those carbohydrates which produces two monosaccharides on hydrolysis. *E.g.,* sucrose, maltose and lactose.

   (iii) **Oligosaccharides:** Those carbohydrates which give two to ten monosaccharides on hydrolysis.

   (iv) **Polysaccharides:** Those carbohydrates which on hydrolysis give large number of monosaccharides hydrolysis. *E.g.,* starch, cellulose, glycogen.

3. **Sugar:** Carbohydrates which are sweet in taste.

   (i) **Reducing sugars:** Those which reduce Fehling's or Tollen's reagent due to availability of free aldehydic groups. *E.g.,* glucose, fructose, galactose.

   (ii) **Non-reducing sugars:** Those which do not reduce Fehling's or Tollen's reagent. They do not have free aldehydic group. *E.g.,* sucrose.

4. **Glucose:** It is a monosaccharide with molecular formula $C_6H_{12}O_6$.

5. **Preparation :**

   (i) **From sucrose :**

$$C_{12}H_{22}O_{11} + H_2O \longrightarrow \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

(ii) From starch :

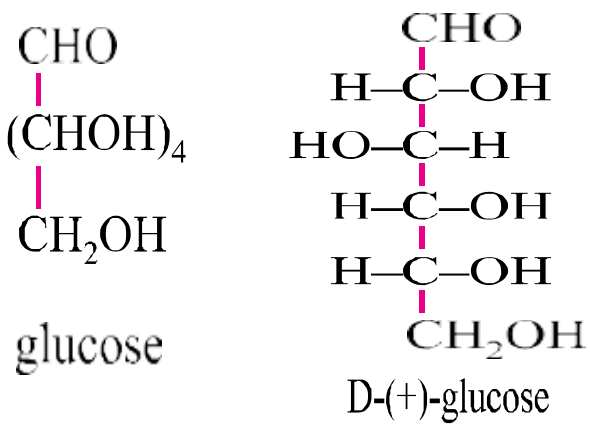
$$(C_6H_{10}O_5)_n + nH_2O \longrightarrow C_{12}H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_6$$

glucose

6. Structure :

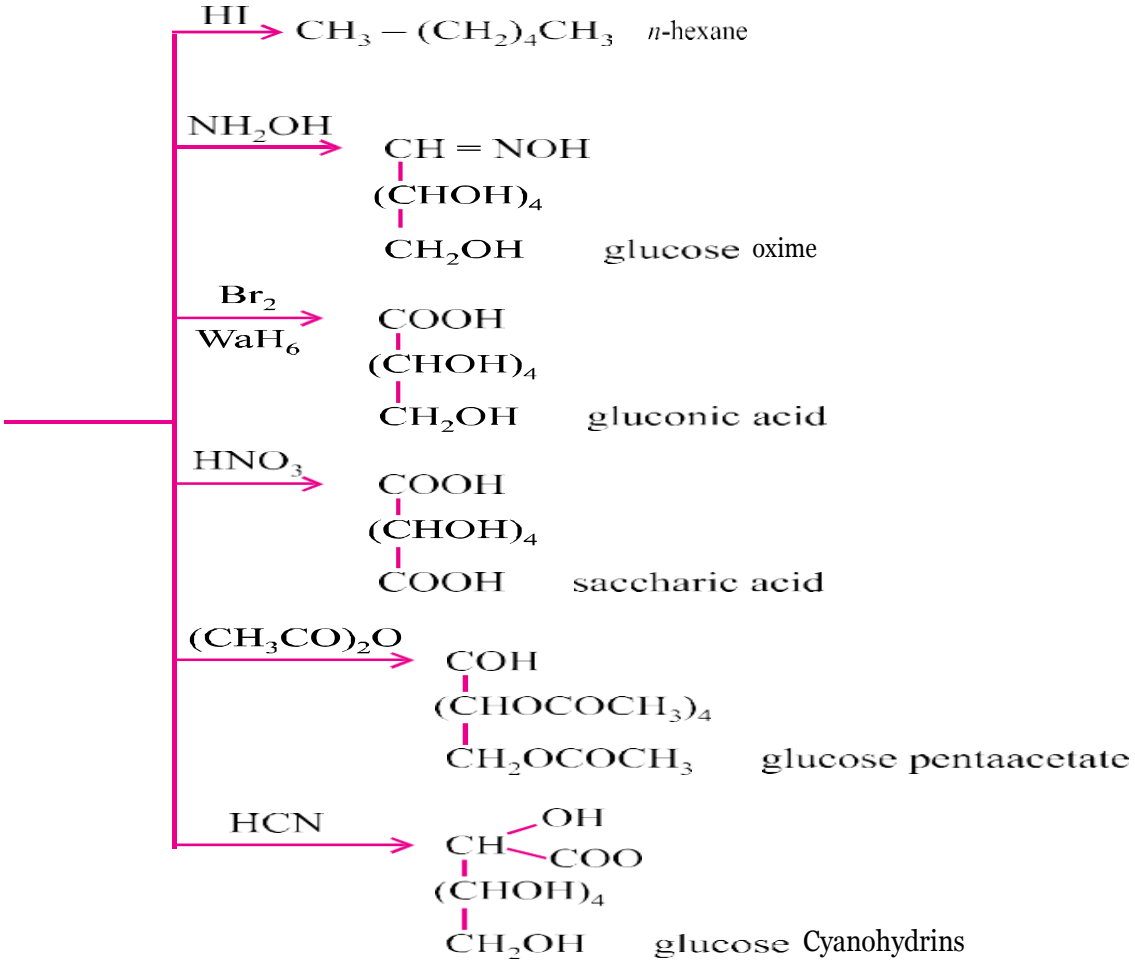
Fischer structure:

(+) glucose has 'D' configuration as shown:



'D'- means – OH group on first chiral 'C' from the bottom is on right hand and (+) means it is dextrorotatory *i.e.,* it rotates plane polarized light towards right.

Reactions of glucose :



Objections against open chain structure of glucose

The open chain structure was unable to explain the following reactions:

(a) It does not give the 2, 4-DNP test, Schiff's test and does not form the hydrogensulphide product with $NaHSO_3$.

(b) The pentacetate of glucose does not react with NH_2OH, indicating the absence of free aldehydic group.

(c) Glucose exist in 2 different crystalline forms □ and □ forms. These are called anomers. They differ in optical rotation; they also differ in melting point.

After which a close chain (cyclic) structure of glucose was proposed by Haworth.

* Anomers are isomers which have a different configuration at C-1 functional group c-atom

7. **Glycosidic linkage:** The linkage between two monosaccharide units through oxygen is called the glycosidic linkage.
8. **Proteins:** These are macro molecules made up of amino acids joined by amide linkage (- CONH -) is here called as peptide linkage. These are required for growth and development of the body.
9. **Amino acids:** These contain an amino (- NH_2) and an acidic (- COOH) group and are therefore amphoteric in nature. In solution they exist in the form of zwitter ion (a dipolar ion).
10. **Classification**

Fibrous Protein	Glubular Protein
(i) Polypeptide chains run par`allel or anti-parallel and held together by hydrogen and disulphide bonds.	(i) Chains of polypeptide coil around to give a spherical shape.
(ii) Generally insoluble in water *e.g.,* keratin, collagen, myosin, fibroin.	(ii) Usually soluble in water, *e.g.,* insulin, thyroglobin, albumin, haemoglobin and fibrinogen gets converted into fibrous protein fibroin on clotting of blood.

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